



**OPERATION *AND*
MAINTENANCE
Manual**

**MODEL GSM-115
4 RANGE SURVEY METER
AND PROBES
HP-265 – GP200
GP-1001 – GP-1002
GLE-1**

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1.0 SPECIFICATIONS

INPUT SENSITIVITY _____	MINIMUM SENSITIVITY 0.05 v-pp MAXIMUM PULSE AMPLITUDE OVER 10 V-PP POSITIVE OR NEGATIVE POLARITY.
RANGES _____	4 LINEAR RANGES 0 - 500 CPM/0 - 0.2 mR/h 0 - 5,000 CPM/0 - 2 mR/h 0 - 50,000 CPM/0 - 20 mR/h 0 - 500,000 CPM/0 - 200 mR/h SCALE CALIBRATED IN CPM/ μ Sv/h AVAILABLE
ELECTRICAL LINEARITY _____	\pm 5% OF FULL SCALE
RESPONSE TIME _____	CONTINUOUSLY VARIABLE FROM 4 - 20 SECONDS FOR 90% SCALE
DRIFT _____	LESS THAN 5%
TEMPERATURE COEFFICIENT _____	LESS THAN 0.2%/DEG. C.
HIGH VOLTAGE _____	ADJUSTABLE FROM 500 - 1300 VDC REGULATED \pm 1%.
LOW VOLTAGE _____	+ 5 VDC & - 5 VDC REGULATION \pm 0.5%
BATTERY _____	2 - 9 VDC ALKALINE
BATTERY OPERATION _____	200 HOURS NOMINAL
METER _____	2.5" SCALE RUGGEDIZED MOVEMENT TOP SCALE CALIBRATED 0 - 500 CPM & 0 - 0.2 mR/h - SCALE CALIBRATED 0 - 500 CPM/ μ Sv/h AVAILABLE BOTTOM SCALE CALIBRATED 0 - 15vdc ACCURACY & LINEARITY \pm 2%
TEMPERATURE RANGE _____	- 23 °C TO 60 °C (-10 ° F TO 140 ° F)
HUMIDITY RANGE _____	5 - 95% NON-CONDENSING

1.0 SPECIFICATIONS CONTINUED

DETECTOR SATURATION SYSTEM _____	SYSTEM ELECTRICALLY "LATCHES" THE METER FULL SCALE & ENERGIZES THE DETECTOR FAULT INDICATOR WHEN THE DETECTOR SATURATES IN A HIGH RADIATION FIELD. METER WILL RETURN TO NORMAL OPERATION WHEN THE RADIATION AT THE DETECTOR RETURNS TO NORMAL OPERATING LIMITS. THE SYSTEM WILL REMAIN LATCHED IN FIELDS OF OVER 1000 R/HR WITH GM DETECTOR
DIMENSIONS _____	5 1/2" (14 cm) H X 3 " (7.5cm) W X 7" (18cm)L - INCLUDING PROBE HOLDER
WEIGHT _____	2 1/4 POUNDS (1 kilo) W/BATTERIES
HOUSING _____	CAST ALUMINUM TOP, EXTRA HEAVY DEEP DRAWN BOTTOM AND HEAVY DUTY CARRYING HANDLE
HOUSING FINISH _____	BLUE CATALYZED POLYURETHANE WASH PRIMER UNDERCOAT

2.0 DESCRIPTION

The Model GSM-115 is a ruggedized, moisture resistant Portable Rate meter designed to accept the signals from Johnson Geiger-Mueller detectors i.e. HP-265, GP-200, GP-1001, GP1002 and scintillation detectors L GLE-1, GSP-1, GSP-2 & ASP-2A. A durable taunt-band, waterproof panel meter displays the detector signal of the 4 linear ranges in CPM or mR/h ($\mu\text{Sv/h}$ AVAILABLE). The internal battery voltage and high voltage supply can be read directly AT ANY TIME on the meter by placing the VOLTAGE SELECTOR switch on the front panel in the correct position. A Low Battery LED (lower left corner of the meter) lights automatically indicating the internal battery voltage will soon be to low for proper operation. Saturation (continuous discharge) of the GM detector or a shorted probe cable will automatically latch the panel meter FULL SCALE and energize a RED LED in the right corner of the meter indicating the GM type detector has saturated or the probe cable has shorted. The meter will remain "latched" full scale in radiation fields of over 1000 R/Hr and will automatically return to normal operation when the radiation detector is no longer saturated or in the event of a cable failure, when the defective cable has been replaced. Response time is continuously variable from 4 - 20 seconds for 90% of full scale. A waterproof speaker indicating the relative strength of the radiation field at the detector can be switched on or off from the front panel. The top and bottom housings are securely sealed together by heavy duty stainless steel latches and a "O" ring gasket.

3.0 THEORY OF OPERATION

3.1 GENERAL:

The GSM-115 utilizes the very latest field proven, SMT (surface mount) solid state circuitry to accurately and reliably operate most ionizing radiation detectors. The electronic circuitry is located on 2 industrial type printed circuit boards that use the latest surface mount technology for good accessibility and reliability. The printed circuit boards are directly interconnected by durable pin type connectors to reduce wiring and increase the reliability of the instrument. Separate non-interacting controls are provided to calibrate each range, adjust the regulated low voltage supply and adjust the high voltage supply. Separate positive and negative 5 vdc power supplies provide clean, well regulated DC power to all of the GSM-115 circuitry. The High Voltage Supply is adjustable from 500 vdc to 1300 vdc and well regulated ($\pm 1\%$). The HV supply can provide the necessary voltage & current to operate most type radiation detectors. Separate circuitry automatically monitors GM type detectors for saturation and the voltage level of internal batteries. The high voltage and battery voltage can be measured directly from front panel meter by placing the VOLTAGE SELECTOR switch in the appropriate position and reading the voltage on the 0 - 15 vdc scale on the panel meter.

3.2 DETECTOR SIGNAL - BATTERY & HIGH VOLTAGE READOUT

The input amplifier (U1) amplifies all usable detector signals to a minimum level of 0.250 v -pp (gain of approximately 13.5). The output of U1 is connected directly to U2 which is an adjustable voltage comparator. The comparator functions as a gain control to permit only signals above a preset level to be further processed by the logic portion of the instrument. The minimum level INPUT signal that can be processed when the comparator is adjusted to maximum sensitivity is 0.050 v-pp. Detector signals of several volts amplitude WILL NOT saturate the GSM-115 circuitry or cause multi-pulsing. All detector signals with amplitudes above the 0.05 v-pp setting will be processed by the remaining circuitry. This feature minimizes and rejects low level noise in the meter circuit of the GSM-115. The signal from U2 is conveyed to U3 for processing into a precision constant area pulse that is generated for each input pulse. The constant area pulses are integrated into a precision analog signal that is proportional to the frequency of the detector signal. Individual non-interacting potentiometers (R9 = X1000, R11 = X100, R13 = X10 & R15 = X1) are provided to calibrate each range. The precision analog signal from U3 is conditioned in a potentiometer and capacitance network (R39 & C17) to provide a continuously variable response time of 4 - 20 seconds for 90% of full scale. The output of the response network is connected to a precision analog amplifier U4 and the audio output amplifier Q1 for further processing. The output of U4 is routed to a network of analog switches that are utilized to control the signals that can be displayed on the meter of the GSM-115. The analog switches are configured to connect the detector signal to the panel meter during normal operation and to display the battery or high voltage when the VOLTAGE SELECTOR switch is adjusted to display the battery or high voltage. All signal switching to the meter is automatic and only requires the MAIN SELECTOR OR VOLTAGE SELECTOR switch be adjusted to the desired function.

3.3 HIGH & LOW VOLTAGE POWER SUPPLIES

Two 9 vdc alkaline batteries are utilized to provide power for the GSM-115 circuits. The power from the batteries is connected to E1 the positive 5 vdc power supply regulator. The output of E1 is connected to the circuits requiring a +5 vdc supply and U2 the negative 5 vdc regulator. The output of the -5 vdc regulator is connected to the circuits requiring a -5 vdc supply.

The high voltage supply utilizes a special high efficiency transformer with a feed back winding and oscillator circuit to generate a low ripple high voltage. The output of the transformer T1 is connected to a voltage doubler network to increase the voltage to at least 1500 vdc. The output of the voltage doubler circuit is filtered in a RC pi type filter and connected to the probe BNC receptacle through R1, a 1 meg ohm resistor. R1 is also the load resistor for the detector circuit. The output of the high voltage circuit is constantly measured by the HV oscillator circuit through a high resistance network consisting of R4-R8 & C1, Q2 & a part of U2. Any increase or decrease in the high voltage will result in the appropriate increase or decrease in the power being provided the high voltage oscillator Q1. The high voltage resistor R4 is also utilized by the high voltage readout circuit a part of U1 to measure and display the high voltage on the panel meter.

3.4 DETECTOR SATURATION CIRCUIT

The high resistance network consisting of R4 on the power supply PC board and part of the integrated circuits U2 & U5 on the logic board are utilized to monitor and energize the visual display for detector saturation. U2 monitors the High Voltage being provided the detector circuit. This network can detect any significant change in the current being supplied to a GM detector. Saturation of a GM detector greatly increases the current being provided to the detector and will dramatically increase the current required to maintain the High voltage. This large current change will result in a large signal change at the input of U2. This signal change at the input of U2 will result in a large change in the output of U2 that will switch LED D6 DETECTOR on and switch the output of U5 on energizing the analog switch U6 that will cause the panel meter to indicate full scale. The DETECTOR LED will automatically be extinguished when the detector is removed from the high radiation field and the power required to operate the High Voltage circuit returns to normal.

