



LUDLUM MEASUREMENTS, INC.
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CALIBRATION PROCEDURES

MODEL: 9-3

DIAL: none

DETECTOR: N/A

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Date: *31 JAN 2006*

Approved by: *Ronald S. S.*

Date: *3 Feb 08*

Q/A Approval: *Larry Hillis*

Date: *4 Feb 08*

Equipment Required

All instruments used in calibrating the Model 9-3 must be calibrated by standards traceable to the National Institute of Standards and Technology and must have a current calibration label attached.

- Cs-137 source capable of exposure rates of 1 mR/hr to 4 R/hr.
- DC power supply capable of supplying 1.8 to 3 VDC
- Calibration range from 1 mR/hr to 50 R/hr
- Low background area ($\leq 10 \mu\text{R/hr}$)

Calibration Procedures

If any calibration procedure cannot be completed satisfactorily, the instrument shall be tagged and removed for proper disposition.

✓NOTE: Observe all radiation safety precautions when using radioactive sources.

- Check the condition of the desiccants. Use only fresh or re-vitalized desiccants. Wait 24 hours after installation of new desiccants before proceeding with calibration.

✓NOTE: When placing the Model 9-3 into the can, orient the instrument so that the unimorph speaker is on the left side when reading the meter dial.

- Ensure that the meter movement has proper mechanical zero. The adjustment is on the front of the meter bezel. It must be adjusted to "zero" with the Range selector switch "OFF".
- Perform mechanical checks and visual inspections to ensure that the switches, buttons, and other mechanical devices function properly and that no obvious defects are present.
- Perform check for geotropism. (Refer to generic instructions for details on how to perform this check, if needed.)
- Remove the instrument can. Disconnect chamber connector J1 from the main board.
- Remove the batteries from the battery compartment.
- Turn the instrument on using the 3V power supply instead of the batteries. Rotate the Range switch to the X1

Model 9-3 Calibration Procedures
Revision 0

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- position. Adjust R36 for a meter reading of zero.
- Press the BAT TEST pushbutton. Adjust the supply voltage until the meter reading lines up with the low end of the BAT TEST line. Supply voltage should be in the range of 1.8 to 2V.
 - Increase the supply voltage to 3V. The meter should read up scale near the high end of the BAT OK line
 - Reassemble the instrument and replace the can. Replace the batteries in the battery compartment.
 - Rotate the Range switch to the X1000 position and wait 20 minutes. Rotate the Range switch to the X1 position and wait 2 minutes. Press RESET and adjust ZERO for a meter reading of zero.
 - Place the Model 9-3 in an area of low background radiation ($\leq 10 \mu\text{R/hr}$) and adjust L to zero the meter reading. Confirm the zero setting by pressing RESET and observing a zero reading. Readjust both controls if necessary. Allow a minimum of 20 seconds settling time after releasing the RESET switch.
 - Place the Model 9-3 on the calibration range and calibrate each scale at a meter reading of 4 mR/hr. Refer to Table 1 for a listing of the calibration points needed. Confirm that the meter reads within 5% at 1mR/hr times the Range switch selection.
 - Document using the appropriate forms.

TABLE 1			
	Range Multiplier	Reference Calibration Point	Instrument Dial Reading
UCP	X1	4 mR/hr	4 mR/hr
LCP	X1	1 mR/hr	$\approx 1 \text{ mR/hr}$
UCP	X10	40 mR/hr	4 mR/hr
LCP	X10	10 mR/hr	$\approx 1 \text{ mR/hr}$
UCP	X100	400 mR/hr	4 mR/hr
LCP	X100	100 mR/hr	$\approx 1 \text{ mR/hr}$
UCP	X1000	4 R/hr	4 mR/hr
LCP	X1000	1 R/hr	$\approx 1 \text{ mR/hr}$
UCP	X10K	40 R/hr	4 mR/hr
LCP	X10K	10 R/hr	$\approx 1 \text{ mR/hr}$