

# Inexpensive Modifications That Enhance the Use of the Gamma Camera

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A most disconcerting situation that occurs while imaging with the scintillation camera is to find that one has inadvertently photographed the isotope spectrum or that counts have been collected with an empty Polaroid camera or one with the dark slide still in place. The frequency of these occurrences warrants the use of three signal devices to warn the operator that one or all three of these errors are present.

One modification of the gamma camera was to install an audio alarm that is activated when the isotope spectrum is displayed. This inexpensive and simple modification may prevent costly cathode-ray-tube damage due to phosphor burn by the isotope spectrum should the latter accidentally be displayed for a prolonged period of time. Further, this modification minimizes inconvenience to the patient and reduces the procedure time and film cost by eliminating repeated studies due to inadvertent spectrum photographs.

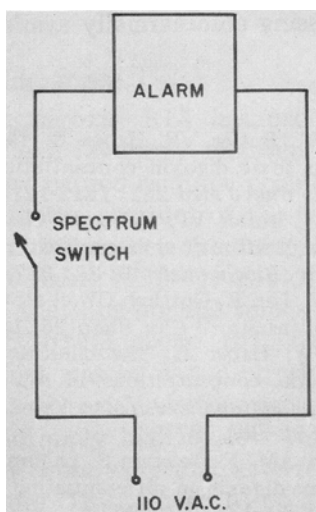


FIG. 1. Spectrum alarm schematic diagram.

Two other modifications were incorporated into the Polaroid camera back to provide a visual signal when the film pack was empty or the dark slide was in place. Below are directions for incorporating these modifications into the Nuclear-Chicago Pho/Gamma scintillation camera.

## Isotope Spectrum Alarm

The spectrum alarm circuit is shown in Fig. 1. This simple circuit can be incorporated into the existing electronics without interfering with the proper operation of the scintillation camera. The parts required are listed in Table 1. The switch in the schematic is part of the camera electronics and *does not* have to be added. When installing the spectrum alarm, care must be taken to be sure that the terminals used are *not* incorporated into other gamma camera circuitry. Figure 2 shows the exact location of two unused terminals on the spectrum switch. They are on the last wafer of this switch at 11 and 1 o'clock. Wire is soldered onto these terminals and then routed to the back of the "A" chassis. The 110 volt a-c power outlets are located on the back of the gamma camera console at the bottom and to the left. Any unused 110 volt a-c outlet can be used. The alarm can be mounted on the rear of the "A" chassis to the left of the CRT

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Table 1: Parts Required For Spectrum-Warning Alarm

Quantity	Part No.	Manufacturer	Description
1	SC-110	Mallory	Sonalert (110 volt a-c)
1	---	---	8' a-c line cord

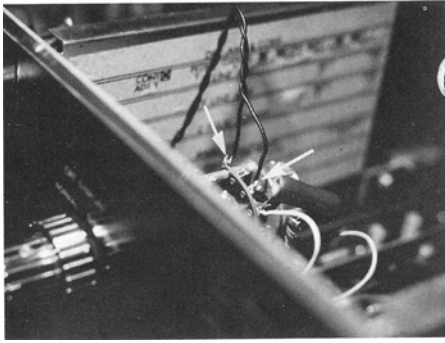


FIG. 2. Location of switch terminals to be used for spectrum alarm.

Table 2: Parts Required for "Film-Out" and Dark Slide Indicators

Quantity	Part No.	Manufacturer	Description
3	126-195	Amphenol	Connectors with hoods and clamps
2	126-197	Amphenol	Connectors with locking clip
1	SS12ET20	Cutler Hammer	Miniature switch
2	162-8430-0931	Dialco	Pilot light (Red)
2	327	Chicago Miniature Lamp Works	Lamps

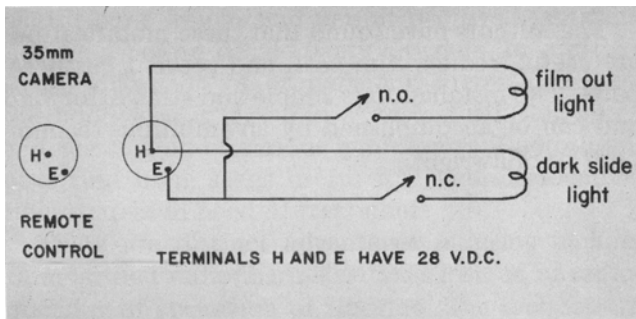


FIG. 3. Dark-slide and "film-out" schematic diagram.

terminals. This type of alarm may have to be covered by placing tape over the speaker grill to reduce the noise level when it is activated.

