

Radiation Safety &  
Imaging Quality Assurance  
Product Catalog





## *New Company*

*Ludlum is pleased to announce the recent formation of Ludlum Medical Physics. This unique company was created to more fully serve the Medical Physics community with products and services focusing on radiation detection instrumentation along with an accompanying line of test tools, phantoms and shielding for diagnostic and nuclear medicine quality assurance.*

*This catalog presents a whole range of products all from one company whose roots are legendary for high quality, affordable pricing, long service life and superior after-market support. Ludlum is committed to upholding these same values which have made it so successful for nearly 5 decades.*

*[www.medphys.ludlums.com](http://www.medphys.ludlums.com)*



*Visit our website to see our complete line of products and view the latest news.*

## *Technical Support*

*Sig Ditzig is the Medical Business Development Manager for Ludlum Medical Physics and brings a wealth of experience and knowledge of this market. Sig will be available to answer any technical questions and to assist in selecting products best suited to your needs. You can reach Sig at 440-878-0898 or via email: [sditzig@ludlums.com](mailto:sditzig@ludlums.com).*

RADIATION  
SAFETY

NUCLEAR  
MEDICINE  
QUALITY  
ASSURANCE

DIAGNOSTIC  
QUALITY  
ASSURANCE

## *Dependable Solutions at Affordable Prices*

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# New from Ludlum....

## *All Digital Pressurized Ion Chamber Survey Meter*



*Model 9DP*

Ludlum's NEW Model 9DP is an all digital pressurized ion chamber meter delivering highly sensitive measurements of exposure and exposure rate. In addition to the stunning color display, this instrument features auto-ranging and zeroing, dose rate peak capturing, and data logging to a USB thumb drive. This instrument can be set up to display a variety of user-defined messages in any language and is also available in SI units. *Learn more on page 13.*

## *Ludlum Exclusive*



*TG-51 Filter*



*HVL Filter Holder*

The Ludlum Exclusive, HVL Filter Holder and the TG-51 Filter have been designed to simplify the routine procedure of HVL and TG-51 measurement requirements, while at the same time protecting the filters used in these applications from damage. *See page 25.*

## *Nested CTDI Phantom*



*Model L-007N*

The Ludlum Nested CTDI Phantom can be used with any CT system and may be used to image and monitor adult head and body as well as pediatric dose requirements. The 'nested' configuration significantly reduces the weight of the phantom and therefore improves set-up and handling as well. *Details on page 40.*

*Dependable Solutions at Affordable Prices*

# Survey Meters (GM/Scintillation)

Model 3



Part Number: 48-1605

Model 44-9



Part Number: 47-1539

## Model 3 Survey Ratemeter with 44-9 Pancake Probe

### Introduction

This is Ludlum's best selling general purpose, handheld analog ratemeter known for accuracy and long lasting dependability. When connected to the Model 44-9 pancake detector, this system simultaneously detects alpha, beta and gamma radiation making it an excellent choice for Medical and Health Physics applications. The analog meter face supports an operating range of 0 - 200 mR/hr for measuring gamma exposure rate and 0 - 660 kcpm for alpha/beta/gamma. With the addition of the Model 180-2 sample holder, it can also be used to make a quick evaluation of wipe test surveys in the Nuclear Medicine department. When ordered together, the Model 3 and 44-9 Probe includes a 39" long interconnecting cable, and is shipped calibrated and ready for use.

### Specifications

#### Model 3 Analog Ratemeter

MULTIPLIERS: X0.1, X1, X10, X100  
 RANGE: 0-200 mR/hr, and 0-660,000 counts/minute (cpm)  
 LINEARITY: Reading within 10% of true value with detector connected  
 AUDIO: Built in unimorph speaker with ON/OFF switch (greater than 60 dB at 2 feet)  
 HIGH VOLTAGE: Adjustable from 400 - 1500 volts  
 THRESHOLD: Fixed at 40 mV  $\pm$  10 mV  
 RESPONSE: Toggle switch for FAST (4 seconds) or SLOW (22 seconds) from 10% to 90% of final reading  
 POWER: 2 each "D" cell batteries (housed in externally accessible sealed compartment)  
 BATTERY LIFE: Typically greater than 2000 hours with alkaline batteries  
 TEMPERATURE RANGE: -4°F to 122°F (-20°C to 50°C)  
 SIZE: 6.5" H x 3.5" W x 8.5" L (16.5 x 8.9 x 21.6 cm)  
 WEIGHT: 3.5 lbs. (1.6 kg) including batteries

#### Model 44-9 GM Pancake Detector

WINDOW: 1.7  $\pm$  0.3 mg/cm<sup>2</sup> mica  
 WINDOW AREA: Active - 15 cm<sup>2</sup>; Open - 12 cm<sup>2</sup>  
 EFFICIENCY(2pi): Typically 5%-<sup>14</sup>C; 22%-<sup>90</sup>Sr/<sup>90</sup>Y; 19%-<sup>99</sup>Tc; 32%-<sup>32</sup>P; 15%-<sup>239</sup>Pu  
 SENSITIVITY: Typically 3300 cpm/mR/hr (<sup>137</sup>Cs gamma )  
 ENERGY RESPONSE: Energy dependent  
 DEAD TIME: Typically 80  $\mu$ s



Model 180-2  
Sample Holder

### Options

Model 3-IS, Intrinsically Safe Ratemeter Instrument– for Operating Room & other hazardous environments: PN: 48-3581  
 Model 44-2, 1" x 1" NaI Gamma Detector: PN: 47-1532  
 1 uCi <sup>137</sup>Cs Check Source: PN 01-5196

# Survey Meters (GM/Scintillation)

## Model 3-IS Intrinsically Safe Ratemeter

### Introduction

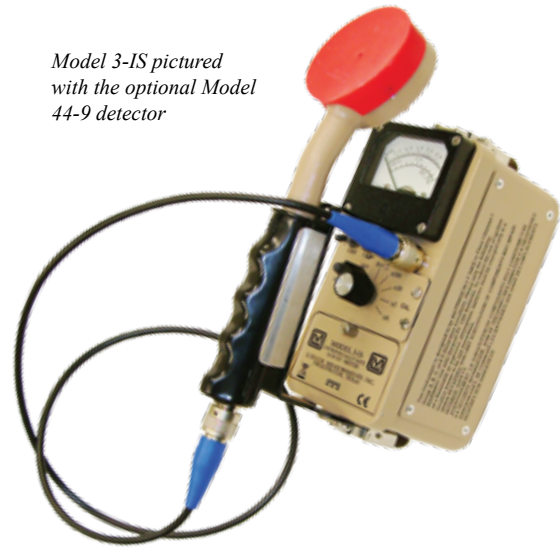
This intrinsically safe, general purpose ratemeter is patterned after Ludlum's best selling Model 3. This instrument was designed and tested to meet the demanding standards called for by current US intrinsic safety standards. Intrinsic safety (IS) is a protection technique for safe operation of electronic equipment in potentially explosive atmospheres.

The optional detectors which can be used to sustain the intrinsic safety rating are Ludlum Models 44-9, 44-2, 44-6 and 44-38.

### Specifications

#### Model 3-IS

WORKING CONDITIONS: Intrinsic safety  
 INDICATED USE: Alpha, beta, gamma survey  
 METER DIALS: Depends upon detector selected  
 MULTIPLIERS: X0.1, X1, X10, X100  
 SIZE: 6.5" H x 3.5" W x 8.5" L (16.5 x 8.9 x 21.6 cm)  
 WEIGHT: 3.5 lbs (1.6 kg) including batteries  
 CERTIFICATIONS:  
 UL 913  
 Class I, II, & III  
 Division 1 Groups A,B,C,D  
 CSA C22.2 No.157  
 UL 61010-1  
 CSA C22.2 No. 61010-1



Model 3-IS pictured with the optional Model 44-9 detector

Part Number: 48-3581

### Optional Intrinsically Safe Detectors

#### Model 44-9, GM Pancake

USE: Alpha, beta, gamma  
 WINDOW:  $1.7 \pm 0.3$  mg/cm<sup>2</sup> mica  
 WINDOW AREA: Active - 15 cm<sup>2</sup>  
 Open - 12 cm<sup>2</sup>  
 EFFICIENCY(2pi): Typically 5%  
<sup>14</sup>C; 22%<sup>90</sup>Sr/<sup>90</sup>Y; 19%<sup>99</sup>Tc; 32%<sup>32</sup>P; 15%<sup>239</sup>Pu  
 SENSITIVITY: Typically 3300 cpm/mR/hr (<sup>137</sup>Cs gamma)  
 SIZE: 1.8" H x 2.7" W x 10.7" L (4.6 x 6.9 x 27.2 cm)  
 WEIGHT: 1 lb (0.5 kg)

#### Model 44-2, Gamma Scintillator

USE: Low-level, wide-energy  
 SCINTILLATOR: 1" diameter x 1" thick NaI (2.5 x 2.5 cm)  
 SENSITIVITY: Typically 175 cpm/uR/hr (<sup>137</sup>Cs gamma)  
 BACKGROUND: 1900 cpm  
 ENERGY RANGE: 50 KeV - 1.5 MeV  
 SIZE: 2" diameter x 7.3" long (5.1 x 18.5 cm)  
 WEIGHT: 1 lb. (0.5 kg)

#### Model 44-6, Beta/Gamma GM

USE: Beta, gamma survey  
 DETECTOR: 30-45 mg/cm<sup>2</sup> stainless steel wall halogen quenched GM  
 SENSITIVITY: 1200 cpm per mR/hr (<sup>137</sup>Cs gamma) with window closed  
 BACKGROUND: 20 cpm closed; 25 cpm open  
 BETA CUT OFF: Approximately 200 keV (window open)  
 CONSTRUCTION: 1000 mg/cm<sup>2</sup> wall density  
 SIZE: 1.2" diameter 6" long (3 x 15.2 cm)  
 WEIGHT: 1 lb (0.5 kg)

#### Model 44-38, Beta/Gamma GM

USE: Energy compensated gamma survey  
 DETECTOR: 30-45 mg/cm<sup>2</sup> stainless steel wall halogen quenched GM  
 SENSITIVITY: 1200 cpm per mR/hr (<sup>137</sup>Cs gamma) with window closed  
 BACKGROUND: 20 cpm closed; 25 cpm open  
 BETA CUT OFF: Approximately 200 keV (window open)  
 SIZE: 1.3" diameter 6.5" long (3.3 x 16.5 cm)  
 WEIGHT: 1 lb (0.5 kg)

### Options

1 uCi <sup>137</sup>Cs Check Source: PN 01-5196  
 Check Source Holder: PN 4062-166  
 Small Carrying Case: PN: 2311062

## Survey Meter (GM/Scintillation)

## Model 193-6 Floor Survey Monitor

**Introduction**

The Ludlum Model 193-6 Floor Survey Monitor may be used for a variety of medical and health physics applications and is ideal for low level (microR) measurement of real or suspected radiation spills in a variety of environments.

This instrument design utilizes a highly sensitive 6" diameter plastic scintillation detector which makes short work of confirming (or clearing) the presence of radionuclides in an isotope laboratory or nuclear medicine work area. The detection range is from background up to 1000 uR/hr.

Attached to the user-end of the pole is a 4 decade analog ratemeter employing an aluminum cast instrument housing with a separate battery compartment and accompanying metal handle. The overall design delivers industrial robustness and quality that promote long lasting protection and instrument life.



Part Number: 48-3063

**Specifications**

INDICATED USE: Low level (microR) gamma survey

ALARM: dual action alarm:

- 1) A fixed alarm point that can be set at any point from 10% of full scale to full scale, and is indicated by a constant audible tone, and the lamp turning on.
- 2) A quick deviation alarm that is based on background radiation levels. When the instrument is turned on, it takes an 8 second measurement of background radiation levels and determines a deviation alarm setting. If the radiation level exceeds this setting, the alarm audio will beep every 1/8 second, and the lamp will flash.

RESET: Push button to zero meter, and also re-accumulate background data and recalculate the alarm point.

BATTERY LIFE: Typically 600 hours with alkaline batteries (battery condition can be checked on meter)

DETECTOR: 6" diameter x 1" thick (15.2 x 2.5 cm) plastic scintillator

SENSITIVITY: Typically 2000 cpm/uR/hr (<sup>137</sup>Cs gamma)

METER DIAL: 0 - 1 uR/hr, BAT TEST (others available)

MULTIPLIERS: X1, X10, X100, X1000

ENERGY RESPONSE: Energy dependent

HIGH VOLTAGE: Fixed based on detector

WEIGHT: 8.5 lbs. (3.9 kg) including batteries

**Options**

1 uCi <sup>137</sup>Cs Check Source: PN: 01-5196

Shoulder Strap: PN: 4363-413

Handle Mounted Meter Light: PN: 4464-154

# Survey Meters (GM/Scintillation)

Model 14C



Part Number: 48-1611

Model 44-9



Part Number: 47-1539

## Model 14C Survey Ratemeter with Pancake Probe

### Introduction

This general purpose, handheld analog ratemeter supports operating two separate radiation detectors. A switch on the front panel allows the user to select between the internally mounted GM detector for detecting gamma exposure over a range of 0 - 2000 mR/hr or the external Model 44-9 GM pancake detector. The pancake detector is sensitive to alpha, beta and gamma and is the industry standard for detecting contamination. This survey meter additionally supports externally connected scintillation detectors in lieu of GM's. The Model 14C can be used in a wide range of Medical and Health Physics applications. With the addition of the Model 180-2 sample holder, it can be utilized to make a quick evaluation of wipe test surveys in the Nuclear Medicine department.

### Specifications

#### Model 14C, Survey Meter

MULTIPLIERS: X0.1, X1, X10, X100, X1000  
 LINEARITY: Reading within  $\pm 10\%$  of true value with detector connected  
 ENERGY RESPONSE: Within  $\pm 15\%$  of true value between 60 keV - 3 MeV (internal detector only)  
 CONNECTOR: Series "C" (others available)  
 AUDIO: Built in unimorph speaker with ON/OFF switch (greater than 60 dB at 2 feet)  
 HIGH VOLTAGE: 900 V (setting can be checked on meter); THRESHOLD: 30 mV  $\pm$  10 mV  
 RESPONSE: Toggle switch for FAST (4 seconds) or SLOW (22 seconds) from 10% to 90% of final reading  
 POWER: 2 each "D" cell batteries (housed in sealed compartment that is externally accessible)  
 BATTERY LIFE: Typically greater than 2000 hours with alkaline batteries  
 TEMPERATURE RANGE: -4°F to 122°F (-20° to 50° C)  
 SIZE: 6.5" H x 3.5" W x 8.5" L (16.5 x 8.9 x 21.6 cm)  
 WEIGHT: 3.5 lbs (1.6 kg) including batteries

#### Model 44-9, GM Pancake Detector

WINDOW: 1.7  $\pm$  0.3 mg/cm<sup>2</sup> mica  
 WINDOW AREA: Active - 15 cm<sup>2</sup>; Open - 12 cm<sup>2</sup>  
 EFFICIENCY(2pi): Typically 5%<sup>-14C</sup>; 22%<sup>-90Sr/90Y</sup>; 19%<sup>-99Tc</sup>; 32%<sup>-32P</sup>; 15%<sup>-239Pu</sup>  
 SENSITIVITY: Typically 3300 cpm/mR/hr (<sup>137</sup>Cs gamma)  
 ENERGY RESPONSE: Energy dependent  
 DEAD TIME: Typically 80  $\mu$ s

### Options:

Model 44-2, 1" x 1" NaI Gamma Detector: PN: 47-1532  
 1  $\mu$ Ci <sup>137</sup>Cs Check Source: PN: 01-5196  
 Check Source Holder: PN: 4062-166



Model 180-2  
Sample Holder



# Survey Meters (GM/Scintillation)

## Model 14C-MERK Response Kit

### Introduction

This response kit is an ideal tool for any Emergency Department or Nuclear Medicine Department. It offers a detector complement optimized for medical isotopes and includes personal dosimetry protection. The kit will easily meet the (radiation) requirements of their Emergency Response Plan.

