

**MODEL 4084**

**CANARY 4**

**MANUAL**

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**SEPT 1994**

**health physics instruments**

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Division of Far West Technology

## I. INTRODUCTION

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The Model 4084 is an electronic dosimeter. It is a very rugged weather-sealed instrument designed for operation in hostile environments. The dosimeter measures penetrating radiation from .01 mrad to 9999.99 mrad.

## II. OPERATION

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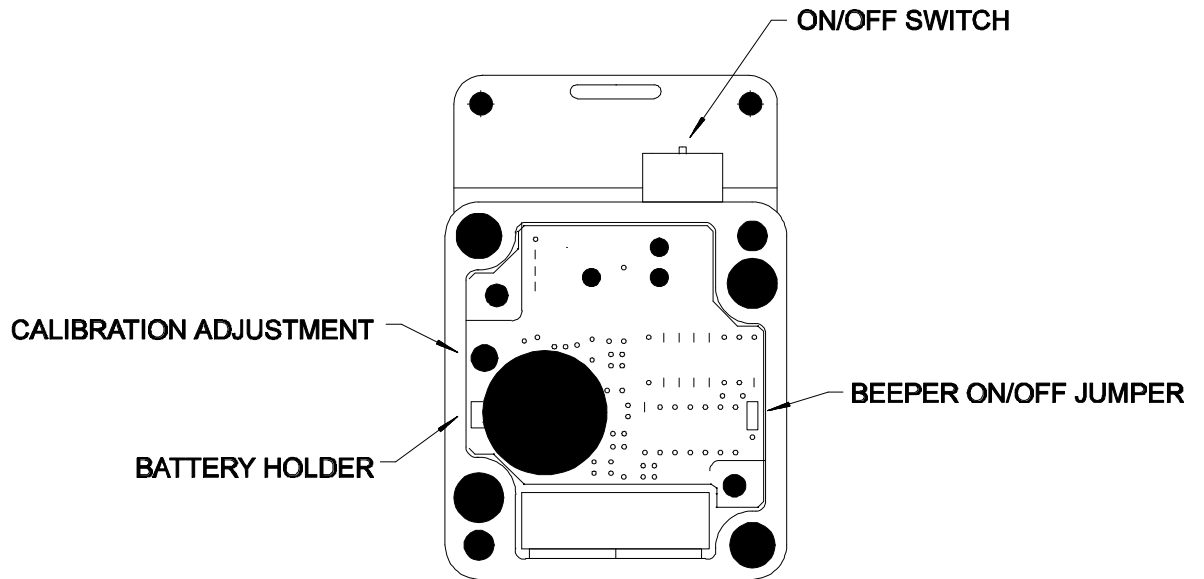
The instrument is turned on by the toggle switch on the top of the instrument. The display will reset to zero when the power is turned on and the beeper will beep. The instrument will now start integrating the radiation dose. If you want to reset the dose just turn the instrument off then back on.

The beeper will indicate the condition of the battery. When the instrument is turned on if the batteries are good it will beep. If the batteries are bad, it will have a short beep. When the instrument is in operation, if the battery condition is poor, the beep will change to a short beep every time it accumulates 0.01 mR.

The beeper can be turned off by removing the jumper on the top of the circuit board. It is marked BUZZ on the circuit board in small letters. When the jumper is removed the beeper will still beep at turn on to indicate battery condition.

