TMI DOCUMENTS

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Revision 1
1750
06/14/76

THREE MILE ISLAND NUCLEAR STATION

STATION HEALTH PHYSICS PROCEDURE 1750

OPERATION AND CALIBRATION OF G.S.M. 5 SURVEY INSTRUMENT

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Unit 1 Staff Recommends Approval

Approval J. Lomandin Date 3/22/76
Cognizant Dept. Head

Unit 2 Staff Recommends Approval

Approval J. Lomandin Date 3/22/76
Cognizant Dept. Head

Unit 1 PORC Recommends Approval

Date _____
Chairman of PORC

PORC comments of _____ included
(date)

By _____ Date _____

Unit 2 PORC Recommends Approval

Date _____
Chairman of PORC

PORC comments of _____ included
(date)

By _____ Date _____

Approval G. P. Miller / J. J. Colitz Date 6/12/76 / 6-14-76
Station Superintendent/
Unit Superintendent

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THREE MILE ISLAND NUCLEAR STATION

STATION HEALTH PHYSICS PROCEDURE #1750

Operation and Calibration of GSM-5 Survey Instrument

1.0 PURPOSE

The purpose of this procedure is to explain in detail the operation and calibration of the GSM-5 survey instrument.

2.0 DISCUSSION

The model GSM-5 survey meter is a multipurpose instrument with application and versatility for measuring radioactivity. There are three probes that are available, an open end GM probe, and a side window GM probe and an alpha scintillation detector. A regulated 900 volt power supply provides potential for all probes. There are ranges corresponding to 500, 5,000 and 50,000 CPM or alternately, 0.2, 2 and 20 mR/hr.

3.0 REFERENCES

3.1 WM B. Johnson and Associates Technical Manual.

3.2 Health Physics Procedure 1749.

4.0 EQUIPMENT

4.1 GSM-5 Survey Meter

4.2 ASP 2-A Alpha Scintillation Probe

4.3 GP-90 Side Window GM-Probe

4.4 GP-200 End Window GM-Probe

4.5 MSC-1 Manual Sample Changer

4.6 DIG-1 Digital Timer and Scaler

4.7 VPE 2 Varipulse (Pulse Generator) or equivalent

4.8 CM-1 Count Multiplier

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5.0 OPERATING INSTRUCTIONS

5.1 Operating Instructions for GSM-5 Survey Meter with side window probe and ASA-2 speaker.

5.1.1 Turn range selector switch on GSM-5 to "X1" position.

5.1.2 Depress battery test button on GSM-5. Indicating needle should move into green colored section of meter scale.

5.1.3 Move speaker switch to "ON" position. If no blips are heard from speaker as meter needle is responding, battery replacement in speaker assembly may be necessary.

5.1.4 When using side window probe, twist knurled knob slightly and push probe out of Beta shield.

5.1.5 Equipment is now ready for use.

5.1.6 CAUTIONS

5.1.6.1 Switches on survey meter and accessories should be turned off when equipment is not in use.

5.1.6.2 Probes and/or accessory equipment should be neither connected nor disconnected while any power supply switch is in "ON" position.

5.1.7 CALIBRATION

5.1.7.1 The GSM-5 survey meter with side window probe will be calibrated at least once every 3 months.

5.1.7.2 Set Victoreen Inst. Calibration 64-764, 100mCi Cs-137, in position for calibration.

5.1.7.3 Place detector at proper location to detect 15 MR/HR. Adjust calibration pot if necessary as described in HPP 1636.

5.1.7.4 Place detector at proper location to detect 1.5 MR/HR. Adjust calibration pot if necessary as described in HPP 1636.

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5.1.7.5 Place detector at proper location to detect 0.15 MR/HR above background.

5.1.7.6 Recheck instrument at each calibration point.

5.1.7.7 Record the calibration in the Instrument Calibration Log Book located in the H. P. Lab.

5.2 Operating procedure for GSM-5 survey meter with end window probe, DIG-2 Count Multiplier and Digital Timer Scaler, MSC-1 manual sample changer, and ASP-2A alpha scentillation probe.