4.0 OPERATING CONTROLS - INDICATORS - FRONT PANEL

4.1 CONTROL - MAIN SELECTOR SWITCH

- OFF ——— ALL POWER DISCONNECTED TO THE INSTRUMENT.
- X 1000 ——— PANEL METER TOP SCALE IS CALIBRATED 0 - 500 CPM & 0 - 0.2 mR/HR IN 50 DIVISIONS. METER READING IS MULTIPLIED X 100 FOR ACTUAL READING IN COUNTS PER MINUTE OR mR/h. FULL SCALE 500,000 CPM OR 200 mR/h.
- X 100 ——— PANEL METER TOP SCALE IS CALIBRATED 0 - 500 CPM & 0 - 0.2 mR/HR IN 50 DIVISIONS. METER READING IS MULTIPLIED X 100 FOR ACTUAL READING IN COUNTS PER MINUTE OR mR/h. FULL SCALE 50,000 CPM OR 20 mR/h.

4.0 OPERATING CONTROLS LED INDICATORS - FRONT PANEL CONTINUED

- * X 10 ————— PANEL METER TOP SCALE IS CALIBRATED 0 - 500 CPM & 0 - 0.2 mR/h IN 50 DIVISIONS. METER READING IS MULTIPLIED X 10 FOR ACTUAL READING IN COUNTS PER MINUTE OR mR/h. FULL SCALE 5000 CPM OR 2.0 mR/h.
- * X 1 ————— PANEL METER TOP SCALE IS CALIBRATED 0 - 500 CPM & 0.2 mR/h IN 50 DIVISIONS. METER READING IS MULTIPLIED X 1 FOR ACTUAL READING IN COUNTS PER MINUTE OR mR/h. FULL SCALE 500 CPM OR 0.2 mR/h.

4.1 CONTROL - VOLTAGE SELECTOR SWITCH

- BATTERY — INDICATE THE BATTERY VOLTAGE ON 0 - 15 VDC SCALE
- HV ————— INDICATES THE HIGH VOLTAGE TO THE PROBE ON THE 0 - 15 SCALE MULTIPLIED X 100 (0 - 1500 VDC)

4.2 CONTROL - AUDIO SWITCH

- * TURNS THE AUDIBLE SIGNAL THAT INDICATES DETECTOR SIGNAL LEVEL ON OR OFF.

4.3 CONTROL - RESET SWITCH

- * RESETS THE PANEL METER TO ZERO.

4.4 CONTROL - RESPONSE CONTROL

- * POTENTIOMETER THAT ENABLES THE USER TO ADJUST THE RESPONSE TIME OF THE INSTRUMENT FROM 4 SECONDS TO 20 SECONDS FOR 90 % OF FULL SCALE METER DEFLECTION.

4.5 INDICATOR - LOW BATTERY

- * LOCATED IN THE LOWER LEFT SIDE OF THE PANEL METER UNDER THE LETTERS BATT. RED LED WILL LIGHT AUTOMATICALLY WHEN THE BATTERY VOLTAGE DROPS BELOW APPROXIMATELY 6.8 VDC.

4.6 INDICATOR - DETECTOR SATURATION

- * LOCATED IN THE UPPER RIGHT SIDE OF THE PANEL METER UNDER THE LETTERS DETECTOR. RED LED WILL LIGHT AND PANEL METER WILL LATCH FULL SCALE AUTOMATICALLY INDICATING THE GEIGER-MUELLER TYPE DETECTOR HAS SATURATED (CONTINUOUS DISCHARGE) AND IS NO LONGER PROVIDING ACCURATE INFORMATION OR THE PROBE CABLE HAS SHORTED. THE PANEL METER WILL RETURN TO NORMAL OPERATION AND THE LED WILL EXTINGUISH WHEN THE RADIATION FIELD AT THE DETECTOR IS BELOW THE SATURATION LEVEL OR THE PROBE CABLE HAS BEEN REPLACED.

4.7 CONNECTORS - FRONT PANEL**4.7.1 DETECTOR PROBE**

* BNC TYPE CONNECTOR

5.0 OPERATING INSTRUCTIONS**5.1 BEFORE OPERATION**

5.1.2 The GSM-115 has been adjusted to operate with a probe utilizing a 900 vdc detector tube. This High Voltage setting will permit operation with Johnson probes HP-265, GP-200, GP-1001 & GLE-1 WITHOUT ANY CHANGE IN THE HIGH VOLTAGE SETTING. Other detectors requiring a different High Voltage and/or input sensitivity will require resetting the high voltage and input sensitivity to assure satisfactory detector operation. Refer to the Maintenance Section 6.2.2 or 6.2.4 for the High Voltage and input sensitivity adjustment procedure.

5.1.3 The input sensitivity has been to approximately 0.050 v-pp for operation with any of the detectors listed in 5.1.2. This sensitivity setting is recommended for operation with all GM & scintillation type detectors. See the MAINTENANCE SECTION 6.2.4 for adjustment instructions.

5.1.4 Check the Appendix for the specific operating instructions for the HP-265, GP-200, GP1001, GP1002 or GLE-1 detectors.

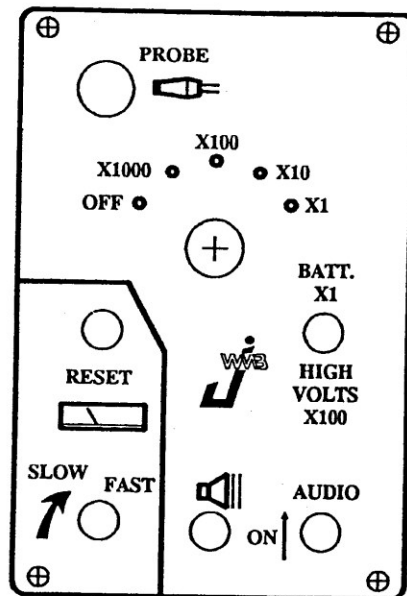
5.2 INSTRUMENT OPERATION

5.2.1 Connect the detector probe BNC to the INPUT BNC receptacle located on the front panel. FIGURE 1 shows the location of the front panel controls.

5.2.2 Adjust the MAIN SELECTOR switch to the X1000 position. CHECK the internal battery voltage by switching the voltage check switch to the BATTERY position and verify the internal battery is reading at least 6.8 vdc

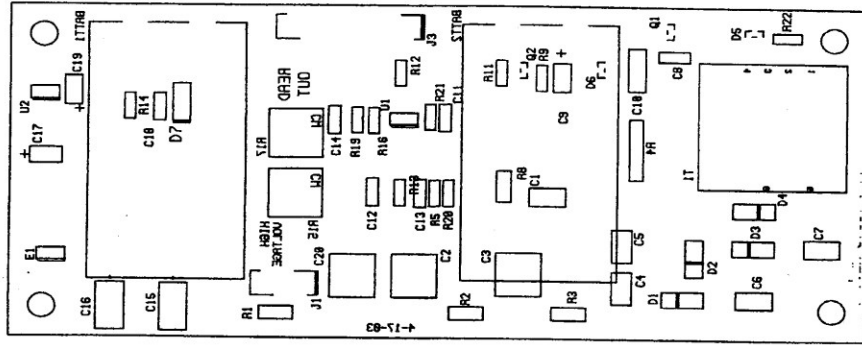
5.2.3 Adjust the voltage check switch to the HIGH VOLTAGE position and verify the high voltage is reading the voltage required for the probe that will be connected to the GSM-115. Most GM type probes require 900 or 550 vdc for correct operation.

5.2.4 Adjust the MAIN SELECTOR switch to the X1 position. The panel meter will indicate the background radiation in the vicinity of the detector. If the meter is indicating in excess of full scale turn the MAIN SELECTOR switch to the next highest range or until the reading is below full scale.

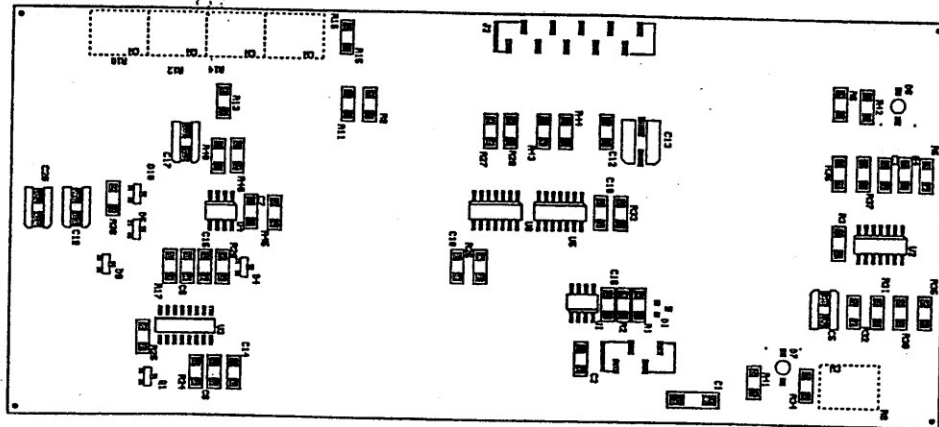


GSM-115

FRONT PANEL CONTROLS
FIGURE 1



GSM-115 POWER SUPPLY PC BOARD
P/N 11843



GSM-115 FRONT PANEL/LOGIC PC BOARD
P/N 12057

CALIBRATION CONTROLS AND MAJOR COMPONENTS
FIGURE: 2

6. 0 MAINTENANCE**6.1 TEST INSTRUMENTS REQUIRED**

- **DIGITAL VOLTMETER CAPABLE OF ACCURATELY READING 0 - 10 VDC TO 0.010 VDC WITH INPUT IMPEDANCE OF AT LEAST 20 MEG OHM.**
- **HIGH VOLTAGE VOLTMETER CAPABLE OF READING 1500 VDC WITH INPUT IMPEDANCE OF AT LEAST 1000 MEG OHM.**
- **OSCILLOSCOPE WITH AT LEAST 20 MHz BANDPASS AND 0.010/CM V-PP INPUT SENSITIVITY.**
- **PULSE GENERATOR WITH VARIABLE PULSE AMPLITUDE CONTROL. RANGE 0 - 500,000 PULSES/MINUTE (833.33 PULSES/SEC.) VARIABLE FROM 0.005 V-PP TO 5 V-PP. ACCURACY 1% OR BETTER OF INDICATED OUTPUT.**
- **10 MEG OHM RESISTOR 1/2 WATT & TEST LEAD INSULATED FOR HIGH VOLTAGE.**
- **3-4 FOOT LENGTH OF COAXIAL CABLE WITH MALE BNC CONNECTORS ON EACH END.**

