QUASAR PROJECT KIT # 3014-230 - 230V MAINS STROBOSCOPIC LIGHT

General Guidelines for Electronic Kits and Assembled Modules

Thank you for choosing one of our products. Please take some time to carefully read the important information below concerning use of this product. The assembly and operating instructions are on the following pages. Help with component identification can be found on our website at www.quasarelectronics.com/componentid.htm. If you are unsure about any aspect of the assembly or use of this product please contact our Support Team before proceeding.

WEEE Directive (Waste Electrical and Electronic Equipment)
Notice To All European Union Citizens. Important environmental information about this product.
The crossed out wheeled bin symbol on this product, package or documentation indicates that disposal of this product after its lifecycle could harm the environment. Do not dispose of this product (or batteries if used) as unsorted municipal waste. It should be disposed by a specialized company for recycling.
The unit should be returned to your distributor or to a local recycling service. Please respect the local environmental rules. If in doubt contact your local authorities about waste disposal rules.

Safety: General rules concerning safe use of our Kits or Modules.
To ensure your safety, please observe these safety measures. In no way are these complete. As safety requirements vary, please check with your local authorities, in order to comply with local requirements. If in doubt, seek the help of a qualified person.

Battery or wall-adaptor operated devices are safe devices. They do not require special attention unless mains voltage is connected to an output e.g. a relay.

To ensure electrical safety, and also protection from fire or personal injury, make sure your mains operated equipment complies with these safety hints:

- Use a suitable plastic enclosure. If a metal enclosure is used, make sure it is properly earthed.
- Use a power switch if the device consumes more than 10W. Use a double pole switch for mains operated, transformer-less kits.
- Mount a fuse in series with the mains switch. Use a slow blow (T) 50mA fuse for transformers up to 10W and a 100mA fuse for transformers up to 20W.
- Use a mains input connector, or a robust power cord with a clamp.
- Internal wiring carrying mains voltages must have a minimum cross-sectional area of 0.5mm^2.

If supplied, attach the power rating label near the power cord of the device and fill-out the mains voltage, frequency, power consumption and fuse values.

Troubleshooting and Support
90% of non working kits are due to poor soldering.
We operate a Get-You-Going service for non-working kits but there is a charge based on the time and components needed to complete the repair. Quite often it is not economically viable for us to repair and it is cheaper to supply a new ready made product at full cost.

Disclaimer
Quasar Electronics reserves the right to change product specifications or to discontinue products without notice. Quasar Electronics cannot be held responsible for any loss or damage, direct or indirect, which might occur from the use of a product. Quasar Electronics Kits or Modules are intended for educational and demonstration purposes only. They are not intended for use in commercial applications. If they are used in such applications the purchaser assumes all responsibility for ensuring compliance with all local laws. In addition, they are not suitable for use as or as a part of life support systems, or systems that might create a hazardous situation of any kind.

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INTRODUCTION

This kit contains the circuit to trigger a xenon flashtube. This flashtube is exactly the same as those seen on aircraft and signal beacons and as those contained in camera flash units, fast passport photo kiosks and at discos. Other uses include endoscopes, laser pumps, high speed photocopiers and typsetting. The frequency of flash can be adjusted from about once every 3 seconds to about 3 per second.

(Actually the kit contains TWO flashtubes. The xenon filled tube is the one the makes all the light. However there is another flashtube which contains neon gas. It flashes as well but provides a different function as will be explained later.)

WARNING! Mains Voltage! Risk of Electrocution!

This board connects directly to 230Vac mains supply. It must be assembled, housed in a suitable enclosure before use, tested & commissioned by a competent person.

Please ensure that all relevant local safety regulations are complied with. NOT SUITABLE FOR CHILDREN! Caution! Strobe lighting can induce epileptic fits.

ASSEMBLY INSTRUCTIONS

Assembly is straight forward - just follow the component overlay on the PCB. Add the lowest height components first to aid in assembly. Note that the back metal part of the SCR (silicon controlled rectifier) C106D is high-lighted on the overlay. The xenon flashtube is a non-polarised type and can be inserted either way around. Take extra care when inserting the tube into the PCB so that the thick leads at each end are not bent apart too much. If so then the tube can break. The neon tube can also be fitted either way around.

The electrolytic capacitors must be fitted with the positive lead going into the positive marked hole shown on the PCB overlay.

