Kit 162. 6VDC XENON FLASHER

This Kit builds the circuit to trigger a high voltage xenon flashtube using a 6 volt DC input from a power supply. The flashrate is fixed but we explain how you can vary it by changing resistor &/or capacitor values. (Actually the Kit contains two types of flashtubes. The xenon filled tube is the one which makes all the light. However, there is another flashtube which contains neon gas. This flashes as well but provides a different function as will be explained below.)

The Kit is constructed on a single-sided printed circuit board (PCB). Protel Autotrax and Schematic were used to design the board.

ASSEMBLY INSTRUCTIONS
First check the components supplied against the Component Listing. Follow the overlay on top of the PCB. Note the orientation of the Xenon tube (red dot), the trigger coil, the electrolytic capacitor C1 and the diodes.

CIRCUIT DESCRIPTION
There are three parts to the circuit:

- an **oscillator** centered around T1 transformer
- an **RC network** C3, R3 and R4 which controls the flashrate
- the **flash circuit** itself

Oscillator. This is a self-oscillating circuit centered around T1. Applying power turns on Q1 via current flow through R2. This causes current to flow in the primary winding of T1. The resulting magnetic field causes a voltage to be induced into the secondary winding, The polarity of this voltage (at pin 3) is such that it turns off Q1. Current stops flowing in the primary, the magnetic field collapses and the induced secondary voltage reverses polarity. This voltage now causes Q1 to turn off and the whole process repeats.

The turns ratio between the primary winding (pins 1 & 4) of T1 and the secondary winding (pins 2 & 5) is high (25turns to 1500turns resp.) So the voltage induced at pin 2 is high. This alternating voltage is half-wave rectified by diode D3 which then charges capacitor C4. This produces a DC voltage across C4 of about 375V. This voltage is negative (due to orientation of D3).

RC Network. Capacitor C3 is charged at a rate determined by resistors R3 and R4. This charging rate determines the flashrate. (more later).

Flash Circuit The voltage across C3 is also applied across the neon tube N1 via pins 1 and 2 of the trigger transformer T2 and the SCR CR02AM-8A Q2. This voltage increases as C3 charges. When it reaches about 70V (the firing voltage of the neon) N1 fires, a voltage pulse is put onto the gate of the SCR, Q2 and Q2 conducts discharging C3. This puts a voltage pulse into the trigger transformer T2 which is stepped up to hundreds of volts. When the high voltage pulse from the trigger transformer appears on the surface of the flash tube the electric field inside the tube initiates the breakover and the tube flashes. The cycle then begins again.

Flash Rate. This is determined by the RC network of C3, R3 and R4. The time constant of the RC network is given by the equation $T = R \times C$.

Reducing T will reduce the charge time and increase the flash frequency rate. Conversly, increasing T will increase the charge time and reduce the flash rate.

For the values supplied (R=20Mohm; C=.1uF) the circuit flashes at about 2 flashes per second. If we short one of the 10M resistors R is now halved and the flash rate will be about double (4 per second).

Slowing the flash rate is not quite so easy. Resistors values above 10M are hard to get. The easiest thing to do is increase the value of C3. Try a 0.15uF or 0.22uF capacitor. **Remember it has to be rated at 400V.** Increasing C3 to 0.22uF will reduce the flash rate to about 4 flashes every 5 seconds, or just under 1/sec.

Brightness. Increasing the value of C4 say from 2.2uF to 4.4uF or more will increase the brightness of the flash.

WHAT TO DO IF IT DOES NOT WORK
Poor soldering is the most likely reason that the circuit does not work. Check all solder joints carefully under a good light. Next check that all components are in their correct position on the PCB. Check that the diodes and electrolytic capacitor are the right way round. Check also transistor Q1. The metal tab should be nearest the transformer.

PARTS LIST – K162

Resistors (1W carbon, 5%)

24K red yellow orange	R5	1
33K orange orange orange	R2	1
10M brown black blue	R3,4	2

Capacitors

270pF 1000V	C2	1
0.1uF 400V polyester	C3	1
2.2uF 630V 225	C4	1
1000uF 16V electrolytic	C1	1

Semiconductors

1N4004	D1,2,3	3
H1061 NPN power amp	Q1	1
CR02AM-8A SCR	Q2	1

Miscellaneous

Transformer	T1	1
Trigger coil	T2	1
Neon tube	N1	1
Xenon flashtube		1
Fuse holder & cover		1
1 amp fuse		1
PCB, K162V2 or V3		1

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WARNING: Before handling this kit please discharge capacitor C4. This could be charged to over 300V and will give you a nasty shock if you touch it. Discharge the C3 by shorting it with a 1K resistor.

Note that the Trigger coil T2, and the Xenon Flash U-tube used in this kit are the same as are used in Kit 163, our 12VDC Xenon Flasher.

You may download the data sheet of the CR02AM at

http://kitsrus.com/pdf/cr02am.pdf

NOTE: the Mitsubishi data sheet on the CR02AM-8A we believe is **wrong.** The device is an SCR not a triac. When tested with an ohm-meter the device behaves like an SCR.

Looking at the device if you number the pins pin 1, 2 and 3 left to right, then there is a forward voltage drop from pins 1 to pin 2. Everything else is open. This means that pin 1 is the gate, pin 2 the cathode and pin 3 the anode. If it were a triac there would be two P-N junctions from the gate to each of the main terminals. Here is what we think is the **wrong** data sheet.

http://kitrsus.com/pdf/cr02am8a.pdf

Thanks to Tom Diviney for pointing out this conflict to us.

See our website at **http://kitsrus.com**