The Response Kit includes the:

- \* Model 14C Analog Survey Ratemeter which is designed with an internal energy compensated GM gamma detector capable of measuring gamma exposure levels up to 2000 mR/hr. A switch on the front panel enables the user to select between the internal GM or to one of the external probes supplied with the kit.
- \* Model 44-9 Pancake Probe
- \* Model 44-2 NaI Scintillation Probe
- \* Model 25, Personal Dosimeter/Ratemeter allows medical personnel to monitor their safety during activities associated with a radiation incident
- \* 1 uCi, <sup>137</sup>Cs check source
- \* 39" long detector cable



Part Number: 48-3722

### Specifications

#### Model 14C Specifications

MULTIPLIERS: X0.1, X1, X10, X100, X1000  
 LINEARITY: Reading within  $\pm 10\%$  of true value with detector connected  
 ENERGY RESPONSE: Within  $\pm 15\%$  of true value between 60 keV - 3 MeV (internal detector only)  
 CONNECTOR: Series "C" (others available)  
 AUDIO: Built in unimorph speaker with ON/OFF switch (greater than 60 dB at 2 feet)  
 HIGH VOLTAGE: 900 V (setting can be checked on meter); THRESHOLD: 30 mV  $\pm$  10 mV  
 RESPONSE: Toggle switch for FAST (4 seconds) or SLOW (22 seconds) from 10% to 90% of final reading  
 POWER: 2 each "D" cell batteries (housed in sealed compartment that is externally accessible)  
 BATTERY LIFE: Typically greater than 2000 hours with alkaline batteries  
 TEMPERATURE RANGE: -4°F to 122°F (-20° to 50° C)  
 SIZE: 6.5" H x 3.5" W x 8.5" L (16.5 x 8.9 x 21.6 cm)

#### Model 44-9, GM Pancake Detector

USE: Alpha, beta, gamma survey  
 WINDOW: 1.7  $\pm$  0.3 mg/cm<sup>2</sup> mica  
 WINDOW AREA: Active - 15 cm<sup>2</sup>; Open - 12 cm<sup>2</sup>  
 EFFICIENCY(2pi): Typically 5% -<sup>14</sup>C;  
 22% -<sup>90</sup>Sr/<sup>90</sup>Y; 19% -<sup>99</sup>Tc; 32% -<sup>32</sup>P; 15% -<sup>239</sup>Pu  
 SENSITIVITY: Typically 3300 cpm/mR/hr (<sup>137</sup>Cs gamma)  
 ENERGY RESPONSE: Energy dependent

#### Model 44-2, Gamma Scintillator

USE: Low-level, wide-energy  
 SCINTILLATOR: 1" diameter x 1" thick NaI (2.5 x 2.5 cm)  
 SENSITIVITY: Typically 175 cpm/uR/hr (<sup>137</sup>Cs gamma)  
 BACKGROUND: 1900 cpm  
 ENERGY RANGE: 50 KeV - 1.5 MeV  
 SIZE: 2" diameter x 7.3" long (5.1 x 18.5 cm)  
 WEIGHT: 1 lb. (0.5 kg)

#### Model 25

DETECTOR: Internal energy-compensated GM  
 ENERGY RANGE: 60 keV to 2 MeV  
 DISPLAY: 3½ digit backlit LCD display with a total range from .01 mR/hr (or mR) to 1999 R/hr (or R), also displays time remaining from 19:59 to 00:01 (in hh:mm format). (Model 25-1 displays .001 mSv/h to 19.99 Sv/h)  
 ALERT & ALARMS: Adjustable over entire range  
 ALARM INDICATIONS: Distinct alerts and alarms for exposure and accumulated dose  
 AUDIO: Built in speaker (Typically 95 dB at 1 foot)  
 LOW BATTERY INDICATION: Provides 8 hours warning of low battery  
 POWER: 2 each lithium coin cell batteries  
 BATTERY LIFE: Typically 6000 hrs.  
 TEMPERATURE RANGE: -40°F to 150°F (-40° to 65°C)  
 SIZE: 3.0" H x 2.125" W x 0.687" thick (7.6 x 5.4 x 1.7 cm)  
 WEIGHT: 5.1 oz including batteries

# Survey Meters (GM/Scintillation)

## Model 2241-3 Digital Survey Meter

### Introduction

The Model 2241-3 is a versatile digital, auto-ranging survey ratemeter with a built-in scaler for timed counts. This multi-purpose meter supports GM, proportional and scintillation detectors. A selector switch on the front panel permits the operator to select between 4 different detector setups to accommodate switching between different detectors out in the field without requiring any re-calibration.

The 2241-3 can be used for a wide range of Medical and Health Physics applications and will be a valuable asset to any medical center RSO.



Part Number: 48-2864

### Specifications

**DISPLAY:** 4 digit Liquid Crystal Display (LCD) with digits 0.5" high. Two additional digits 0.2" high for scaler mode counts. Warning indicators for counter overflow, Alert, Alarm, Battery, and Counting.

**LCD BACKLIGHT:** Pushbutton activated for pre-programmed interval, 5,15,30,60,90,120, 180 or 240 seconds

**RATEMETER:** Programmable units of measurement, autoranging,

**SCALER:** Adjustable from 1 - 999999 seconds, displayed time base seconds or minutes

**UNITS:** R/hr, Sv/hr, cpm, cps and counts

**ALARMS:** Ratemeter Mode: programmable over entire range, Scaler Mode: adjustable from 1 to 999999 counts

**AUDIO:** Built-in speaker, 60 dB at 2 feet, internal adjustable volume, audio divide by 1,10,100 or 1000 events/click

**LINEARITY:**  $\pm 10\%$  of true value

**CONTROLS:** Selector switch for choosing between 4 different detector setup parameters, Ratemeter/Scaler Mode switch, Audio On/Off switch, Fast/Slow Response switch, Light button, Reset button

**RESPONSE:** Choice of Variable (default) or Fixed. All times correspond to a range of 10% to 90% of final reading

**RS-232:** 150 - 19.2 K bps, used for setup and data streaming at 2 second intervals, "D" type connector

**POWER:** 2 each "D" cell batteries (housed in sealed compartment that is externally accessible)

**BATTERY LIFE:** Typically 200 hours with alkaline batteries

**TEMPERATURE RANGE:** -4° F to 122° F (-20° C to 50° C)

**SIZE:** 6.5" H x 3.5" W x 8.5" L (16.5 x 8.9 x 21.6 cm)

**WEIGHT:** 3.5 lbs (1.6 kg) including batteries

### Options

Carrying Case: PN: 2311062

1 uCi <sup>137</sup>Cs Check Source: PN: 01-5196

Check Source Holder: PN: 4062-166

## Survey Meters (GM/Scintillation)

### Model 2241-3 MERK Medical Environment Response Kit

#### Introduction

This response kit is an ideal tool for any Emergency Department or Nuclear Medicine Department. It offers a detector complement optimized for medical isotopes and includes personal dosimetry protection. The kit will easily meet the (radiation) requirements of their Emergency Response Plan.

The Model 2241-3 MERK Kit includes the:

- \* Model 2241-3 digital survey ratemeter with built-in scaler
- \* Model 44-9, 15 cm<sup>2</sup> GM Pancake Detector
- \* Model 44-2, 1" x 1" NaI Scintillator Detector
- \* Model 44-142, 100 cm<sup>2</sup> Beta Scintillator Detector
- \* Model 25, Personal Dosimeter/Ratemeter allows medical personnel to monitor their safety during activities associated with a radiation incident
- \* 1 uCi, <sup>137</sup>Cs check source
- \* 39 inch long detector cable
- \* Carrying case, for easy transportation of the kit to the affected site



Part Number: 48-2864

#### Specifications

##### Model 2241-3 Digital Survey Meter

**DISPLAY:** 4 digit Liquid Crystal Display (LCD) with digits 0.5" high. Two additional digits 0.2" high for scaler mode counts. Warning indicators for counter overflow, Alert, Alarm, Battery, and Counting.  
**LCD BACKLIGHT:** Pushbutton activated for pre-programmed interval, 5,15,30,60,90,120, 180 or 240 seconds  
**RATEMETER:** Programmable units of measurement, autoranging,  
**SCALER:** Adjustable from 1 - 999999 seconds, displayed time base seconds or minutes  
**UNITS:** R/hr, Sv/hr, cpm, cps and counts  
**ALARMS:** Ratemeter Mode: programmable over entire range, Scaler Mode: adjustable from 1 to 999999 counts  
**AUDIO:** Built-in speaker, 60 dB at 2 feet, internal adjustable volume, audio divide by 1,10,100 or 1000 events/click  
**LINEARITY:** ± 10% of true value  
**CONTROLS:** Selector switch for choosing between 4 different detector setup parameters, Ratemeter/Scaler Mode switch, Audio On/Off switch, Fast/Slow Response switch, Light button, Reset button  
**RESPONSE:** Choice of Variable (default) or Fixed. All times correspond to a range of 10% to 90% of final reading  
**RS-232:** 150 - 19.2 K bps, used for setup and data streaming at 2 second intervals, "D" type connector  
**POWER:** 2 each "D" cell batteries (housed in sealed compartment that is externally accessible)  
**BATTERY LIFE:** Typically 200 hours with alkaline batteries  
**TEMPERATURE RANGE:** -14° F to 122° F (-10° C to 50° C)  
**SIZE:** 6.5" H x 3.5" W x 8.5" L (16.5 x 8.9 x 21.6 cm)  
**WEIGHT:** 3.5 lbs (1.6 kg) including batteries

##### Model 44-9, GM Pancake Detector

**WINDOW:** 1.7 ± 0.3 mg/cm<sup>2</sup> mica  
**WINDOW AREA:** Active - 15 cm<sup>2</sup>; Open - 12 cm<sup>2</sup>  
**EFFICIENCY(2pi):** Typically 5% - <sup>14</sup>C; 22% - <sup>90</sup>Sr/<sup>90</sup>Y; 19% - <sup>99</sup>Tc; 32% - <sup>32</sup>P; 15% - <sup>239</sup>Pu  
**SENSITIVITY:** Typically 3300 cpm/mR/hr (<sup>137</sup>Cs gamma)  
**ENERGY RESPONSE:** Energy dependent  
**DEAD TIME:** Typically 80 µs

##### Model 44-2, Gamma Scintillator

**USE:** Low-level, wide-energy  
**SCINTILLATOR:** 1" diameter x 1" thick NaI (2.5 x 2.5 cm)  
**SENSITIVITY:** Typically 175 cpm/uR/hr (<sup>137</sup>Cs gamma)  
**BACKGROUND:** 1900 cpm  
**ENERGY RANGE:** 50 KeV - 1.5 MeV  
**SIZE:** 2" diameter x 7.3" long (5.1 x 18.5 cm)  
**WEIGHT:** 1 lb. (0.5 kg)

##### Model 44-142, Beta Scintillator

**USE:** Beta contamination survey  
**AREA:** 100 cm<sup>2</sup> active, 89% open  
**SCINTILLATOR:** 0.01" Thick  
**WINDOW:** 1.2 mg/cm<sup>2</sup>  
**EFFICIENCY:** 4% - <sup>14</sup>C; 30% - <sup>90</sup>Sr/Y; 20% - <sup>99</sup>Tc  
**BACKGROUND:** 300-350 cpm in 10 uR/hr field  
**SIZE:** 3.2" x 3.5" x 12.2" (8.1 x 8.9 x 31 cm)

##### Model 25

**DETECTOR:** Internal energy-compensated GM  
**DOSE RATE RANGE:** 0-1000 R/hr  
**DOSE RANGE:** 0 - 1999 R  
**ENERGY RANGE:** 60 keV to 2 MeV  
**DISPLAY:** 3½ digit backlit LCD  
**ALERT & ALARMS:** Adjustable over entire range  
**ALARM INDICATIONS:** Distinct alerts and alarms for exposure and dose  
**AUDIO:** Built in speaker, 95 dB at 1'  
**LOW BATTERY INDICATION:** Provides 8 hours warning of low battery  
**POWER:** 2 lithium coin cell batteries  
**BATTERY LIFE:** Typically 6000 hrs.  
**TEMPERATURE RANGE:** -40°F to 150°F (-40° to 65°C)  
**SIZE:** 3.0" H x 2.125" W x 0.687" thick (7.6 x 5.4 x 1.7 cm)  
**WEIGHT:** 5.1 oz including batteries

## Survey Meters (Ion Chambers)

### Model 9-4 Air Ionization Chamber Survey Meter

#### Introduction

The Ludlum 9-4 is a rugged air ionization chamber for performing beta-gamma dose rate measurements over a 5 decade span ranging from background to 50 R/hr. This instrument is an excellent tool for measuring exposure rates from leakage and scatter radiation around diagnostic and therapeutic x-ray rooms.

The chamber wall, including the instrument case, is 1000 mg/cm<sup>2</sup>. A 1000 mg/cm<sup>2</sup> retractable beta shield allows beta measurement with a 7 mg/cm<sup>2</sup> window. The chamber is automatically compensated for temperature and pressure changes.



Part Number: 48-3739

#### Specifications

RANGE: 0 - 50 R/hr  
 ENERGY RESPONSE: +/- 20% of true value from 40 keV - 2 MeV  
 LINEARITY: Reading within 10% of true value  
 RESPONSE TIME: Approximately 5 seconds for 90% of final meter deflection on the x1 and x10 scales, and 3 seconds on the x100, x1k and x10k scales  
 BETA RESPONSE: Factor of 4.8 difference between window open and closed measurements when exposed to a uranium slab  
 CHAMBER VOLUME: 220 cm<sup>3</sup>  
 CHAMBER CONSTRUCTION: Carbon coated acrylic  
 SIDE WALL: 1000 mg/cm<sup>2</sup> aluminum and acrylic  
 BETA SHIELD: Retractable 1000 mg/cm<sup>2</sup> phenolic slide with side button control  
 WINDOW: 7 mg/cm<sup>2</sup> aluminized mylar  
 WINDOW AREA: 40 cm<sup>2</sup>  
 COMPENSATION: Automatically corrects for temperature and pressure changes in atmosphere  
 TEMPERATURE RANGE: -4° to 122° F (-20° to 50° C). Temperature compensation maintains calibration within 15% of 25° C reading  
 PRESSURE COMPENSATION RANGE: 70 - 106 kPa  
 METER: 2.5" (6.4 cm) arc, 1 mA, pivot-and jewel suspension  
 METER DIAL: 0 - 5 mR/hr, BAT TEST  
 CONTROLS:  
 \* Range Switch: 5 range multipliers x1, x10, x100, x1k, x10k and instrument off  
 \* Reset: Pressing the reset button causes the chamber to discharge  
 \* Bat Test: Pushbutton used to check battery capacity  
 \* Zero Adjust: 1 turn potentiometer to zero reading  
 \* Display Light: On/off switch  
 \* Calibration: Digitally set via USB to serial computer interface, stored in non-volatile memory  
 POWER: 2 each "D" cell batteries housed in a sealed externally-accessible compartment  
 BATTERY LIFE: 400 hours  
 CONSTRUCTION: Cast and drawn aluminum with beige powder-coating  
 SIZE: 9.2" H x 3.5" W x 8.5" L (23.4 x 8.9 x 21.6 cm) including instrument handle  
 WEIGHT: 4.2 lbs (1.9 kg) including batteries

#### Options:

Carrying Case: PN: 2311062  
 5 uCi <sup>137</sup>Cs Check Source: PN: 01-5186  
 Calibration Kit: PN: 4293-676

## Survey Meters (Ion Chambers)

## Model 9DP Pressurized Ionization Chamber Survey Meter

**Introduction**

The newly designed, all digital, Ludlum Model 9DP, pressurized ion chamber meter will provide highly sensitive measurements of exposure and exposure rate. The meter is light weight yet rugged, and can be used for medical, laboratory and industrial applications. The new meter offers auto-zeroing and auto-ranging features, as well as, an integrate mode and peak holding to capture the highest reading since the instrument was turned on. Other key features include a stunning full color, sunlight readable display, audio output, data logging with time stamp, USB PC interface, programmable user messages, free firmware updates via internet, rechargeable batteries, dose clearing, multi-lingual support and more.