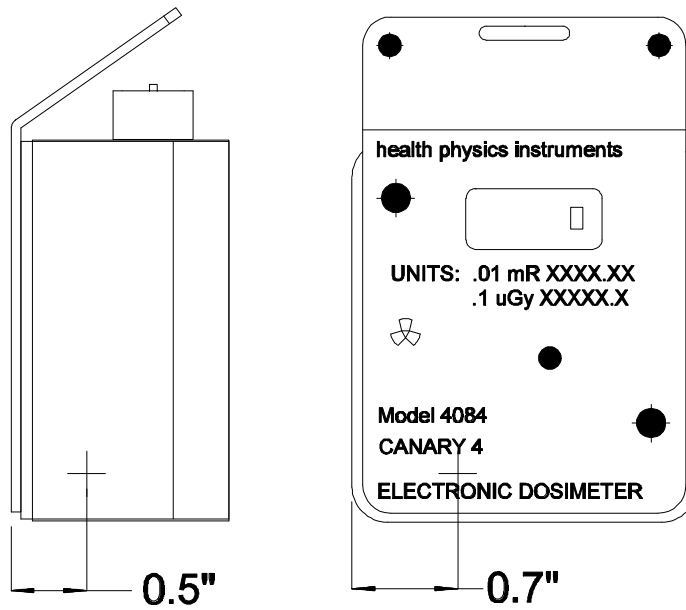
The readout is a digital display. The display has no decimal point. The units of the display are in .01 mR or .1 $\mu$ Gy. Thus if the digital display has the number 135 it means 1.35 mR or 13.5  $\mu$ Gy. Next to the units on the front panel are markings that show the position of the decimal point on the actual display. XXXX.XX mR means that the decimal point is 2 digits from the right and XXXXX.X  $\mu$ Gy means that the decimal point is 1 digit from the right.

The instrument will respond and add counts to the display if it receives strong shocks. Banging it against a table, or dropping it will register. We recommend wearing the instrument under a protective layer of clothing or in a pocket so it does not repeatedly bang against anything.



## CONTROL LOCATION

### FIGURE 1



## DETECTOR LOCATION

### FIGURE 2

### III BATTERY REPLACEMENT

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The batteries are easy to replace. Remove the cover on the back of the instrument by unscrewing the 4 screws. The screws are captive to the rear cover. Inside you will see the battery holder. There are two batteries in the battery holder. Remove the top one first. It helps if you have something non-metallic such as a popsicle stick to help remove them. Do NOT use a screwdriver because it could short the batteries. Shorting the batteries could cause them to explode.

Insert the new batteries one at a time with the - side down, and the + side up. The Battery size is: BR2325. These are 3 volt coin sized lithium cells. In a pinch you can use any 3 volt lithium cells that would fit into the holder.

### IV CALIBRATION

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Required: Radioactive gamma source capable of 60 mR/h at a distance greater than 50 cm. Cs137, Ra226 are both acceptable.

1. Measure the battery voltage. The two batteries should add up to greater than 5 volts. Replace if necessary with two BR 2325 lithium batteries.
2. Expose the front of the instrument (the side with the display) to the source. The center of the detector is 1/2" back from the front and .3" up from the bottom and .7" from the left side of the case.
3. Expose the instrument to 60 mR/h for 1 minute. The display should read the number 100 ñ 5 which translates to 1.00 mR ñ 0.05 mR.
4. If the reading is not within the numbers indicated, then open up the case and turn the small white adjustment next to the battery holder. Turn it Clockwise to increase the reading. The control is very sensitive, a small adjustment will change the reading considerably.
5. Repeat steps 2,3 and 4 until the instrument is in adjustment.

### V. REPAIR

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The circuit board removes from the instrument by removing the two large mounting screws. The Module, Beeper and on-off switch all have their own connectors that plug into the circuit board. The orientation of the connectors is marked on the circuit board as the colors of the wires. The Display module has an additional retainer of hot melt glue on its two faces to keep the module from separating.

Hint: if you want to check the display module with the circuit board out of the instrument and no connectors hooked up to it, do the following:

1. Jumper the connector where the switch plugs in. This can be done with a clip lead or a jumper similar to the one supplied to turn the beeper on and off. This turns the instrument on.
2. Place the circuit board in front of you with the display at the top so you can read it.
3. Touch the index finger of your right hand on the farthest right bottom pin. This is where the green lead of the module would go if the module were plugged in. Move the index finger of your left hand to on top of the display. The display should count if you are not

touching anything else. What is happening is the oscillator from the display is coupling into the input of the amplifier. This causes the display to count.

The wires to the display module and beeper are all 32 Ga. If you need to use thicker wires be careful because they may be too stiff and not allow the beeper to beep properly.

If the wires to the beeper break, resolder them to the beeper using very little additional solder. If there is more than just a little solder on the beeper it will not function.

