

## Activity B-4. Triggering a Flash Unit with Sound

Goal: To learn how to use a simple circuit to trigger an electronic flash unit by sound

Prelab:

1. Read the introductory material for this activity.
2. Submit answers to the questions on the reading in the online form.

Note: There is nothing to write in your journal for this activity.

Equipment:

- Vivitar 283 flash unit
- 4 AA batteries and SB-4 adapter
- Modified PC cord (standard Vivitar 283 flash plug to RCA)
- Piezoelectric sound trigger (requires 9-V battery)
- Balloons and pin
- Jeweler's screwdriver (flathead)

Introduction: You've already seen how to trigger a flash discharge by shorting across the flash terminals. In this activity, you'll use a *sound trigger*, a circuit that shorts the terminals electronically in response to sound.

The three parts of a sound trigger are a *microphone*, an *amplifier*, and a *silicon-controlled rectifier* (SCR). Figure 1 shows how the components are connected. The microphone picks up the sound of the event to be observed. The amplifier boosts the current from the microphone signal in order to actuate the SCR. The SCR serves as a switch to short the flash terminals, which are connected to the *cathode* (C) and *anode* (A) of the SCR. The amplifier output is connected to the *gate* (G) and cathode of the SCR. When the microphone picks up a sound, the amplified electrical current flows in the gate-cathode circuit of the SCR. That in turn allows current to flow in the anode-cathode circuit, thus discharging the flash unit. Besides acting as a switch, the SCR isolates the amplifier from the voltage across the flash terminals.

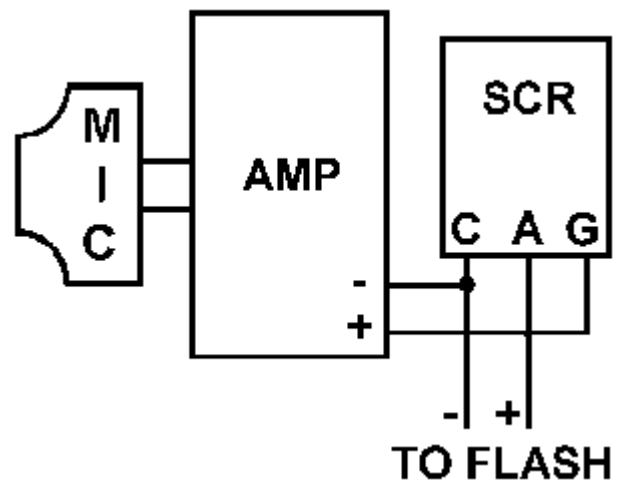


Figure 1. Block diagram of a sound trigger

The sound trigger for this activity uses a *piezoelectric* film as the microphone.<sup>1</sup> The film is pressure-sensitive, producing a voltage spike in response to the sudden deformation caused by a loud, sharp sound such as a handclap or balloon burst. The trigger doesn't have a wide frequency response and won't detect soft sounds. This is an advantage if you don't want every little sound setting off your flash unit. If, however, you want a very sensitive sound trigger, there is a way to construct one using a tape recorder.<sup>2</sup>

<sup>1</sup> If you wish to build your own sound trigger from scratch, see Appendix D for a circuit diagram and parts list.

<sup>2</sup> A method of constructing a sensitive sound trigger using a tape recorder is described in Appendix E.

1. Assemble the sound trigger, modified PC cord, and flash unit as shown in Figure 2.<sup>3</sup> Turn the flash unit on (if using batteries) or plug in the SB-4 adapter. The sound trigger will automatically be powered on when the 9-V battery is connected.
2. In order to test the trigger, clap your hands or snap your fingers to discharge the flash unit. Test the sensitivity of the trigger by seeing how far you can stand from it before a clap no longer actuates it. Try adjusting the 5-k $\Omega$  potentiometer to see how it affects the sensitivity. Turn the dial clockwise to increase the sensitivity. You'll need a flathead jeweler's screwdriver for this. If you have trouble getting the sound trigger to function properly, make sure that all connections are good and that the sensitivity is not too high or too low. If the sensitivity is turned too high, the flash unit will discharge spontaneously and then will not discharge again. If this happens, turn the sensitivity down just enough to allow the flash unit to be discharged.
3. Set the flash unit in the yellow automatic mode and point it at a nearby object so that the duration will be a minimum. Then set off the flash unit repeatedly with successive claps or snaps. This works because each flash uses only a small portion of the stored energy, and it takes a very short time to replenish that energy.
4. Now try observing a balloon burst. Place the microphone of the trigger near the balloon and point the flash unit at the balloon. Turn the room lights down. Pop the balloon with a needle, watching it as you do.



**Figure 2. Sound trigger connected to a flash unit**

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<sup>3</sup> Note that the PC cord has been modified by replacing the PC socket with an audio plug. This provides a convenient way of connecting the flash unit to a trigger. Audio plugs (also known as RCA plugs) are available from neighborhood electronic stores. PC plugs are difficult to come by.