LUDLUM MEASUREMENTS M44-10 Gamma Scintillator User Manual

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Contents

Introduction

The Model 44-10 sodium iodide (NaI) gamma scintillator is primarily used for detecting high-energy gamma radiation in the range of 60 keV to 2 MeV. It consists of a 5.1 x 5.1 cm (2 x 2 in.) diameter by thickness NaI crystal coupled to a photomultiplier tube and is housed in a 0.16 cm (0.062 in.) thick aluminum housing. The detector is energy dependent, over-responding by a factor of 5 in the 100 keV range and under-responding by a factor of 0.5 above 1 MeV when normalized to 137 Cs.

The Model 44-10 will operate with any Ludlum instrument or equivalent instrument that provides 500-1200 volts. The recommended instrument input sensitivity is approximately -10 mV or higher.

Some common applications for this detector include background radiation monitoring, high-sensitivity surveying, and spectrum analysis when used in conjunction with a single or multi-channel analyzer.

Model 44-10

Note:
The detector does not contain any consumable materials.

Note:
If the detector is used in a manner not intended by the manufacturer, the detector may not function properly

Unpacking and Repacking

Remove the calibration certificate or detector functional check certificate and place it in a secure location. Remove the detector and accessories (cable, etc.) and ensure that all of the items listed on the packing list are in the carton. If more than one detector is in the carton, refer to the calibration certificate(s) for serial number (S/N) match. The Model 44-10 S/N is located on the side of the detector near the connector.

To return the instrument or detector for repair or calibration, provide sufficient packing material to prevent damage during shipment and appropriate warning labels to ensure 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 “Service Department” from the drop-down menu. Then choose the appropriate Service Department division where you will find a link to the form.

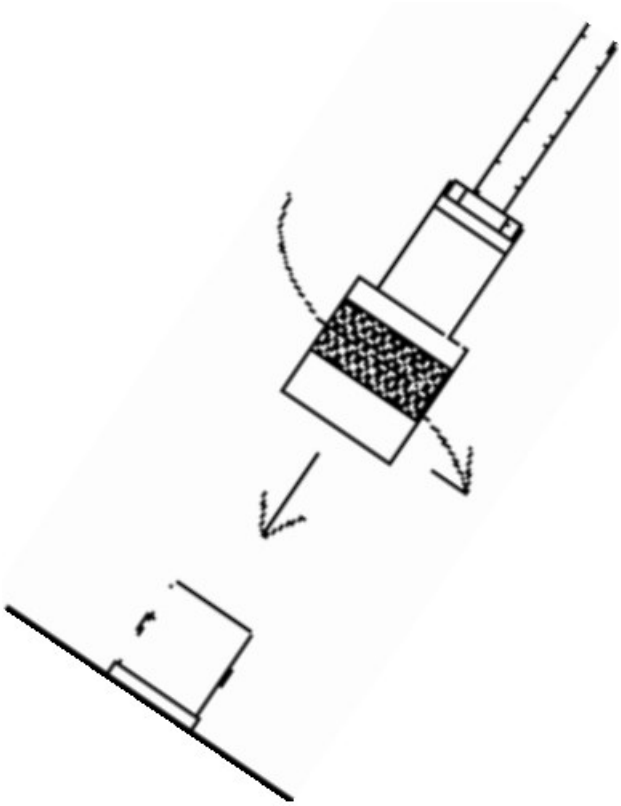
Specifications

- **SCINTILLATOR:** 5.1 x 5.1 cm (2 x 2 in.) (Dia x thickness), NaI (Tl) crystal
- **SENSITIVITY:** typically 900 cpm/µR/hr (137Cs gamma)
- E**NERGY RESPONSE**: energy dependent
- **COMPATIBLE INSTRUMENTS:** general purpose survey meters, ratemeters, and scalers
- **TUBE**: 5.1 cm (2 in.) diameter magnetically shielded photomultiplier
- **OPERATING VOLTAGE**: 500-1200 V
- **DYNODE STRING RESISTANCE**: 60 megohm
- **EFFICIENCY** (4π): 125I is 4%; 57Co is 20%, 137Cs is 9%; and 60Co is 15%.
- **CONNECTOR**: Series “C” (others available)
- **CONSTRUCTION**: aluminum housing with beige polyurethane enamel paint
- **TEMPERATURE RANGE**: -20 to 50 °C (-4 to 122 °F); may be certified to operate from -40 to 65 °C (-40 to 150 °F)
- **SIZE**: 6.6 x 27.9 cm (2.6 x 11 in.) (Dia x L)
- **WEIGHT**: 1.04 kg (2.3 lb)

Operating Procedures

CONNECTING TO AN INSTRUMENT

Connect one end of the cable provided to the detector by firmly pushing the connector together while twisting clockwise a quarter of a turn until latched. Repeat the process in the same manner with the other end of the cable and the instrument.