The O-ring is attached to the front panel and to the beeper with silicone adhesive. Make sure you make a complete seal because this is the seal for the opening in the case. If you have to remove a beeper replace it by first attaching the O-ring to the beeper with silicone, then attaching the beeper with O-ring to the instrument. Mark a dot with a marker on the center of the beeper then align the dot with the hole in the instrument case. If you put the O-ring on the case first, the beeper often is not centered and the silicone may bleed over the O-ring on the beeper.

We put a dab of silicone adhesive under the guard for the switch before screwing it down to keep it from unscrewing.

The Screws that hold the front panel to the case are 10-32 with an Allen head. The Allen wrench to fit is 1/8".

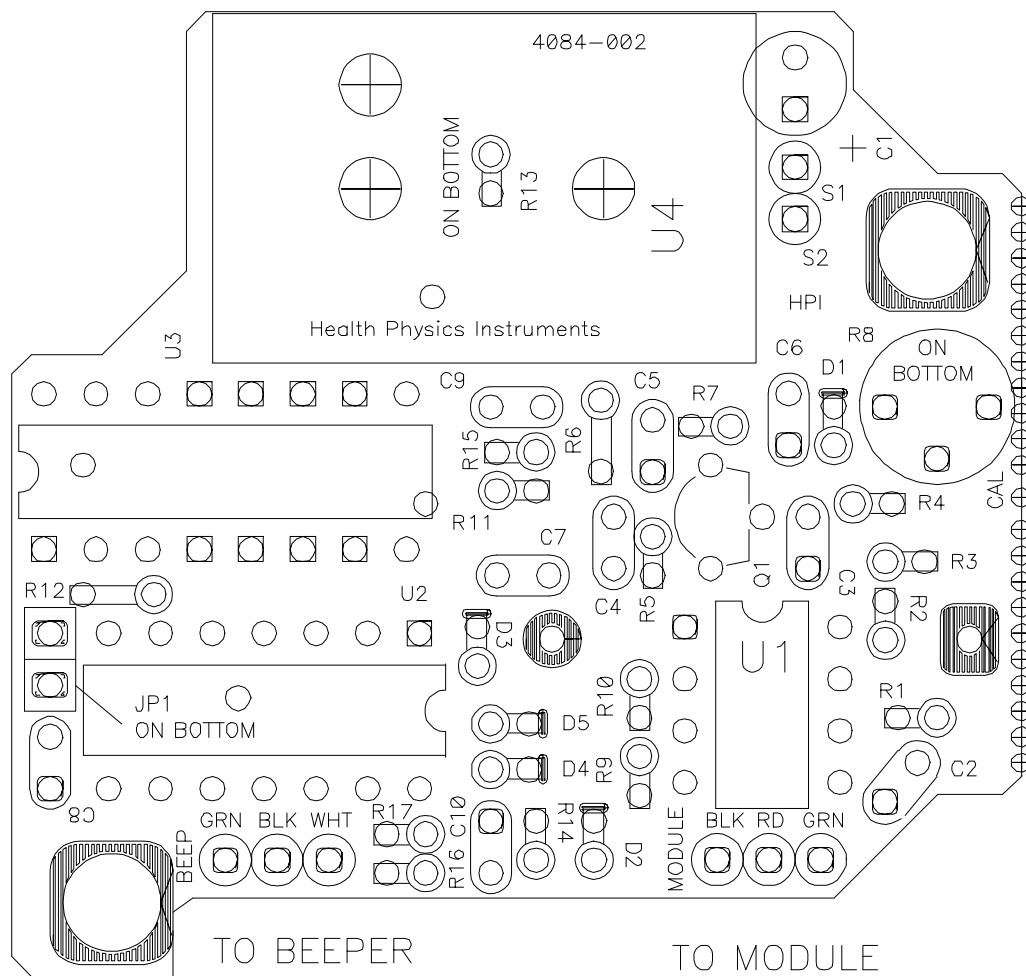
If the plastic in front of the display needs to be replaced use .030 Polycarbonate and use silicone adhesive to mount it to the case. There are 4 solder jumpers on the side of the board with the battery holder. These are set up to divide the pulses from the detector before they are counted for the display.

The module is mounted to the case using double stick foam tape that provides shock mounting. The module should float on the tape and not touch the case at any point. If it does, shocks from the case will be transmitted to the module and will register as counts on the display. We mount the module using a jig that keeps it separated from the sides, however it is not difficult to do without it. Push the module into place lightly and if it is not placed correctly it can be gently removed and replaced. Once it is in the correct position push it down firm to set the adhesive on the tape.

