Slave Flash for Digital

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Although most digital cameras have a built-in flash, a connection for an external flashlight is rarely seen. Still, on some occasions it's useful to have just a tad more light and that's why we propose a simple add-on.

Cameras

Don't throw away your old flashlight!

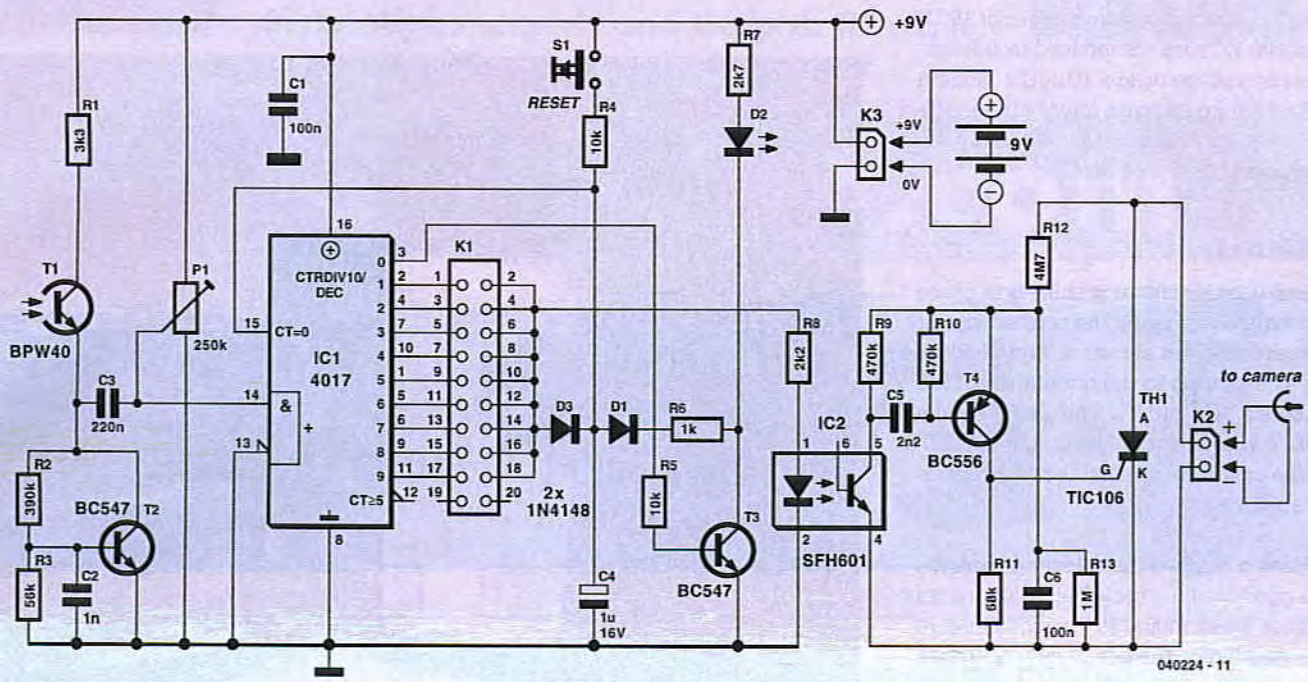

Figure 1. The circuit counts a user-defined number of flashes before firing a powerful external flashlight.

As many of you will be able to avow, the light capacity of the flash facility on low-cost digital cameras is often marginal if not insufficient. Problems typically occur where the object to be photographed is too far away, or if a (very) short shutter time is required. In those difficult cases, the slave flash we're about to describe may come in really useful.

The idea is simple: detect the flash from the camera and use it to trigger a powerful external flashlight with the aid of a thyristor.

A cursory look at the circuit diagram in **Figure 1** reveals that the practical side of things is rather more complex than you might have expected. In many cases, a digital camera supplies a short 'pre-flash' that serves, among others, to adjust the white balance of the internal CCD (charge-coupled device) chip. Lots of cameras also feature 'red eye correction' where several pre-flashes cause the pupils of humans and certain animals to close to some extent. Some cameras supply just one pre-flash, others a whole series. Of course we do not want our slave flashlight to respond to these pre-flashes, else it would be triggered too early! This problem has been taken into account in the circuit design, which is in stark contrast with many off-the-shelf slave flash controllers.

