# TRAFFIC LIGHT CONTROLLER

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## Outline

This design uses TTL ICs to simulate the appearance of traffic lights. The "lights" consist of three LEDs which go on and off in the sequence followed by actual traffic lights. Applications of this circuit might be found in model town and railway layouts, or (with a little modification) as a yes/no decision maker.

The sequence displayed must be: red, red/yellow, green, yellow, and back to red again. In addition the red or green periods (which are equal) must be longer than the yellow or red/yellow periods (which are also equal). The circuit follows this succession in a continuous cycle.

## Circuit Description

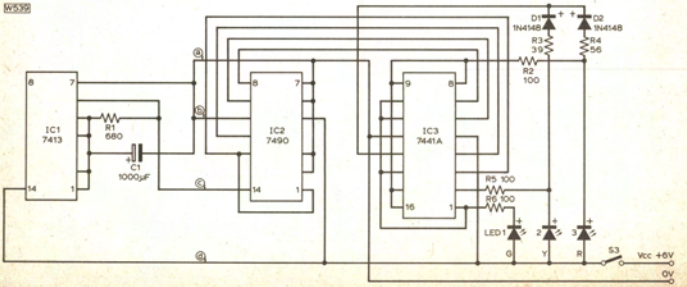
The circuit consists of four distinct sections; these are the oscillator, the counter, the decoder and the display.

The oscillator is a SN7413, dual four input nand Schmitt which, together with R1 and C1, generates a series of pulses. The frequency is set by C1 (1000$\mu$F) which gives reasonable timing for a model layout. These pulses are fed to a SN7490 decade counter, which advances by one whenever an input pulse is detected. When it reaches nine, it resets to zero; in this way the continuous cycle is produced. The count appears in binary at pins 12, 9, 8, 11 (1, 2, 4, 8 respectively). This count is taken to IC3, which is a SN7441A binary to decimal decoder. It has ten output pins which are normally high, but which go low in conjunction with the binary input. For example, when binary 0101 appears at the input pins, output pin 14 (associated with decimal 5) goes low. Since the decoder input cycles from zero to nine, the decoder outputs will do the same. These outputs are in four groups, each controlling a particular display function.

*Fig. 1: The main circuit diagram.*

## The display

This consists of three LEDs, arranged one above the other as in conventional traffic lights. The red LED is driven from counts zero, one, two and three; the



green LED from counts five, six, seven and eight; and the yellow LED from count nine. Count four drives both the red and yellow LEDs, via diodes D1 and D2. These prevent the yellow LED lighting during counts zero, one, two and three, and the red LED lighting during count nine.

## ★ components

**Resistors**
R1 680Ω
R2 100Ω
R3 39Ω
R4 56Ω
R5 100Ω
R6 100Ω
R7 10kΩ

**Capacitors**
C1 1000μF, 25V
C2 10μF, 6V
C3 100μF, 6V

**Semiconductors**
IC1 SN7413
IC2 SN7490
IC3 SN7411A
Tr1 BC109C
D1 and D2 general purpose silicon
LED 1 Green, LED 2 Yellow, LED 3 Red

**Miscellaneous**
Relay 14 pin DIL reed type (Doram), Veroboard 0·1" matrix 50mm × 45mm, S1 2 pole, 2 way. S2 push-to-make switch. S3 Single pole, one-way. 6V batteries, Case.

## Construction

The unit is constructed on a piece of 0·1in Veroboard which measures 50 x 45mm. Layout details, including modifications for the decision maker, are shown in **Fig. 3**

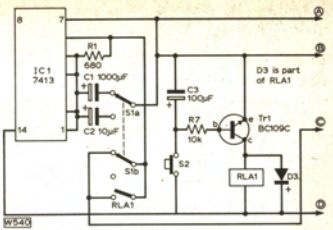



*Fig. 2: Modifications around IC1 for use in "random" mode.*

## Modifications for Decision Maker

These modifications detailed in **Fig. 2**, allow the circuit to be turned into a form of "coin tosser". When switched in C2 determines the oscillator frequency, and sets it much faster than C1. The input to the 7490 is also disconnected from the oscillator, but is reconnected when the relay (a 14-pin DIL reed type) is energised. The relay is operated by TR1, which has a delay circuit C3/R7. When S2 is pushed, C3 charges to the supply potential and holds TR1 on. As C3 slowly discharges through R7 and TR1 base, it provides a delay of a few seconds, holding the relay on after S2 has been released. When RLA1 de-energises, the counter is again disconnected from the oscillator, and the display freezes in one state. When the switching speed of the display and the time delay on RLA1 are combined, it becomes impossible to predict just how the display will stop—in other words, the outcome is random. Should the display halt at a state which includes a yellow light, S2 may be pushed again. ●

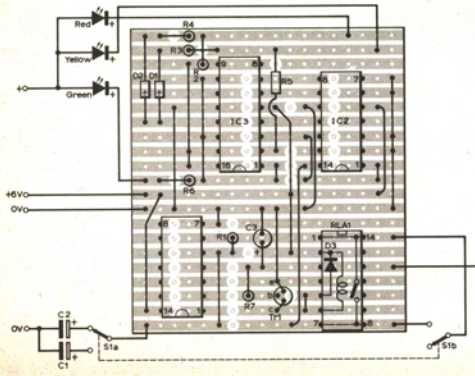



*Fig. 3: General Veroboard layout of composite unit.*