# Kitronik

GENERATE A PLEASING AROMA WITH THIS

# AIR FRESHENER KIT
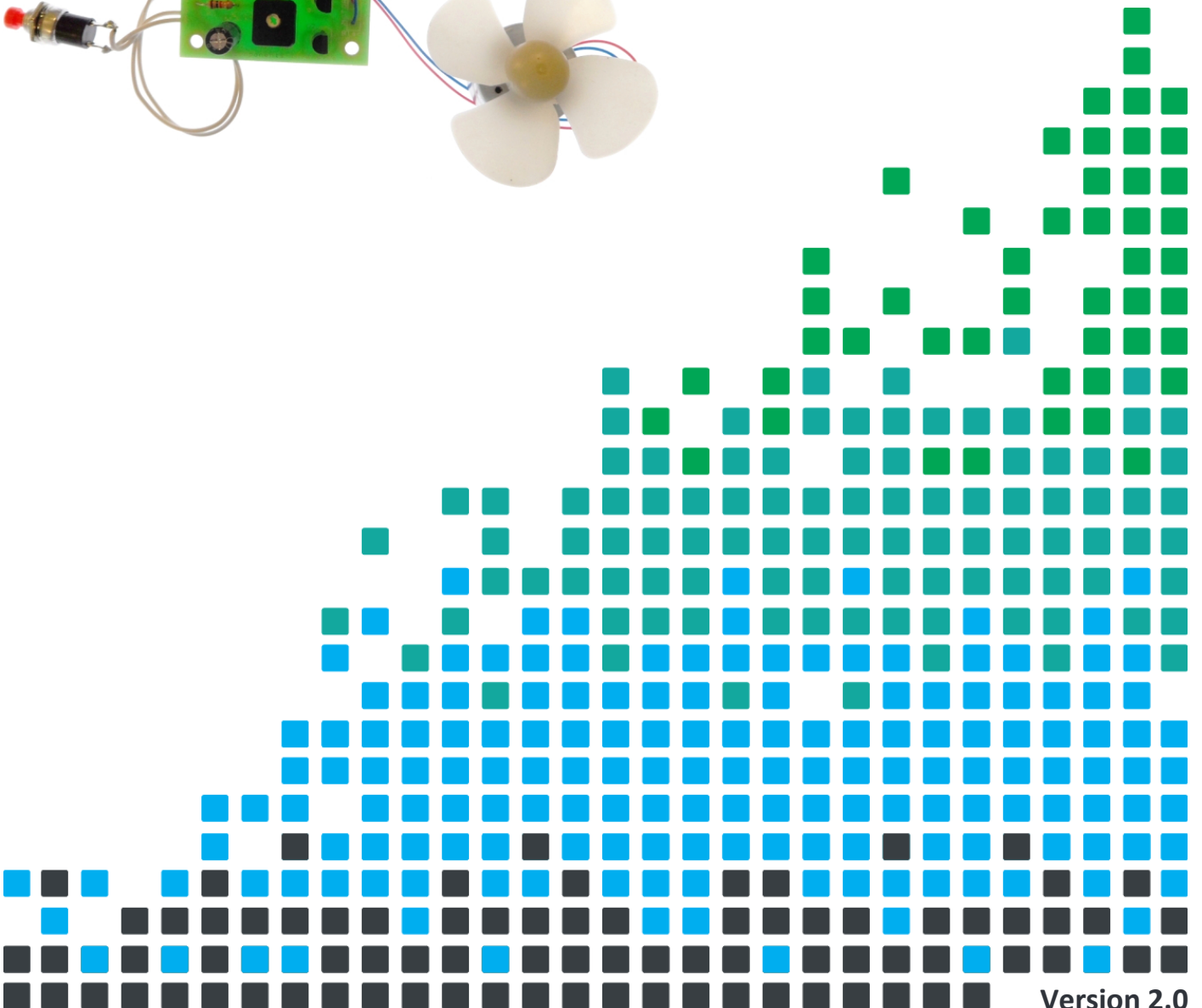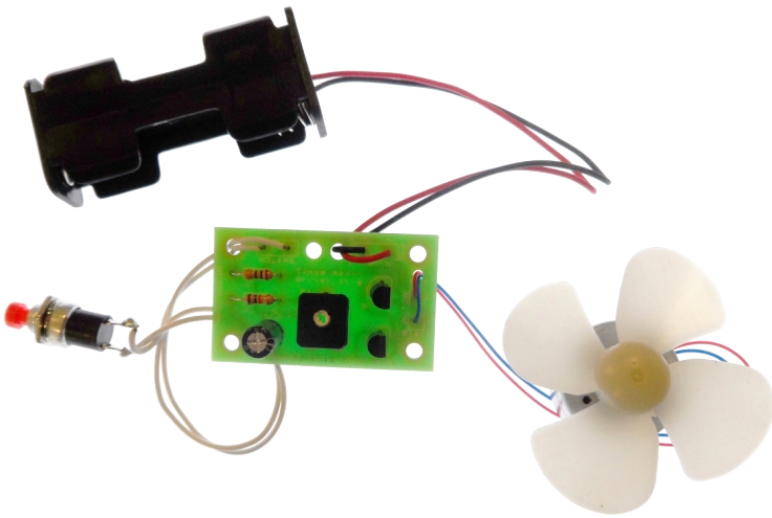
Version 2.0

## Build Instructions

Before you start, take a look at the Printed Circuit Board (PCB). The components go in the side with the writing on and the solder goes on the side with the tracks and silver pads.

