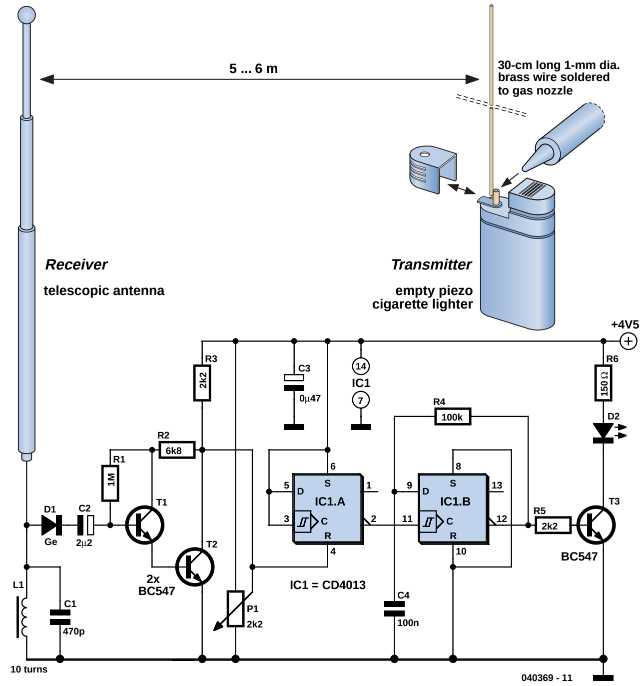
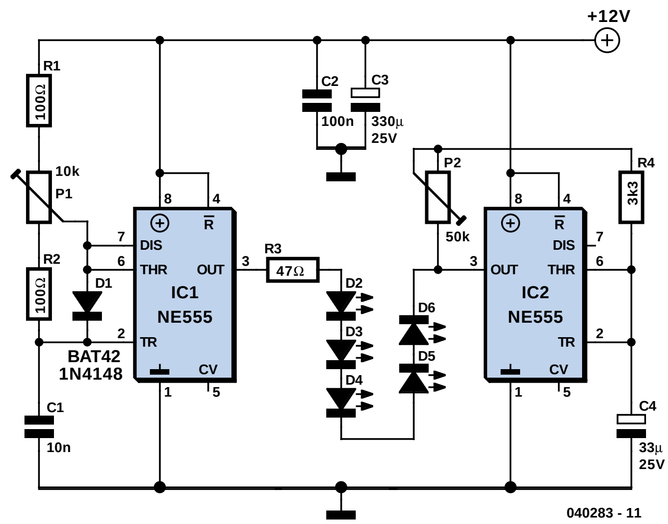




Spark Transmitter

Markus Bindhammer

In 1896, Marconi successfully covered a distance of about 3 km using electromagnetic waves. A little later, he established radio contact across water between Lavernock Point, South Wales and Flat Holm Island. The transmitter consisted of a spark inductor coupled to a dipole antenna. At the receiver side, he used another dipole and a glass tube filled with silver and nickel filings, the so-called coherer. The filings enabled the coherer to act as a 'defined' bad contact with the RF pulse energy 'rattling' the contact and thus driving the audio amplifiers connected to the output.

The circuit shown here operates on he same principle. Admittedly it does not cover the same distance as Marconi's extensive radio equipment, but then you do not need to start filing away on the family's silver cutlery! The transmitter consists of an empty (!) disposable cigarette lighter with a piezo spark mechanism. On the gas nozzle of the **empty** lighter you solder a 30-cm long, 1-mm diameter (20 SWG) solid brass wire which acts as an antenna. When the spark button is pressed, the antenna briefly radiates electromagnetic energy in the VHF FM frequency band. The effect is easy to verify by holding the transmitter close to an FM radio and 'firing' it!

Compared with the primitive transmitter, our receiver is a more up to date design realised in 'all solid-state' electronics. A telescopic antenna picks up the transmitter's RF energy and applies it to a resonant circuit consisting of an inductor and a capacitor. The electrical signal is rectified by a Germanium diode (AAxxx or OAxx) and amplified by a darlington stage. The collector of the second transistor causes voltage changes at pin 4 of the bistable (flip-flop) IC type 4013. The receiver sensitivity can be adjusted using preset P1. Each time the transmitter sparks away, the flip-flop toggles and switches the LED on or off. As a circuit variation, you may want to use a relay instead of a LED to allow lamps, a TV set, motors or actuators to be switched on and off using your 'primitive' spark transmitter. Your friends will be impressed.

