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C-A OPERATIONS PROCEDURES MANUAL

8.15.5 C-A Equipment Calibration Procedures for Chipmunks
(Area Radiation Monitors)

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Hand Processed Changes

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Collider-Accelerator Department Chairman Date

V. Castillo

8.15.5 C-A Equipment Calibration Procedure For Chipmunks (Area Radiation Monitors)

1. Purpose

The purpose of this document is to provide calibration instructions Chipmunks that are being calibrated for the first time after manufacture and chipmunks that have failed annual recalibration procedure.

2. Responsibilities

The Chipmunks are calibrated and maintained by Access Controls Group (ACG) technicians.

3. Prerequisites

3.1 Training in use of the two Cesium-137 sources.

3.2 The calibration sources will be calibrated by the Radiological Control Division (RCD) every three years. Do not proceed unless source has a current calibration sticker.

3.3 The test box, digital multimeter, and oscilloscope used for Chipmunk calibration will have been calibrated within the previous 12 months at the C-A Department Calibration Lab.

3.4 Wear your (Thermoluminescent Dosimeter (TLD)).

4. Precautions

4.1 The Cesium-137 sources must be retracted when moving or positioning the Chipmunk on the test fixtures.

5. Procedures

5.1 First Power Up

Switch power on and allow unit to stabilize for about one hour. Connect Chipmunk MUX output to the scaler portion of the test box. Move the Chipmunk to a low background to stabilize for 30 minutes in background region.

5.2 Physical Inspection

5.2.1 Open each chassis as necessary to inspect internally and externally for: loose connectors, loose wiring, damaged AC line cord, poor solder connections, loose mechanical connections.

5.2.3 Correct faults before proceeding with calibration.

5.2.4 Check and adjust front panel meter for zero before power is applied to the unit.

5.4 Mechanical Zero

5.4.1 Check and adjust front panel meter for zero before power is applied to the unit.

5.5 Power Supply Check

5.5.1 Apply AC power and check all bulbs.

5.5.2 Replace defective bulbs.

5.5.3 Reconnect to AC power through a variable autotransformer (Variac). With the AC line voltage at 90 and 140 volts check that the +5, +5, -15 volt power supply nodes are within $\pm 5\%$ using a digital meter. Check that High Voltage supply provides 225-275 volts across resistor R5. Use oscilloscope to check that peak-peak ripple voltage on each low voltage node is less than 0.2% of nominal output. Remove Variac and re-connect line cord to standard 115 VAC source.

5.6 RP- 84A/84B Startup and Fail-Safe Circuits Test.

5.6.1 Separate blue and white box and connect S-Level Test Box 12-26 output connector. Turn on AC power to Blue Box. Insert TTL pulses on TP-1 on RP-84A/84B at a frequency of 1.11 Hz; 22 VDC must be seen on the test box. Remove TTL pulse from TP-1 and start stopwatch. After 1.5 to 4 minutes the 22 V must drop out. Turn off AC power to Blue Box.

5.6.2 Insert TTL pulses on TP-1 of RP-84A/84B at a frequency of 1.11 Hz. Turn on AC power to Blue Box, and start the stopwatch. Sonalert must start "chirping" in 3.5 to 4.5 minutes.

5.6.3 Turn off the pulser output on the test box.

5.7 Ratemeter Calibration

5.7.1 Using the output connector on the test box verify, and if necessary, adjust the S-level trip points on the RP63/63A ratemeter to be within $\pm 10\%$ of the indicated values. Remove the S-level test box.

Pulse calibration:

Move toggle switch on RP-84A/84B to upper position (QF5). Insert TTL pulses 1 μ sec wide on TP-1. With 11.1 Hz input adjust GAIN (top pot of RP63/63A) for a full scale reading, 100 mrem/hr.

With 1.11 Hz input, adjust bottom pot of RP-84A/84B for a reading of 10mrem/hr.

Repeat above steps as necessary.

With 11.1 Hz input move toggle switch on RP-84A/84B to center position (QF2.5); ratemeter should read 45-55 mrem/hr and the green and yellow LED's on the front panel must light.

Return toggle switch to upper position; meter must indicate 90-110 mrem/hr and green LED on front panel must light.

With .555 HZ input ratemeter should read 5 mrem/hr.

Remove cable between Chipmunk and test box.

5.8 Zero Electrometer

5.8.1 Turn off power and mate blue and white boxes. Connect a jumper across electrometer feedback capacitor C2. This requires opening the Zero enclosure inside the white box. Apply AC Power to Chipmunk. Attach oscilloscope probe to test point INT on the RP-263 board, on the side of the Zero enclosure. Vary zero-adjust pot for minimum DC output voltage corresponding to zero input signal.

5.8.2 Switch power off, remove shorting jumper from feedback cap, C2, and replace bottom cover and gasket of the electrometer box. Reapply AC power and allow unit to stabilize for 5 minutes

5.9 Source Calibration.

5.9.1 Observe safe operating procedures; retract or shield source when not in use, and when changing units; DO NOT GO FORWARD OF THE SOURCE UNLESS IT IS RETRACTED!

5.9.2 Move Chipmunk to table (30 mCi ¹³⁷ Cs) leaving the AC power on. Connect Chipmunk MUX output to the scaler scalar portion of the test box. Unlock the cover on the source shield and expose the Chipmunk to an 8mR/hr gamma field. Allow to stabilize for 5 minutes. Perform a 100

second count on the scaler. Adjust the top pot on the RP-84A/84B for reading between 4.50 and 4.59 Hz. Make three additional 100 second runs and record average.

- 5.9.3 If “as found” background is outside of acceptable range, then proceed with background measurement. Otherwise, proceed to section 5.10. Close and lock the source shield. Remove Chipmunk, while still powered, to a low background region away from the source. Allow unit to stabilize for 30 minutes in background field. Perform background count for 1000 seconds. Background should read between .07 and .10 Hz. If background is out of tolerance repeat source calibration, adjusting pot for 4.44 Hz plus current background reading. Then repeat background reading for 1000 seconds, and record final value.

5.10 High Range Source Checks.

- 5.10.1 Move Chipmunk to 150 mCi Cs-137 source test location with test box and power connected. Unlock the cover on the source shield and expose the Chipmunk to an 80 mR./hr gamma field. Allow to stabilize for 5 minutes. Perform a 100 second count on the scaler and record; repeat twice. Acceptable counts are 4500 counts $\pm 10\%$.

- 5.10.2 Expose Chipmunk to 150mR/hr gamma field. Perform 3 counts each of 100 seconds and records readings. Acceptable counts are 8520 counts $\pm 10\%$.

5.11 Calibration Label

- 5.11.1 Install calibration label on the unit, indicating current date, next calibration date, background reading, and your signature or initials.

6. Documentation

- 6.1 A log sheet [C-A-OPM 8.15.1.a](#) is to be filled out for each unit.

- 6.2 Calibration sticker is to be attached to each unit.

7. References

None

8. Attachments

[C-A-OPM-ATT 8.15.1.a “Chipmunk Calibration Log Sheet”](#)