Counting flashes

The author of the circuit employed an almost antediluvian design from Elektor's 1979 Summer Circuits issue. With reference to Figure 1, phototransistor T1 detects the camera's flashes. The resulting pulses across C3 are applied to the clock input of decade counter IC1.

The circuit around T2 operates as a kind of zener diode, with C2 preventing instability owing to too rapid fluctuations of the 'zener' voltage. Without this precaution, the counter would run the risk of missing the odd pulse. The capacitor also eliminates any 100-Hz hum that may be picked up.

Switch S1 enables the circuit to be reset, causing output Q0 to go high and transistor T3 to switch on LED D2. With the LED on, the slave flashlight is ready for use. T3 also ensures that capacitor C4 is discharged and the

reset input of IC1 is returned to Low. At each light pulse on T1, the next output of IC1 will go high — Q1 on the first flash, Q2 on the second, and so on. A jumper or wire link on K1 allows you to select the flash that should actually trigger the slave flashlight. The LED in optoisolator IC2 is then switched on and C5 causes T4 to conduct briefly. This in turn causes thyristor Th1 to be fired and the terminals of connector K2 to be short-circuited briefly.
The optoisolator ensures that the flashlight voltage remains isolated from the (battery) supply of the rest of the circuit. The connections of older flashlights may well carry voltages of 150 V to 200 V. These are reduced to safe levels by voltage divider R12-R13. Modern flashlights use much lower voltages (5-10 V), in which case R12 may be replaced by a wire link.

Construction

Building this circuit is unlikely to cause problem if you use the printed circuit board artwork shown in **Figure 2**. Do pay attention to the orientation of the diodes, ICs and T1. The phototransistor's case is not unlike that of an LED. The collector terminal is near the flattened side.

Having finished the soldering work it's a good idea to check if all components have been mounted correctly before switching on the power supply. In rare cases D2 will light immediately when the supply is switched on as IC1 will randomly activate one of its outputs. However, D2 must come on in response to S1 being pressed briefly.
Preset P1 allows the input signal for the decade counter the adjusted. Some experimentation may be required before you find the optimum setting for P1:

- turn the wiper to the 'ground' extreme position.
- press S1
- slowly advance the wiper of P1
- stop when LED D2 goes out
- back off a little in the 'ground' direction

Finally, a note on hooking up the external flashlight: pin 1 of K2 — connected to the anode of Th1 and resistor R10 — should be taken to the centre contact of the flashlight socket.

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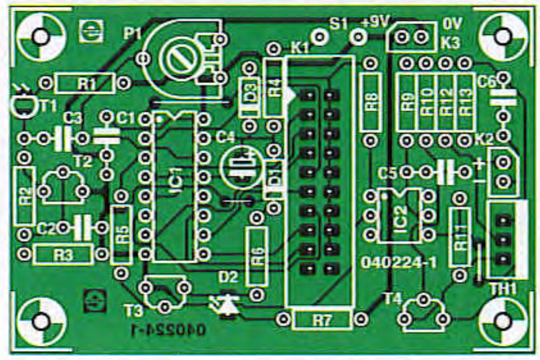

Figure 2. Once built up the circuit's sensitivity may be adjusted with the preset.

COMPONENTS LIST

Resistors:
R1 = 27kΩ
R2 = 390kΩ
R3 = 56kΩ
R4,R5 = 10kΩ
R6 = 1kΩ
R7 = 2kΩ7
R8 = 2kΩ2
R9,R10 = 470kΩ
R11 = 180kΩ
R12 = 4MΩ7
R13 = 1MΩ
P1 = 250kΩ preset

Capacitors:
C1,C6 = 100nF
C2 = 1nF
C3 = 220nF
C4 = 1µF 16V
C5 = 2nF2

Semiconductors:
D1,D3 = 1N4148
D2 = LED, 3 mm, low current
T1 = BPW40
T2,T3 = BC547
T4 = BC557
Th1 = TIC106
IC1 = 4017
IC2 = SFH601

Miscellaneous:
Bt1 = 9-V battery with clip-on lead
S1 = pushbutton with 1 make contact
K1 = 20-way boxheader with jumper, or a double-row pinheader (2 x 9) with jumper
PCB, available from The PCBShop, ref. 040224.