

## Kit 12. Music – Light Modulator



A music to light modulator is a circuit that controls the intensity of one or more lights in response to the level of an audio input. The problem in older circuits is that there was a direct electrical connection between the lights using mains voltage (110 to 250V AC) and the amplifier circuit low voltage (9 to 12V) levels. Any fault in the high voltage circuit could destroy the low voltage section (and possibly give a nasty shock to anyone touching it.)

This potential problem has been overcome using an opto-coupler. There is no electrical link between the high and low voltage parts of the circuit. This kit introduces the opto-triac (MOC3021), which is a further development of the opto-coupler. An audio input controls an LED. The light from the LED drives the photo sensitive gate of the photo-triac. The LED and the triac are mounted within a single package. This triac is used as a driver to control a slave triac, which is capable of handling a larger current.

### Specifications :

Input trigger voltage	2.3 - 2.5V
AC input voltage	110V - 250V AC
Load (2 Amp. max)	500W @ 250V 220W @ 110V

**WARNING!** This kit uses mains voltage supply. Treat it with extreme care. It can kill you. Check everything you do. Ask someone to check your work if you are unsure.

### Assembly Instructions

Assembly is straightforward. Start with the lowest height components first. Check that you put the MOC3021 in the correct way around. Leave the other triac, Q1, and its heatsink until last. Lightly secure Q1 to the heatsink using the screw and nut then fit the whole assembly to

the PCB. Once soldered into position, tighten the screw and nut.

**Note!** The value of resistor R3 depends on the mains supply voltage to be used. For 110V systems use the 2K7 resistor. For 220-240V systems use the 5K6 resistor. Both are supplied.

It is suggested that you house the kit in a plastic enclosure and do not operate the kit with the lid removed, to prevent coming into contact with exposed high voltage parts.

### **Remember that the heatsink is at mains potential!**

Terminal blocks are provided to attach the mains supply and the lamp to be modulated. The kit is not suitable for driving fluorescent lamps. Use incandescent lamps less than the maximum wattage listed.

### Circuit Description

The circuit diagram shows how simple the circuit really is. The audio signal is applied across the LED of the opto-triac. The potentiometer adjusts the input sensitivity while R2 limits the LED current. The LED emits infrared light in response to the input signal. The triac driver inside the MOC3021 package is sensitive to the IR light, and activates a slave triac which controls the load. R3 limits the gate current of the power triac Q1.

A triac is a bilateral switch, similar to an SCR, but conducts in both directions. Current flow between the two main terminals is controlled by the gate, and the series voltage drop is low when turned on. The mains voltage applied to X2 is thus fed to the lamp at X3 when the input signal is large enough for the triacs to conduct, and switched off when the signal level drops and the triacs turn off. The triacs will turn on for each half cycle of mains frequency that their gates are triggered. The lamp is therefore turned on and off very rapidly, depending on the music level. Because of the thermal lag in the lamps themselves, this appears as a pulsating change in light intensity rather than an on/off strobe effect.

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## What To Do If It Does Not Work

**First disconnect the board from the mains supply. Unplug it completely.**

Poor soldering is the most likely cause of problems. Check all solder joints carefully under a good light. Next check that all components are in their correct position on the PCB. Make sure the opto-coupler chip is in the correct way around, and the potentiometer is set correctly.

Reconnect the AC mains supply. **Carefully** using a voltmeter, check the voltage at various parts of the circuit. Maybe the input signal is not large enough to drive the opto-coupler? It needs at least 1.2V RMS and a current of 5mA (approx). It should be driven from the speaker output of a power amplifier or possibly the headphone output of some portable CD players, radios etc.

## What To Learn From This Kit

The Kit introduces the optocoupler-triac which provides electrical isolation between a low voltage input signal and the high voltage mains supply. It is not designed to handle high current however, so a power triac is used to switch the load.

## Parts List

### Resistors

1K PCB mount pot.....	R1.....	1
330R 1/2W carbon.....	R2.....	1
2K7 1W carbon.....	R3.....	1
5K6 1W carbon.....	R3.....	1

### Semiconductors

MOC3021 Opto-triac.....	IC1.....	1
2N6075 or BT136 Triac.....	Q1.....	1

### Miscellaneous

2.5mm audio jack .....	X1.....	1
2 way screw terminal .....	X2, X3.....	2
IC socket, 6 pin .....		1
Heatsink .....		1
3mm screw and nut .....		1
K12 Printed Circuit Board ..		1

The data sheet for the MOC3021 is available from our web site at :

[www.kitsrus.com](http://www.kitsrus.com)

## Circuit Diagram