(040369-1)

Flashing Light with Dimmer

Myo Min

Most cheap emergency flashing lights at fixed locations employ glass-based bulbs to generate light. The typical filament bulb is fragile, has a short lifetime and requires a (relatively) high voltage. To overcome these disadvantages, the author designed the above circuit, using a solid-state light source, a dimmer function and readily available ICs, all aiming at maximum compactness.

In a flashing light unit, ultra-bright LEDs have distinct advantages over normal LEDs and of course glass-based bulbs. IC1 with R1, R2, P1 and C1 supplies the pulsewidth modulated (PWM) signal that will drive the ultrabrights at a constant frequency. P1 allows you to adjust the brightness. Additional drivers are not necessary as the NE555 can source currents up to 200mA. If you need more light output, simply add some more LED strings (R3, D2~D6); up to 8 strings may be connected in parallel with the one shown.

IC2 with P2, R4 and C4 forms another astable multivibrator that sinks the LED string current according to flash rate.

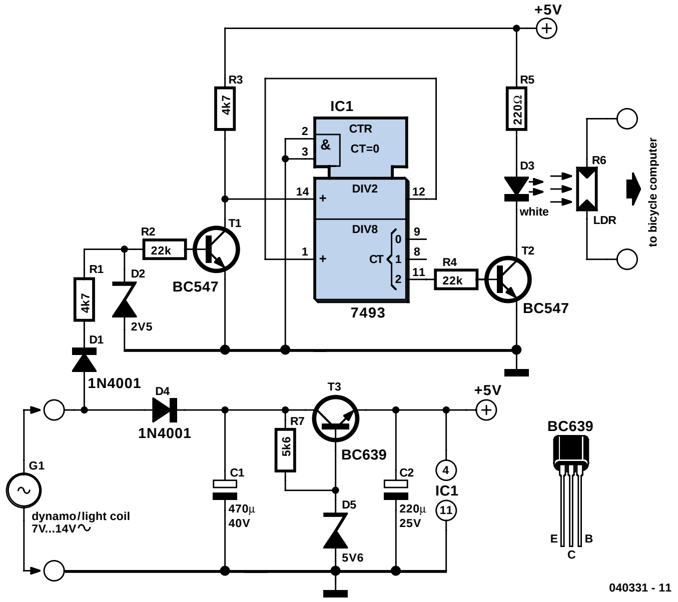
Preset P2 controls the flash rate. C2 and C3 are decoupling capacitors to ensure stable operation at high and low frequencies. The circuit is best powered by a 12 VDC adapter with regulated output, or a step-up converter circuit around, say, a MAX761 and some AA batteries. For the latest blue and white LEDs, it is necessary to consider current limiting resistor, R3, and the number of LEDs in the string. For IC1, the PWM frequency is calculated from

$$f = (1.44 / (P1C1))$$

The frequency must be greater than 5 kHz to eliminate flicker effects.

For IC2, the design equation is the same (but using the values of P2 and C2). The flash rate should be adjusted between 0.5 Hz and 5 Hz.

(040283-1)



Rev Counter for Mopeds

Peter van der Maarel

Older mopeds are not usually fitted with a rev counter, which is a bit of a shortcoming. The making or finding of a suitable indicator instrument or display is often the greatest obstacle for the hobbyist. The author of this circuit has devised a practical solution to this problem in the shape of a (cheap) bicycle computer. Such bicycle computer is easily attached to the handlebars and it usually has a large and very readable display.

The moped engine's generator is used to detect the rev speed. The generator is connected directly to the engine drive shaft and generates an AC voltage for the on-board electrical system. The frequency of this voltage corresponds with the rev speed of the engine. This frequency, however, is too high to be used directly by the bicycle computer. The solution for this is to divide the frequency of the signal by 16, using a binary counter of the type 7493, before connecting it to the cycle computer.

The generator signal is first rectified by D1, R1 and D2 and then limited to 2.5 V. Transistor T1 turns it into a usable logic signal. Counter IC1 contains four flip-flips, one after the other, which divides the signal by 16. This signal drives, via T2, the white LED D3. LDR R6 reacts to the blinking LED and is connected to the cycle computer in place of the supplied wheel sensor.

The generator signal also supplies the power for the circuit. D4/C1 provide rectification and filtering, after which the voltage is regulated to 5 V by T3 and D4.

For a correct read-out (calibrated rev counter), the bicycle computer needs to be adjusted for a wheel circumference of 889 mm or 89 cm (wheel diameter 28 inch).

Make sure that when building the circuit it is suitably protected against vibration and moisture. Mount the LED and LDR directly opposite each other and keep in mind that they need to be well shielded from ambient light.

(040331-1)