The Model 9DP can be used for a variety of medical and health physics applications and is ideal for measuring exposure rates from leakage and scatter radiation around diagnostic and therapeutic x-ray rooms. The unit is shipped calibrated and ready for use upon arrival at the customer's site.



Part Number: 48-3742

**Specifications**

RADIATION DETECTED: Beta above 1 MeV; Gamma & X-rays above 25 keV

OPERATING RANGES: With R/h units: 0-500 uR/h, 0-5 mR/h, 0-50 mR/h, 0-500 mR/h, 0-5 R/h

With Sv/h units: 0 - 5 uSv/h, 0 -50 uSv/h, 0-500 uSv/h, 0 - 5 mSv/h, 0 - 50 mSv/h

CHAMBER VOLUME: 230 cc pressurized to 125 PSI

ACCURACY: +/- 10%

RESPONSE TIME: Ranges from 5 seconds in lowest range to under 2 seconds in highest range when measuring from 10% to 90% of final value

MEASUREMENT READOUTS: Simultaneous display of Dose Rate, Integrated Dose and Highest Dose Rate (Peak Hold)

DATA LOGGING: Stored to detachable USB thumb drive in csv format for easy retrieval by PC spreadsheet/database programs. Data points include real-time clock generated date and time with dose rate, integrated dose, and instrument status. Logging time intervals are set by PC interface program.

LCD DISPLAY: 3.5" diagonal (8.9 cm), 240 H x 320 W pixels, TFT active matrix, 262 colors, 220 cd/m<sup>2</sup>

USER CONTROLS: Instrument on/off, slow/fast response, audio on/off, alarm acknowledge/meter reset and clearing integrated dose

AUTOMATIC FUNCTIONS: Auto Ranging, Auto Zeroing, Auto LCD Backlighting

AUDIO OUTPUTS: Built-in unimorph speaker, > 60 dB at 2 feet, audio jack for connection to optional headset

ALARMS: Two levels of radiation alarms available, each are user programmable throughout entire readout range and set through a PC interface program.

Other alarms include low battery and various detector failures

TEMPERATURE RANGE: -4° to 122° F (-20° C to 50° C)

POWER: Eight rechargeable AA NiMH batteries, supplied with wall charger for direct connection to instrument

BATTERY LIFE: ~ 12 to 24 hours between charges depending upon use of backlighting

PC INTERFACE: USB, requires special cable and PC program sold separately

CONSTRUCTION: Durable plastic with metal support

SIZE: 8.62" H x 4.55" W x 9.63" L (21.9 x 11.6 x 24.5 cm)

WEIGHT: 3.15 lbs (1.43 kg) including batteries

**Options**

Dimension Interface Package, PN: 4293-763

Carrying Case, PN: 2310330

Stereo Headset, PN: 47-3708

## Specialized Survey Meters

## Model 702 NaI-based Isotope Identifier

**Introduction**

The portable Model 702 isotopic measurement system was developed to give end users a simple tool to quickly locate any abnormal levels of radioactivity and accurately identify the isotopes present. The instrument is coupled to a 2" x 2" NaI detector whose signal is gain stabilized and automatically calibrates itself via an embedded <sup>40</sup>K source. Other detector sizes and types are optionally available. The Model 702 additionally offers several advanced features for well trained experts seeking to perform more detailed analysis either in the field or in a laboratory. Spectrums can be captured to a removable Compact Flash disk or sent to a PC via an Ethernet connection. Quantum PC software to analyze the spectra more thoroughly is included along with a rugged carrying case and NiMH battery charger.

The Model 702 can be used for a wide range of Medical and Health Physics applications and will be a valuable asset to any medical center RSO. The unit is shipped calibrated and ready for use upon arrival at the customer's site.

**Specifications**

**FUNCTIONS:** Nuclide identification, spectrum analysis, dose rate calculation (rem/hr or Sv/hr), total dose, audible search tool.

**INTEGRATED ELECTRONICS:** Digital signal-processing MCA

**ADC TYPE:** Base converter 14-bit pipelined-flash

**CONV. MODES:** Linear 256, 512, 1024 QCC 256, 512 (U.S. Patent 5,608,222)

**LLD/ULD:** 0 to 100% of FS adjustable in < .01% steps Zero: ±100% of FS adjustable by channels

**PULSE PROCESSOR:** Trapezoidal filter with adjustable time constant and pulse shape discrimination.

**GAIN:** 0.5 to 16.0

**DETECTOR:** 2" x 2" NaI

**DETECTOR SENSITIVITY:** 900 cpm/uR/hr

**ENERGY RESOLUTION:** 7%

**ENERGY RANGE:** 18 keV – 3 MeV

**DISPLAY:** 320 x 240 high brightness 32000-color 3.5" transfective LCD display

**I/O:** 10/100 Ethernet port and optional RS-232 adapter cable.

**POWER:** 8 standard NiMH AA batteries and spare battery holder included; alkaline AAs can also be used. Universal AC power adapter included.

**TEMPERATURE RANGE:** -4° F to 122° F (-20° C to 50° C)

**TRIGGER LISTS:** Multiple trigger lists can be selected for different applications, including standard ANSI isotopes, medical, industrial, or user-defined lists.

**LIBRARY CUSTOMIZATION:** Modifications of isotopes and their associated energy lines can be done either in the field or using Microsoft Excel®. Essentially no limit to number of isotopes or lines.

**EASE OF USE:** Setup options can be password-protected for use by non-technical personnel.

**CALIBRATION:** Automatic calibration (temperature) stabilization with integral low-level 40K source. Coarse and fine energy calibration and dose-rate calibration done at factory, but available for expert users.

**CLOCK:** Battery-backed real-time clock/calendar.

**CONTROLS:** 7-key custom keypad with one-thumb operation.

**ALARM:** Visual (on screen) and Audio (internal speaker or optional headphones)

**WEIGHT:** 5.4 lbs. (2.45 kg)

**DIMENSIONS:** 12" L x 4" H x 5" W (30.5 x 10.2 x 12.7 cm) (excluding detector)

**Options**

Model 701, with 1" x 1" NaI Detector: PN: 48-3645

Model 703, with 3" x 3" NaI Detector: PN: 48-3646

Model 711, with 1.5" x 1.5" LaBr Detector: PN: 48-3644



Part Number: 48-3642

## Specialized Survey Meters

## Model 2241-4 Neutron Meter

**Introduction**

The Ludlum Model 2241-4 Portable Neutron Ratemeter/Scaler with moderated ( $^3\text{He}$ ) 9" Remball, is designed to make mRem neutron survey measurements for a variety of medical and health physics applications. The Model 2241-4 has the necessary sensitivity for the monitoring of neutron energies produced in the Megavoltage Linac environments in Radiation Therapy Facilities.

NCRP Report #151 redefines the need to evaluate not only new Linac installations but also equipment that has been upgraded for higher energies and broader capabilities like IMRT and Rotational Beam systems, which may be beyond what original shielding designs had recommended.



Part Number: 48-2973

**Meter Specifications**

DISPLAY: LCD with programmable backlight on time  
POWER: Two each "D" cell batteries  
BATTERY LIFE: Typically 200 hours  
AUDIO: Built-in audio speaker with Audio On/off switch, greater than 60 dB at 2 feet  
SCALER TIME: Pre-programmable from 1 - 999999 seconds. Can display seconds or minutes  
ALERT/ALARM: Pre-programmable alarms for Ratemeter and Scaler modes  
SIZE: 8.5" L x 7" H x 3.75" W (21.6 x 17.8 x 21.6)  
WEIGHT: 3.6 lbs. (1.63 kg)  
RS-232: "D" type connector, used for programming instrument and outputting data at 2 second intervals, baud rate from 150 - 19.2k bps

**Detector Specifications**

DETECTION RANGE: Thermal to approximately 12 MeV  
ENERGY RESPONSE: Approximately follows the inverse of the radiation protection guide curve for neutron dose  
DETECTOR: 2 Atm  $^3\text{He}$  tube LND 25185 or equivalent  
MODERATOR: 9" (22.9 cm) diameter cadmium-loaded polyethylene sphere  
SENSITIVITY: Typically 100 cpm/mrem/hr ( $^{241}\text{AmBe}$  fast neutrons)  
GAMMA REJECTION: Typically 10 cpm or less through 10 R/hr (100 mSv/hr) ( $^{137}\text{Cs}$ )  
OPERATING VOLTAGE: ~1200 volts  
THRESHOLD: -2 mV  
CONNECTOR: Series "C" (others available)  
SIZE: 10.25" H x 9" W x 9" D, (26.5 x 22.9 x 22.9 cm) including brackets  
TEMPERATURE RANGE: 5°F to 122°F (-15° to 50° C)  
WEIGHT: 14.5 lbs (6.6 kg)

# Personal Dosimeters / Pocket Meters

## Model 25 Personal Radiation Monitor

### Introduction

The Ludlum Model 25, Personal Radiation Monitor is a small, lightweight and yet rugged (shock proof and water resistant), alarming dosimeter. The Model 25 continuously monitors and alerts medical or hazmat personnel to the presence of radiation while also keeping track of the accumulated dose. The dual audible and visual alarms are adjustable over the entire display range.

Dose Rate: .01 mR/hr to 1999 R/hr

Dose: .01 mR to 1999 R

Calculated 'stay-time' to the programmed alarm is displayed by pressing the Mode key.

This instrument is also available in an 'Intrinsically Safe' version for use in Hazmat or Surgical Applications, where explosive gasses may be an issue. The Model 25 may also be used for monitoring the (real-time) daily accumulated dose of pregnant employees in Nuclear Medicine departments and Radiology/Fluoroscopic environments throughout the medical center. A protective Rubber Case and Lanyard are included.



Part Number: 48-3584

### Specifications

DISPLAY RANGE: .01 mR/hr to 1,000 R/hr

DETECTOR: Internal energy-compensated GM

GAMMA SENSITIVITY: 18 cpm/mR/hr

ENERGY RANGE: 60 keV to 2 MeV

DISPLAY: 3½ digit backlit LCD display with a total range from .01 mR/hr (or mR) to 1999 R/hr (or R), also displays time remaining from 19:59 to 00:01 (in hh:mm format)

ALARMS: Radiation alarms adjustable over entire range

- |                           |  |
|---------------------------|--|
| 1) Dose rate alert        | 5) Time remaining to allowed dose (hi)         |
| 2) Dose rate (hi)         | 6) Time remaining to allowed dose (lo)         |
| 3) Accumulated dose alert | 7) Detector failure                            |
| 4) Accumulated dose (hi)  | 8) Low battery notice when only 8 hours remain |

ALARM INDICATIONS: Distinct alerts and alarms for exposure and accumulated dose

AUDIO: Built in speaker (typically 95 dB at 1 foot )

LOSS OF COUNT: Detector failure results in a visual and audible warning

CALIBRATION: Requires no tools or software when exposed to a traceable radiation field

POWER: 2 each lithium coin cell batteries

BATTERY LIFE: Typically 6000 hours

CONSTRUCTION: Injection-molded plastic housing with sub-surface printed membrane front panel, completely gasketed for water resistance. Supplied with rubber boot with built-in belt feed-through

TEMPERATURE RANGE: -40°F to 150°F (-40°C to 65°C)

SIZE: 3.0"H x 2.125"W x 0.687"D (7.6 cm x 5.4 cm x 1.7 cm)

WEIGHT: 5.1 oz including batteries

### Options

Model 25-IS, Intrinsically Safe per US standards, PN: 48-3661

Arm Band, PN: 21-8974

Nylon Case, PN: 2311485



## Personal Dosimeters / Pocket Meters

## Model AT-138



Part Number: 51-2936

## Direct Read Dosimeter / Charger

**Introduction**

The Classic Model AT series, Direct Read Quartz/Carbon Fiber Pocket Dosimeters are available in a variety of monitoring ranges. The Low energy Model AT-138 (0-200 mR) may be used in Laboratory or Medical environments where gross accumulated dose measurements may be required for documentation of worker and visitor traffic in restricted areas.

**Specifications**

RANGE: 0 - 200 mR

ENERGY RESPONSE: 16 keV to 2 MeV

RADIATION DETECTED: Gamma and x-ray from 16 keV to 2 MeV

DETECTOR: Fiber electrometer mounted in an electrically conducting plastic ion chamber

DETECTOR HOUSING: Very low permeability plastic, hermetically sealed

ACCURACY: Within 10% of true exposure

RATE RESPONSE: Dose rate independent for gamma and x-radiation

ELECTRICAL LEAKAGE: Less than 0.5% of full scale for 24 hours at 50° C

TEMPERATURE RANGE: -4° F to 122° F (-20° C to 50° C)

RELATIVE HUMIDITY: Up to 90%

DIMENSIONS:

Length: 4.5 in. (12.4 cm),

Diameter: 0.6 in. (1.5 cm)

WEIGHT: 1.0 oz. (25 grams)

FINISH: Barrel and end caps: Natural matte black

Clips: Color coded plastic (color signifies range) or metal clips

WARRANTY: 2 year limited warranty

\* Meets ANSI Specifications N13.5 and N322

\* Low Leakage: Measures Background

## Model AT-909 Dosimeter Charger



Part Number: 51-2938

**Options**

Model AT-909 Charger - battery powered, PN: 51-2938

Model SCI-Charger, PN: 51-2940

## Model SCI-Charger (Hand Powered Charger)



Part Number: 51-2940

# Personal Dosimeters / Pocket Meters

## Passive Dosimetry System



## Dosimetry Reader System



## Model L-OSL Series Dosimeters

### Introduction

The InLight dosimeter provides x, gamma, and beta radiation monitoring with optically stimulated luminescence (OSL) technology. OSL technology is the newest advancement in passive radiation protection dosimetry. This InLight dosimeter offers reanalysis and imaging capabilities, precision with a wide dynamic range of measurement, long-term stability, and environmental integrity. This dosimeter is engineered to be read out by an InLight reader.

The Landauer InLight dosimeter design contains an assembly of a case component with an open window, aluminum, copper, and plastic filters, along with a four-positioned aluminum oxide detector slide component. Both the case and slide are uniquely bar coded with serial numbers for chain of custody and sensitivity identification.

Ludlum offers the following three dosimeters:

<u>Description</u>	<u>Model</u>	<u>Part Number</u>
Whole Body	L-OSL-WB	99-9806
Whole Body Albedo Neutron	L-OSL-WBN	99-9807
Environmental	L-OSL-ENV	99-9808

### **NEW! Model L-OSL-CT1-4**

CT Dosimeter for CTDI Measurement, PN: 99-9816



## Model L-OSL MS Micro Star Reader

### Introduction

The MicroStar reader provides readout for InLight System dosimeters. The InLight System measures radiation exposure with aluminum oxide detectors (Al<sub>2</sub>O<sub>3</sub>:C) read out by optically stimulated luminescence (OSL) technology. The reader stimulates the detector with a light emitting diode (LED) array causing it to luminesce in proportion to the amount of radiation exposure and the intensity of stimulation light. The luminescence is detected and measured by the reader's photo multiplier tube using a high sensitivity photon counting system. A dose calculation algorithm is then applied to the measurement to determine exposure results. This nondestructive type of readout allows for dose verification through reanalysis.

InLight menu-driven software residing on an external PC provides control over the setup, analysis, and data recording enabling dosimeter read out and reader quality control.

Designed for portability, the small lightweight reader can be used anywhere to measure immediate and accurate radiation dose assessments. For emergency response use, area monitoring, single point radiation assessment, or any radiation assessment application.

The Microstar reader includes operating, analysis and dose calculation algorithm software, laptop computer, carrying case, and a choice of InLight whole body dosimeters or OSL dots for single point measurements.

## Personal Dosimeters / Pocket Meters

Model 2401-P Front View



Part Number: 48-2875

Back View with Optional Belt Clip



### Pocket A/B/G Survey Meter

#### Introduction

The Ludlum Model 2401-P pocket sized Alpha, Beta, Gamma Survey Meter is an economical, portable and easy to use hand-held multipurpose survey meter. The 2401-P can be used for a wide range of Medical and Health Physics applications.

This meter is great for measuring low level surface contamination (I-125), or for locating dropped or lost (therapeutic) seeds in the Radiology or Nuclear Medicine departments.

