

A Flashgun Isolator

Digital cameras can be damaged by connecting them to a traditional design of electronic flashgun. **David Gibson** describe an isolator that will protect the camera's sensitive electronics from the possible high voltage of a flashgun.

The Problem

Recently, on the Cave Photography Group mailing list at caves.org.uk/lists/ there has been some discussion on how flashguns can damage digital cameras. Some 'traditional' designs present a high-voltage at their trigger terminals. This could be outside the specification of the digital camera, which only expects a logic-level signal. In fact, the problem is not confined to digital cameras – even traditional mechanical contacts can, it is suggested, be damaged. Information at weinproducts.com/safesyncs.htm suggests that the problem may be widespread; and Wein sell a special 'safe sync' unit to get around the problem.

Originally, I was sceptical, believing the high voltage to be present only at a high impedance, so I am grateful to Ian Drummond for correcting me. With a traditional trigger circuit, the HT is present at a high impedance only until the trigger contacts are shorted, whereupon a small capacitor, charged to the full HT (up to 400V) will discharge through the camera contacts.

There is a list of flashgun terminal voltages at botzilla.com/photo/strobeVolts.html but I am sceptical as to whether that is reliable data. For a high impedance, high-voltage gun, it is essential to use a very high impedance voltmeter, or else the measurement could be considerably in error. Some of the data at the above URL suggests to me that it has been incorrectly measured. Both those URLs are links from the page bstorage.com/speleo/bulbs, which is worth a visit.

The obvious solution to the problem is to place a low value resistor (say 68Ω) in series with the trigger contacts to limit the current to 5mA or so. This appears to work for me, and is possibly all you need to do, although more a sophisticated solution is possible.

Designing a Solution

Initially, I could not think of a solution that did not require some sort of powered circuitry, and so there is the nuisance of having to provide a battery unless the power can be supplied by bleeding a very small amount out of the flashgun terminals.

I considered this some time ago, as a means of powering my flashgun slave, but I decided it was too unreliable – it is necessary to clamp the voltage, probably with a zener diode, but these may not regulate at the very

low current available from some types of flashgun trigger terminals and so designs using a zener diode (e.g. Lappin 2002) may not work reliably with all flashguns.

However, very low-current precision reference diodes are now available. The MAX6009A uses less than 1μA. New low-current zener diodes are also contenders: the Philips BZX399-C3V6 has a leakage of 1μA at 2V. See www.farnell.com/datasheets/17296.pdf. Most traditional zeners do not maintain a low leakage for parts rated at less than about 3.9V, so this device is exceptional.

Using the Device

Referring to the circuit diagram, the camera contacts are connected between T2 and T3 – the centre of the hot-shoe usually goes to T3, but your camera might be different. The position of LK1 needs to be set according to the type of flashgun. Position 1 (as shown) should work with most guns and flashbulbs. Position 2 should work with all guns but it will not work with bulbs.

To use the unit as a power source for my slave unit, you should omit all the components in the dotted outline, and connect the slave's power terminals to T3 and T1. The slave's trigger outputs go to T4 and T1.

Specification

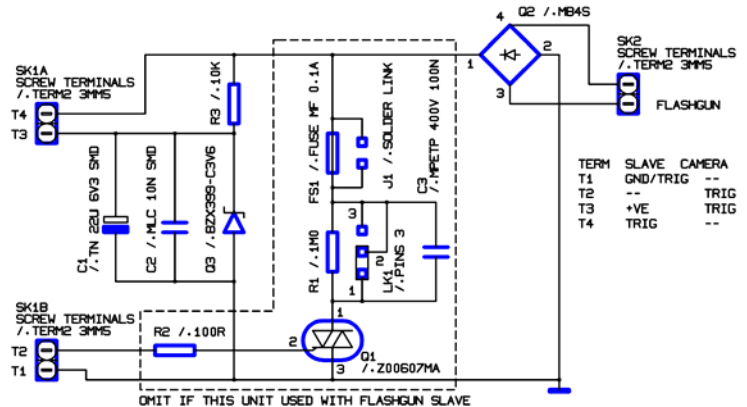
This unit should work with all types of flashgun, including low-voltage guns, but it will not work with guns that include an isolating capacitor in their trigger circuit.

The unit should work with standard designs of capacitor-discharge bulb firer.

The camera is subjected to a maximum voltage stress of 3.6V. When the unit fires, the camera current consists of a very brief 30mA pulse of a few milliseconds in length.

Reference

Lappin, Ted (2002), *A Camera Flash Adapter Cord*, Speleonics 23, pp10-12. Online at caves.org.uk/section/commelect/speleonic.html [sic].



Circuit Description

The diagram uses component references from my database, so it will not be meaningful – but you should be able to deduce the salient points.

Because the polarity of the flashgun is not known for certain, it is rectified by Q2. Q3 is an ultra-low current reference diode such as the MAX6009A or an ultra-low leakage zener diode such as the BZX399-C3V6.

The value of R3 has to be chosen with care – it must supply enough current to Q3 when used with a low voltage flashgun, but must not overload Q3 when used with a high voltage flashgun. This tends to favour a zener diode over the Maxim part.

One of my flashguns measured 4.5V and about 50μA (open-circuit voltage and short-circuit current) at its terminals, which could suggest that it is a 4.5V source in series with 100kΩ. This would mean that R3 would pass 23μA, which is 1μA at 2V for the diode and 22μA to charge C1, which is a little low, and so C1 will take a few seconds to charge. But C1 is probably far too large anyway – you could try a smaller part.

Another of my flashguns measured 37.5V & ≈30μA. Let's suppose this was really 375V in series with 10MΩ and that my meter has a resistance of 1MΩ. In this case R3 does nothing significant, and we have about 30μA available.

The camera contacts are connected between T2 (-) and T3 (+) so that when the camera output goes short-circuit (probably a small FET open-drain output) the gate of Q1 is pulled to 3V via R2. The camera is limited to seeing 3V and 30mA for a period of a millisecond or two whilst C1 discharges into the gate of Q1. If you are uncertain of the polarity of your camera contacts, another bridge rectifier is called for.

When Q1 fires, it triggers the flashgun through the same circuit that I use with my slave units.

You could add a 68Ω resistor in series with the output for added safety.

Choice of Components

Q1 **must** be a low-gate-current device that will trigger very quickly. It does not need to be a triac though – an SCR will do.

Q3 **must** be an ultra-low-current reference diode – a general purpose zener diode or shunt regulator will not work reliably.

Q1, Q2 and C3 **must** be rated at 400V or more.

C1 **must** be an ultra-low-leakage part – probably a tantalum part.