5.2.1 Turn range selector switch on GSM-5 to "XI" position.

5.2.2 Depress Battery Test button on GSM-5. Indicating needle should move into green colored section of meter scale. If indicating needle reads below green portion of meter scale, battery replacement may be necessary.

5.2.3 Insert selected probe through top hole in MSC-1 manual sample changer. Use adapter ring with end window GM probe. If ASP-2A probe is used, switch toggle to "ON".

5.2.4 Insert shelf in second position (middle) on MSC-1 without a sample.

5.2.5 Move toggle switch on DIG-2 to the "ON" position.

5.2.6 Select background or sample count interval by rotating black knob to desired increment. (.5, 1, 2, 3, 4 minutes).

5.2.7 Reset register by depressing black button on register. Note that all decades return to zero.

5.2.8 Commence background or sample count by switching toggle from "stop timer reset" position to "count" position. "Count terminated" lamp will glow at completion of count. Return "count" toggle switch to "stop timer reset" position.

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5.2.9 Place sample on second shelf on MSC-1.

5.2.10 Adjust range selector switch on GSM-5 so that needle reads on scale.

5.2.11 Select count rate multiplier by rotating black knob to desired increment.

5.2.12 Repeat steps 5.2.5 through 5.2.10 for the sample. At completion of count interval, determine net cpm by the following procedure:

$$\frac{(\text{Total Counts}) \times (\text{Count Multiplier})}{(\text{Count Time In Min.})} - (\text{Background}) = \text{Net C/M}$$

5.2.13 Calibration - Efficiency

5.2.13.1 The calibration of GSM-5 survey meter with end window probe, ASP-2A Alpha Scentillation probe, DIG-2 Count Multiplier and Digital Timer Scaler will be calibrated at least once every refueling interval.

5.2.13.2 Follow steps 5.2.1 through 5.2.5.

5.2.13.3 Count interval will be set at 1 minute.

5.2.13.4 Follow steps 5.2.7 through 5.2.11 with the exception that step 5.2.9 will be the ^{137}Cs or ^{230}Th sources depending upon the probe used.

5.2.13.5 At completion of count interval determine the percent efficiency by using the following formula:

$$\frac{\text{Total Counts/min}}{\text{Source dpm}} \times 100 = \text{efficiency in \%}$$

5.3 DIG-2 Count Multiplier and Digital Timer-Scaler Combination.

5.3.1 Calibration of timer selector

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5.3.1.1 Set timer selector switch to .5 minutes.

5.3.1.2 Turn "on" "off" switch to "on" position.

5.3.1.3 Using a stop watch simultaneously turn timer reset switch to count position and activate stop watch. Stop the stop watch when "time end" light comes on.

5.3.1.4 Repeat steps 5.3.1.1 through 5.3.1.3 for timer selector settings of 1 minute, 2 minutes, 3 minutes, and 4 minutes.

5.3.1.5 Record the calibration in the Instrument Calibration Log Book located in the H. P. Lab.

5.4 Calibration of Scaler Register (to be completed by Instrument Department).

5.4.1 Hook BNC Connector from Vari-Pulser "Pulse" connection to input connector of DIG-2.

5.4.2 Set "Pos" "Neg" switch on the vari-pulser to the "Pos" position.

5.4.3 Set output selector to 1.0 volts.

5.4.4 Set minutes selector switch on the DIG-2 to the 1 minute position.

5.4.5 Set count selector on the DIG-2 to the X1 position.

5.4.6 Set the frequency CPM selector switch on the Vari-Pulser to a setting of 100 cpm.

5.4.7 Depress register reset button on the DIG-2.

5.4.8 Turn the "on" "off" switch on the DIG-2 to the on position.

5.4.9 Turn the timer reset switch on the DIG-2 to the count position.

5.4.10 Repeat step 5.4.5 through 5.4.9 using the following settings.

1. DIG-2 Count Selector Switch - X100
2. Vari-Pulser (frequency) - 10,000 cpm

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5.4.11 Record the calibration in the Instrument Calibration Log Book located in the H.P. Lab.