### 1 PLACE RESISTORS

Start with the two resistors:
The text on the PCB shows where R1 and R2 go.
Ensure that you put the resistors in the right place.

| PCB Ref | Value | Colour Bands |
| --- | --- | --- |
| R1 | 1M | Brown, black, green |
| R2 | 1K | Brown, black, red |

### 2 SOLDER THE VARIABLE POTENTIOMETER

Solder the variable potentiometer into the PCB where it is labelled R3.

### 3 PLACE THE TRANSISTORS

Place the two transistors into the board where it is labelled Q1 and Q2. Make sure that the device is the correct way around. The shape of the device should match the outline on the PCB.
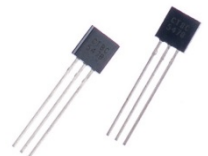
### 4 PLACE THE CAPACITOR

Place the capacitor into the board where it is labelled C1. Make sure that the device is the correct way around. The capacitor has a '-' sign marked on it, which should match the same sign on the PCB. **Using an electrolytic capacitor backwards could result in it being destroyed.**
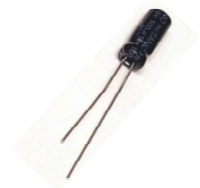
### 5 ATTACH THE BATTERY HOLDER

Attach the battery holder. Start by feeding the leads through the strain relief hole next to the power connection. The wire should be fed in from the rear of the board.

The red lead should be soldered to the '+' terminal (also marked with the text 'red') and the black lead should be soldered to the '-' terminal (also marked with the text 'black').
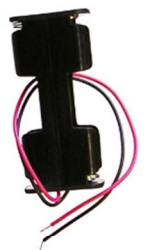
**6** SOLDER THE MOTOR

Solder the motor to the board where it is marked 'motor'. Again, use the strain relief and make sure that the red and black wires go to the right place.

**7** ATTACH THE RESET SWITCH

Attach the reset switch. First cut and strip two short lengths of the wire supplied. Solder one to each of the two terminals on the switch. Then solder the other end to the PCB where it is marked 'switch'. It does not matter which way around the two wires go.

# Checking Your Air Freshener PCB

Check the following before you insert the batteries:

**Check the bottom of the board to ensure that:**
- All holes (except the 4 large (3mm) holes in the corners) are filled with the lead of a component.
- All these leads are soldered.
- Pins next to each other are not soldered together.