6. 2 TEST PROCEDURES**6.2.1. CHECK 5 VDC POSITIVE POWER SUPPLY & 5 VDC NEGATIVE POWER SUPPLY**

- 6.2.1.1. **Remove the GSM-115 from its housing by unlatching the spring loaded latches located in each end of the housing.**
- 6.2.1.2. **Check 9 vdc batteries with the DVM. Batteries must read 6.8vdc or higher.**
- 6.2.1.3. **Connect the DVM to PIN 2 of E1. DVM should read 5.00 vdc \pm 0.05 vdc**
- 6.2.1.4. **Connect the DVM to pin 5 of U2 on the POWER SUPPLY BOARD. DVM should read -5.00 vdc \pm 0.05 vdc**
- 6.2.1.5. **This completes checking of the low voltage power supplies.**

6.2.2. ADJUST THE HIGH VOLTAGE POWER SUPPLY.

- 6.2.2.1. **Remove the GSM-115 from its housing by unlatching the spring loaded latches located in each end of the housing.**
- 6.2.2.2. **Connect the HIGH VOLTAGE voltmeter to the INPUT BNC receptacle**

6.2.2. ADJUST THE HIGH VOLTAGE POWER SUPPLY - CONTINUED

- 6.2.2.3. Adjust the MAIN SELECTOR switch to the X1000 range.
- 6.2.2.4. Adjust potentiometer R15 on the POWER SUPPLY BOARD until the HIGH VOLTAGE reads 900 vdc \pm 20 vdc
- 6.2.2.5. Adjust the MAIN SELECTOR switch to the HIGH VOLTAGE position and adjust potentiometer R17 until the panel meter indicates 900 vdc.
- 6.2.2.6. This completes adjustment of the High voltage power supply.

6.2.3. CHECK DETECTOR SATURATION CIRCUIT

- 6.2.3.1. Remove the GSM-115 from it's housing by unlatching the spring loaded latches located in each end of the housing.
- 6.2.3.2. Connect one end of the 10 meg ohm resistor to the ground lead at the base of the INPUT BNC receptacle.
- 6.2.3.3. Connect one end of the insulated High Voltage test lead to the other end of the 10 meg ohm resistor.
- 6.2.3.4. Adjust the MAIN SELECTOR switch to the X1000 position.
- 6.2.3.5. CAREFULLY AND MOMENTARILY TOUCH THE HIGH VOLTAGE TEST LEAD TO THE CENTER CONDUCTOR OF THE INPUT BNC RECEPTACLE.
- 6.2.3.6. The FAULT INDICATOR on the front panel should light and the panel meter should indicate FULL SCALE. REMOVING the test lead from the center conductor of the BNC should extinguish the LED and release the meter. Adjust R8 until the LED glows brightly and repeat the test to verify correct operation.
- 6.2.3.7. This completes testing of the TUBE SATURATION CIRCUIT.

6.2.4. ADJUST INPUT SENSITIVITY

- 6.2.4.1. Remove the GSM-115 from it's housing by unlatching the spring loaded latches located in each end of the housing.
- 6.2.4.2. Connect the pulse generator to the input connector through the coaxial cable with BNC connectors on each end.
- 6.2.4.3 Adjust the pulse generator to 500,000 cpm. Adjust pulse amplitude control to lowest amplitude that will be measured, but not below 0.050 v pep. The input sensitivity of the GSM -115 has a low end range of approximately 0.050 v pp.

6.2.4. ADJUST INPUT SENSITIVITY CONTINUED

- 6.2.4.4. Adjust the MAIN SELECTOR switch on the GSM-115 to the X1000 scale.
- 6.2.4.5. The front panel meter should indicate 500,000 cpm.
- 6.2.4.6. Repeat steps 6.2.1.4 & 6.2.1.5 on the X100, X10 & X1 scales to verify the instrument is counting the input pulses.
- 6.2.4.7. Refer to SECTION 6.2.5 COUNT RATE METER ADJUSTMENT & CALIBRATION FOR THE CALIBRATION PROCEDURE.

6.2.5. RATE METER ADJUSTMENT & CALIBRATION

- 6.2.5.1. Adjust the MAIN SELECTOR switch to the X1000 position.
- 6.2.5.2. Adjust the pulse generator output to 500,000 pulses/minute with an amplitude of 0.050 v pp.
- 6.2.5.3. Adjust potentiometer R9 until the panel meter reads 500,000 counts/minute. Increase the amplitude of the output pulse to 5.0 v pp. Meter reading should remain constant.
- 6.2.5.4. Adjust the MAIN SELECTOR switch to the X100 position.
- 6.2.5.5. Adjust the pulse generator output to 50,000 pulses/minute with an amplitude of 0.050 v pp.
- 6.2.5.6. Adjust potentiometer R11 until the panel meter reads 50,000 counts/minute. Increase the amplitude of the output pulse to 5.0 v pp. Meter reading should remain constant.
- 6.2.5.7. Adjust the MAIN SELECTOR switch to the X10 position.
- 6.2.5.8. Adjust the pulse generator output to 5,000 pulses/minute with an amplitude of 0.050 v pp.
- 6.2.5.9. Adjust potentiometer R13 until the panel meter reads 5,000 counts/minute. Increase the amplitude of the output pulse to 5.0 v pp. Meter reading should remain constant.
- 6.2.5.10. Adjust the MAIN SELECTOR switch to the X1 position.
- 6.2.5.11. Adjust the pulse generator output to 500 pulses/minute with an amplitude of 0.050 v pp.
- 6.2.5.13. Adjust potentiometer R15 until the panel meter reads 500 counts/minute. Increase the amplitude of the output pulse to 5.0 v pp. Meter reading should remain constant.
- 6.2.5.14. This completes the ELECTRICAL CALIBRATION of the rate meter.

6.2.5.15. THE ELECTRICAL CALIBRATION DESCRIBED IN THIS SECTION DOES NOT CALIBRATE THE GSM-115 FOR ACTUAL RADIATION DOSE RATE. DOSE CALIBRATION MUST BE PERFORMED WITH THE APPROPRIATE CALIBRATED RADIATION SOURCE IN A FACILITY THAT HAS BEEN APPROVED BY THE NUCLEAR REGULATORY COMMISSION

6.2.6 RAPID TROUBLE SHOOTING GUIDE

GENERAL: The rapid trouble shooting guide is designed to provide a quick method of determining the overall problems that exist in the major sections of this instrument. The guide is not all inclusive and is best utilized as a diagnostic aid prior to undertaking the repair of the instrument. The sections covered by the RTS are:

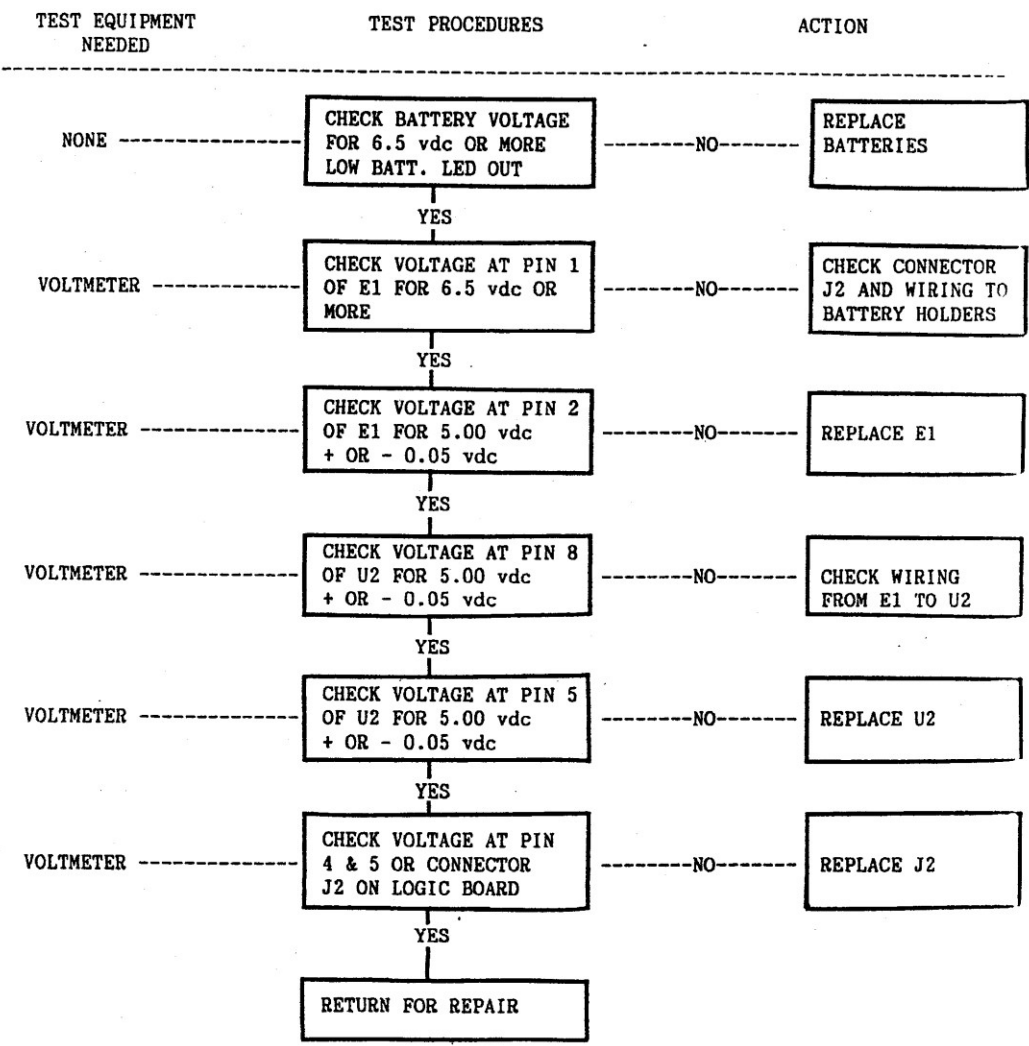
6.2.6.1 - 5 VOLT POSITIVE AND NEGATIVE POWER SUPPLY