### Warning Lights on Polaroid Camera

The modifications of the camera back required to install the dark slide indicator light and switch and "film-out" indicator light and switch can be accomplished with a drill press, bits, and tap-and-die set. Parts required are shown in Table 2. The schematic diagram is shown in Fig. 3. The modified Polaroid camera back with some of its components is shown in Fig. 4. This modification will require that six holes be drilled in the battery compartment of the back. Two holes should be drilled into the aluminum end-plates to accommodate the Amphenol connectors, and two in the battery case cover for the mounting of the indicator lights. Be sure when positioning the indicator lights that they do not interfere with the connectors when the cover is closed. Two small holes should be drilled leading from the battery holder to the film compartment. These holes are shown in Fig. 5, Site A and B. The 35-mm camera remote-control terminal is located on the underside of the CRT housing of the "A" chassis. Pins H and E of this connector carry 28 volts d-c and ground. This voltage is sufficient to activate the "film-out" and dark-slide indicator lights. Modifications are needed to install the contact switch in the film compartment. Figure 6 shows the modification of the internal pressure plate, the solder contact (A), and the solder lug (B). Figure 7 shows the electrical spring contact mounted on the case. When the Polaroid back is closed and there is no film in the camera back, the cover contact and the electrical spring contact mounted to the case will touch and close the circuit causing the film light to go on, thus warning the operator that he is out of film. When there is film in the camera back, the Polaroid film tab serves as an insulator between the cover contact

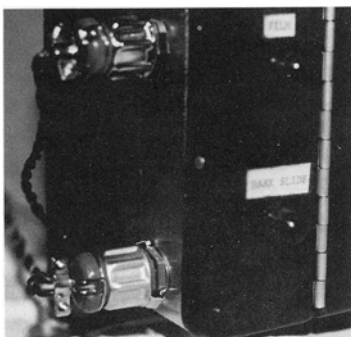


FIG. 4. Connectors and indicator lights installed on camera back.

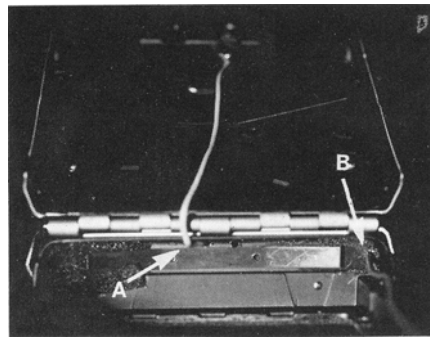
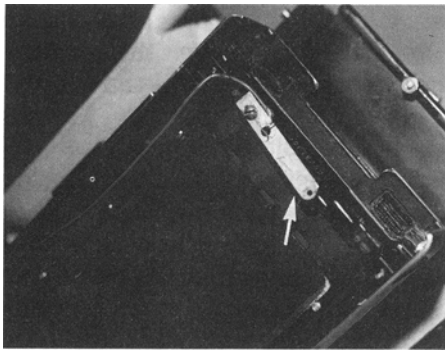


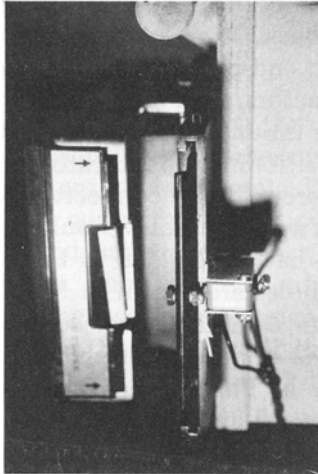
FIG. 5. Holes drilled at A and B permit wires to pass from battery holder to film compartment.



FIG. 6. Camera back pressure plate indicating the solder point contact (A) and solder lug (B).



**FIG. 7.** Electrical spring contact shown mounted on camera back.



**FIG. 8.** Dark slide indicator switch. Arrow points to bolt mounted on dark slide.

and the electrical spring contact, thus not allowing a flow of current to activate the indicator light.

The case contact spring is mounted to the plastic

film holder with a single screw (Fig. 7). A wire is soldered to the contact, routed along the film packet edge, and glued in place so it does not interfere with the changing of the film packs. The cover contact is formed by removing the black paint on the pressure plate on the inside of the cover directly opposite the case contact spring. Solder is then deposited at this point (Fig. 6). A solder lug is mounted, as shown in Fig. 6, and routed through the middle hole leading to the battery compartment (Fig. 5).

The dark slide indicator light switch is installed by mounting a microswitch to the base of the Polaroid camera slide (Fig. 8). The switch is mounted so that when the modified dark slide is inserted it will close the microswitch causing the dark slide indicator light to go on. The dark slide modification is accomplished by drilling a hole in the red curled edge of the dark slide and placing a small nut and bolt in this hole. The head of the bolt should be round and face the switch. This will serve to take up the space between the dark slide and the switch and also to trip the switch when the dark slide is in place (Fig. 8). The microswitch is attached to the base of the dark slide mount by drilling two holes and mounting right angle aluminum brackets. The microswitch is mounted to these brackets. Wire is run from the microswitch around the Polaroid camera mount and connected to the female connector on the Polaroid back.

The authors have found that these modifications are useful, reduce film cost, and prevent costly repairs. The installation is simple and straightforward and can be accomplished by an ambitious technologist or millwright.