

**West Valley Site Management Program  
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Procedure for the Retained Premises**

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**SUBJECT: Bicron MicroRem Survey Meter, Operation Procedure  
for the Retained Premises**

**RP-RPP012.00**

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## **1.0 PURPOSE**

This document identifies the operating and maintenance requirements for the Bicron MicroRem tissue equivalent survey meter (MicroRem meter), and provides direction for radiation workers in the proper usage and handling of this instrument.

## **2.0 SCOPE**

This procedure provides a general description of the MicroRem meter, along with detailed instructions for its operation and use. This procedure also identifies the calibration and operability checks (and their frequency) that must be performed to ensure the instrument's operability and accuracy. However, this procedure is not intended to duplicate or replace the manufacturer's user manual. Consult the manufacturer's user manual (see Central File No. 40101-10), whenever issues or questions arise concerning the instrument's performance (or use) that are not covered in this procedure.

## **3.0 GENERAL**

### **3.1 Instrument Description**

The MicroRem meter is a lightweight, portable survey meter used for those applications requiring accurate dose rate measurements of low-level gamma radiation fields. The instrument reads absorbed dose rate directly, eliminating the need for conversion from mR/hr (milli-Roentgen per hour). The tissue-equivalent scintillator used in the instrument provides a flat energy response calibrated in rem. The MicroRem meter gives tissue-equivalent photon response for x-ray and gamma radiation from environmental levels of 0 - 20  $\mu$ Rem/hr full-scale to survey levels of 200 mRem/hr full-scale. This wide range is achieved by the use of five positions on the eight-position control switch, giving factors from 0.1 to 1000 times the scale reading. The instrument probe allows a detection range from 40 KeV (kiloelectron volt) to 1.3 MeV (millielectron volt), and is accurate to within 10 percent of reading for Cesium-137 between 20 percent and 100 percent of full scale on any range.

### **3.2 Instrument Failure**

If the instrument fails any operability check, is out of calibration, or functions erratically, remove it from service and return it to the Radiation Safety Officer (RSO). If necessary, the RSO will make arrangements for sending the meter out for calibration or repair.

## 4.0 PROCEDURE

### 4.1 Preoperational Checks

Preoperational checks must be performed prior to each use of the instrument. Similar checks should also be performed periodically during extended use.

#### 4.1.1 Battery Check and Replacement

The instrument has two, nine-volt batteries installed. To test the batteries:

Turn the control switch to the “bat” position; the meter should display a reading within the “bat ok” check band. A reading below the “bat ok” check band indicates the need for new batteries. Document the results of the battery check on the Instrument Preoperational Checks Log (see Attachment A).

To replace the batteries:

- Turn the instrument off.
- Open the pull catches at both ends of the case, and separate the top and bottom of the case.
- Install two, nine-volt batteries into the clips on the bottom of the circuit board. Be sure to observe the polarity indicated on the holder.
- Replace the bottom part of the case, orienting the rubber pad under the batteries; then close the catches.
- Repeat the battery check as described above and note the date that the batteries were changed on the Instrument Preoperational Checks Log (Attachment A).

#### 4.1.2 High Voltage Check

- Turn the control switch to the “HV” position. You should observe a meter reading within the “HV ok” check band.
- If the reading falls outside the “HV ok” check band, do not use the instrument. Take the instrument out of service and notify the RSO. The instrument will be sent for repair.
- Document the results of the high voltage test on the Instrument Preoperational Checks Log (Attachment A).

#### 4.1.3 Radioactive Check Source Response Check

After performing the battery and high voltage checks described in Sections 4.1.1 and 4.1.2, the instrument must be checked for response to a known radiation source. The obtained reading must be within +/- 20 percent of the source activity to be acceptable.

To source-check the instrument:

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- Set the selector switch to the appropriate scale for the radiation source activity. For NYSERDA check source (NY1), set the selector to the times 1.0 (x1.0) scale.
  - Hold the source approximately one centimeter (cm) from the meter surface in the front center of the meter. Wait the appropriate time for the meter dial to stabilize (i.e., ~15 seconds).
  - Verify that the meter reads a dose rate within the acceptable range (posted on the meter body).
  - If an unacceptable dose rate is observed, check to see that the source is being held at the front center portion of the meter where the instrument probe is most sensitive, and ensure that it is within one centimeter of the surface. This can be done by moving the source on the front of the instrument to see where the meter dial reads the highest. Reread the dose rate once the location and distance has been confirmed. If an unacceptable reading is observed, do not use the instrument and notify the on-site Radiation Safety person or the NYSERDA RSO.
  - Source-checks should be performed before and after each use of the instrument.
  - Record the source ID, activity and source-check results on the Instrument Preoperational Checks Log (Attachment A).

#### **4.1.4 Instrument Calibration Check**

- Verify that a valid calibration sticker is affixed to the instrument. Instruments will be calibrated in accordance with *Instrument Calibration for the Retained Premises*, RP-RPP011. The sticker should identify: the date the meter was calibrated, the due date for the next calibration, the initials of the calibrator and the instrument's serial number. If the calibration has expired, or the sticker is missing, do not use the instrument and notify the WVSMP RSO.
- Record the calibration due date from the calibration check on the Instrument Preoperational Checks Log (Attachment A).

Completed log forms will be filed by the NYSERDA RSO in the WVSMP Central files (Central File No. 40101-10).

## **4.2 Instrument Operation**

Only radiation-worker trained individuals are permitted to operate the Bicon MicroRem meter for routine or required surveys at the State-Licensed Disposal Area (SDA).

### **4.2.1 Range Selection and Response Time:**

The MicroRem meter has five linear ranges spanning from 0 to 200 mRem/hr. For work at the SDA, the lowest range selector value (i.e., x0.1) will be used for most surveys and measurements. The actual dose rate is obtained by multiplying the meter reading and the range selector value (i.e., x0.1 equals a range from 0 to 20  $\mu$ Rem/hr). The instrument response time at the two lowest ranges on the instrument dial (i.e., x0.1 and x1.0) is approximately 15 seconds. Response times on the higher scales range from five to two seconds.

To measure dose rates on the lower scale settings, the instrument must be held in the desired location for at least 15 seconds.

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#### 4.2.2 Field Operation

- Perform and record all preoperational checks as described above.
- Prior to entering an unknown radiation field, set the range scale selector to the highest range setting expected to be encountered (e.g., typical exposure rates are between 5 and 100 microrem/hr). Enter the area and take initial readings, holding the instrument in a given location for at least five seconds. If the meter does not respond, set the range setting to the next lower range and repeat until a stable reading is observed on the two lower range settings (i.e., x0.1 or x1.0), then hold the instrument in a given location for at least 15 seconds.
- If the meter reading goes to full scale, reset the range setting to the next highest range so that a mid-range reading is observed, if possible.
- When changing range settings or unstable readings are observed, depress the "reset" button to reset the electronics and begin reading the radiation field again.
- Observe the range scale readings as the instrument is moved slowly through survey areas. When large deflections are observed, stop and hold the instrument at the location until a stabilized reading is observed (e.g., ~15 seconds on lower range scales).
- Avoid dropping the instrument or subjecting it to severe shock. Should either of these events occur, perform the battery and high voltage checks described in Sections 4.1.1 and 4.1.2 before continuing.
- If the instrument malfunctions, fails operability checks, or displays erratic readings, discontinue use and notify the WVSMP RSO.

#### 5.0 ATTACHMENT

Attachment A: Instrument Preoperational Checks Log, one page.

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**ATTACHMENT A**

**INSTRUMENT PREOPERATIONAL CHECKS LOG**

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