

It quickly became apparent while working on a demonstration utilizing a laser pointer that moving the power switch off the body of the laser would be very useful. Pushing the button on the side of the laser invariably ruined the optical alignment of the demonstration. We describe a straightforward way to add an external switch to the pointer by breaking the contact between the positive end of the internal batteries and the laser back. The technique should work for most commercial laser pointers, red or green.

We have been working on an optics demonstration which utilizes a green laser pointer. It quickly became apparent that an external switch would have to be made so that the laser could be turned on and off after being aligned with the optics without knocking it out of alignment. This was done by breaking the contact between the positive end of the internal batteries and the laser back. The technique should work for most commercial laser pointers, red or green.

A picture of a pen-type laser pointer before and after modification is in Figure 1. The laser pointer turns on when the external wires are touched together. Once the laser has been modified to allow an external switch it is also straightforward to attach the laser pointer to an external power source.

To rig up an external switch for a laser pointer, begin by drilling a small hole in the back cap, just large enough for two wires to fit through. Once the hole is drilled, cut two lengths of wire long enough for you to be able to work with and make adjustments if need be. Strip about an inch of insulation off the ends of each wire. Some key chain laser pointers have a knob on the end; be sure to cut this off with a hacksaw before drilling your hole; see Figure 2 below.

One wire, the red one in Figure 3, will end up attached to the cap of the pointer. Make a loop out of one end of this wire small enough in diameter to fit inside the cap. The loop



Figure 1: Pen-type pointer before and after modification.



Figure 2: Bullet-type laser pointer before and after modification. Note the Knob on the left end was cut off with a hacksaw before drilling a hole in the end cap.

should sit nicely against the laser end cap when the wire is pulled taut. Soldering is preferred here for guaranteed contact and making the new setup more secure, but it is not mandatory. If you plan to solder the wire, you should wait until you have tested your setup.

The black wire in Figure 3 will make contact with the batteries. Coil up one end of this wire; be sure to make the coil as tight as possible to ensure good contact with the battery. This coil, like the loop in the red wire, should be perpendicular to the length of wire.

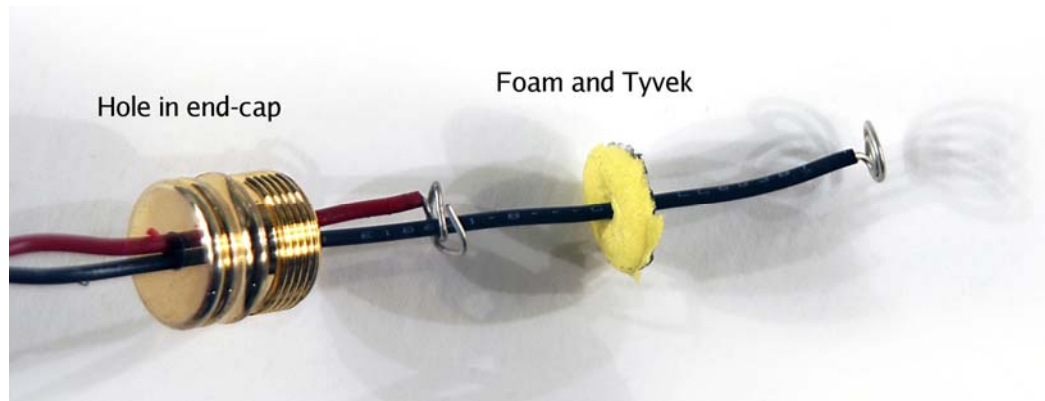


Figure 3: Modified end-cap.

Once you have prepared the coil place an insulating layer between the wire coil and loop. We used foam 1 mm thick to which we attached a layer of Tyvek (the foam can be found in the craft section of a discount store, often in the shape of animals; mailing envelopes made of Tyvek are also widely available.) We used the end cap for a form and cut out small round discs the same diameter of the inside of the cap. The foam provides electrical insulation and the Tyvek protects the foam from being punctured by the wire. If your pointer runs on button batteries, you may need a thicker layer of foam to prevent the batteries from making contact with end cap. We used a layer of foam about 5mm thick to modify our red pointer.

Thread the black coiled wire through the insulation then through the hole in the cap as shown in Figure 3. You should try to center the black wire in the loop of red wire. This makes it easier to get the wire through the cap and prevents the coil from moving to the side, touching the cap walls, and shorting out the circuit. Make sure the wires going through the cap hole still have their insulation intact to prevent the wires making contact at that point. You can use super glue to secure the wire coil to the foam discs for stability, though it is not necessary. Be careful not to get too much glue on the wire coil or you might lose your contact. As with soldering, do not glue until you have tested your setup.

If your pointer runs on button batteries, insulate the sides of the batteries to prevent them from making electrical contact with the inside wall of the laser pointer. One way to do this is to wrap the batteries with a layer of tape as shown in Figure 4. Use a single layer of tape; if the tape is too thick it is very difficult to remove the batteries from the pointer

(though our experience is that a laser pointer survives a few sharp taps against a hard surface to remove the batteries).

Test your modified laser pointer by separating the bare ends of the wires you have added and trying to turn it on. If the laser turns on you have a problem; when the external wires are not touching the pointer should not turn on. Next hold down the power button on the laser and touch the two wires together. If the laser turns on you are done! It is convenient



Figure 4: The button batteries on the left have been insulated by wrapping them in a single layer of transparent tape. The picture on the right shows a replacement for the button batteries if the pointer will be attached to an external power supply. It is a piece of metal rod (the rod needs to be conducting) wrapped with electrical tape so that it fits snugly into the pointer.

to tape down the button on the pointer itself so that only the external wires are needed to turn the laser on.

To secure the wires against being pulled out, we sealed off the hole in the cap from the outside with epoxy. This seems to have worked well to keep the wires secure as well as keeping them from rubbing and wearing against the hole leading to either short circuiting or breaking off. It will be difficult or impossible to undo your modifications once you apply epoxy so be sure that the pointer functions properly before gluing.

Modifying your pointer to use an external power source is straightforward. The idea is to replace the internal batteries with a metal rod and then connect the external wires to batteries or a power supply. Any diameter metal rod small enough to fit inside your laser pointer will work. Cut the rod to the same length as the batteries it is replacing and wrap the rod with electrical tape so that it fits snugly inside the laser body, as shown in Figure 4. Attach the wires to external batteries or an external power supply and test that the laser pointer comes on. A compact laser pointer, designed for button batteries, can be powered by external AA or AAA batteries instead, reducing the cost of operating the laser.

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