#### Specifications

INDICATED USE: Alpha, beta, gamma survey  
 DETECTOR: 2.1" diameter pancake G-M  
 SENSITIVITY: Typically 3300 cpm/mR/hr (<sup>137</sup>Cs gamma)  
 ENERGY RESPONSE: Energy dependent  
 METER DIAL: 0 - 0.15 mR/hr; 0 - 500 cpm, BAT OK  
 MULTIPLIERS: X1, X10, X100  
 RANGE: 0-15 mR/hr; 0 - 50,000 cpm  
 LINEARITY: Reading within  $\pm 10\%$  of true value  
 AUDIO: Built in unimorph speaker (Quiet position turns audio OFF)  
 CALIBRATION CONTROLS: Accessible from front of instrument (protective cover provided )  
 RESPONSE: Typically 5 seconds from 10% to 90% of final reading  
 POWER: 1 each 9 volt batteries  
 BATTERY LIFE: Typically 250 hours with alkaline batteries (battery condition can be checked on meter )  
 METER: 2.5" (6.4 cm) arc, 1 mA analog type  
 CONSTRUCTION: Aluminum housing with beige polyurethane enamel paint and recessed subsurface printed membrane front panel.  
 TEMPERATURE RANGE: -4°F to 122°F (-20° to 50°C)  
 SIZE: 1.8" H x 3.3" W x 5.3" L (4.6 x 8.4 x 13.5 cm)  
 WEIGHT: 0.9 lbs (0.4 kg) including battery

#### Options

Belt Clip, PN: 4397-176  
 Handle, PN: 4397-165  
 Air & Watertight Case, PN: 2311119  
 Canvas Case, PN: 2310517  
 1 uCi, <sup>137</sup>Cs Check Source, PN: 01-5196



Model 2401-P with Handle and Case

## Area / Portal Monitors

### Model 375/2 & 375/4 Monitors



### Model 271 & 272D Remotes



Model 271



Model 272D

## Digital Area Monitors

### Introduction

The Model 375/2 & 375/4 are compact and very affordable digital area monitors. The only difference between the two models are their detection ranges (see specs below). The basic monitor and internal energy compensated GM is ideal for a wide variety of medical and health physics applications. The audible alarm and visual color coded alert indicators are designed to alert personnel of the presence of radioactive material. The unit is powered by a 6v rechargeable battery that is continuously trickle charged when the unit is connected to an AC Power supply.

With the addition of the optional Remote Alarm Modules, these area monitors can be used to provide continuous monitoring of (normal) background radiation in radioactive material preparation and work areas (ie. Nuclear Medicine Hot Labs). The system can also be used for monitoring of Teletherapy (Cobalt) Treatment rooms, notifying personnel that the source is exposed and in-use.

### Specifications

#### RANGE:

- Model 375/2: 0.1 mR/hr - 1 R/hr
- Model 375/4: 1.0 mR/hr to 10 R/hr

DISPLAY: 4 digit LED display with 0.8" (2 cm) character height

DISPLAY RANGE: 0 - 9999

DISPLAY UNITS: Can be made to display in uR/hr, mR/hr, R/hr, uSv/h, mSv/h, Sv/h, cpm, cps, and others

LINEARITY: Reading within plus or minus 10% of true value

RESPONSE: Typically 3 seconds from 10% to 90% of final reading

LOW ALARM: Indicated by a yellow light and slow beep (1 per second) audible tone (can be set at any point from 0 - 9999)

HIGH ALARM: Indicated by a red light and fast beep (4 per second) audible tone

LOW BAT: (yellow) Indicates less than 2 hours of battery power remaining

CALIBRATION CONTROLS: Accessible from front of instrument (protective cover provided)

OVERLOAD: Senses detector saturation (indicated by display reading "-OL-")

POWER: 95 - 135 VAC (178 - 240 VAC available), 50 - 60 Hz single phase (less than 100 mA)

BACKUP BATTERY: 6 volt sealed lead acid rechargeable battery (built-in)

BATTERY LIFE: Typically 48 hours in non-alarm condition, 12 hours in alarm condition

BATTERY CHARGER: Battery is continuously trickle charged when instrument is turned on

CONSTRUCTION: Aluminum housing with ivory polyurethane enamel paint

TEMPERATURE RANGE: -4° F to 122° F (-20° to 50° C)

SIZE: 7.4" H x 9.7" W x 2.5" D (18.7 x 24.6 x 6.4 cm)

WEIGHT: 6.5 lbs (2.3 kg)

### Order Part Numbers

Model 375/2, PN: 48-2410

Model 375/4, PN: 48-2411

### Options

Model 271 Remote Alarm Module, PN: 48-2475

Model 272D Remote Alarm Module, PN: 48-3575

### Model 375P-336 Portal Monitor

#### Introduction

The Model 375P-336 utilizes the standard Model 375 area monitor display and a pair of plastic scintillation detectors (each measuring 41" H x 9.7" W x 3.3" D). The Monitor/Detector pair is easily installed and can be used for a variety of health and medical physics applications. In the Nuclear Medicine department, the unit is ideal for monitoring personnel or laundry for possible contamination that may have been unknowingly spilled. The portal type monitor may also be used as a radiation contamination triage device, to alert Emergency Department personnel of potentially contaminated patients or equipment coming into the emergency room.

Audible and visual (light) alarms can be programmed and set to any point within the units (0-9999 Kcps) range. An RS232 data output is provided for connection to a printer or PC.

The unit is powered by a 6v rechargeable battery that is continuously trickle charged when the unit is connected to an AC Power supply.



Part Number: 48-3285

#### Specifications

RANGE: 0.1 mR/hr - 1 R/hr

DISPLAY: 4 digit LED display with 0.8" (2 cm) character height

DISPLAY RANGE: 0 - 9999

DISPLAY UNITS: Can be made to display in uR/hr, mR/hr, R/hr, uSv/h, mSv/h, Sv/h, cpm, cps, and others

LINEARITY: Reading within plus or minus 10% of true value

RESPONSE: Typically 3 seconds from 10% to 90% of final reading

LOW ALARM: Indicated by a yellow light and slow beep (1 per second) audible tone (can be set at any point from 0.0 - 9999)

HIGH ALARM: Indicated by a red light and fast beep (4 per second) audible tone

LOW BAT: (yellow) Indicates less than 2 hours of battery power remaining

CALIBRATION CONTROLS: Accessible from front of instrument (protective cover provided)

OVERLOAD: Senses detector saturation (indicated by display reading "-OL-")

POWER: 95 - 135 VAC (178 - 240 VAC available), 50 - 60 Hz single phase (less than 100 mA)

BACKUP BATTERY: 6 volt sealed lead acid rechargeable battery (built-in)

BATTERY LIFE: Typically 48 hours in non-alarm condition, 12 hours in alarm condition

BATTERY CHARGER: Battery is continuously trickle charged when instrument is turned on

CONSTRUCTION: Aluminum housing with ivory polyurethane enamel paint

TEMPERATURE RANGE: -4° F to 122° F (-20° to 50° C)

SIZE: 7.4" H x 9.7" W x 2.5" D (18.7 x 24.6 x 6.4 cm)

WEIGHT: 6.5 lbs (2.3 kg)

## Area / Portal Monitors

### Model 375 Controller



Part Number: 48-3470-1

### Detectors (*two included with system*)



## Model 375P-1000 Waste Survey Monitor

### Introduction

The Ludlum 375P-1000 Waste Survey Monitor is ideal for inspecting outgoing trash and/or medical waste for possible low level radioisotope contamination. The system continuously monitors background levels and will alert the user when the infrared sensors detect a contaminated object. Once the object is removed, the system will return to normal (background) monitoring.

The Waste Survey Monitor will easily pay for itself in the prevention of just one contaminated shipment. Fines assessed by the various regulatory agencies are significantly more than the cost of installing this monitor at your facility.

Options include a red strobe light alarm and a date and time printer to document the occurrence of the detected contaminant.

### Specifications

RANGE: 0.1 mR/hr - 1 R/hr  
 DISPLAY: 4 digit LED display with 0.8" (2 cm) character height  
 DISPLAY RANGE: 0 - 9999  
 DISPLAY UNITS: Can be made to display in UR/hr, mR/hr, R/hr, UoSv/h, mSv/h, Sv/h, cpm, cps, and others  
 LINEARITY: Reading within plus or minus 10% of true value  
 RESPONSE: Typically 3 seconds from 10% to 90% of final reading  
 LOW ALARM: Indicated by a yellow light and slow beep (1 per second) audible tone (can be set at any point from 0.0 - 9999)  
 HIGH ALARM: Indicated by a red light and fast beep (4 per second) audible tone  
 LOW BAT: (yellow) Indicates less than 2 hours of battery power remaining  
 CALIBRATION CONTROLS: Accessible from front of instrument (protective cover provided)  
 OVERLOAD: Senses detector saturation (indicated by display reading "--OL--")  
 POWER: 95 - 135 VAC (178 - 240 VAC available), 50 - 60 Hz single phase (less than 100 mA)  
 BACKUP BATTERY: 6 volt sealed lead acid rechargeable battery (built-in)  
 BATTERY LIFE: Typically 48 hours in non-alarm condition, 12 hours in alarm condition  
 BATTERY CHARGER: Battery is continuously trickle charged when instrument is turned on  
 CONSTRUCTION: Aluminum housing with ivory polyurethane enamel paint  
 TEMPERATURE RANGE: -4° F to 122° F (-20° 50°C)  
 SIZE: 7.4" H x 9.7" W x 2.5" D (18.7 X 24.6 X 2.5 cm)  
 WEIGHT: 6.5 lbs (2.3 kg)

### Options

Date/Time Printer, PN: 4396-072  
 Red Alarm Strobe Light, PN: 4396-171

## Check Sources / Carry Cases

### Check Sources



### Check Source Holder



### Carrying Cases



### Survey Meter Check Sources / Cases

#### Check Sources

A variety of check sources are available in a broad range of activity, to confirm proper operation of radiation detection equipment or for training purposes. Those listed below are the most common: call Ludlum if you require others.

1 uCi, <sup>137</sup>Cs, PN: 01-5196

5 uCi, <sup>137</sup>Cs, PN: 01-5186

1 uCi, <sup>60</sup>Co, PN: 01-5187

#### Check Source Holder

An optional Check Source Holder is also available for easy mounting to survey and monitoring equipment.

Check Source Holder, PN: 4062-166

#### Carrying Cases

An assortment of cases are available for our survey meters and monitors.

##### Storm (weather proof)

Small PN: 2311062

Medium PN: 2311063

Large PN: 23011064

##### Airmold (air-tight & weather proof)

Small PN: 2310278

Medium PN: 2310330

Large PN: 2310327

**Model L-100 PTW Universal Multimeter****Introduction**

The Ludlum Model L-100 PTW Universal Multimeter is designed for the QC evaluation of a wide variety of x-ray machines, including standard Radiographic, Fluoroscopic, Portable, Mammography, and CT, as well as Dental and Panoramic units.

The automatic features of the L-100 measures peak kV, exposure time and dose output of the x-ray unit quickly and easily. Simply position the L-100 so that it is located within the radiation beam of the x-ray unit. The display will show the measured kV, exposure time, and dose of the x-ray equipment being evaluated.

There is also an analog output which connects to an oscilloscope to view the voltage waveform when needed.



Part Number: 99-9200

**Specifications**

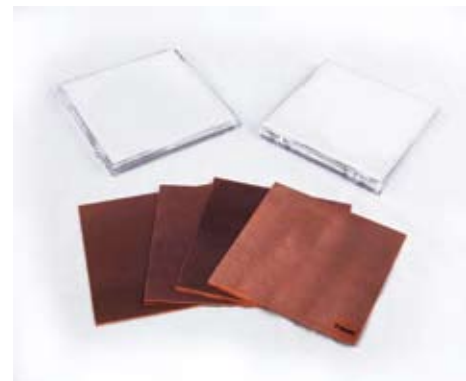
Irradiation Time:	0.3 ms – 999 s
Digital Resolution:	300 ms
Voltage:	(22 – 150) kV
Digital Resolution:	+/- 0.1kV
Energy Dependence:	< +/- 2 %
Reproducibility:	< +/- 0.5%
Operating Temp.:	15 to 35° C
Dimensions:	6.1" L x 3.75" W x 1.77" D
Weight:	750 g (1.65 Lbs)

**Options**

Model L-25018 Oscilloscope Cable, 10 m PN: 99-9201  
Model L-522038 Soft Carrying Case, PN: 99-9202

**Accessories**

Model L-430 Standard Purity Al HVL Filter Set, 10 cm x 10 cm, Weight: 0.15 lbs., PN: 99-9400  
Model L-434 Ultra High Purity Al HVL Filter Set, 10 cm x 10 cm, Weight: 0.15 lbs., PN: 99-9401  
Model L-431 Copper HVL Filter Set, 10 cm x 10 cm, Weight: 0.25 lbs., PN: 99-9402

*Accessory Filters*



## Diagnostic Test Tools

Model L-051



Part Number: 99-9432

Model L-435



Part Number: 99-9428

### TG-51 Linac Filter

The primary purpose of the AAPM TG-51 dosimetry protocol was to provide a uniform methodology for a clinical reference dosimetry measurement. Both the photon and electron beams from accelerators needed to be within the recommended nominal energies (Beam Quality). The methodology included the application of a 1 mm thick lead foil that is placed just below the accelerator head, to reduce the electron contamination and therefore help to specify the beam quality. The lead foil is typically attached to the accelerator head or to the blocking tray using surgical tape, wires or whatever material was available.

The Ludlum Model L-051 "TG-51 Linac Filter" has been designed to simplify the task of making the prescribed Beam Quality Measurements, by providing a true 1mm thick lead foil (+/-0.2 mm) that has been specially bonded to a 12" x 12" polycarbon (Lexan®) plate. The plate has an opening cut into the center, exposing a 10 cm x 10 cm area of the bonded 11cm x 11cm lead foil. This plate can be customized by the user to fit the tracks of most blocking trays. The polycarbon material is easily cut with a standard utility knife or sheers. The combination lead foil and polycarbon plate also helps to maintain the integrity of the lead foil and also makes it easier to handle and store the filter.

#### Specifications

12" x 12" Polycarbon Plate  
11 cm x 11 cm x 1 mm thick Lead foil

### HVL Filter Holder

The new Ludlum L-435 HVL Filter Holder is designed to simplify the routine HVL measurement process. For years the method of attaching the HVL filters to the x-ray collimator involved using large quantities of medical/surgical tape. While tape does do the job, it also tends to destroy the thinner aluminum filters; particularly the high purity mammography filters.

The Model L-435 HVL Filter Holder eliminates the need to use tape to attach the HVL filters to the collimator housing.

The Filter Holder consists of a polycarbon base 9.5" x 9.5". Permanently bonded to the center of the base plate is an acrylic pocket, open on one side and designed to hold a standard or high purity Al Filter set. The polycarbon material is easily cut with a standard utility knife or sheers to accommodate the two most common collimator track sizes in a given department. The base may also be attached with the provided velcro-type strips for odd sized collimators. In either case the filters themselves are protected from damage associated with the application and removal of heavy medical/surgical tape.

#### Specifications

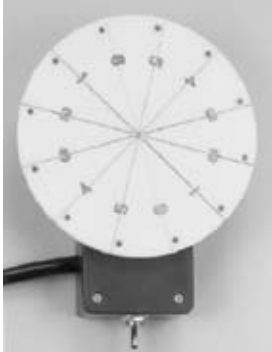
Base Material: Polycarbon 9.5" x 9.5"  
Filter Pocket: Acrylic, 10.2 mm x 10.2 mm x 9 mm H

#### Options

Model L-430 Standard Aluminum HVL Filter Set  
Model L-434 Ultra High Purity Aluminum HVL Filter Set (Mammography)  
Model L-431 Copper HVL Filter Set

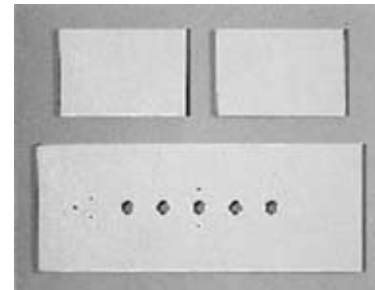
## Diagnostic Test Tools

Model L-629



Part Number: 99-9425

Model L-644



Part Number: 99-9429

**Rotating Spoke Test Tool****Introduction**

The Rotating Spoke Test Tool is designed to evaluate the performance of the Fluoroscopic Imaging Systems. The tool demonstrates screen image lag, motion blur, contrast, and related distortions encountered in fluoroscopic exams. (As Described in AAPM Rpt. 60)

When combined with aluminum or acrylic block attenuators, the Rotating Spoke Test Tool provides the user with a means to simulate the movement of guide wires and radiopaque catheters, seen in Angiography or Cardiac Cath patient procedures.

