

# Surplustronics Traffic Light Kit KS0020

Before you start check you have all the parts listed:

## SUPPLIED PARTS

R1, R3,8= 47K Yellow (4), Violet (7), Orange (3), Gold (5%)

R2, R4, R6 = 1K Brown (1), Black (0), Red (2), Gold (5%)

C1, C2, C3 = 47uF Electrolytic Capacitor

Q1, Q2, Q3 = BC547 NPN Transistor

LED 1 = RED LED Light Emitting Diode

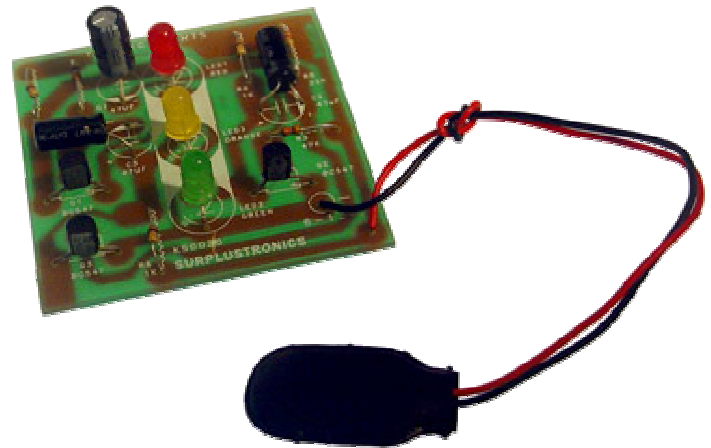
LED 2 = GREEN LED Light Emitting Diode

LED 3 = ORANGE LED Light Emitting Diode

PCB = SKPCB 11 Printed Circuit Board

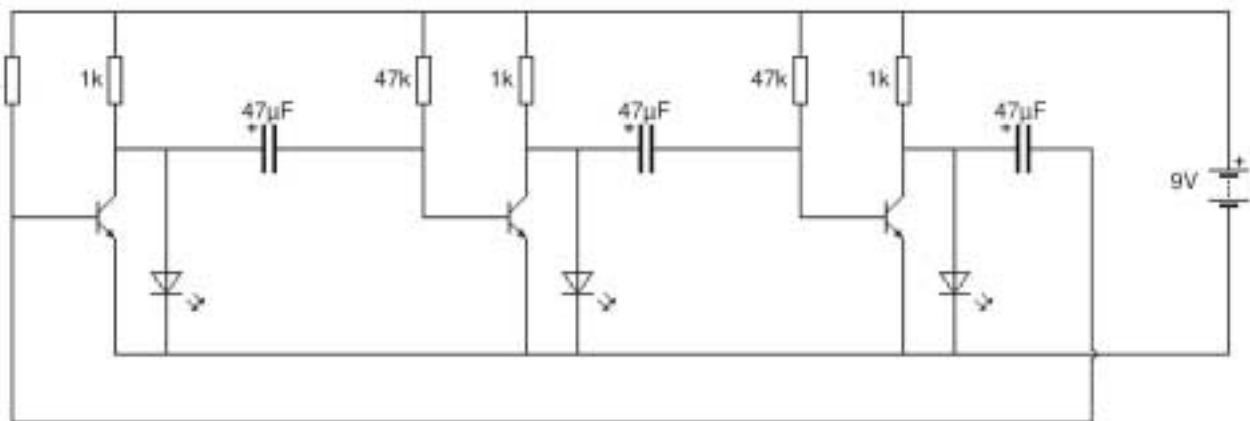
BATTERY CLIP = Battery Clip for 9V Battery

SOLDER = Small Coil of Solder



## YOU WILL NEED TO SUPPLY:

Soldering Iron, Side Cutters, 9V 216 Battery.



Circuit Diagram - Traffic Lights

## ASSEMBLY

If you are not familiar with soldering please read the soldering tips and instructions on the back of these instructions first. If you plan to use the plastic packaging for your project case, ensure when inserting the components that you keep their height lower than that of the packaging.

Start by fitting the resistors, either way round is OK with resistors. When you insert the resistor wires push them all the way in so the resistor body is close to the PCB.

Tip: On the bottom of the PCB bend the wires over slightly, that way the components will not easily fall out when you turn the board over. Solder each resistor as you install it then cut the excess lead wires off flush with the circuit board. Tip: To hold the PCB still while soldering, push one edge of the PCB into a big lump of blutack.

Next the capacitors, these you must watch which way round they go, each has a -sign meaning this is the negative, match this with the same marking on the PCB. Fit them one at a time the same method as you did for the resistors but only push the wires into the PCB until the body is about 5mm off the top of the board.

Next the Transistors: These only go one way round, make sure the D shape body of the transistor matches that on the PCB. You may have to bend the legs a little to. Get them to fit.

Only insert the transistors wires far enough so they protrude about 3mm on the back of the PCB then solder them. Now the LED's, these only work one way round, inspect the LED's carefully and you will see the round body has a notch near one leg, make sure this notch match's the same marking on the PCB then you insert it. Only insert the LED lead wires 3 mm or so through the PCB so they will stand tall off the PCB.

Now attach the Battery Clip wires to the PCB (not the battery yet), RED wire goes to the + (positive) on the PCB and the BLACK wire goes to the -(negative). Before you connect the battery get someone else to check all your assembly or recheck yourself. If all seems OK, connect the battery, if you have done everything correctly you will see your Traffic Lights blinking in sequence.

## How it works:

This circuit is based on one of the most common oscillator circuits in electronics, the astable multivibrator circuit. The standard astable multivibrator has only 2 stages, we have added a third to make it more interesting.

The transistors do all the work here, transistors behave like a switch, they turn on and conduct a large current (from "c" collector to "e" emitter) when a small current is applied to "b" base. The more you apply to the base the harder it turns on and more current flows through the collector to the emitter and back to the battery

When power is first applied, Q1 is turned on by the small current flowing in R1, this causes a larger current to flow in Q1 collector which robs power from the red LED (turns the led off) this increasing current in Q1 collector causes the voltage at this point to fall, as capacitor C1 is connected here also, the falling voltage from C1 transfers to Q2 base which causes Q2 to turn off its collector current which means all the current from R4 can flow through the green led making it glow.

When C1 is completely discharged R3 can now start to apply a small current to Q2 base which starts to turn on Q2 collector flow, robbing current from the green LED so the green LED turns off, as Q2 collector voltage is falling, now capacitor C2 transfers this falling voltage and current to Q3 base which causes Q3 to turn off its collector current which means all the current from R4 can flow through the orange LED making it glow, as each stages output is connected to the input of the next these cycles are repeated over and over making the traffic lights blink in sequence continuously.

Some of you clever cookies may ask why we didn't put the LED's in series with the collectors of the transistors. There is a good reason - connected that way the chase effect would have 2 LED's chasing each other not 1 (not very good traffic lights)