6.2.6.2 - HIGH VOLTAGE POWER SUPPLY

6.2.6.3 - AUDIO OUTPUT OR METER MOVEMENT

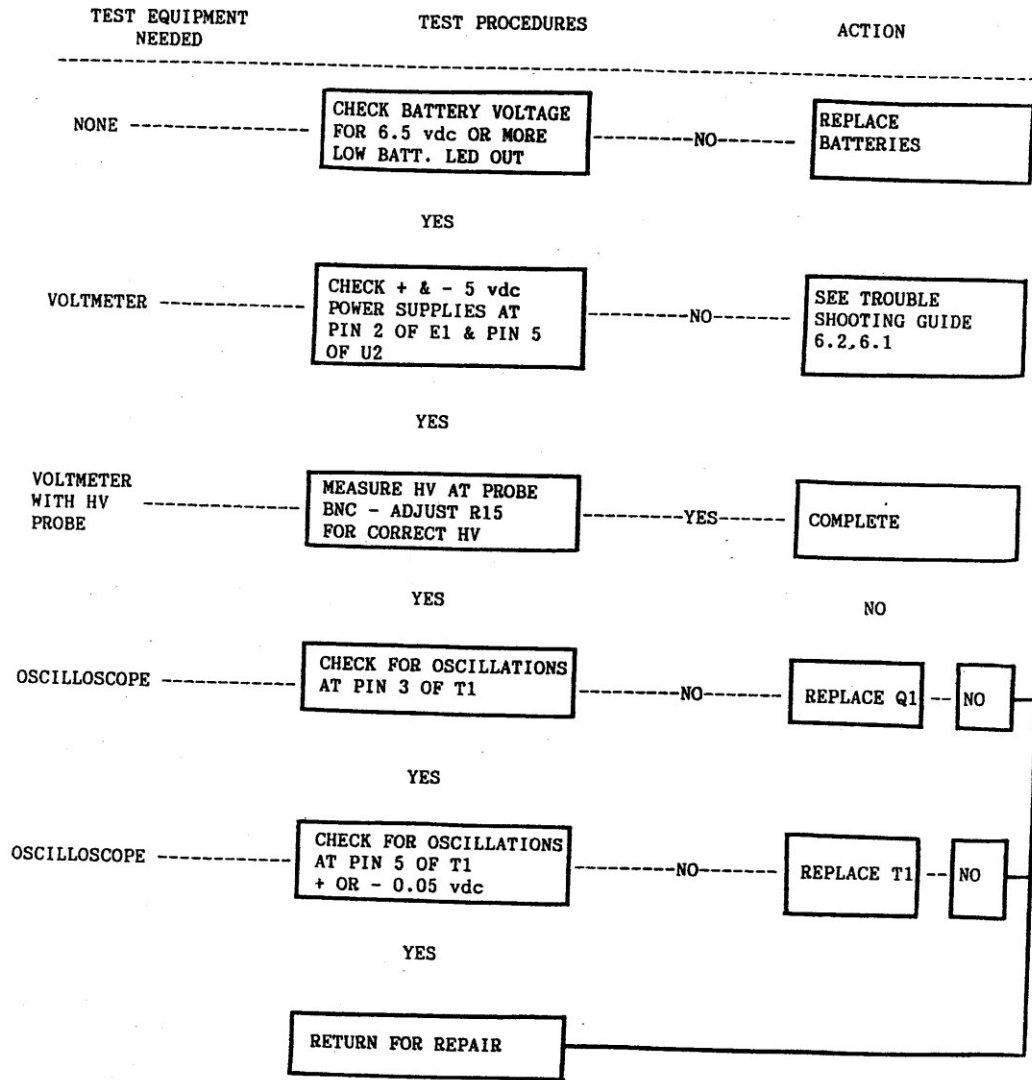
6.2.6.1

NO 5 VOLT POWER SUPPLY



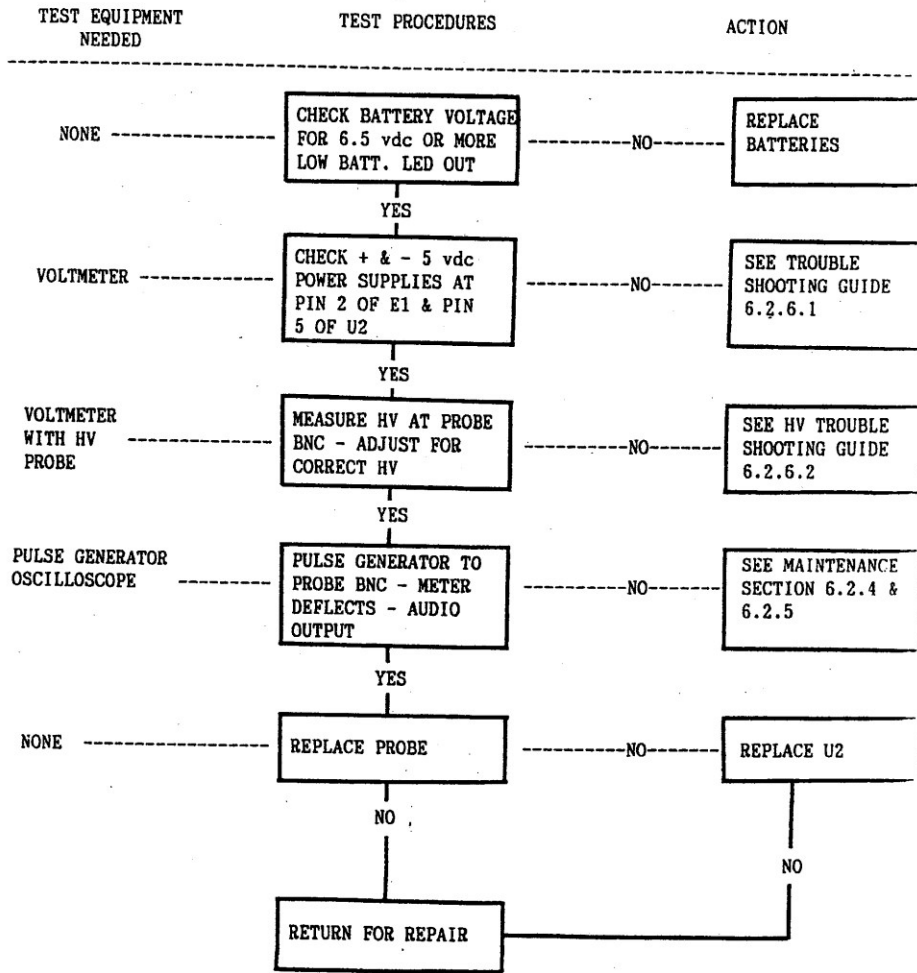
6.2.6.2

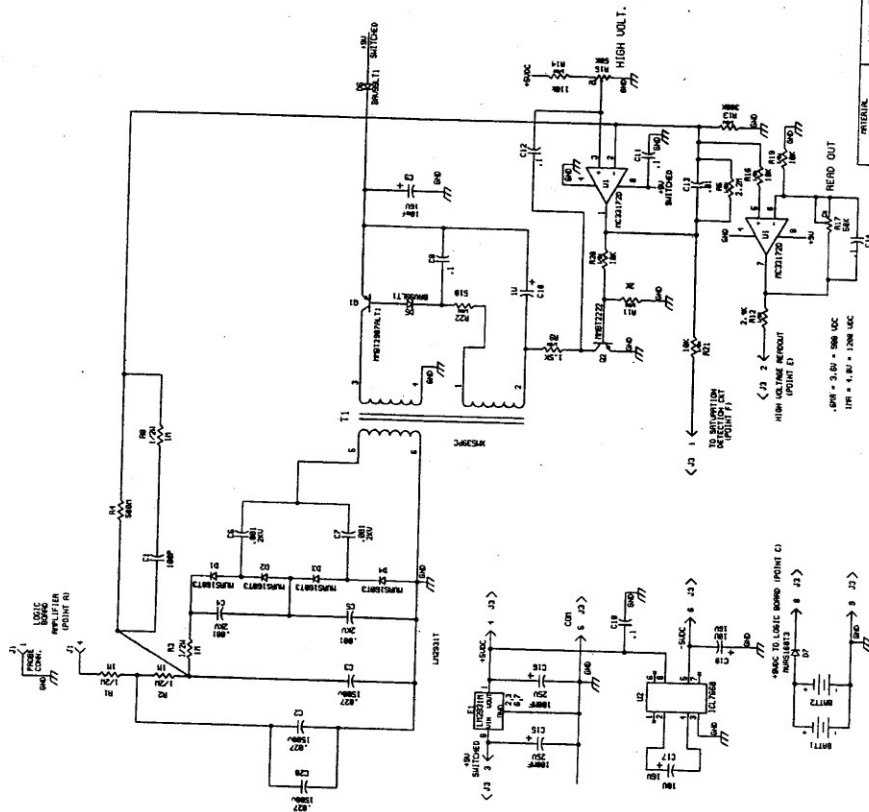
NO HIGH VOLTAGE



6.2.6.3

NO AUDIO OR METER MOVEMENT





LM- B. JOHNSON ASSOCIATES, INC.
 RONCEVERTE, WEST VIRGINIA, U.S.A.