Put the 680 ohm 10W resistor 2 to 3 mm above the PCB. It can get quite hot when the kit operates at the maximum flash rate so putting it above the PCB aids in cooling it. The xenon flashtube can be located some distance away from the PCB - it does not to be located on the PCB itself.

CIRCUIT DESCRIPTION

The rated life of the xenon flashtube supplied with this kit is two million flashes, which is over 100 hours if left on at the maximum flash rate. When a potential difference of about 6000 volts is applied to the trigger electrode painted on the OUTSIDE glass of the U-tube then the xenon gas inside the tube will ionize and current will flow between the electrodes at either end of the tube. This produces the characteristic bright flash. It is the transformer coil which provides the step up voltage to produce the 6000 volt trigger pulse. It has a primary winding of 10 turns and a secondary winding of 500 turns.

The switch which “closes” to give the pulse of energy to trigger the xenon flashtube is the neon tube. Let us discuss the operation of the neon tube in general before we look at the circuit in particular.

The neon is connected as a relaxation oscillator as shown in Figure 1. The neon tube itself can be seen simply to contain two electrodes in parallel to each other in a small glass bulb. The air has been replaced by neon gas. When a potential difference (PD) below a critical value is applied across the electrodes the neon gas will ionize but conduct almost no current. As the PD approaches the critical value the neon gas glows with its characteristic orange/pink colour. At about 70V (called the striking voltage) current will flow across the electrodes. The PD must drop to about 60V (the extinction voltage) for current to stop flowing.

The operation of the relaxation oscillator circuit in Fig. 1 can now be seen. When power is applied the capacitor starts to charge.

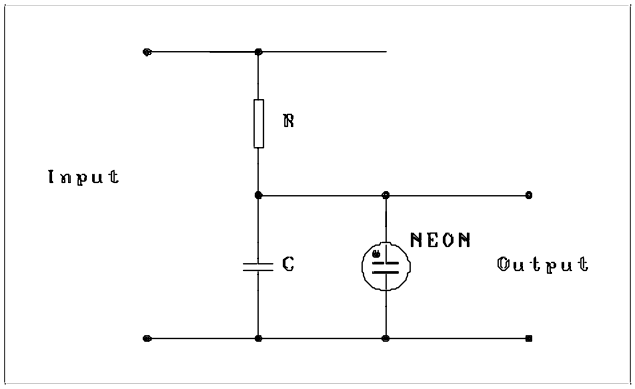

Figure 1.

When it reaches the striking voltage the neon will conduct and draw current from the capacitor. The voltage across the capacitor will fall. When the voltages fall to the extinction voltage the neon will stop conducting and the capacitor will start to recharge. Thus the cycle will continue as long as a PD is kept across the circuit.

Now we look at the circuit of the kit itself. The first part of the circuit is a voltage doubling circuit. It is connected directly to the mains power supply and alternately charges C2 and C3 on each half cycle of the mains supply via the 680 ohm resistor. The diodes provide half-wave rectification, so each capacitor is charged to 1.414 times the mains voltage (about 155V). This gives a total voltage across the two electrolytics of about 310V. The charging time must be fast enough to keep up with the fastest flash rate.

Next comes a potential divider ladder. The potential divider circuit determines the rate at which C1 will charge. C1 and the neon are connected in a relaxation circuit as just described. When the neon ‘strikes’ it triggers the triac and C1 discharges through the trigger coil. This produces a

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5 - 6kV pulse to the xenon flashtube and the xenon flashtube 'strikes'. After the flash all capacitors C1, C2 and C3 are discharged and the cycle starts again as long as power is applied to the circuit.

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 the components are in their correct position on the PCB, especially the triac, diode, electrolytic capacitor and the trigger coil. Thirdly, CAREFULLY follow the track with a voltmeter to check the potential differences at various parts of the circuit. **Remember you are dealing with mains voltage which can kill you.**

PARTS LIST - KIT 3014 - 240V

Resistors

68 ohm 1W resistor..... 1
1K (brown, black, red) 1
220K (red, red, yellow)..... 1
390K (orange, white, yellow)..... 1

Capacitors

..... 1
electrolytic 2

Miscellaneous

Xenon flashtube, ... 1
Trigger coil, ... 1
Neon tube, ... 1
SCR, ... 1
1M potentiometer..... 1
Knob for potentiometer 1
1N4007 diode..... 2
Screw terminal strip, 2 way..... 1
Kit 3014-240 PCB..... 1