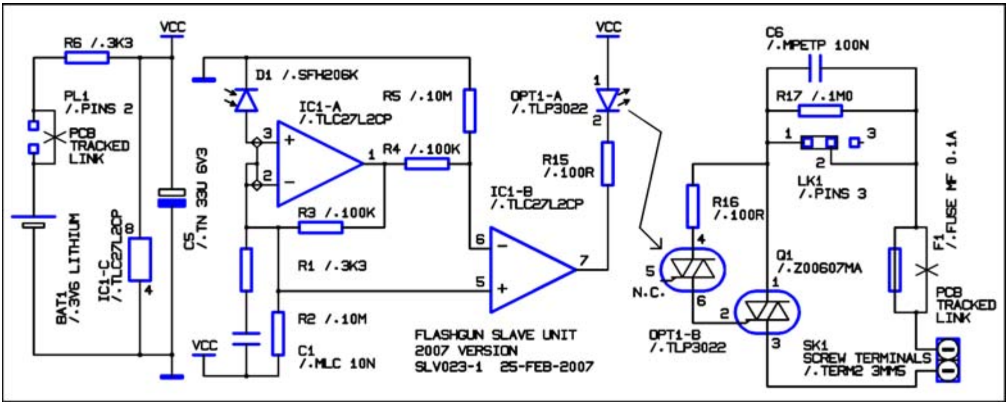
High-Performance Flashgun Slave: Circuit diagram (SLV023)

This circuit diagram is provided as an aid to debugging, for people who are building their slave unit from a kit of parts. Please note that I am no longer providing printed instructions with the kit of parts; instead, you can download them from **caves.org.uk / flash / newsletter.html**. That URL also contains a link to the parts list.



How it Works

Note: The component numbering is carried over from an earlier version of the design, which is why some component numbers are omitted. The component references are in the context of my CAD system, e.g. TN – tantalum, MLC – multi-layer ceramic, MPETP – metallised PETP foil.

The slave unit is based around a photodiode D1, which is operated in the photovoltaic mode. In summary, IC1 amplifies the signal from the photodiode, and compares it with the ambient level, stored on C1. For various reasons, the circuit has to operate with a positive earth, as shown in the diagram. There are some other subtle features too, which were discussed in earlier articles in the CREG journal. A sharp pulse from an electronic flashgun will result in a low-going pulse at the output of IC1-B.

The photovoltaic nature of the operation means that the unit triggers when a pulse of light exceeds the ambient level by a certain fraction. It is this feature that makes the unit so sensitive, and which allows it to operate in daylight as well as dark conditions. The actual diode used is not significant and you can, in fact, use an ordinary LED. The reason I do not do so is only that I have never got around to doing the necessary design verification.

Resistors R1 to R5 form a network with some particular properties, and it is important that you do not alter the values of R2-R5 without understanding the consequences. R1 can be altered (see below) to allow for different supply voltages, provided C1 is also adjusted appropriately.

C6 and R17 allow the unit to be used with high-current triggers, such as are found on some *Vivitar* guns, which would otherwise cause the triac to latch. These aspects of the circuit are discussed in the construction notes. R16 is important, as it ensures that the bulk of the current flows through the power triac instead of the opto-triac.

The quiescent current of the slave unit is about 10µA. A quick calculation shows that at 20µA ,a 1.0Ah battery would last over five years, so if you use a Lithium cell with a 10 year shelf life there is clearly no need for an on/off switch. C5 and R6 provide essential decoupling.

The op-amp is specified for operation down to 3V. To be on the safe side, I use a 3.6V lithium cell instead of the two 1.5V alkaline cells I used previously. It is possible to obtain op-amps that will work at well below 3V but they do not usually have the other essential characteristic that this circuit requires – FET inputs with picoamp bias current. The '27L2 seems to work satisfactorily at under 3V and so using two 1.5V cells is still acceptable.

The opto-isolator is rated for a continual current of 100mA and a surge current of 1.2A. This is adequate for most flashguns, but can lead to problems with bulb firers. I have therefore added the power triac to increase the ruggedness of the output stage. The resettable thermal fuse, F1, is advisable if the unit is used to fire bulbs directly (i.e. without a capacitor-discharge firer). This part is not normally fitted, and is bypassed with a tracked link.

If you need to change the supply voltage you must make some changes to the resistor network. There are several ways to do this, but the simplest is just to alter R1 in inverse proportion to the supply voltage change, and then to alter C1 to correct the time constant. In other words, if you double the supply voltage to 6V you should halve the value of R1, to around 1K5, and then double C1 to around 22N. You should also increase R6 and R15 in proportion to the supply voltage.

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