TESTING THE DETECTOR

1. Ensure that the instrument high voltage (HV) is at the proper setting for the detector (900 volts).
2. Connect the detector to the instrument and check for a proper background reading (typically 4,000-10,000 cpm at 8-15 µR/hr).
3. Expose the detector to a check source and verify that the instrument indicates within 20% of the check source reading from the last calibration. Alternatively, expose the detector to a source of known value and verify that the detector detects greater than or equal to the efficiency listed in the specification section of this manual.
4. Instruments and detectors that meet these criteria are ready for use. Failure to meet these criteria may indicate a malfunction in the detector.

Safety Considerations

ENVIRONMENTAL CONDITIONS FOR NORMAL USE

1. Indoor or outdoor use (in a dry environment)
2. No maximum altitude
3. Temperature range of -20 to 50 °C (-4 to 122 °F); may be certified for operation from -40 to 65 °C (-40 to 150 °F)
4. Maximum relative humidity of less than 95% (noncondensing)
5. Pollution Degree 3 (as defined by IEC 664) (Occurs when conductive pollution or dry nonconductive pollution becomes conductive due to condensation. This is typical of industrial or construction sites.)

CLEANING INSTRUCTIONS AND PRECAUTIONS

The detector may be cleaned externally with a damp cloth, using only water as the wetting agent. Do not immerse

the instrument in any liquid. Observe the following precautions when cleaning:

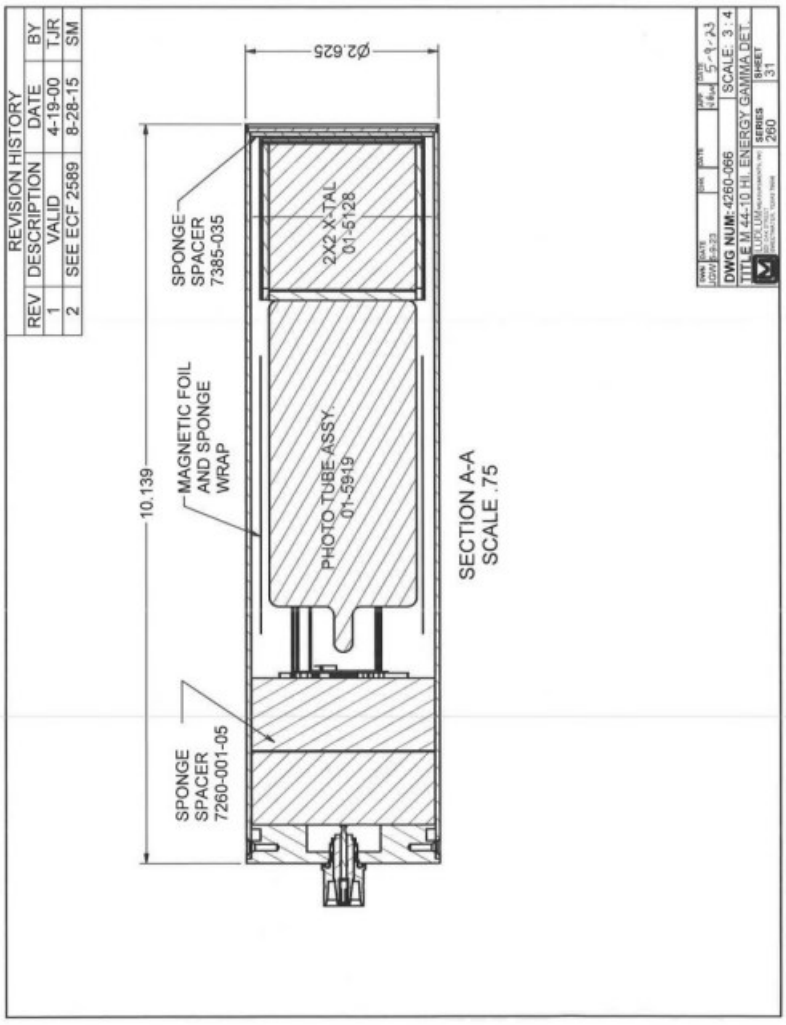
1. Turn the instrument electronics OFF.
2. Allow the instrument to sit for one minute.
3. Disconnect the detector cable before cleaning the detector