**MODEL GSM-115
 POWER SUPPLY
 PC BOARD**

PARTS LIST

7.0 PARTS LIST7.1 GSM-115 LOGIC BOARD & FRONT PANEL - P/N 12057 - REVISION 0

JOHNSON P/N	DESCRIPTION	REFERENCE	QUANTITY REQUIRED
12057-1	LOGIC PRINTED CIRCUIT BOARD	PCB	1
112948	KINGSBRIGHT 2.5 X 2MM RED (SMT) AM2520SURCK09	D6,D7	2
108350	1M 5% 1/8 W SMT RESISTOR	R4	1
110912	18K 5% 1/8W SMT 1206 PKG	R31	1
108117	10K 5% 1/8W SMT 1206 PKG	R3,5,32,36-38	6
108117	10K 5% 1/8W SMT 1206 PKG	R11,43,44,46	4
108116	100K 5% 1/8W SMT RESISTOR	R13,34	2
108829	47K 5% 1/8W SMT RESISTOR	R33	1
108118	4.7K 5% 1/8W SMT RESISTOR	R26	1
108952	12K 5% 1/8W SMT 1206 PKG	R27	1
108787	2.7K 5% 1/8W SMT RESISTOR	R15,R20	2
110634	91K 5% 1/8W SMT 1206 PKG	R45	1
100711	15K 5% 1/8 W SMT RESISTOR	R24	1
109128	560K 5% 1/8 W SMT RESISTOR	R2	1
100703	20K 5% 1/8 W SMT RESISTOR	R1	1
108119	100Ω 5% 1/8W SMT 1206 PKG	R6,R40	2
108789	470 Ω 5% 1/8W SMT RESISTOR	R41,42	2
11572	500 K POTENTIOMETER	R14	1
11159-2	SPACER, DWG# B35675		1
103570	POTS, 10K 3386X-1-103	R10	1
103755	POTS, 200K 3386X-1-204	R8,12	2
103742	SWITCH, 6 POS - A20615RNCQ	SW1	1
107424	TOGGLE SW SPDT	SW4	1
105293	PANEL METER 1 MADC JOHNSON 0-500 CPM/0-.2 mR/h	M1-AA	1
105294	SPEAKER - SMA24A - SONICALL	A1	1
101553	3 amp PUSHBUTTON SWITCH	SW3	1
106508	TERMINAL, 1502-2 KEYSTONE	TP1-5	5
105291	SWITCH 7105SYCQE OFF-ON-OFF	SW2	1
108358	CAPACITOR 0.1MFD 50V ±20% SMT	C2,3,7,10,12	5
108358	CAPACITOR 0.1MFD 50V ±20% SMT	C14,18	2
111185	CAPACITOR 0.22MFD 50V ±10% SMT	C6	1
100242	CAPACITOR 0.01MFD 50V ±20% SMT	C15	1
108123	DIODE 200MW - 100V - SMT	D4,5,9,10	4
109134	IC SMT LP339M	U2	1
101221	DIODE 1N34A 60V, 5MA	D3	1
108361	QUAD SWITCH MC14066BD SMT	U6	1
110814	DUAL ONE SHOT MM74HC4538M-SMT	U3	1
107593	TERMINAL BCS-1040L-S-TE	J1	1
103757	POT - 3386X-1-202 2K	R16	1

7.1 GSM-115 LOGIC BOARD - P/N 12057 - REVISION 1

JOHNSON P/N	DESCRIPTION	REFERENCE	QUANTITY REQUIRED
108865	DUAL DIODE PMBD70000T/R SMT	D1	1
107592	TERMINAL BCS-110-L-S-TE	J2	1
103759	POT 1MEG 392-JA-105	R39	1
108661	TRAN - NPN MMBT2222ALT1SMT	Q1	1
111027	75K 5% 1/8W RESISTOR SMT	R30	1
111028	5.1 MEG 5% 1/8W RESISTOR SMT	R35	1
111026	1.8 K 5% 1/8W RESISTOR SMT	R28	1
111268	100MF 16V ±20% CAP - SMT	C13	1
111166	10MF 16V ±20% CAP - SMT	C19,20	2
111186	4.7MF 25V ±10% CAP - SMT	C17	1
111036	22PF 100V ±10% CAP - SMT	C16	1
102076	100PF 3KVV ±10% CAP - SMT	C1	1
111035	3 INPUT GATE MC14025BD -SMT	U5	1
111184	I.C. BIFET TL061CD - SMT	U1,4	2
108385	10MF 25V ±10% CAP - SMT	C5	1
108120	150K 5% 1/8W RESISTOR SMT	R17	1
108349	1K 5% 1/8W RESISTOR SMT	R9,25	2
9077-3	POT MOD -B33285		1
9077-4	ROTARY SWITCH MOD B33288		1
111351	0.22MFD ±20% CAP - SMT	C8	1

7.2 GSM-115 POWER SUPPLY PC BOARD - P/N 11843-1 & MISCELLANEOUS MATERIALS

JOHNSON P/N	DESCRIPTION	REFERENCE	QUANTITY REQUIRED

11843-1	POWER SUPPLY PC BOARD 11843-1		1
104539	TRANSFORMER XO539PC	T1	1
108117	10K 5% 1/8W RESISTOR SMT	R16,19,20,21	4
109127	300K 5% 1/8W RESISORR SMT	R13	1
100210	2K 5% 1/8W RESISORR SMT	R11	1
100238	510 Ω 5% 1/8W RESISORR SMT	R22	1
109896	2.4K 5% 1/8W RESISORR SMT	R12	1
108353	1.5K 5% 1/8W RESISORR SMT	R9	1
109163	110K 5% 1/8W RESISORR SMT	R14	1
110656	10MF 16V ±20% CAP - SMT	C9,17,19	3
111180	1MEG 5% 1/2W - SMT	R1-3,8	4
110227	DUAL DIODE 70V BAV99T/R - SMT	D5-7	3
109975	NPN TRANSISTOR EMMT489 - SMT	Q2	1
109156	MC33172D I.C. - SMT	U1	1

7.2 GSM-115 POWER SUPPLY PC BOARD - P/N 11843-1 & MISCELLANEOUS MATERIALS

JOHNSON P/N	DESCRIPTION	REFERENCE	QUANTITY REQUIRED

100242	CAPACITOR 0.01MFD 50V ±20% SMT	C13	1
1108358	CAPACITOR 0.1MFD 50V ±20% SMT	C8,11,12,14,18	5
109133	I.C LM2931M-5.0V REG - SMT	E1	1
111128	CAPACITOR 100MFD 50V ±20% SMT	C15,16	2
109011	TRANSISTOR PNP - TMPT2907AKT SMT	Q1	1
112695	CAPACITOR .001MFD 1KV ±20% SMT	C4-7	4
112298	CAPACITOR .027MFD 1500V ±20% SMT	C2,3,20	3
110761	DIODE - 1 AMP 600V - MURS160T3	D1-4	4
112118	CAPACITOR 100PFD 3KV ±20% SMT	C1	1
100481	CAPACITOR 1MFD 50V ±20% SMT	C10	1
112994	36 PIN CONN TSM-136-03-S-SV	J1,3	2
101608	TRIM POT 50K - SMT	R15,17	2
112074	CMOS VOLTSGE CONV - SMT ICL7660CBA	U2	1
103625	RESISTOR 500MEG 20% HV 1/4W	R4	1
109501	RESISTOR 2.2MEG 5% 1/8W SMT	ACROSS C13	1
112820	BATTER HOLDER 9 V BATT	B1,B2	2
106323	CONNECTOR, COVER 4 PIN #640550-4		1
8234-14	PROBE HOLDER SPACER		1
8234-3	PROBE HOLDER		2

APPENDIX

MODEL HP-265 OPERATING INSTRUCTIONS

MODEL GP-200 OPERATING INSTRUCTIONS

MODEL GP-1001 OPERATING INSTRUCTIONS

MODEL GP-1002 OPERATING INSTRUCTIONS

MODEL GLE-1 OPERATING INSTRUCTIONS

APPENDIX

MODEL HP-265 OPERATING INSTRUCTIONS

MODEL GP-200 OPERATING INSTRUCTIONS

MODEL GP-1001 OPERATING INSTRUCTIONS

MODEL GP-1002 OPERATING INSTRUCTIONS

MODEL GLE-1 OPERATING INSTRUCTIONS

MODEL HP-265 OPERATING INSTRUCTIONS:**1. GENERAL:**

The model HP-265 "pancake" detector is will detect a wide range of ionizing radiation, most Of the alpha, beta & gamma radiation commonly found in the laboratory. The detector has a sensitive area of approximately 1.75" diameter (2.5 square inches) and a window density of 1.6 mg/cm². The probe is protected by a copper screen that is approximately 72% open area.