The Rotating Spoke Test Pattern consists of a circular 5.5 inch diameter acrylic disk with steel 12 wires arranged on its surface in 30 degree intervals. The wire diameters range from 0.02" to 0.005". There are two wires of each size directly opposite each other on the disk. Lead numbers (1-6) appear on each half of the disk near the perimeter.

The disk is mounted on a synchronous motor with a speed of 30 RPM to simulate movement of wires. The visibility of smaller diameter wires ( 0.014" or less) will confirm the system performance.  
[ 0.14" is a common guide wire size ]

**Grid Alignment Test Kit****Introduction**

Grid Alignment Test Kit is designed to confirm that the proper centering, and height uniformity of a standard or focused grid is correctly aligned with the central axis of the x-ray beam.

The test procedure is simple and requires that the holed test plate is centered to the x-ray table and positioned such that the length of the tool is perpendicular to the direction of the grid lines. One exposure is then made centered over each hole in the test plate.

After processing, the film (image) is examined for potential changes in optical density. A properly centered and level grid should provide 5 equal densities on the test film (image).

**Specifications**

One holed test plate, 9" x 3.5" x 0.187" (0.0625 Pb with .0625 acrylic on each side); with 5 test holes.  
Two blocking plates which are 3.5" x 2.375".

## Diagnostic Test Tools

## Model L-301 Table Top Densitometer



Part Number: 99-9600

## Model L-331 Portable Densitometer



Part Number: 99-9601

## Model L-396 Sensitometer



Part Number: 99-9602

## Tools for Processor Quality Assurance

**Introduction**

The Model L-301 Table Top and Model L-331 Portable Densitometers are easy to use precision instruments designed to provide highly accurate and repeatable (black & white) optical density readings. This makes them an ideal tool for Processor Quality Assurance.

The readings provided by the Model L-310 will alert you to fluctuations in processing conditions and allow you to take the necessary corrective action before film quality becomes an issue. The Model L-301 offers an optional RS-232 interface.

**Specifications**

Measuring range: 0-5.0 D with 2 and 3 mm apertures; 0-4.0 D with 1 mm aperture

## Model L-396 Sensitometer

**Introduction**

The Model L-396 Sensitometer is a required tool for processor quality assurance. This easy-to-use unit features a 21 step density wedge with 0.15 D increments. The Dual colored (green and blue) light source provides for precise and controlled repeatable exposures. The created film allows for the monitoring of processor variations by comparing the 'control' film to the previously created step wedge. Speed, contrast and base-plus-fog values are collected using the model 301 or 331 densitometers.

**Specifications**

Exposure stability:  $\pm 0.02$  log exposure per year

Unit-to-unit repeatability:  $\pm 0.02$  log exposure

Power requirement: 9 volt alkaline battery (included) approx. 10,000 exposures

### Model PMLX Precision Photometer

#### Introduction

The Model PMLX Precision Photometer is designed to measure both illuminance (the amount of light falling on a surface) in lux (lumens per m<sup>2</sup>) and luminance (the amount of light emitted from a surface in 'nit' (candela per m<sup>2</sup>)).

The Precision Photometer quickly verifies that collimator light sources are in accordance with regulations. It also measures the brightness and uniformity of an x-ray viewbox for appropriate brightness and uniformity.

When used for Mammography Quality Control, the photometer will provide measurement of viewer luminance and room illuminance required by MQSA guidelines.

Either of two optional (rigid or flexible) fiber optic probes can be used to make measurements of SMPTE\* patterns produced by digital display units, in order to determine appropriate density and contrast settings for image display monitors.

The battery operated photometer has a bright LED display and only two operating controls: "Measure" for taking readings, and "Range" to adjust the meter display to the light being measured.

#### Specifications

Range: 0.1 to 999,000 lux or nits  
Dimensions: 4" H x 2.8" W x 1.2" Thick  
Weight: 4 oz.

\* SMPTE: Society of Motion Picture & Television Engineers  
\*\* Must be calibrated with meter



Part Number: 99-9700

#### Options

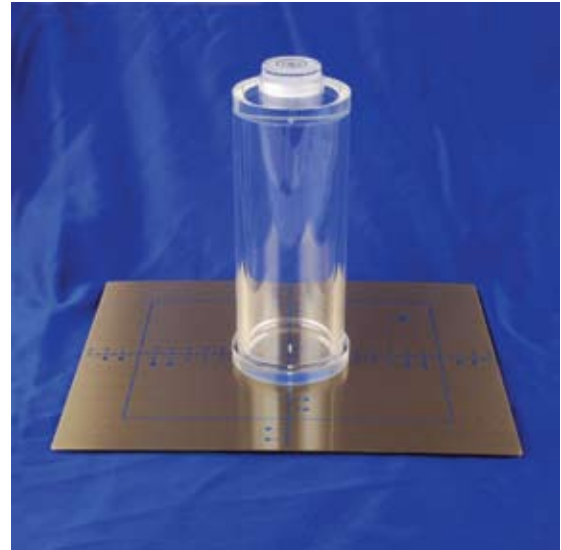
Model PM10: Rigid Fiber Optic Probe**	PN: 99-9701
Model PM11: Flexible Fiber Optic Probe**	PN: 99-9702
Model PM12: Illuminance Receptor **	PN: 99-9703
Model PM13: Luminance Receptor	PN: 99-9704

**Model L-661-662 Collimator / Beam Alignment****Introduction**

The Ludlum Model L-661-662 Collimator/ Beam Alignment test tool provides the necessary verification of the proper congruence of the collimator light field and the x-ray beam. Mis-alignment of the collimator may cause key portions of the image to be missing from the radiographic image.

The beam alignment (cylinder) portion of the test tool confirms that the central ray is perpendicular to the image receptor. Improper beam alignment will cause a distorted radiographic image.

The test tool is easy to use and readily identifies misalignments and improper angulation of the x-ray tube.



Part Number: 99-9405

**Specifications****Collimator Test Plate**

Size: 8" x 10" plate with 14 cm x 18 cm pattern etched onto surface

Weight: 6.5 oz.

**Beam Alignment Cylinder**

Dimensions: 5.9" H x 2.5" Outside Diameter

Weight: 0.54 Lbs.

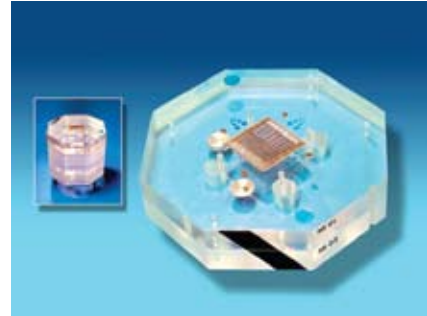
## Diagnostic Test Tools

Model L-901



Part Number: 99-9000

Central Target Assembly



### NEMA SCA&I Fluoroscopic Phantom

#### Introduction

The NEMA-SCA&I was developed to evaluate and standardize the Interventional fluoroscopic image. The design is the result of a collaboration of efforts between the Society for Cardiac Angiography and Interventions and the National Electric Manufacturers Association. Use of the phantom provides voluntary compliance with published NEMA standard XR21.

The phantom is primarily manufactured from PMMA (acrylic) with x-ray absorption properties similar to soft tissue at standard diagnostic energies. There are a variety of static and dynamic test targets designed to assess spatial resolution, motion unsharpness and radiation exposure.

The 12 PMMA plates provide a variety of phantom thicknesses, allowing simulation of child to adult configurations.

An optional carrying case is also available

#### Plate / Parts List

<u>Quantity</u>	<u>Plate No</u>	<u>Description</u>
1	01	Central Target Assembly
1	02	Working Thickness Range (WTR) Plate A
1	03	WTR Plate B
1	04	WTR Plate C
3	05	WTR Plate D
1	06	WTR Plate E
4	07	Blank Plate with alignment parts
1	08 & 08A (1 ea)	Field Size Plate
1	09	Alignment Target for test stand
1	10	Alignment Cross for test stand
1	11	Alignment Target for small base
1	12	Alignment Cross for small base
1	13	Rotating Target Assembly
1	14	Test Stand
1	15	Small Base
1	16	3 mm thick lead plate with laminate
1	17	2 mm thick copper plate with laminate
35	--	Alignment pins

**Model L-903 Fluoroscopic Phantom**

**Introduction**

The Model L903 Fluoroscopic Phantom provides a quick but comprehensive assessment of Fluoroscopic Contrast, Detail and Resolution. The PMMA equivalent plates offer the necessary attenuation properties needed to simulate various patient thicknesses.

The various contrast and detail test objects and high contrast resolution mesh targets are ideal for routine image assessment and help the medical physicist and associated QA personnel ensure that physicians are receiving accurate high quality images.

The overall phantom measures 25 cm wide by 25 cm long x 20.7 cm high. The phantom consists of three attenuation plates and one test object plate.



Part Number: 99-9001

**Specifications**

High Contrast Mesh Lines/Inch  
( 9 Patterns)

- A – 80
- B – 12
- C – 16
- D – 20
- E – 24
- F – 30
- G – 40
- H – 50
- I - 60

Low Contrast Hole Depths  
(Hole Depths / Center Disk)

- 1 – 0.068
- 2 – 0.049
- 3 – 0.035
- 4 – 0.025
- 5 – 0.018
- 6 – 0.0126
- 7 – 0.0091
- 8 – 0.0063
- 9 – 0.0040

## Diagnostic Test Tools

### Fluoroscopic Alignment Device

#### Introduction

The Ludlum Fluoroscopic Beam Alignment device consists of an aluminum plate with 4 sliding brass strips set in recessed channels. The strips define the border or visible area of the image receptor. A plastic overaly prevents any vertical displacement of the brass strips. Holes drilled in half inch intervals are filled with higher density material for visibility through the brass strips. The device when placed in the center of the image receptor is designed to correct or optimize fluoroscopic collimation.

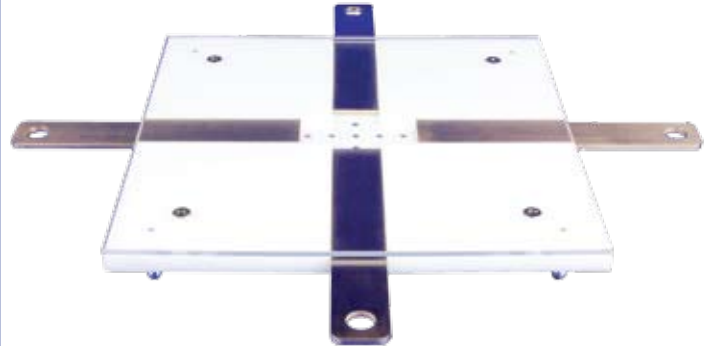
Any portion of the fluoroscopic field that falls outside the image receptor does not contribute to the useful image and can lead to unnecessary exposure to the patient. This very simple but critical measurement will identify a misaligned fluoroscopic system.

#### Specifications

Dimensions: 9" x 9" x 5/8"

Weight: 5 Lbs.

### Model L-600



Part Number: 99-9406

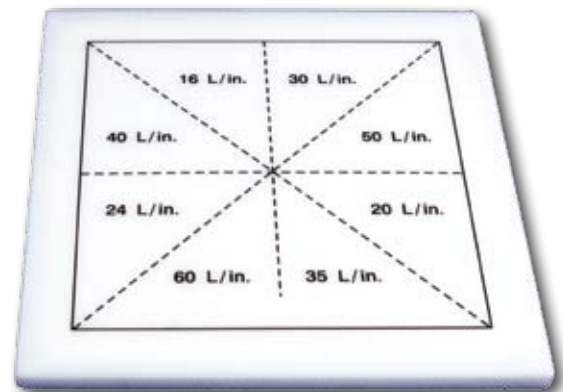
### Fluoroscopic Resolution Test Tools

#### Introduction

The Fluoroscopic Resolution Test Tool is a plastic plate containing eight groups of copper and brass mesh screening. Three models are offered; each with different resolutions and are arranged in an irregular and nonsequential rotation to permit better visualization of the different resolution patterns. These test tools provide a quick check on Image Intensifier or video system resolution.

Model No.	Resolution	Part Number
601	16 - 60 LPI	99-9407
618	30 - 100 LPI	99-9408
619	60 - 150 LPI	99-9409

### Models L-601, 618 & 619

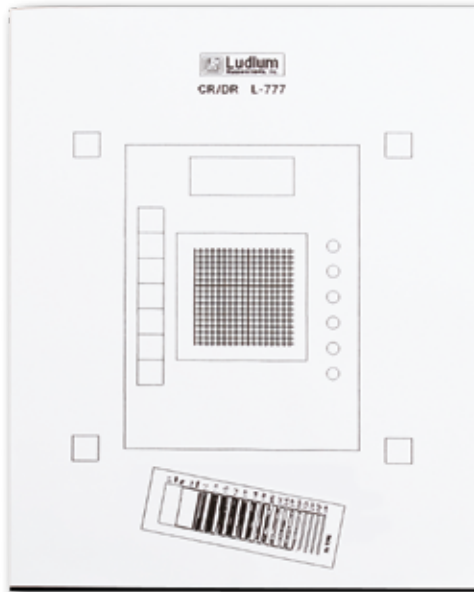


Part Number: See table



## Diagnostic Test Tools

### Model L-777



Part Number: 99-9412

### CR/DR Test Tool

#### Introduction

The Ludlum CR/DR Test Tool is designed for the evaluation of the newer filmless digital CR (Computed Radiography) and DR (Digital Radiography) imaging systems.

The CR/DR Test Tool incorporates a variety of testing parameters that, when used daily, tracks Geometry (region of interest) Symmetry, Line Pair Resolution, as well as, Low and High Contrast performance. Measurements of the various targets allow for evaluation of both the monitor and printed film image. The CR/DR tool will become a valuable asset to the QA Technologist and the Medical Physicist when trying to determine the source of an image quality problem or complaint.

The large 14" x 17" size make it ideal for quick checks on automated chest systems.

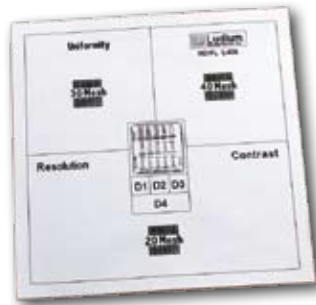
#### Specifications

Dimensions: 14" W x 17" H x 0.5" D

Weight: 7 Lbs.

Converging Line Pair Test Pattern

### Model L-656



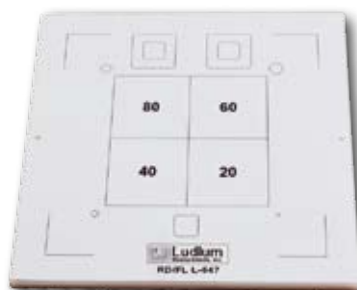
Part Number: 99-9411

### RD/FL Contrast/Resolution Test Tools

#### Introduction

The Ludlum RD/FL Phantoms are an easy to use tool to quickly assess the general radiographic and fluoroscopic image quality and performance of a standard imaging system. The ability to measure contrast and resolution in one exposure allows the QC Technologist, service engineer, or medical physicist to quickly determine whether or not the system is working correctly. When used daily, the RD/FL test tools will also easily identify trends that may be an indication of image degradation, typically caused by slight changes in kVp or mAs.

### Model L-647



Part Number: 99-9410

### RD/FL Contrast/Resolution Test Tool

#### Introduction

The L-647 phantom has three various shaped mesh patterns ranging from 20 to 100 lines per inch. Surrounding the Mesh Pattern are four Low contrast targets of varying diameters (2 mm, 4 mm, 6 mm and 8 mm). The Model L-656 RD/FL Digital Test Tool has a centered contrast scale and a line pair resolution insert that allows simultaneous evaluation of resolution, contrast and density uniformity.