Parts List, Drawings and Diagrams

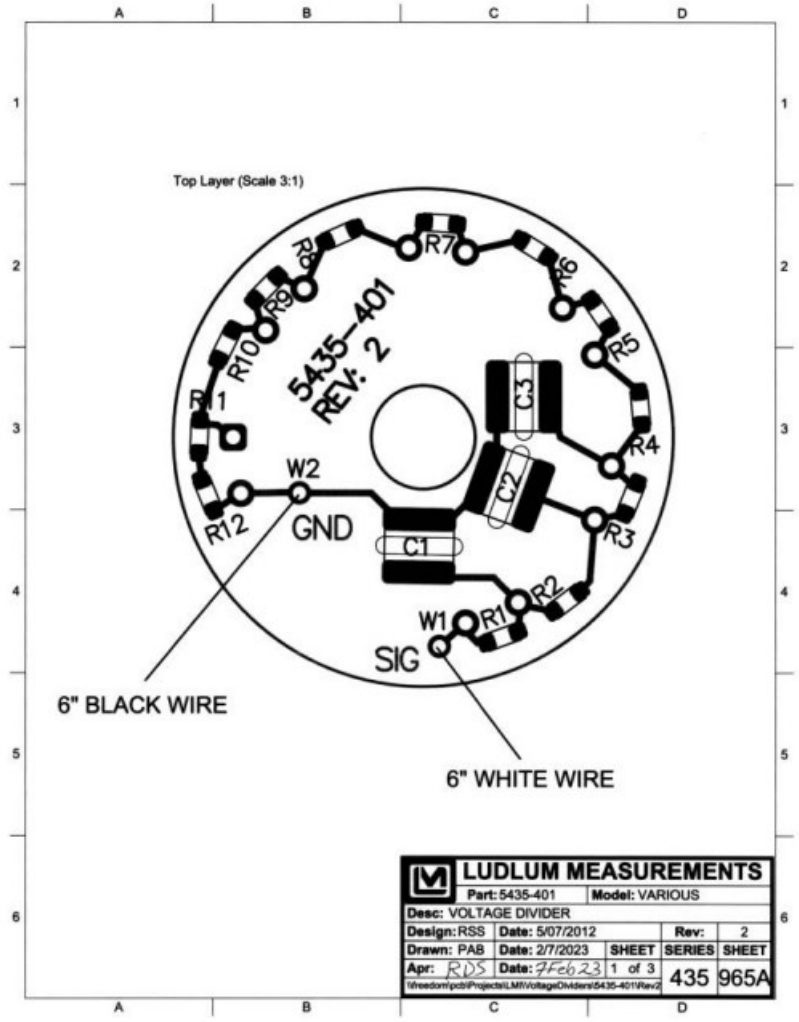
Model 44-10 Gamma Scintillator

Reference	Description	Part Number
UNIT	Completely Assembled Model 44-1 0 Gamma Scintillator	47-1540
1 EA	BODY CASE W/ CAP	2260-002-02
1 EA	CONNECTOR CAP	7260-002-01
1 EA	2 x 2 inch NaI CRYSTAL	01-5128
1 EA	2 inch PHOTO TUBE ASSY	01-5919
1 EA	CONNECTOR, UG706/U	4478-011
1 EA	O-RING	16-8289
8 EA	SPONGE SPACER	7260-001-05
1 EA	END SPONGE SPACER	7385-035
*	MAGNETIC FOIL	01-5019/5026
1 EA	SPONGE WRAP	21-9267