# PARTS LIST

DESIGN	QUAN	PART NO	TYPE	DESCRIPTION	MFG/SUPPLIER	DRAWING #
B1	2	BR2325	3 Volt	Battery		4084-001
C1	1		4.7 up 6V	Capacitor, Tantalum		4084-001
C10	1		0.001 up 50V	Capacitor Cerami c		4084-001
C2	1		0.01 up 50V	Capacitor Cerami c		4084-001
C3	1		0.001 up 50V	Capacitor Cerami c		4084-001
C4	1		0.1 up 50V	Capacitor Cerami c		4084-001
C5	1		0.1 up 50V	Capacitor Cerami c		4084-001
C6	1		0.1 uF 50V	Capacitor Cerami c		4084-001
C7	1		0.1 uF 50V	Capacitor Cerami c		4084-001
C8	1		0.001 uF 50V	Capacitor Cerami c		4084-001
C9	1		0.1 uF 50V	Capacitor Cerami c		4084-001
D1	1	1N4148		Diode, High Speed		4084-001
D2	1	1N4148		Diode, High Speed		4084-001
D3	1	1N4148		Diode, High Speed		4084-001
D4	1	1N4148		Diode, High Speed		4084-001
D5	1	1N4148		Diode, High Speed		4084-001
Q1	1	2N3392	NPN	Transistor		4084-001
R1	1		100K	Resistor, 1/8W 5% CF		4084-001
R10	1		91K	Resistor, 1/8W 5% CF		4084-001
R11	1		1M	Resistor, 1/8W 5% CF		4084-001
R12	1		1M	Resistor, 1/8W 5% CF		4084-001
R13	1		2.2M	Resistor, 1/8W 5% CF		4084-001
R14	1		100K	Resistor, 1/8W 5% CF		4084-001
R15	1		470K	Resistor, 1/8W 5% CF		4084-001
R15	1		2.2M	Resistor, 1/8W 5% CF		4084-001
R15	1		300K	Resistor, 1/8W 5% CF		4084-001
R16	1		200K	Resistor, 1/8W 5% CF		4084-001
R17	1		1M	Resistor, 1/8W 5% CF		4084-001
R2	1		1M	Resistor, 1/8W 5% CF		4084-001
R3	1		1M	Resistor, 1/8W 5% CF		4084-001
R5	1		100K	Resistor, 1/8W 5% CF		4084-001
R7	1		200K	Resistor, 1/8W 5% CF		4084-001
R8	1		100K	trimmer, 1 turn		4084-001
R9	1		1M	Resistor, 1/8W 5% CF		4084-001
S1	1	TTE13D2T	Sealed SPDT	Switch, Toggle	Alco	4084-001
U1	1	TLC27L2CP	Dual	Oper. Amplifier		4084-001
U2	1	40106	Hex	Schmitt Inverter		4084-001
U3	1	40103	8 Bit	Binary Divider		4084-001
U4	1		Counter/Driver	LCD Display		4084-001
M1	1	HPI 4084-004	01060603/A	Enclosure	HPI/ROSE	4084-006
M10	2	BR2325		Battery		4084-006
M11	1	BH906S	2 x Lithium	Battery Holder	MemProDev	4084-006
M12	2		4mm x 5mm Philister	Screw, Machine X		4084-006
M13	2		10-32 x 1/4 PAN HD SOC SET	Screw, Machine		4084-006
M2	1	HPI 4084-003		Front Panel	HPI	4084-006
M3	1	HPI 4084-007		Circuit Board	HPI	4084-006
M4	1	HPI 4084-MOD		Detector Module Assy	HPI	4084-006
M5	1	2-017		O-ring		4084-006
M6	1	4084-BEEP		Beeper Assy	HPI	4084-006
M7	1	4084-SWITCH		Switch Assy	HPI	4084-006
M8	1	G-11-4	Natural	Switch Guard	ALCO	4084-006
M9	1	4084-LENS	Polycarb	Lens	HPI	4084-006

TO ON-OFF SWITCH



PARTS PLACFMFNT DIAGRAM