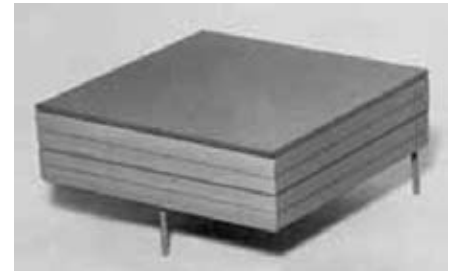
## Diagnostic Test Tools

Model L-760



Part Number:  
99-9413

Model L-706



Part Number:  
99-9430

### Acrylic Modular X-ray Phantom

#### Introduction

The Acrylic Modular X-ray Phantom is made up of a series of acrylic and aluminum plates that provide the various attenuation characteristics of various body part thicknesses. The variation in the number of acrylic plates and/or spacers simulate either a standard chest, abdomen, skull or extremity.

The acrylic phantoms conform to AAPM recommendations noted in report # 31 ( Standardized Methods for Measuring Diagnostic X-ray Exposure); and also those noted in Report #60 (Instrumentation Requirements for Diagnostic Radiological Physicists).

The Phantom set is also useful for making exposure technique charts for commonly used projections. The latter has been a long standing requirement of the JCAHO (Joint Commission on Accreditation of Health Care Organizations).

These phantoms are ideal for adjusting Automatic Exposure Controls and Automatic Brightness Controls on Diagnostic and Fluoroscopic Systems.

#### Specifications

The Modular Phantom contains the following components:

Five Acrylic Sheets:	25 cm x 25 cm x 2.54 cm thick
One Acrylic Sheet:	25 cm x 25 cm x 5.08 cm thick
One Aluminum Sheet:	25 cm x 25 cm x 1 mm thick
One Aluminum Sheet:	25 cm x 2 cm x 2 mm thick
One Aluminum Sheet:	7 cm x 25 cm x 4.5 mm thick
Spacers for a 5.08 cm air gap	

### Patient Penetrometer

#### Introduction

Patient Penetrometer Kit provides the necessary patient phantom attenuation material to test the (exposure rate) output of any standard or digital fluoroscopic system. The Penetrometer Kit is designed to work with most any x-ray exposure or multimeter measurement device.

The blocks simulate the attenuation of 26cm of water or a very large adult abdomen at 90Kvp. Two of the plates simulates a child abdomen or adult chest. The 7 x 7" 'stop plate' allows the user to evaluate the automatic brightness control at maximum output. A 7" x 7" x 0.0312" contrast gradient plate with four holes, each twice the area of the previous smaller hole, is placed between the 3/8" aluminum plates.

#### Specifications

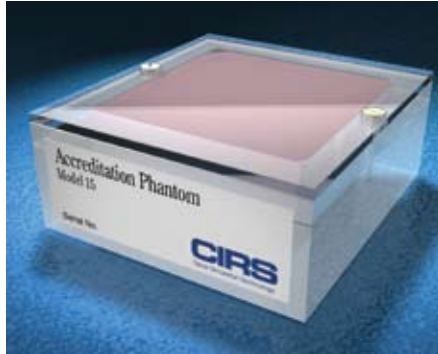
The Kit consists of ( four ) 7" x 7" x (3/8") plates of high purity (1100) aluminum.

The Contrast Gradient Plate holes are as follows: ( 0.25"; 0.176"; 0.125"; 0.0625" ).

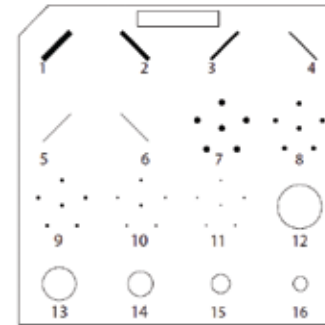
Weight: 9.5 Lbs

## Mammography Test Tools

## Model L-015



Part Number:  
99-9002



## Model L-015 CIRS Mammography Accreditation Phantom

**Introduction**

The Model L-015 Mammography Accreditation Phantom is intended for use as a fundamental part of any Mammography Control Program, and will assure compliance with MQSA (Mammography Quality Standards Act) and ACR (American College of Radiology) guidelines for optimum image quality and performance of the standard mammographic system.

The phantom was designed to determine if a standard mammographic system can detect small structures that are important in the early detection of breast disease. Test objects within the phantom range in size from objects that should be visible on any system, to those that are barely visible on the best of systems.

The phantom is made of a specialized 7 mm thick wax insert that contains 16 sets of test objects. Included are five different aluminum oxide specs to simulate microcalcifications, six varied length nylon fibers and five different lens shaped targets to represent fibrous structures and masses. The wax insert is surrounded by an acrylic cover creating a total thickness of 4.4 cm.

The Mammography Accreditation Phantom will aid in the monitoring of the overall performance of the standard imaging system, from generator to film processor.

**Specifications**

Overall Dimensions: 10.8 cm Long x 10.15 cm Wide x 4.4 cm Thick

Weight: 1.2 Lbs.

## Mammography Test Tools

### Model L-014A



Part Number: 99-9003

### AEC Consistency Phantom

#### Introduction

The CIRS Model L-014A, Phototimer (AEC) Consistency Testing Slabs are designed to assess the AEC system performance of the Mammography unit, in accordance with the (ACR) American College of Radiology and MQSA recommendations.

The BR-12 material is 47% glandular & 53% adipose tissue equivalent, and will provide the precise system assessment required by the medical physicist.

Please Note: A BR-50/50 material (Model L-014AD) is also available upon request.

### Model L-014C



Part Number: 99-9004

### Artifact Phantom

#### Introduction

Also available in the BR-12 material is the Model L-14C Artifact Evaluation Phantom. This phantom provides a uniform cassette sized (18 x 24 cm ) set of two plates, measuring a total 4 cm thickness, as recommended by the ACR and MQSA .

This Phantom is also available in the larger size, 24 x 30 cm (Model L-014E) and in the BR 50/50 material (Model L-014F) upon request.

## Mammography Test Tools

Model L-016A



Part Number: 99-9005

Model L-085



Part Number: 99-9006

### Contrast/Resolution Phantom

#### Introduction

The CIRS Model L-016A Single Exposure High Contrast Resolution Phantom is made up of a set of 3 BR-12 (or BR-50/50) plates, measuring 12.5 cm x 10 cm each, with a combined thickness of 4.5 cm, as recommended by the ACR and MQASA.

Incorporated into the top plate is an acrylic encased set of line-pair resolution targets. The two very precise 17.5 micron thick, gold-nickel alloy bar patterns, positioned at 90 degrees, allow assessment in one exposure, of the system resolution both parallel and perpendicular to the anode cathode orientation of the x-ray tube.

The resolution targets have 17 segments from 5lp / mm and are equivalent to 25 microns of lead or 2.6 mm of aluminum at 20 keV.

The Phantom body is available in the BR-50/50 material upon request. The Line-Pair resolution test pattern may be purchased separately (in the event a replacement is required by ordering the Model L-016W).

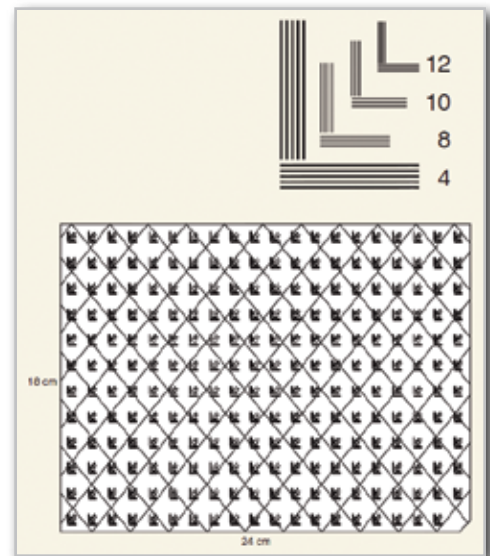
Included in the set is a 30x hand held microscope.

### Full Field Digital Phantom

#### Introduction

The Model L-085 Full Field Digital Mammography Resolution Phantom is specifically designed to monitor new digital mammography systems utilizing the high quality, low noise CCD (charge-couple device) digital sensors.

The Model L-085 Phantom provides a series of L-shaped line-pair targets from 4 to 12 lp/mm. These targets are contiguously positioned to cover an 18 x 24 cm (typical mammography cassette size) area in a one centimeter thick BR-50/50 tissue equivalent slab.



Visual inspection of the image permits a quick assessment of the continuity and resolution of the system.

## Mammography Test Tools

Model L-013



Part Number: 99-9007

Model L-011A



Part Number: 99-9008

### Stereotactic Needle Biopsy Training Phantom

#### Introduction

The Model L-013 Stereotactic Needle Biopsy Training Phantom is a disposable training tool and practice medium for mammography needle biopsy procedures. The phantom can also be used as a QA device for Stereotactic Systems.

The phantom body is shaped to represent a partially compressed breast, allowing the user to apply the necessary compression to meet the 4.5 cm recommended value for optimum imaging.

The phantom outer material is an elastic skin-like membrane that allows multiple training sessions. The internal material is made from a proprietary tissue equivalent gel that prevents the leakage of material when punctured.

Embedded within the phantom are numerous randomly positioned solid masses of varying sizes, as well as, two calcification clusters which are positioned with the medial transverse plane, at the right and left edge of the phantom.

#### Specifications

Overall size: 10 cm x 16.5 cm x 5 cm thick

Volume: 530 cc

Weight: 1.1 Lbs (0.5kg)

### Tissue-Equivalent Phantom

#### Introduction

The Model L-011A Tissue Equivalent Mammography Phantom is a realistically shaped (compressed breast) phantom that will provide the QA Technologist or Medical Physicist with the necessary information to evaluate any mammographic system.

The phantom contains 19 different targets that are engineered to simulate granular calcifications as well as spherical and fibrous masses. The targets range in size from those that should be visible to any system to those that will be difficult to resolve on the best of systems. The phantom also includes a line-pair resolution target and a contrast step wedge.

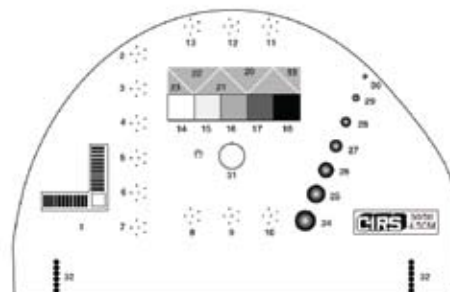
Included are a 30x hand-held microscope and QA documents for recording image evaluations and scores. A technical manual is also provided.

#### Specifications

Optional carrying case available.

Phantom Body: 12.5 cm L x 18.5 cm W x 4.5 cm Thick

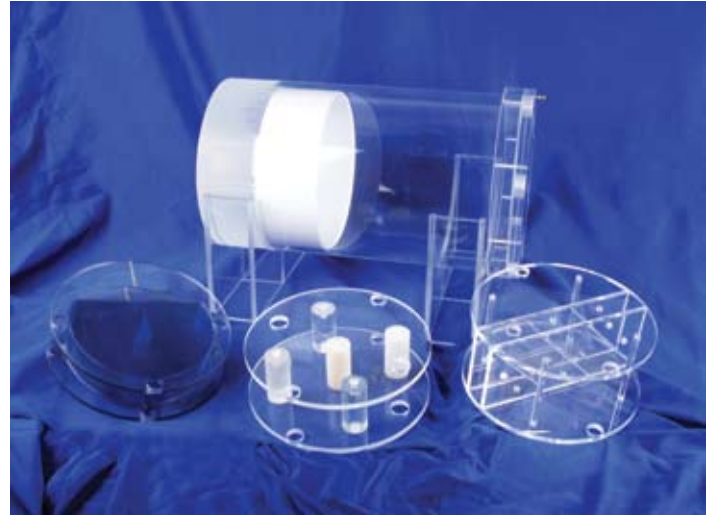
Material: Epoxy Resin



**Model L-610 AAPM CT Performance Phantom****Introduction**

The Ludlum CT Performance Phantom is a modular phantom that provides the user with an efficient method to evaluate the performance of their CT scanners. The 'one' phantom allows for testing of a full range of performance parameters like, Noise, Spatial Resolution, Low and High Contrast, Slice Thickness, Alignment and Linearity. The phantom design is based on the guidelines provided in AAPM Report #1.

The phantom is made up of an acrylic Source Tank and several resolution inserts. The Inserts include a Linearity High Contrast Insert, Beam Width Insert, Low Contrast Insert and a Resolution Insert, along with an External Resolution and Noise Ring. Additionally an 8.0" ID Teflon® ring, positioned at the base of the tank, is designed to simulate bone density.



Part Number: 99-9009

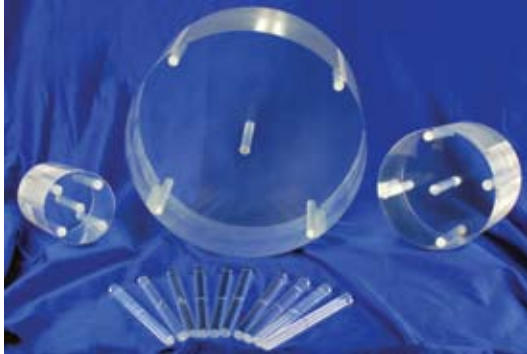
**Specifications**

Source Tank:	8.5" OD x 8.0" ID x 12.75" L
Linearity/Contrast Insert:	7.5" OD x 2.5" L
Resolution Insert:	7.5" OD x 2.5" L
Beam Width Insert:	7.5" OD x 3.5" L
Low Contrast Insert	8.5" OD x 3.75" L
External Whole Body Ring	12" OD x 8.5" ID x 2.5" L
Teflon Band (Bone Ring)	8.0" ID x 0.25 Thick
Weight:	17.25 Lbs.

**Options**

Model L-610CS Case

Model L-007CT

Part Number:  
99-9418

Model L-007N (Nested)

Part Number:  
99-9017

### CT Head/Body/Pediatric CTDI Phantom

#### Introduction

The Ludlum CT Head/Body/Pediatric CTDI (Computed Tomography Dose Index) Phantom, in combination with a specialized CT-Ion chamber, provides a means of determining the approximate dose to the patient for a given series of scans. The CT Head / Body (and Pediatric) phantoms are designed in accordance with the FDA standard, (21 CFR 1020.33) for diagnostic x-ray units, specifically as applied to CT systems. The CTDI sets are available in standard or nested configurations.

These phantoms can be used with any CT system and may be used to image and monitor adult head and body as well as pediatric dose requirements. The Phantom Sets consist of a group of head, body and pediatric acrylic sections with five probe holes in each section. Acrylic rods are provided to seal the unused holes.

#### Specifications

L-007CT Weight: Approx. 40 Lbs for complete set

L-007N Weight: 35 Lbs

#### Model L-007CT Parts

Model L-441 Head CTDI Phantom

Model L-451 Body CTDI Phantom

Model L-491 Peds CTDI Phantom

Model L-007CT Complete CTDI Set

#### Options

L-007CS Carrying Case, PN: 99-9018

L-007NCS Carrying Case, PN: 99-9020

Model L-OSL-CT1-4 Landauer CTDI Dosimeter (See Dosimetry catalog section)



**Model L-3009**



Part Number: 99-9203

**CT Ion Chamber**

**Introduction**

The Model L-3009 CT (pencil-type) Ion Chamber has a sensitive length of 10 cm and is designed for use with the Ludlum CTDI Phantom.

**Specifications**

Chamber Volume: 3.14 cc  
 Wall Material: PMMA, graphite coated  
 Electrode Material: Aluminum  
 Nominal Response: 14 nC/Gy  
 Complies with: IEC 61674

**Therapy Ion Chamber Options**

L-30013 Waterproof Farmer Chamber, PN: 99-9431  
 L-30011 Graphite Non-Waterproof Chamber, PN: 99-9209  
 L-30010 Aluminum Standard Farmer Chamber, PN: 99-9210  
 L-26002 1.00-6 Extension BNC Cable, PN: 99-9211

**Model L-110**



Part Number: 99-9205

**Diagnostic Electrometer**

**Introduction**

The lightweight compact Model L-110 Diagnostic Electrometer is designed for acceptance tests and routine measurements in diagnostic radiology. It measures dose, dose rate, dose length product, and irradiation time. The Model L-110 is ideally suited for CTDI dose measurements.