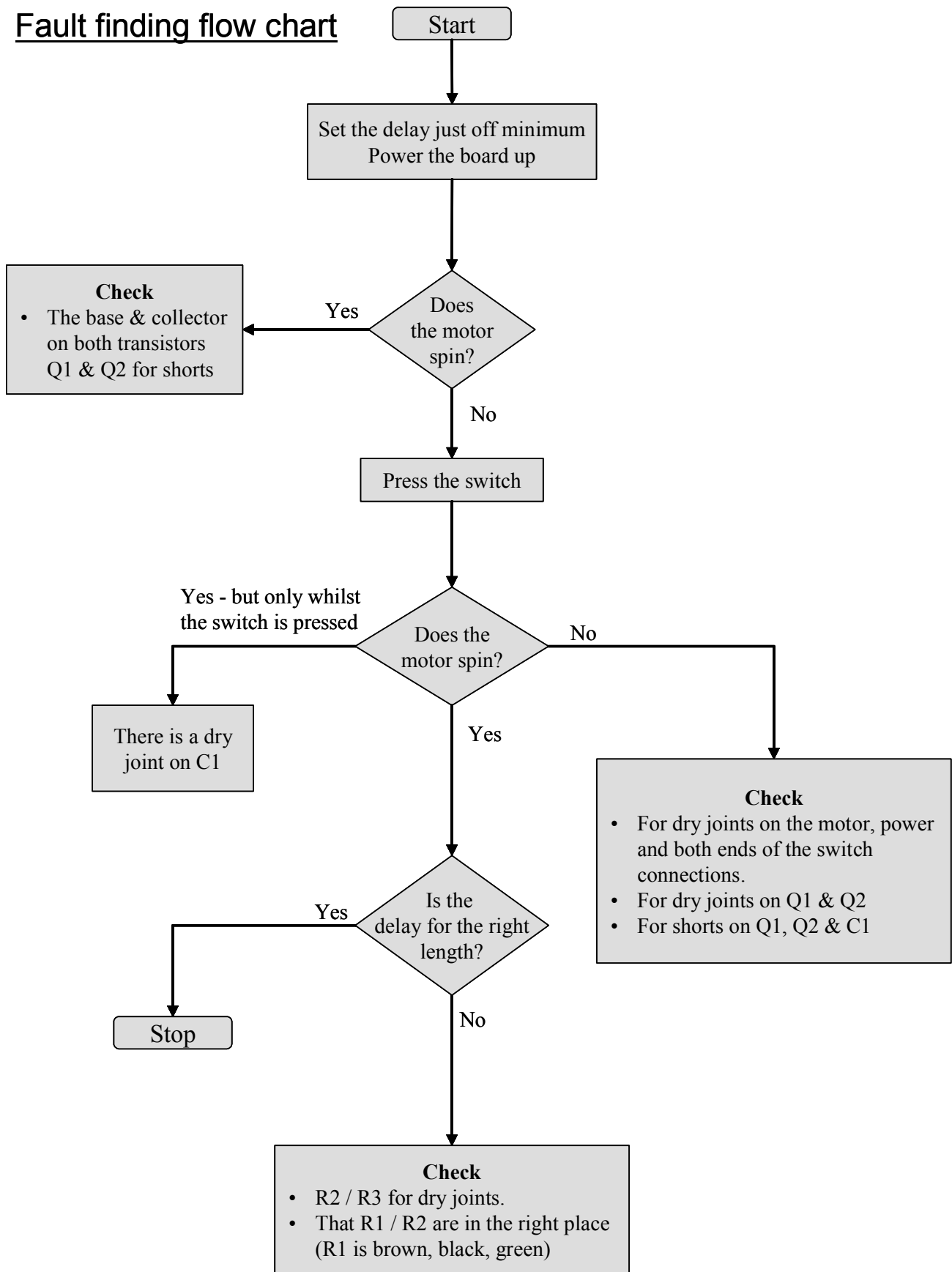**Check the top of the board to ensure that:**
- The shape of the transistors match the outline on the PCB.
- The '-' on the capacitors match the same marks on the PCB.
- The colour bands on R1 are brown, black & green.
- The battery cage is connected to 'POWER' and that the red and black wires match the red and black text on the PCB.
- The motor is connected to 'MOTOR' and that the red and black wires match the red and black text on the PCB.

## *Instructions*
- Insert the batteries.
- When the start switch is pressed, the motor will spin.
- The duration that the motor spins for can be adjusted with R3.
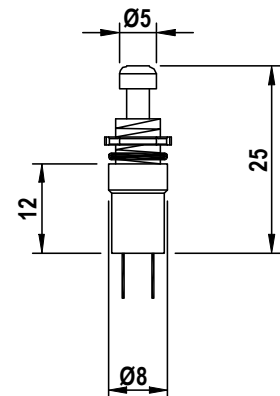
## Fault finding flow chart

**Start**

Set the delay just off minimum
Power the board up

Does the motor spin? — **Yes** →

**Check**
- The base & collector on both transistors Q1 & Q2 for shorts

**No** ↓

Press the switch

Does the motor spin?

**Yes - but only whilst the switch is pressed** →
There is a dry joint on C1

**No** →
**Check**
- For dry joints on the motor, power and both ends of the switch connections.
- For dry joints on Q1 & Q2
- For shorts on Q1, Q2 & C1

**Yes** ↓

Is the delay for the right length?

