

LMI TIPS: Design Changes *September 1992*

Some of our customers who use Model 3's with Model 44-2 and also a Model 19 have experienced a common problem when they use a check source to validate their meter reading. The readings are usually different because of a difference in the placement of the check source in relation to the detector. Hopefully the following procedure will help to clarify this problem.

Scenario: The customer has purchased a Model 3 Survey Meter and a 44-2 Scintillation Detector. They previously owned a Model 19 Micro R Meter. Both setups have been calibrated to Cs-137. The customer places a 1.0 μCi Cs-137 check source at the end of the 44-2 and gets a reading of 500 $\mu\text{R/hr}$ on the M3. He then places the same check source at the detector end of the M19 and gets a reading of approximately 50 % less on the Model 19.

Question: Why do both of the Cs-137 calibrated instruments not read about the same. After all, both instruments read in Micro R/hr ($\mu\text{R/hr}$) and both utilize a 1" x 1" NaI (Tl) scintillation crystal and both instruments are calibrated to Cs-137.

The above scenario and questions are common to the sales and the repair departments at LMI. The position of the scintillation material in the detector is critical when making comparative measurements between detectors as the inverse square law dictates: If you double the distance from the radiation source, the field intensity decreases by a factor of 4. With this in mind, a very minute change in the check source distance will make a significant change in the meter reading. The center of the 1" x 1" NaI (Tl) crystal is approximately 0.9 inches from the detector end (indentations in the can) in the Model 19. On the Model 44-2 the center of the crystal is approximately 0.6 inches from the housing of the detector. The closest calibration point that we use to calibrate the M44-2 and M19 is 15 inches and even though we use the same crystal center for the calibration, a few tenths of an inch cannot be noticed at that distance. But, a few tenths

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of an inch on the check source position, detector mounting position, foam packing within the detector assembly, etc., can make a great difference in the comparative readings. However we do take steps in ensuring that the mounting position and internal packing of the scintillation crystal remains consistent between units to units of the same instrument models.

Another related problem has surfaced in the redesign of the Model 5, serial #'s 93334 and succeeding, and the 14C, serial #'s 92211 and succeeding. For the past year, we have been in the process of updating most of our general purpose survey meters and count ratemeters. Our goal was to scale down circuit design, provide "plug on" circuit boards, and provide a better and more economical product to our customer. In the process we overlooked what effect the repositioning of the internal GM detectors would have on the check source readings which are much different from the readings of previously designed models.

In the case of the Models 5 and 14C, the detectors were kept in the same general location inside the instrument. However, the small difference in placement raised the detectors by approximately 0.9 inches than that of the previous design. The difference in ~~new~~ readings between the old design and new design is approximately 60 to 70 % less when the check source is placed on the bottom of the can. If you have any questions about your instruments, please give our repair department a call.

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