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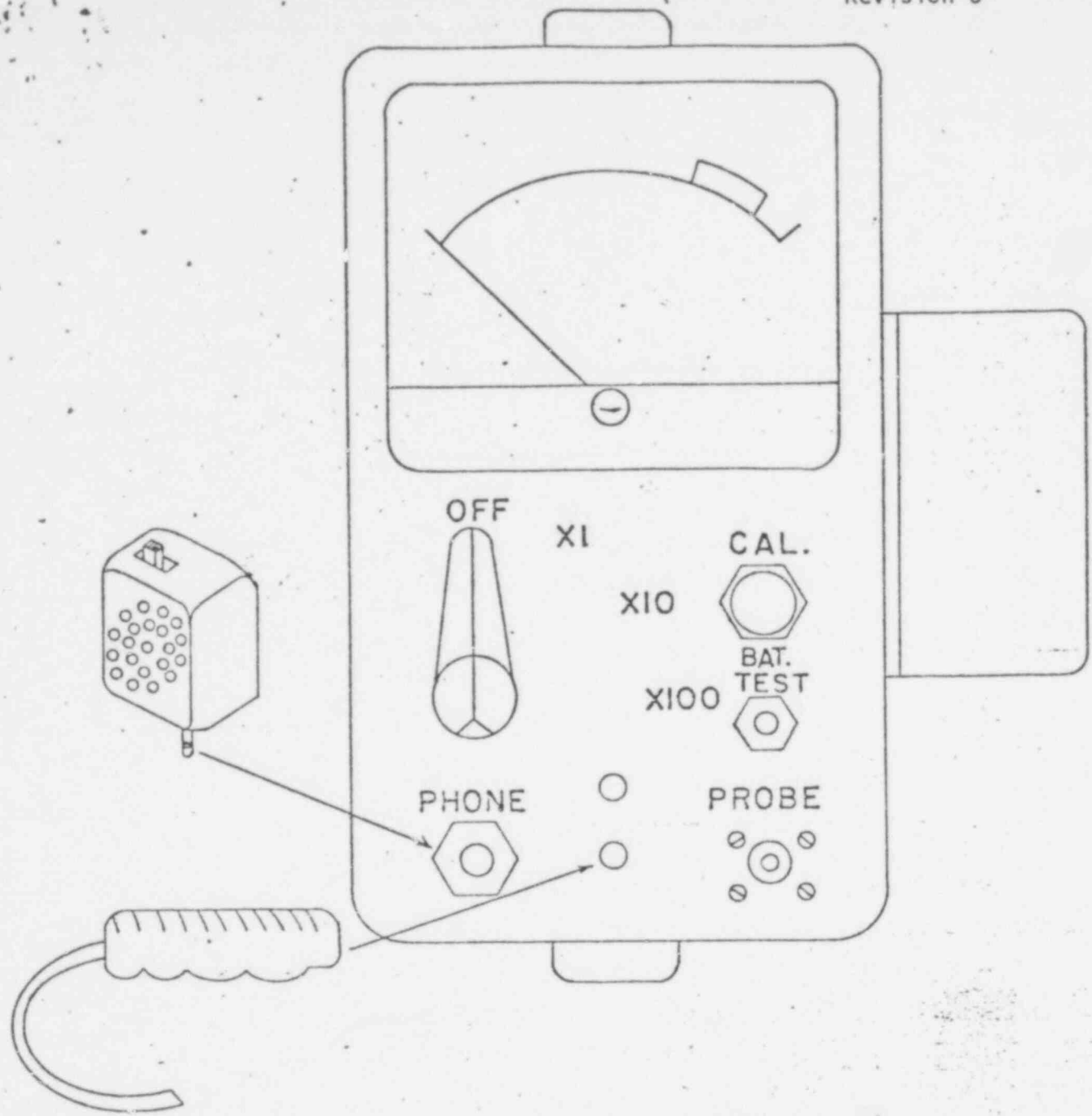

GSM-5 SURVEY INSTRUMENT

Figure 1750-1

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