**Yes** →
**Stop**

**No** ↓

**Check**
- R2 / R3 for dry joints.
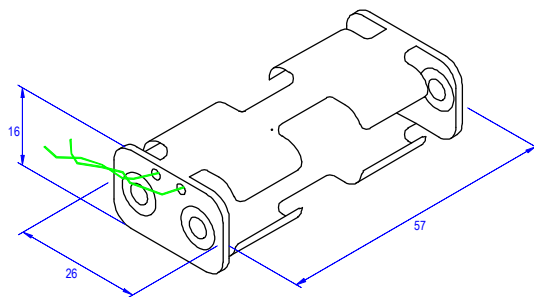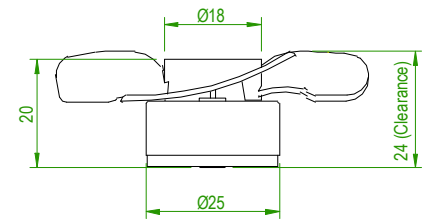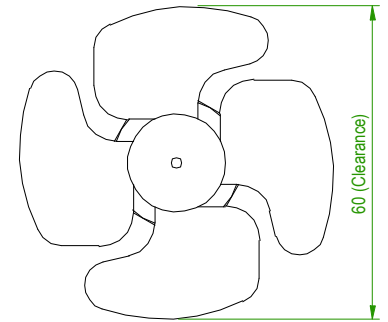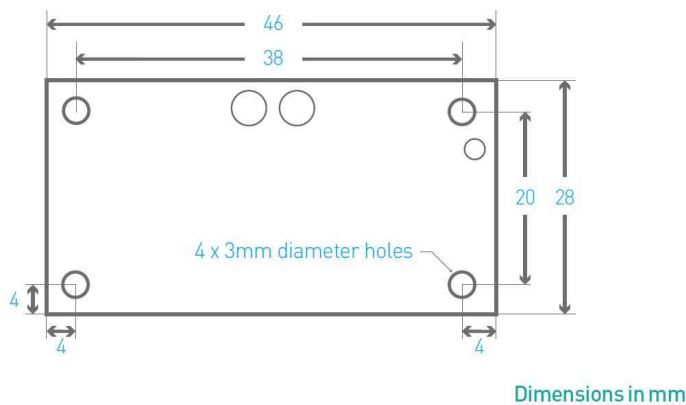- That R1 / R2 are in the right place (R1 is brown, black, green)

## Designing the Enclosure

When you design the enclosure, you will need to consider:

- The size of the PCB (below left).
- Where the fan unit is mounted (right).
- Where the start switch is mounted (bottom right).
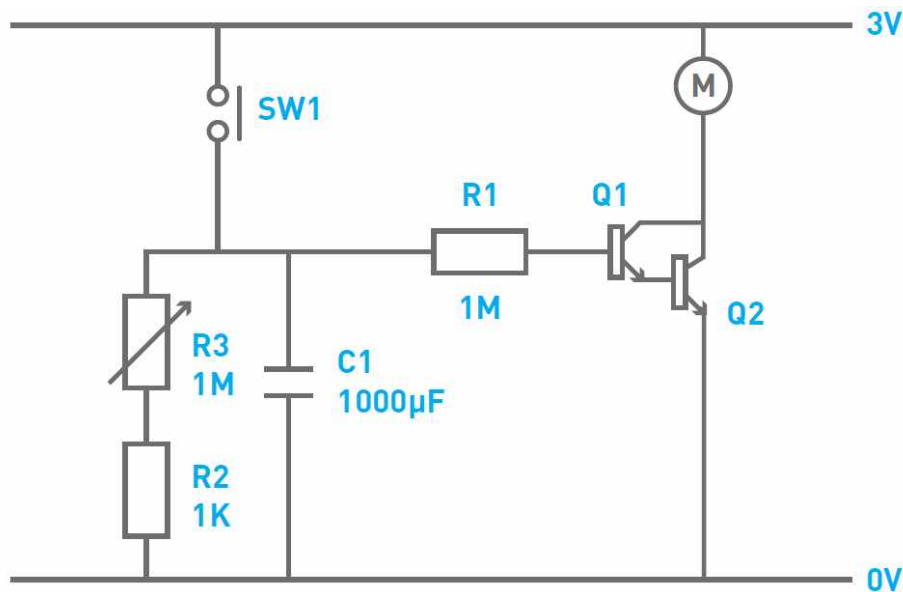- Where the batteries will be housed (bottom left).

These technical drawings of the parts should help you to plan this.
All dimensions in mm.

**Mounting the PCB to the enclosure**

The drawing to the left shows how a hex spacer can be used with two bolts to fix the PCB to the enclosure.

*Your PCB has four mounting holes designed to take M3 bolts.*

## How the Air Freshener Works



When the switch (SW1) is pressed the capacitor (C1) charges. When the switch is released the capacitor (C1) slowly discharges through the resistors (R2 & R3). R2 is just present to make sure that the batteries aren't shorted if the switch is pressed and the variable resistor R3 is set to zero.

As the capacitor (C1) discharges, the voltage across it will decrease. This initially starts at 3 volts and as it discharges, will drop down to zero volts. Whilst this voltage is above 1.4 volts, the Darlington Pair transistor will be turned on and so will the motor. When the voltage on the base goes below 1.4 volts, the transistor switches off and so does the motor.

If R3 is decreased the capacitor is discharged faster and the motor is on for less time. When R3 is a bigger value the current flowing out of the capacitor is lower and the motor stays on for longer.

# Online Information

Two sets of information can be downloaded from the product page where the kit can also be reordered from. The 'Essential Information' contains all of the information that you need to get started with the kit and the 'Teaching Resources' contains more information on soldering, components used in the kit, educational schemes of work and so on and also includes the essentials. Download from:

www.kitronik.co.uk/2123

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🇬🇧 This kit is designed and manufactured in the UK by Kitronik

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