

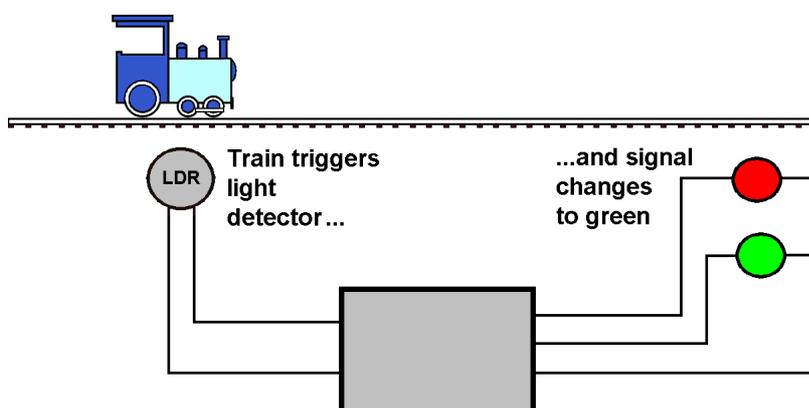
## Automatic signals

This project was prompted by model railway club that has an up line and a down line. Each line has signal lights that are currently operated by switches. Unfortunately, the operators usually forget to throw the switches, resulting in trains running through red lights.

This module detects the approaching train and automatically turn the lights to green for a period until the train passed. The delay in switching back to red is adjustable.

We already have a train detector – the PMP2. This uses an LDR as a general purpose light detector. It is used to detect trains in hidden sidings, automatically switch on station lights when a train is on a platform, etc.

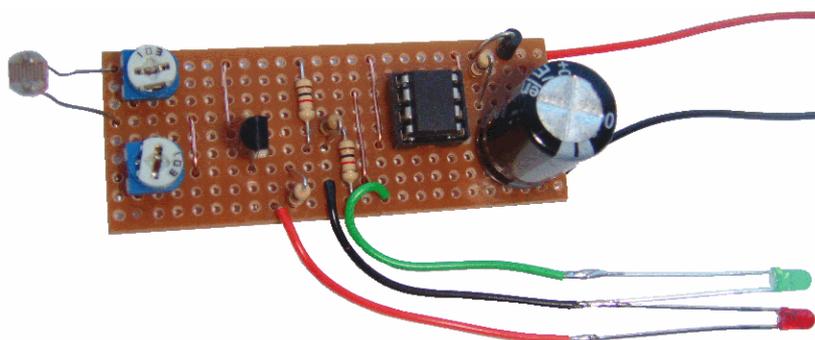
This circuit uses the same detector circuit but blocking the light to the light-dependent resistor (LDR) triggers a timer that is added to the board.



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This results in a module with a single function but one that is useful and not readily available or at a reasonable price. This illustration shows the setup.

The LDR is fitted between sleepers in the track pointing upwards towards the light.



### How it works

The module is based on a 555 timer chip and is composed of three separate parts as follows:

#### The detector

When exposed to light, the LDR has a low resistance and the voltage at the chip's input is high.

When the loco passes over the LDR, it blocks the light reaching the LDR. In darkness, the LDR has a very high resistance and this lowers the voltage at the chip's input.

A 10k trimmer is used to adjust the sensitivity of the detector.

**The timer**

A low voltage on the 555 chip's input triggers the timer into operation.

The 555 timer chip's output is normally low (i.e. 0V).

When triggered, its output pin goes high for a fixed period, before returning to 0V again.

How long the output stays high is determined by the values of the resistors and capacitors used in the circuit.

The second 10K trimmer adjusts the delay to between 3 seconds and 26 seconds.

**The outputs**

The output of the 555 is used to drive two LEDs, one directly and one via a transistor.

The second transistor is used as an 'inverter' which means that a high voltage on its base results in a low voltage on its collector – and vice versa.

When the 555's output pin goes high, the green LED illuminates during the time of that pulse.

The high voltage on the transistor's base drives its collector low and the red LED extinguishes.

The 555 chip can operate on a voltage range of around 4.5V to 14V and the time delays are independent of the voltage used.

The kit is available at all West of Scotland activities (for £1.30) or can be purchased from the national MERG website as PMP 817.