\*\* Also available is the highly sensitive full feature Model L-120 Electrometer, suitable for Diagnostic and Therapy measurements.

**Specifications**

Meets requirements noted in IEC 61674  
 Resolution: 1fA  
 Energy Dependence: < +/- 5%  
 Reproducibility: < +/- 0.5%  
 Available Connectors: BNT, TNC and M  
 Optionally available is the Model L-16018 (100 v) Ion chamber Adapter

**Options**

Model L-6004 Rad/Flouro Detector, PN: 99-9206  
 Model L-6005 Mamm Detector, PN: 99-9207

**Model L-6004 & L-6005**



## CT/MRI Phantoms

Model L-057



Part Number: 99-9019

Model L-040



Part Number: 99-9012

### Multi-Modality Phantom

#### Introduction

The Model L-057 Multi-Modality Abdominal Phantom is designed to address the various needs associated with interventional liver biopsy training needs. The phantom simulates the abdomen from approximately the thorax vertebrae (T-9 – T10) to the Lumbar (L2 - L3) region. The primary organs include the liver, a portion of lung and parts of the portal vein, abdominal aorta, inferior vena cava, and partial kidneys. Embedded within the liver are simulated lesions.

The Model L-057 is manufactured from a variety of proprietary materials including, Zerdine®, Urethane, ABS and Epoxy resins. The phantom is durable enough to be used for multiple scanning sessions and is designed such that it can be imaged not only by CT and MRI systems, but can also be used in Ultrasound.

#### Specifications

Length: 125 mm  
 Width: 280 mm  
 Weight: 5.5 kg

### Multi-Tissue Ultrasound Phantom

#### Introduction

The General Purpose Multi-Tissue Ultrasound Phantom offers a reliable medium of known test objects for repeatable QA assessment of Ultrasound scanner performance.

The phantom is made of a solid elastic material. The Zerdine® material has been designed to accurately simulate human liver tissue. The phantom material will not be affected by changes in temperature. It can be subjected to boiling or freezing conditions, while remaining unaffected and without significant damage. The elasticity of the material allows more pressure to be applied to the scanning surface without damaging the material.

The phantom contains a variety of vertical plane and horizontal plane targets as well as simulated masses, cysts and an array of resolution targets. The phantom comes with a variety of scanning wells to allow for large sector probes.

#### Specifications

Speed of Sound = 1540 m/s + 10m/s  
 Attenuation Coefficient:  
 0.5 db/cm-MHz  
 0.7 dB/cm-MHz

**Model L-042 CIRS General Purpose Urethane Ultrasound Phantom****Introduction**

The General Purpose Urethane Ultrasound phantom provides an alternative (economic) solution for ultrasound quality assurance, and is ideal for monitoring general system performance.

The proprietary urethane material is housed within a rigid PVC container with three separate scanning windows. The three windows allow the scanning targets to be evaluated at multiple depths.

The Model L-042 is compact, lighter weight test tool for ultrasound system consistency checks as well as resolution and lesion detectability assessment. The phantom contains a variety of vertical and horizontal plane targets as well as axial and lateral resolution targets. The phantom also contains a step mass pattern with varying visualization depths.

Note: Because Urethane has a speed of sound = 1430 m/s, the Model L-042 should not be used to assess absolute system performance.

**Specifications**

Speed of Sound = 1430 m/s



Part Number: 99-9013

## Ultrasound Phantoms

Model L-049



Part Number: 99-9014

Model L-045



Part Number: 99-9015

### Elasticity Ultrasound QA Phantom

#### Introduction

The Elasticity QA Phantom is designed to provide users with targets of known hardness. The Phantom contains four of each 10 mm and 20 mm diameter spheres of varying hardness relative to the background material. The spheres are located at depths of 15 mm and 35 mm and will appear almost isoechoic to the background using standard B-Mode Imaging.

The phantom is housed in a durable ABS material with a flexible scanning surface. The surface material is manufactured from Zerdine®, whose properties can be controlled independently of its acoustic properties. The phantom is a reliable and consistent elasticity reference tool for researchers, sales demonstrations and quality assurance testing.

#### Specifications

Speed of sound = 1545 m/s + 10 m/s  
 Attenuation Coefficient: 0.50 dB/cm – MHz + 0.05 db/cm –MHz

### Brachytherapy QA Phantom

#### Introduction

The Brachytherapy QA Phantom was designed for transrectal ultrasound QA and calibration of Brachytherapy systems. It includes targets to assess volume measurements, internal grid accuracy and probe retraction accuracy.

When scanning toward the top of the phantom, a partial grid of wires appears. These wires should line up with the grid that appears on your screen thus ensuring correct vertical and horizontal distance measurements. The phantom includes 13 Monofilament targets and 5 Probe retraction targets. Also included are three different larger target volumes, two spherical and one oval.

The phantom material is made of Zerdine®, a reliable medium which will provide repeatable qualitative assessments of the ultrasound scanner over time.

Included with the phantom is a rugged carrying case.

#### Specifications

Speed of sound: 1540 m/s +/- 10 ms  
 Attenuation Coefficient: 0.50 +/- 0.05 dB/cm-MHz

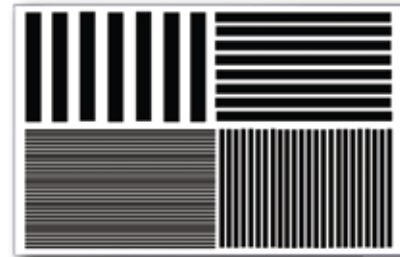
# Nuclear Medicine Phantoms & Accessories

## Model L-823 with L-824 & L-825



Part Number: See table

## Model L-820



Part Number: 99-9423

## PET/SPECT Performance Phantom

### Introduction

The Ludlum PET / SPECT Performance Phantom is designed to measure resolution, linearity and the uniformity of PET (Positron Emission Tomography) and SPECT (Single Photon Emission Computed Tomography) systems.

The Model L-823 Source Tank is the basic component of this phantom. When combined with the Source Tank, the Model L-824 Resolution Insert Set and the Model L-825 Cardiac insert, the PET/SPECT Performance Phantom provides the user with a comprehensive test tool. The phantom can be filled with a  $^{99m}\text{Tc}$  or  $^{201}\text{Tl}$  and water solution to simulate cold and hot lesions and for measuring linearity and uniformity performance of the PET/SPECT system.

### Specifications

Material: Acrylic

Sections are sealed with "O" rings for leak-proof assembly

Source Tank Dimensions: 8.5" OD x 8" ID x 12" L

Linearity/Uniformity: 7.5" OD x 2"

Cold Lesion: 7.5" OD x 3"

Hot Lesion: 7.5" OD x 2.5"

Cardiac Insert Dimensions: 8 inch  $\varnothing$  x 6 to 10 in (h)

Source Tank/Inserts: Weight: 15 Lbs.

Model	Description	Part Number
L-823	Source Tank	99-9419
L-824	Resolution Inserts	99-9420
L-825	Cardiac Inserts	99-9421

## Gamma Camera Bar Phantom

### Introduction

The Model L-820 is ideal for daily/weekly QA checks of scintillation camera performance. The bar pattern phantom measures intrinsic and collimator spatial resolution (ability to see small objects), and spatial linearity (ability to correctly position image data), confirming the gamma camera's overall ability to identify and properly display small anatomic objects.

Each of the sets of parallel lines is precisely machined onto a plastic sheet. The lines are filled (cast) with Cerrobend® high density metal alloy. This causes the gamma radiation to be attenuated, thereby providing the QA image.

The Phantoms is easy to use and satisfies most regulatory quality control requirements for intrinsic resolution. By checking the gamma camera's resolution on a routine basis, with either of these phantoms, it will be possible to make quick adjustments to insure the consistent quality of the images being taken from the data that is collected.

### Specifications

Available in Standard or Large

Size: 16" x 16" or 18" x 18"

Bar Widths: 1/10"; 1/4"; 3/16" 3/8"

Weight: 12 Lbs; 15 Lbs.

## Nuclear Medicine Phantoms & Accessories

Model 2200



Part Number: 48-1651

Model 243



Part Number: 47-1621

### Model 2200 Scaler/Ratemeter - Wipe Test Counter

#### Introduction

The Ludlum Model 2200 Scaler/ Ratemeter is the ideal economic solution for routine sample counting, single channel analyzing and routine radiopharmaceutical related procedures, when used with the Model 243 well scintillator (NaI) detector. The Well Counter's 4 pi geometry and excellent shielding provides excellent sensitivity to higher energy isotopes like I-131.

Two independently adjustable discriminators allow the user to set an 'energy window; to count pulses within a user specified energy range. This portable unit can be powered by wall current or by four D-Cell batteries. The latter allows for continued operations during power interruptions. An optional printer is available for hardcopy archival of wipe test results.

#### Specifications

##### Model 2200, Scaler/Ratemeter

SCALER: 6 digit LED display providing a range of 0 - 999,999 counts  
 SCALER LINEARITY: Reading within 2% of true value  
 TIMER: Pushwheel adjustment from 0 - 999 minutes with selectable X0.1 and X1 multipliers  
 RATEMETER: 0 - 500,000 cpm total range  
 METER DIAL: 0 - 500 cpm, 0 - 2.5 kV, BAT TEST  
 MULTIPLIERS: X1, X10, X100, X1000  
 RATEMETER LINEARITY: Reading within 10% of true value  
 RESPONSE: Toggle switch for FAST (4 seconds), or SLOW (22 seconds) from 10% to 90% of final reading  
 ZERO: Pushbutton to zero meter  
 THRESHOLD: Adjustable from 1.00-10.00  
 WINDOW: Adjustable from 0 to 10.0 above the threshold setting (can be enabled or disabled)  
 DISCRIMINATOR: Adjustable from 2-100 mV at threshold setting of 1.00  
 RS-232: 9 pin connector allowing for printer or computer interface.  
 METER: 2.5" (6.4 cm) arc, 1 mA movement analog type  
 POWER: 85 - 250 Vac, 50-60 Hz or 4 each "D" cell batteries  
 BATTERY LIFE: Typically 120 hours with alkaline batteries (battery condition can be checked on meter)  
 TEMPERATURE RANGE: -4° F to 122° F (-20° C to 50° C)  
 SIZE: 8.5" H x 5" W x 9.3" D (21.6 x 12.7 x 23)

##### Options

Printer, PN: 4167-386

1/2" Lead Shield, PN: 7379-004

##### Model 243, Well

DETECTOR: 2" diameter x 1.8" D (5.1 cm x 4.6 cm) thick integral NaI(Tl) well scintillator  
 WELL: 0.7" diameter x 1.6" D (1.7 cm x 3.9 cm)  
 EFFICIENCY (4pi): 65%-<sup>129</sup>I  
 OPERATING VOLTAGE: 500 - 1200 volts  
 SENSITIVITY: Will detect 0.005 uCi gamma or 200 dpm removable contamination for <sup>99</sup>Tc, <sup>131</sup>I, <sup>201</sup>Tl, <sup>111</sup>In, <sup>125</sup>I, <sup>137</sup>Cs, and <sup>67</sup>Ga  
 CONSTRUCTION: 0.5" (1.3 cm) thick painted lead wall and removable cap  
 BACKGROUND: 1000 cpm or less (optional 1/2" lead sleeve for background reduction)  
 PHOTOMULTIPLIER TUBE: 2" (5.1 cm) diameter  
 SIZE: 11" H x 8" W x 8" L (27.9 x 20.3 x 20.3 cm)  
 WEIGHT: 30 lbs (13.6 kg)  
 SHIPPING WEIGHT: 46 lbs (20.9 kg)

## Nuclear Medicine Phantoms & Accessories

**CAPINTEC Model CRC-25R**

Part Number: 99-9100

**CRC-25W**

Part Number: 99-9104

### CAPINTEC Models CRC-25R & CRC -25W

#### Introduction

The industry standard Capintec CRC-25R Dose Calibrator provides you with the state of the art technology you have come to expect from Capintec. The CRC-25R is space efficient, easy to use and designed to meet the requirements of any Nuclear Medicine department. New features include USB to PC communications, SD Flash back-up, and expanded remote capabilities. The CRC-25 is also available in a PET version (Model CRC-25 PET). The PET version includes additional shielding for the chamber and includes the most common PET isotopes.

All Nuclide data is entered via the custom keyboard. There are 8 presets and 5 user definable keys. More than 80 nuclides can be entered using standard symbols (ie., Co = Cobalt). Calibration values are easily accessed for over 200 nuclides.

An optional printer allows for the printing of full size records and peel-off labels for syringe identification.

Also available is the CRC-25W, Dose Calibrator and Well Combination (shown Above).

#### 25R Features

- USB and RS232 port
- SD flash card software upgrade
- USB printer capability
- Chamber plug-and-play capability
- Remote that communicates over a high-speed serial interface, and plugs into the chamber
- Both remote and chamber can be placed 100 feet from the readout unit
- Selection of Nuclide and Daily Test can be done with the remote
- On screen display of Nuclide Name, Number, Activity, Unit of Measure and Calibration Number
- Large character, high visibility display with automatic backlighting
- Over 80 Nuclides with half-lives in memory
- Automatic zero and background subtraction
- Built-in dose calibration, quality control and self diagnostics
- Includes a pre-set key for F-18 measurements
- Compatible with Nuclear Medicine Management Systems
- Optional printer for full size NRC records and patient labels for syringes and vials.
- Optional remote display indicating Nuclide, Activity and Unit of Measure

## Nuclear Medicine Phantoms &amp; Accessories

## CAPINTEC Model CRC-127R Dose Calibrator

**Introduction**

The economical CRC-127R provides outstanding performance capabilities for the cost conscious user. By incorporating a manual and auto-ranging selection of radionuclides, the unit is designed for simplicity of operation. There are 8 preset calibration settings for commonly used radionuclides:  $^{99}\text{Tc}$ ,  $^{201}\text{Tl}$ ,  $^{67}\text{Ga}$ ,  $^{111}\text{In}$ ,  $^{131}\text{I}$ ,  $^{123}\text{I}$ ,  $^{133}\text{Xe}$  and Moly Assays. A precision Potentiometer 'dials-in' calibration settings for any radionuclide.

**CRC-127R Features**

- Curies or Becquerels units of measure
- Manual or Auto-Range selection
- Bright 4-digit, extra-large LED display
- Full THREE YEAR unconditional guarantee
- Full FIVE YEAR guarantee on battery
- Battery check
- Background and zero adjustment with manual dial



Part Number: 99-9101

**Specifications**

- System Configuration:
  - Push-button/autoranging or manual ranging system
  - Becquerel or Curie readout, lockable in position
  - Well liner and Vial/Syringe dipper
  - Owners Manual
  - Chamber cable 6 feet (longer if required)
- Power Requirements: 100-240 VAC 50/60 Hz, 160 mA
- Circuit Protection: Power line filter, transient voltage suppressor
- Measurement Range:
  - Resolution: 0.01  $\mu\text{Ci}$  (0.001 MBq)
  - Maximum Range: 8 Ci (200 Gbq)
- Weight:
  - Readout: 15 lbs. (6.8 kg)
  - Chamber: 35.3 lbs. (16.0 kg)
- Optional printer with printer port



## Nuclear Medicine Phantoms & Accessories

### CAPINTEC CAPRAC Wipe Test Well Counter

#### Introduction

The CAPRAC Wipe test/Well Counter provides, speed accuracy and a complete range of built-in features. It will detect extremely low levels of activity and will perform a wipe test in just 6 seconds ( for 1 nCi ). The CAPRAC meets '10 CFR Part 35.315' requirements (200 dpm for unrestricted areas and iodine contamination).

The CAPRAC can also serve as a single-well gamma counter in smaller departments that do not need multi-sample changers. There are user defined protocols and trigger levels. A 6-channel pulse-height analyzer permits built-in gamma spectroscopy. Definable conversion factors for specific radionuclides allow the CAPRAC to calculate results in cpm, dpm, nCi, cps, dps or KBq.