2. RADIATION DETECTED:

The HP-265 will detect:

Alpha radiation with energies above 3.5 MeV,
Beta radiation above 100keV
Gamma radiation above 15keV.

3. APPROXIMATE SENSITIVITY TO SELECTED ISOTOPES:

CARBON 14 ——— = 10-12% 2 pi
SULPHUR 35 ——— = 12-14% 2 pi
PHOSPHOR 32 — = 45 - 50% 2pi

4. OPERATION:

- A. CONNECT THE HP-265 TO THE GSM-115 BY CONNECTING ONE END OF THE 39" COAXIAL (SUPPLIED) TO THE BNC CONNECTOR ON THE END OF THE ~~HP-265~~ HP-265 HOUSING. CONNECT THE OTHER END OF THE CABLE TO THE INPUT CONNECTOR ON THE GSM-115.**
- B. TURN THE MAIN SELECTOR SWITCH TO THE X1000 POSITION. DEPRESS THE VOLTAGE SELECTOR SWITCH TOWARDS THE BATT POITION, PANEL METER SHOULD INDICATE BETWEEN 6.8 - 9 VDC. IF LOWER THAN 6.8 VDC CHANGE BATTERIES BEFORE OPERATION.**
- C. TURN THE MAIN SELECTOR SWITCH TO THE X1000 POSITION. DEPRESS THE VOLTAGE SELECTOR SWITCH TOWARDS THE HV POSITION, PANEL METER SHOULD INDICATE BETWEEN 900 VDC (±20 VDC. DO NOT OPERATE THE METER IF HV IS OUT OF RANGE.**
- D. TURN THE AUDIO SWITCH ON.**
- E. PLACE THE MAIN SELECTOR SWITCH IN THE X1 POSITION**
- F. THIS COMPLETES THE VOLTAGE CHECKS AND METER IS NOW READY TO OPERATE.**
- G. THE SENSITIVE PART OF THE HP-265 DETECTOR IS THE AREA UNDER THE COPPER SCREEN. GRASP THE HANDLE OF THE HP-265 IN ONE HAND WITH THE SCREEN SIDE OF THE DETECTOR FACING TOWARDS THE AREA TO BE MEASURED. IF RADIATION IS PRESENT THE METER SHOULD BEGIN TO INDICATE UP SCALE AND PRODUCE AND AUDIBLE "CLICK".**

H. THE METER WILL INDICATE FURTHER UP SCALE AND THE "CLICK" INCREASE IN FREQUENCY THE CLOSER THE FACE OF THE PROBE IS HELD TO THE RADIATION SOURCE OR CONTAMINATION. IF THE METER READING EXCEEDS THE RANGE SWITCH TO THE NEXT HIGHER RANGE (X10 OR X100). THE METER READING IS OBTAINED BY TAKING THE METER READING IN CPM OR DOSE AND MULTIPLYING BY THE RANGE (X1, X10 OR X100). THE METER COMES FROM THE FACTORY CALIBRATED IN CPM (COUNTS PER MINUTE). THE METER CAN BE CALIBRATED IN DOSE (mR/hr) BY A LAB OR FACILITY THAT HAS A CERTIFIED CALIBRATION SYSTEM. BE SURE TO VERIFY THE TYPE CALIBRATION BEFORE MAKING MEASUREMENTS WITH THE GSM-115 **CAUTION: DO NOT LET THE PROBE TOUCH A SURFACE CONTAMINATED WITH RADIOACTIVE MATERIAL OR THE PROBE WILL HAVE TO BE CONTAMINATED. DO NOT LET SHARP OBJECTS PROTRUDE THROUGH THE COPPER SCREEN OR THE FACE OF THE DETECTOR CAN BE DESTROYED AND WILL REQUIRE A NEW DETECTOR TO REPAIR.**

5. DECONTAMINATING THE PROBE:

PLEASE CHECK WITH YOUR RADIATION SAFETY OFFICER BEFORE ATTEMPTING THE FOLLOWING PROCEDURE TO BE SURE YOU ARE COMPLYING WITH ALL REGULATORY REQUIREMENTS.

- A. IF THE METER HAS A HIGH BACKGROUND READING WITH NO RADIATION PRESENT THEN THE SURFACE OF THE PROBE IS PROBABLY CONTAMINATED.
- B. THE PROBE HOUSING CAN BE DECONTAMINATED BY USING A MILD DETERGENT ~~AND~~ Q TIPS, PAPER TOWELS ETC.
- C. MOISTEN A Q TIP OR TOWEL AND SCRUB ALL OUTER SURFACES OF THE PROBE HOUSING. THE COPPER SCREEN CAN BE REMOVED BY REMOVING THE 3 SCREWS HOLDING THE SCREEN IN PLACE. THE PROBE DETECTOR WINDOW IS NOW EXPOSED. THE WINDOW IS VERY THIN AND FRAGILE. BE VERY CAREFUL. CLEAN BOTH SIDES OF THE SCREEN.
- D. INSTALL THE SCREEN WITH THE 3 SCREWS REMOVED FROM THE HOUSING. TURN ON THE METER WITH THE PROBE CONNECTED. IF THE BACKGROUND IS NOT REDUCED TO NORMAL LEVELS THE FACE OF THE DETECTOR IS PROBABLY CONTAMINATED.
- E. REMOVE THE THREE SCREWS HOLDING THE SCREEN TO THE PROBE HOUSING AND CAREFULLY REMOVE THE SCREEN. THE DETECTOR WINDOW IS NOW EXPOSED.
- F. THE DETECTOR IS THE SMOOTH GRAY PART OF THE DETECTOR. MOISTEN A Q TIP WITH THE DETERGENT AND CAREFULLY, VERY GENTLY CLEAN THE FACE OF THE DETECTOR. USE SEVERAL Q TIPS TO KEEP FROM SPREADING THE CONTAMINATION.
- G. REMOVE ALL CONTAMINATED MATERIAL. CAREFULLY REPLACE THE SCREEN BY INSTALLING THE 3 RETAINING SCREWS. TURN ON THE METER, IF THE BACKGROUND IS NOT REDUCED TO NORMAL LEVELS REPEAT THE CLEANING. BE GENTLE AND EXTREMELY CAREFUL WHEN WORKING ON THE FACE OF THE DETECTOR.

MODEL GP-200 OPERATING INSTRUCTIONS:**1. GENERAL:**

The model GP-200 END WINDOW detector is will detect a wide range of ionizing radiation, most Of the alpha, beta & gamma radiation commonly found in the laboratory. The detector has a sensitive area of approximately 1.125" diameter (1 square inches) and a window density of 1.6 mg/cm². The probe is protected by a stainless steel screen that is approximately 90% open area.

2. RADIATION DETECTED:

The GP-200 will detect:

Alpha radiation with energies above 3.5 MeV,
Beta radiation above 100keV
Gamma radiation above 15keV.

3. APPROXIMATE SENSITIVITY TO SELECTED ISOTOPES:

CARBON 14 ——— = 10-12% 2 pi
SULPHUR 35 ——— = 12-14% 2 pi
PHOSPHOR 32 — = 45 - 50% 2pi

4. OPERATION:

- a. CONNECT THE GP-200 TO THE GSM-115 BY CONNECTING ONE END OF THE 39" COAXIAL (SUPPLIED) TO THE BNC CONNECTOR ON THE END OF THE ~~GP-200~~ GP-200 HOUSING. CONNECT THE OTHER END OF THE CABLE TO THE INPUT CONNECTOR ON THE GSM-115.
- b. TURN THE MAIN SELECTOR SWITCH TO THE X1000 POSITION. DEPRESS THE VOLTAGE SELECTOR SWITCH TOWARDS THE BATT POSITION, PANEL METER SHOULD INDICATE BETWEEN 6.8 - 9 VDC. IF LOWER THAN 6.8 VDC CHANGE BATTERIES BEFORE OPERATION.
- c. TURN THE MAIN SELECTOR SWITCH TO THE X1000 POSITION. DEPRESS THE VOLTAGE SELECTOR SWITCH TOWARDS THE HV POSITION, PANEL METER SHOULD INDICATE BETWEEN 900 VDC (±20 VDC. DO NOT OPERATE THE METER IF HV IS OUT OF RANGE.
- d. TURN THE AUDIO SWITCH ON.
- e. PLACE THE MAIN SELECTOR SWITCH IN THE X1 POSITION
- f. THIS COMPLETES THE VOLTAGE CHECKS AND METER IS NOW READY TO OPERATE.
- g. THE SENSITIVE PART OF THE GP-200 DETECTOR FOR MEASURING CONTAMINATION IS THE END OF THE HOUSING UNDER THE STAINLESS STEEL SCREEN. IF THE GP-200 IS DOSE CALIBRATED THEN THE SIDE OF THE DETECTOR IS THE WINDOW. TO MEASURE CONTAMINATION, GRASP THE PROBE HOUSING IN ONE HAND WITH THE SCREEN END OF THE DETECTOR FACING TOWARDS THE AREA TO BE MEASURED. IF RADIATION IS PRESENT THE METER SHOULD BEGIN TO INDICATE UP SCALE AND PRODUCE AND AUDIBLE "CLICK".