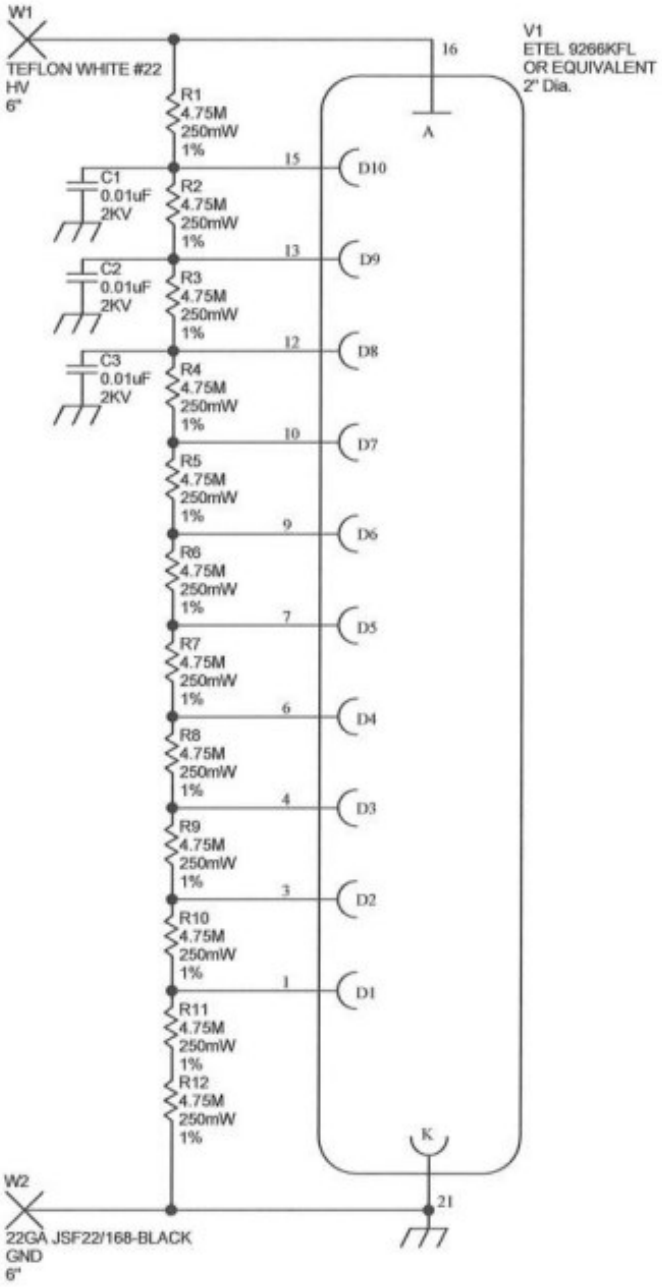
Model 44-10 Gamma Scintillator



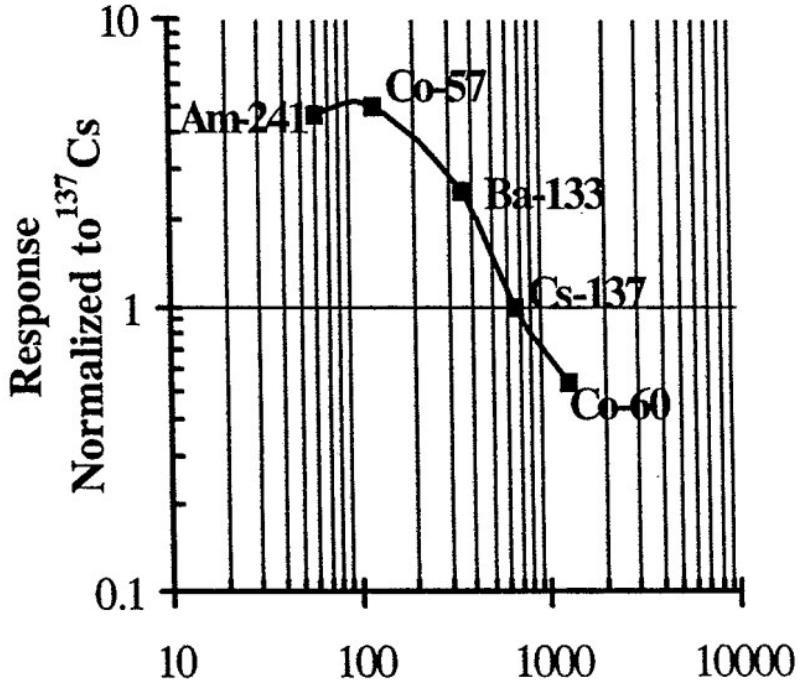
Reference	Description	Part Number
1 each	VOLTAGE DIVIDER	5435-401
3 each	CAP 0.01 µF 2k	04-5722
12 each	RES 4.75 meg 1/8 W, 1%	12-7995
1 each	Silicone white wire #22	21-8543
1 each	Silicone black wire #22	21-8552



2 inch Voltage Divider Board – Schematic



Energy Response for Ludlum Model 44-10



Documents / Resources

	LUDLUM MEASUREMENTS M44-10 Gamma Scintillator [pdf] User Manual M44-10 Gamma Scintillator, M44-10, Gamma Scintillator, Scintillator

References

- Ludlum Measurements, Inc.
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