The unit also has automatic background subtraction and self-diagnosis programs, and includes a 1.3 cm thick outer lead shield. (Optional added shielding is available upon request).



Part Number: 99-9102

#### CAPRAC® Wipe Test/Well Counter Features

- Meets NRC/Agreement State regulations, including new regulations in 10 CFR Part 35.315
- NaI drilled-well crystal detector
- Preliminary isotope identification through gamma spectroscopy
- Optional printer for hard-copy archives wipe-test results; prints photon-energy histograms
- Counts which exceed trigger levels are printed in red

#### Specifications

- Counter Weight: 16.5 lbs,
- Size: 7.25" wide, 11.5" deep, 10.3" high (18.4 x 29.2 x 26.2 cm)
- NaI(Tl) crystal detector
- Power: Standard: 115 VAC 50/60 Hz 0.1A Optional: 220V 50/60 Hz 0.05A
- Measurement periods: 6, 20, 60, 180, 600, 1800 sec
- Radiation shield: 0.5" (1.3 cm) lead outer shield
- Counting rate: cpm, kcpm (Ci) cps, kcps (Bq)
- Counting channels:
  - 1 = 15-100 keV
  - 2 = 100-200 keV
  - 3 = 200-400 keV
  - 4 = 400-660 keV
  - 5 = 660-800 keV
  - 6 = >800 keV
- Sources: <sup>137</sup>Cs or <sup>133</sup>Ba (optional)
- Maximum count rate 60,000cps

#### Also Available

- Optional CAPRAC Printer: Model CAPRAC-PRT
- CAPTUS 3000 Thyroid Uptake System
- Absorbed dose ALERT System

## Shielding Products

### Model L-929-91



Part Number: 99-9300

### Syringe Carrier

#### Introduction

Constructed of stainless steel with all enclosed 1/8" lead. The syringe carrier will store and transport syringes, vials and ampules up to 9" long. The lid is overlapping with a latch to prevent streaming.

#### Specifications

Size: 2.5" W x 9.5" L x 6.5" H

Inside Dimensions: 2" W x 9" L x 1.75" H

Weight: 8 Lbs.

### Model L-929-10



Part Number: 99-9301

### Syringe Holder/Pig

#### Introduction

The 1/2" lead Shielded Syringe Holder / Pig will accommodate unshielded syringes that contain isotopes ranging from 1cc to 20 cc. The unit offers 0.5" of lead shielding. The extra wide base prevents accidental tipping.

#### Specifications

Dimensions: 3-7/8" W x 6.5" H

Weight: 6 Lbs.

### Model L-929-47



Part Number: 99-9302

### Lead Storage Container

#### Introduction

The Lead Lined Storage Container is ideal for storing syringes or other items that have been contaminated with low level energy gamma residue. The 1/8" lead shielding allows contaminated items to be stored until they are properly decayed.

#### Specifications

Dimensions: 5" Diameter x 6.5" H

Weight: 7 Lbs.

## Shielding Products

Model L-929-50



Part Number: 99-9303

Model L-PB1218-15B



Part Number: 99-9500

### Decay Drum

#### Introduction

The Decay Drum is designed to store a variety of low level gamma contaminated materials until the material is appropriately decayed for normal disposal. The inside of the drum is sealed (no exposed lead) to prevent any leakage of the radioactive material between the drum and the lead lining. A 7" x 3" sliding door has been added to the cover to facilitate quick access. Two drums are typically used in a rotation system; one for current use and one for longer term decay.

#### Specifications

Overall Size: 22" Diameter x 33.5" H  
Lead Walls 1/8" Thick  
Finish: Polyurethane Enamel Paint  
Weight: 160 Lbs.  
Under Counter Clearance: 35"

### Clear-Pb® Gamma Shield

#### Introduction

The Clear-Pb Gamma Benchtop shield provides protection from exposure while working with and handling Nuclear Medicine Isotopes. The Clear-Pb® material is made from an acrylic copolymer resin into which lead is chemically introduced as an organic salt compound. The material contains 30% lead by weight. Its physical properties are similar to those of acrylic resins.

#### Specifications

Dimensions: 12" W x 18" H; 1.5 mm Lead Equivalent  
Weight: 25 Lbs.

#### Optional Lead Equivalents

L-PB1218-05B (0.5 mm Lead Equiv.)  
L-PB1218-20B (2.0 mm Lead Equiv.)

## Shielding Products

### Model L-PB2430-05M



Part Number: 99-9502

### Standard Mobile Radiation Shield

#### Introduction

The Model L-PB2430-05M Mobile Radiation Shield provides excellent protection while offering a wide field of view (24" x 30"). The clear portion of the shield is made of Clear-Pb® leaded acrylic and provides a 0.5 mm lead equivalent shielding value. The opaque portion of the shield is made of a phenolic material and the frames are stainless steel. The shields are easily locked into position. The opaque part of the shield is 0.8 mm Pb equivalent.

#### Specifications

Overall Size: 30" W x 75" H

Weight: 188 Lbs.

The PB Shield is also available in 1.0 and 1.5 Lead Equivalent Models.

### Model L-PB4830-05M



Part Number: 99-9503

### Large View Mobile Radiation Shield

#### Introduction

The Model L-PB4830-05M Large View Mobile Radiation Shield offers a full field of view (48" x 30"). The clear portion of the shield is made of Clear-Pb® leaded acrylic and provides a 0.5 mm lead equivalent shielding value. The opaque portion of the shield is made of a phenolic material and the frames are stainless steel. The shields are easily locked into position. The opaque part of the shield is 0.8 mm Pb equivalent.

#### Specifications

Overall Size: 30" W x 75" H

Weight: 191 Lbs.

The PB Shield is also available in 1.0 and 1.5 Lead Equivalent Models.

## Shielding Products

### Model L-PB Series



### Introduction

Clear Pb Shielding has a variety of applications and can be used for Modular X-ray Room Control Booth, Exam Room Windows, as well as for Table-top and Mobile type radiation barriers. See the Shielding sections of this website for more information on the Mobile and Table-top Shields.

The Clear Pb material is made of an acrylic copolymer resin into which lead is chemically introduced as an organic salt compound. The material typically contains 30% lead by weight. Its physical properties are similar to those of acrylic resins.

### Lead Acrylic Shielding

The Clear Pb is available in various sizes and thickness, see table below. Refer to pricing for ordering part numbers.

Size Inches	0.5 mm Pb (12 mm thick)	1.0 mm Pb (22 mm thick)	1.5 mm Pb (35 mm thick)	2.0 mm Pb (64 mm thick)
12 x 12	L-PB1212-05	L-PB1212-10	L-PB1212-15	L-PB1212-20
12 x 24	L-PB1224-05	L-PB1224-10	L-PB1224-15	L-PB1224-20
18 x 24	L-PB1824-05	L-PB1824-10	L-PB1824-15	L-PB1824-20*
18 x 48	L-PB1848-05	L-PB1848-10	L-PB1848-15	L-PB1848-20*
24 x 24	L-PB2424-05	L-PB2424-10	L-PB2424-15	L-PB2424-20
24 x 30	L-PB2430-05	L-PB2430-10	L-PB2430-15	L-PB2430-20*
24 x 36	L-PB2436-05	L-PB2436-10	L-PB2436-15	L-PB2436-20*
24 x 48	L-PB2448-05	L-PB2448-10	L-PB2448-15	L-PB2448-20
36 x 48	L-PB3648-05	L-PB3648-10	L-PB3648-15	L-PB3648-20
36 x 60	L-PB3660-05	L-PB3660-10	L-PB3660-15	L-PB3660-20*
36 x 72	L-PB3672-05	L-PB3672-10	L-PB3672-15	L-PB3672-20*
36 x 84	L-PB3684-05	L-PB3684-10	L-PB3684-15	L-PB3684-20
48 x 48	L-PB4848-05	L-PB4848-10	L-PB4848-15	L-PB4848-20
48 x 60	L-PB4860-05	L-PB4860-10	L-PB4860-15	L-PB4860-20*
48 x 72	L-PB4872-05	L-PB4872-10	L-PB4872-15	L-PB4872-20*
48 x 84	L-PB4884-05	L-PB4884-10	L-PB4884-15	L-PB4884-20*
48 x 96	L-PB4896-05	L-PB4896-10	L-PB4896-15	L-PB4896-20
72 x 96	L-PB7296-05	L-PB7296-10	L-PB7296-15	L-PB7296-20*

\* Special Order Only

**Ludlum Lead Lined Nuclear Medicine Work Station - Model L-995-037****Introduction**

The all in one Nuclear Medicine work station has a stainless steel work surface with a 5" backplash and a 1/2" beveled edge on the other three sides to prevent spills from draining off the top. The vertical supports of the cabinet are steel filled with lead. There is a 4" diameter chute to dispose of used syringes into a 'Sharps' container (plastic container not included), that sits on a sliding pull out shelf in the cabinet. The chute has a stainless steel encased 1/2" lead cover.

The cabinet also includes a well for the dose calibrator well chamber. There is also an attached L-Block made of 1/2" lead encased with steel and a steel framework around the 1/2" thick leaded glass. The unit sits on (4) 3" high adjustable leveling legs. The entire cabinet, except for the stainless steel work surface, is painted with tan textured paint.

The two stainless steel shelves are height adjustable and have a 5/8" spill lip on all four sides. The floor surface inside the cabinets is also stainless steel. The two doors on the cabinet open from the center to 180°. Both doors are lead encased in steel and have an L-handle with a key lock. The doors have a 7/8" overlap on the cabinet openings.



Part Number: 99-9304

There are three optional side shields available for the top of the cabinet (L-995-037S). The shields are 1/2" lead covered with stainless steel and in fit into "I" brackets with two vertical corner gussets. [Side Shield size: 27.5" D x 18.5" H x 0.75" thick (1/2" Lead covered with Stainless Steel)]

**Specifications****Cabinet Dimensions**

Overall Size: 36" W x 30" D x 36.125" H (work surface)

41.125" (top of backplash)

Cabinet Openings: 14.25" W x 24.5" H

**Shelf Sizes**

L-Block Dimensions:

Sharps Container Shelf: 5.5" W x 8.5" D x 15/16" H

Large Pullout Shelf: 12.25" x 25.25" D x 5/8" H

Large Fixed Shelf: 13.75" W x 25.25" D x 5/8" H

Well for Dose Calibrator: 8.0" Dia. x 9.5" Deep

**L-Block Dimensions**

Front of L-Block: 14.25" W x 19.0" H x .075" Thick

Overall height of L-Block: 28.5" H

Window angle: 45°

Window Viewing Area: 13.0" W x 12.0" H

Model NM-1 Custom Hot lab Package(s)



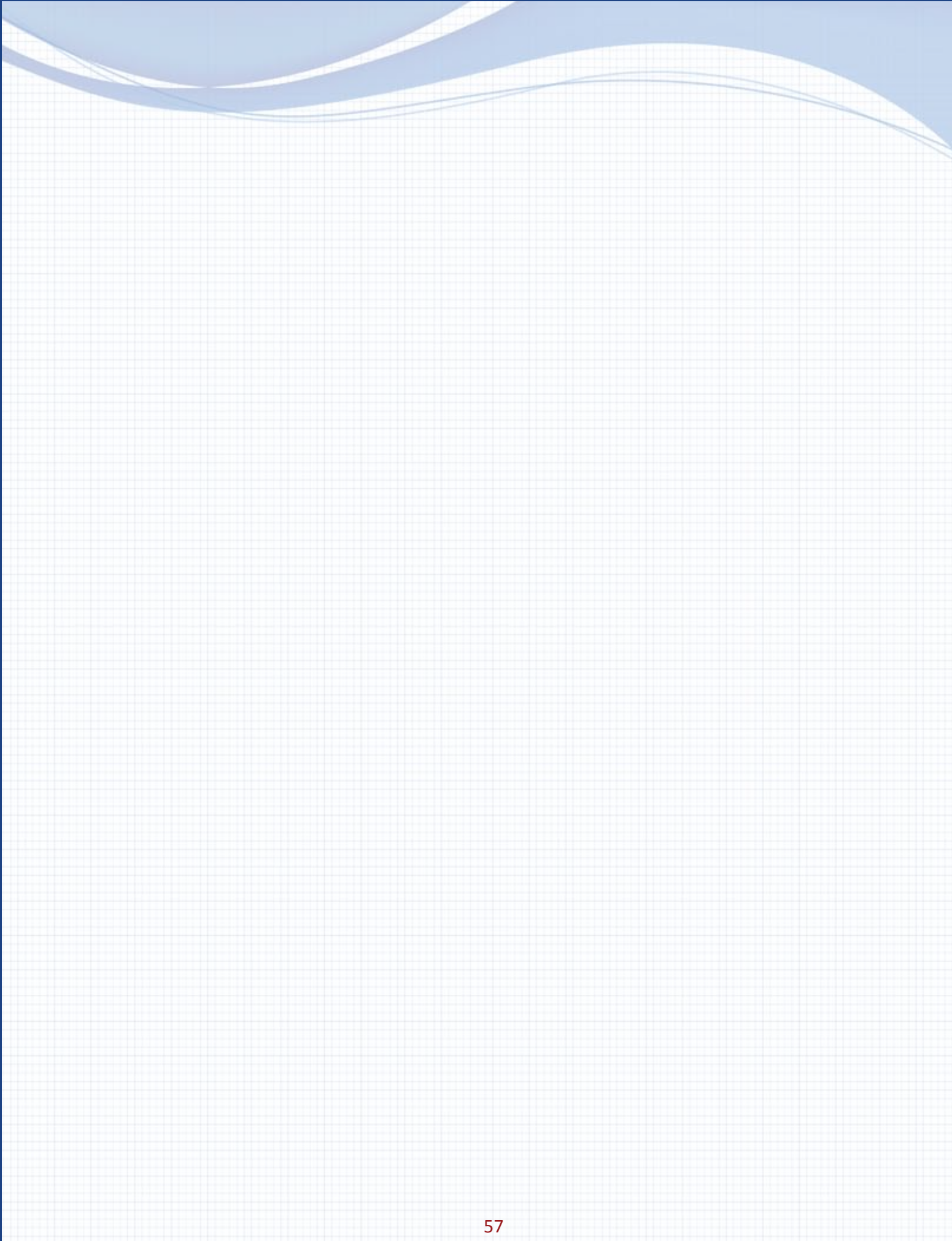
The Ludlum Custom Hot Lab Package is designed to provide the user with the Hot Lab equipment and accessories needed to start and operate a Nuclear Medicine facility. Whether you require only a few instruments and products, or a complete radiation monitoring, QA, shielding and lead lined cabinetry set up, we can provide the package that will best meet your needs.

Please contact your Ludlum representative for questions regarding the list of products you require.

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2241-3	10	L-929-91	50
2241-3 MERK	11	L-995-037	54
2241-4	15	L-3009	41
2401P	19	L-25018	24
AT-138	17	L-25018	24
AT-909	17	L-26002	41
CAPRAC	49	L-30010	41
CAPRAC-PRT	49	L-30011	41
CAPTUS3000	49	L-30013	41
Cases	23	L-522038	24
Check Sources	23	L-OSL-50A	18
Check Source Holder	23	L-OSL-200	18
CRC 127R	48	L-OSL-500	18
CRC 25PET	47	L-OSL-CT1-4	38
CRC 25R	47	L-OSL-CT5-20	38
CRC 25W	47	L-OSL-CT21-40	38
L-007CT	40	L-OSL-ENV	18
L-007N	40	L-OSL-ENVH	18
L-007NCS	40	L-OSL-MN	18
L-011A	38	L-OSL-MS	18
L-013	38	L-OSL-NANO-S	18
L-014A	36	L-OSL-NANO-U	18
L-014C	36	L-OSL-WB	18
L-015	35	L-OSL-WBH-CLM	18
L-016A	37	L-OSL-WBH-STD	18
L-040	42	L-OSL-WBN	18
L-042	43	L-OSL-WR	18
L-045	44	L-OSL-WRH	18
L-049	44	L-PB1218-05B	51
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L-057	42	L-PB1218-20B	51
L-085	37	L-PB2430-05M	52
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