- h. THE METER WILL INDICATE FURTHER UP SCALE AND THE "CLICK" INCREASE IN FREQUENCY THE CLOSER THE FACE OF THE PROBE IS HELD TO THE RADIATION SOURCE OR CONTAMINATION. IF THE METER READING EXCEEDS THE RANGE SWITCH TO THE NEXT HIGHER RANGE (X10, X100 OR X1000). THE METER READING IS OBTAINED BY TAKING THE METER READING IN CPM OR DOSE AND MULTIPLYING BY THE RANGE (X1, X10, 100 OR X1000). THE METER COMES FROM THE FACTORY CALIBRATED IN CPM (COUNTS PER MINUTE). THE METER CAN BE CALIBRATED IN DOSE (mR/hr) BY A LAB OR FACILITY THAT HAS A CERTIFIED CALIBRATION SYSTEM. BE SURE TO VERIFY THE TYPE CALIBRATION BEFORE MAKING MEASUREMENTS WITH THE GSM-115 **CAUTION: DO NOT LET THE PROBE TOUCH A SURFACE CONTAMINATED WITH RADIOACTIVE MATERIAL OR THE PROBE WILL HAVE TO BE CONTAMINATED. DO NOT LET SHARP OBJECTS PROTRUDE THROUGH THE COPPER SCREEN OR THE FACE OF THE DETECTOR CAN BE DESTROYED AND WILL REQUIRE A NEW DETECTOR TO REPAIR.**

5. DECONTAMINATING THE PROBE:

PLEASE CHECK WITH YOUR RADIATION SAFETY OFFICER BEFORE ATTEMPTING THE FOLLOWING PROCEDURE TO BE SURE YOU ARE COMPLYING WITH ALL REGULATORY REQUIREMENTS.

- a. ~~IF THE~~ **IF THE METER HAS A HIGH BACKGROUND READING WITH NO RADIATION PRESENT THEN THE SURFACE OF THE PROBE IS PROBABLY CONTAMINATED.**
- b. **THE PROBE HOUSING CAN BE DECONTAMINATED BY USING A MILD DETERGENT AND Q TIPS, PAPER TOWELS ETC.**
- c. **MOISTEN A Q TIP OR TOWEL AND SCRUB ALL OUTER SURFACES OF THE PROBE HOUSING INCLUDING THE STAINLESS STEEL SCREEN. TURN THE METER ON TO DETERMINE IF THE CONTAMINATION HAS BEEN REMOVED. IF THE PROBE IS STILL CONTAMINATED THE SCREEN COVERING THE DETECTOR CAN BE CLEANED AGAIN USING STEP C IN THIS PROCEDURE.**
- d. **IF THE PROBE STILL SHOWS SIGNS OF CONTAMINATION CONTACT YOUR RADIATION SAFETY OFFICER FOR FURTHER ASSISTANCE.**
- e. **DO NOT RETURN A CONTAMINATED METER OR PROBE TO THE MANUFACTURER.**

MODEL GP-1001 OPERATING INSTRUCTIONS:**6. GENERAL:**

The model GP-1001 is a energy compensated side window gm detector that is designed to detect gamma radiation up to 200 mR/hr between 40 keV and 2 Mev. The detector has a sensitive area of approximately 1.5" X 0.4". The probe is protected by an aluminum housing that is approximately 0.035" thick. The approximate center of the detector is engraved in the outer housing. The GP-1001 requires 900 vdc for proper operation.

7. RADIATION DETECTED:

The GP-1001 will detect:

Gamma radiation from 40 keV to 2 Mev.
SENSITIVITY: 1000 CPM/mR/hr

8. OPERATING RANGE:

0 - 200 mR/hr gamma radiation

9. OPERATION:

- a. CONNECT THE GP-1001 TO THE GSM-115 BY CONNECTING ONE END OF THE 39" COAXIAL (SUPPLIED) TO THE BNC CONNECTOR ON THE END OF THE GP-1001 HOUSING. CONNECT THE OTHER END OF THE CABLE TO THE INPUT CONNECTOR ON THE GSM-115.
- b. TURN THE MAIN SELECTOR SWITCH TO THE X1000 POSITION. DEPRESS THE VOLTAGE SELECTOR SWITCH TOWARDS THE BATT POSITION, PANEL METER SHOULD INDICATE BETWEEN 6.8 - 9 VDC. IF LOWER THAN 6.8 VDC CHANGE BATTERIES BEFORE OPERATION.
- c. TURN THE MAIN SELECTOR SWITCH TO THE X1000 POSITION. DEPRESS THE VOLTAGE SELECTOR SWITCH TOWARDS THE HV POSITION, PANEL METER SHOULD INDICATE BETWEEN 900 VDC (± 20 VDC. DO NOT OPERATE THE METER IF HV IS OUT OF RANGE.
- d. TURN THE AUDIO SWITCH ON.
- e. PLACE THE MAIN SELECTOR SWITCH IN THE X1 POSITION
- f. THIS COMPLETES THE VOLTAGE CHECKS AND METER IS NOW READY TO OPERATE.
- g. BE SURE THE GSM-115 HAS BEEN DOSE CALIBRATED WITH THE GP-1001 BEFORE MAKING ANY RADIATION MEASUREMENTS.
- h. THE SENSITIVE PART OF THE GP-1001 DETECTOR FOR MEASURING GAMMA RADIATION IS THE SIDE OF THE HOUSING NEAR THE ENGRAVED CENTER OF THE DETECTOR MARK. TO MEASURE CONTAMINATION, GRASP THE PROBE HOUSING IN ONE HAND WITH THE SIDE OF THE DETECTOR FACING TOWARDS THE AREA TO BE MEASURED. IF RADIATION IS PRESENT THE METER SHOULD BEGIN TO INDICATE UP SCALE AND PRODUCE AND AUDIBLE "CLICK".

- i. THE METER WILL INDICATE FURTHER UP SCALE AND THE "CLICK" INCREASE IN FREQUENCY THE CLOSER THE FACE OF THE PROBE IS HELD TO THE RADIATION SOURCE OR CONTAMINATION. IF THE METER READING EXCEEDS THE RANGE SWITCH TO THE NEXT HIGHER RANGE (X10, X100 OR X1000). THE METER READING IS OBTAINED BY TAKING THE METER READING IN CPM OR DOSE AND MULTIPLYING BY THE RANGE (X1, X10, 100 OR X1000). THE METER COMES FROM THE FACTORY CALIBRATED IN CPM (COUNTS PER MINUTE). THE METER CAN BE CALIBRATED IN DOSE (mR/hr) BY A LAB OR FACILITY THAT HAS A CERTIFIED CALIBRATION SYSTEM. BE SURE YOU KNOW THE CALIBRATION OF THE SYSTEM BEFORE PROCEEDING TO MAKE MEASUREMENTS. CAUTION: DO NOT LET THE PROBE TOUCH A SURFACE CONTAMINATED WITH RADIOACTIVE MATERIAL OR THE PROBE WILL HAVE TO BE CONTAMINATED.

10. DECONTAMINATING THE PROBE:

PLEASE CHECK WITH YOUR RADIATION SAFETY OFFICER BEFORE ATTEMPTING THE FOLLOWING PROCEDURE TO BE SURE YOU ARE COMPLYING WITH ALL REGULATORY REQUIREMENTS.

- a. IF THE METER HAS A HIGH BACKGROUND READING WITH NO RADIATION PRESENT THEN THE SURFACE OF THE PROBE IS PROBABLY CONTAMINATED.
- b. THE PROBE HOUSING CAN BE DECONTAMINATED BY USING A MILD DETERGENT AND Q TIPS, PAPER TOWELS ETC.
- c. MOISTEN A Q TIP OR TOWEL AND SCRUB ALL OUTER SURFACES OF THE PROBE HOUSING. TURN THE METER ON TO DETERMINE IF THE CONTAMINATION HAS BEEN REMOVED. IF THE PROBE IS STILL CONTAMINATED REPEAT THE CLEANING PROCEDURE.
- d. IF THE METER IS STILL INDICATING A HIGH READING WITH NO RADIATION PRESENT
- e. CONTACT YOUR RADIATION SAFETY OFFICER FOR FURTHER INSTRUCTIONS.
- f. DO NOT RETURN A CONTAMINATED METER OR PROBE TO THE MANUFACTURER.

MODEL GP-1002 OPERATING INSTRUCTIONS:**11. GENERAL:**

The model GP-1002 is a energy compensated side window gm detector that is designed to detect gamma radiation up to 1000 mR/hr between 50 keV and 2 Mev. The detector has a sensitive area of approximately 1.1" X 0.308" (). The probe is protected by an aluminum housing that is approximately 0.035" thick. The approximate center of the detector is engraved in the outer housing. The GP-1001 requires 550 vdc for proper operation.

12. RADIATION DETECTED:

The GP-1002 will detect:

Gamma radiation from 50 keV to 2 Mev.

SENSITIVITY: 450 CPM/mR/hr

13. OPERATING RANGE:

0 - 1000 mR/r gamma radiation

14. OPERATION:

- a. CONNECT THE GP-1002 TO THE GSM-115 BY CONNECTING ONE END OF THE 39" COAXIAL (SUPPLIED) TO THE BNC CONNECTOR ON THE END OF THE GP-1002 HOUSING. CONNECT THE OTHER END OF THE CABLE TO THE INPUT CONNECTOR ON THE GSM-115.
- b. TURN THE MAIN SELECTOR SWITCH TO THE X1000 POSITION. DEPRESS THE VOLTAGE SELECTOR SWITCH TOWARDS THE BATT POSITION, PANEL METER SHOULD INDICATE BETWEEN 6.8 - 9 VDC. IF LOWER THAN 6.8 VDC CHANGE BATTERIES BEFORE OPERATION.
- c. TURN THE MAIN SELECTOR SWITCH TO THE X1000 POSITION. DEPRESS THE VOLTAGE SELECTOR SWITCH TOWARDS THE HV POSITION, PANEL METER SHOULD INDICATE BETWEEN 550 VDC (± 20 VDC. DO NOT OPERATE THE METER IF HV IS OUT OF RANGE.
- d. TURN THE AUDIO SWITCH ON.
- e. PLACE THE MAIN SELECTOR SWITCH IN THE X1 POSITION
- f. THIS COMPLETES THE VOLTAGE CHECKS AND METER IS NOW READY TO OPERATE.
- g. BE SURE THE GSM-115 HAS BEEN DOSE CALIBRATED WITH THE GP-1002 BEFORE MAKING ANY RADIATION MEASUREMENTS
- h. THE SENSITIVE PART OF THE GP-1002 DETECTOR FOR MEASURING GAMMA RADIATION IS THE SIDE OF THE HOUSING NEAR THE ENGRAVED CENTER OF THE DETECTOR MARK. TO MEASURE CONTAMINATION, GRASP THE PROBE HOUSING IN ONE HAND WITH THE SIDE OF THE DETECTOR FACING TOWARDS THE AREA TO BE MEASURED. IF RADIATION IS PRESENT THE METER SHOULD BEGIN TO INDICATE UP SCALE AND PRODUCE AND AUDIBLE "CLICK".

- i. THE METER WILL INDICATE FURTHER UP SCALE AND THE "CLICK" INCREASE IN FREQUENCY THE CLOSER THE FACE OF THE PROBE IS HELD TO THE RADIATION SOURCE OR CONTAMINATION. IF THE METER READING EXCEEDS THE RANGE SWITCH TO THE NEXT HIGHER RANGE (X10, X100 OR X1000). THE METER READING IS OBTAINED BY TAKING THE METER READING IN CPM OR DOSE AND MULTIPLYING BY THE RANGE (X1, X10, 100 OR X1000). THE METER COMES FROM THE FACTORY CALIBRATED IN CPM (COUNTS PER MINUTE). THE METER CAN BE CALIBRATED IN DOSE (mR/hr) BY A LAB OR FACILITY THAT HAS A CERTIFIED CALIBRATION SYSTEM. BE SURE YOU KNOW THE CALIBRATION OF THE SYSTEM BEFORE PROCEEDING TO MAKE MEASUREMENTS. **CAUTION: DO NOT LET THE PROBE TOUCH A SURFACE CONTAMINATED WITH RADIOACTIVE MATERIAL OR THE PROBE WILL HAVE TO BE CONTAMINATED.**

15. DECONTAMINATING THE PROBE:

PLEASE CHECK WITH YOUR RADIATION SAFETY OFFICER BEFORE ATTEMPTING THE FOLLOWING PROCEDURE TO BE SURE YOU ARE COMPLYING WITH ALL REGULATORY REQUIREMENTS.

- a. IF THE METER HAS A HIGH BACKGROUND READING WITH NO RADIATION PRESENT THEN THE SURFACE OF THE PROBE IS PROBABLY CONTAMINATED.
- b. THE PROBE HOUSING CAN BE DECONTAMINATED BY USING A MILD DETERGENT AND Q TIPS, PAPER TOWELS ETC.
- c. MOISTEN A Q TIP OR TOWEL AND SCRUB ALL OUTER SURFACES OF THE PROBE HOUSING. TURN THE METER ON TO DETERMINE IF THE CONTAMINATION HAS BEEN REMOVED. IF THE PROBE IS STILL CONTAMINATED REPEAT THE CLEANING PROCEDURE.
- d. IF THE METER IS STILL INDICATING A HIGH READING WITH NO RADIATION PRESENT
- e. CONTACT YOUR RADIATION SAFETY OFFICER FOR FURTHER INSTRUCTIONS.
- f. **DO NOT RETURN A CONTAMINATED METER OR PROBE TO THE MANUFACTURER.**

MODEL GLE-1 OPERATING INSTRUCTIONS:**1. GENERAL:**

The model GLE-1 LOW ENERGY SCINTILLATION detector is designed to primarily detect low energy gamma ionizing radiation with a high sensitivity 1" diameter X 2mm thick sodium iodide crystal. The detector has a sensitive area of approximately 1.0" diameter (0.75 square inches) and a window density of 70.0 mg/cm². The probe is protected by a .006" thick plastic window.

2. RADIATION DETECTED:

The GLE-1 will detect:

Beta radiation above 1MeV
Gamma radiation above 15keV.

3. APPROXIMATE SENSITIVITY TO SELECTED ISOTOPES:

IODINE 125 -- 38% 2pi

4. OPERATION:

- a. CONNECT THE GLE-1 TO THE GSM-115 BY CONNECTING ONE END OF THE 39" COAXIAL (SUPPLIED) TO THE BNC CONNECTOR ON THE END OF THE GLE-1 HOUSING. CONNECT THE OTHER END OF THE CABLE TO THE INPUT CONNECTOR ON THE GSM-115.
- b. TURN THE MAIN SELECTOR SWITCH TO THE X1000 POSITION. DEPRESS THE VOLTAGE SELECTOR SWITCH TOWARDS THE BATT POSITION, PANEL METER SHOULD INDICATE BETWEEN 6.8 - 9 VDC. IF LOWER THAN 6.8 VDC CHANGE BATTERIES BEFORE OPERATION.
- c. TURN THE MAIN SELECTOR SWITCH TO THE X1000 POSITION. DEPRESS THE VOLTAGE SELECTOR SWITCH TOWARDS THE HV POSITION, PANEL METER SHOULD INDICATE BETWEEN 900 VDC (± 20 VDC. DO NOT OPERATE THE METER IF HV IS OUT OF RANGE.
- d. TURN THE AUDIO SWITCH ON.
- e. PLACE THE MAIN SELECTOR SWITCH IN THE X1 POSITION
- f. THIS COMPLETES THE VOLTAGE CHECKS AND METER IS NOW READY TO OPERATE.
- g. THE SENSITIVE PART OF THE GLE-1 DETECTOR IS THE END WITH THE PLASTIC WINDOW. GRASP THE GLE-1 IN ONE HAND WITH THE WINDOW END OF THE DETECTOR FACING TOWARDS THE AREA TO BE MEASURED. IF RADIATION IS PRESENT THE METER SHOULD BEGIN TO INDICATE UP SCALE AND PRODUCE A AUDIBLE "CLICK".

- h. THE METER WILL INDICATE FURTHER UP SCALE AND THE "CLICK" INCREASE IN FREQUENCY THE CLOSER THE FACE OF THE PROBE IS HELD TO THE RADIATION SOURCE OR CONTAMINATION. IF THE METER READING EXCEEDS THE RANGE SWITCH TO THE NEXT HIGHER RANGE (X10, X100 OR X1000). THE METER READING IS OBTAINED BY TAKING THE METER READING IN CPM AND MULTIPLYING BY THE RANGE (X1, X10, X100 OR X1000). THE METER COMES FROM THE FACTORY CALIBRATED IN CPM (COUNTS PER MINUTE).
- i. CAUTION: DO NOT LET THE PROBE TOUCH A SURFACE CONTAMINATED WITH RADIOACTIVE MATERIAL OR THE PROBE WILL HAVE TO BE CONTAMINATED. DO NOT LET SHARP OBJECTS PROTRUDE THROUGH THE PLASTIC WINDOW OR THE FACE OF THE DETECTOR CAN BE DESTROYED AND WILL REQUIRE A NEW CRYSTAL TO REPAIR.

5. DECONTAMINATING THE PROBE:

PLEASE CHECK WITH YOUR RADIATION SAFETY OFFICER BEFORE ATTEMPTING THE FOLLOWING PROCEDURE TO BE SURE YOU ARE COMPLYING WITH ALL REGULATORY REQUIREMENTS.

- a. IF THE METER HAS A HIGH BACKGROUND READING WITH NO RADIATION PRESENT THEN THE SURFACE OF THE PROBE IS PROBABLY CONTAMINATED.
- b. THE PROBE HOUSING CAN BE DECONTAMINATED BY USING A MILD DETERGENT AND Q TIPS, PAPER TOWELS ETC.
- c. MOISTEN A Q TIP OR TOWEL AND SCRUB ALL OUTER SURFACES OF THE PROBE HOUSING AND PLASTIC WINDOW.
- d. TURN ON THE METER WITH THE PROBE CONNECTED. IF THE BACKGROUND IS NOT REDUCED TO NORMAL LEVELS THE FACE OF THE DETECTOR IS STILL CONTAMINATED.
- e. REPEAT THE CLEANING PROCEDURE. USE SEVERAL Q TIPS TO KEEP FROM SPREADING THE CONTAMINATION.
- f. SAVE ALL CONTAMINATED MATERIAL. TURN ON THE METER, IF THE BACKGROUND IS NOT REDUCED TO NORMAL LEVELS REPEAT THE CLEANING.
- g. DO NOT RETURN A CONTAMINATED METER OR PROBE TO THE MANUFACTURER.