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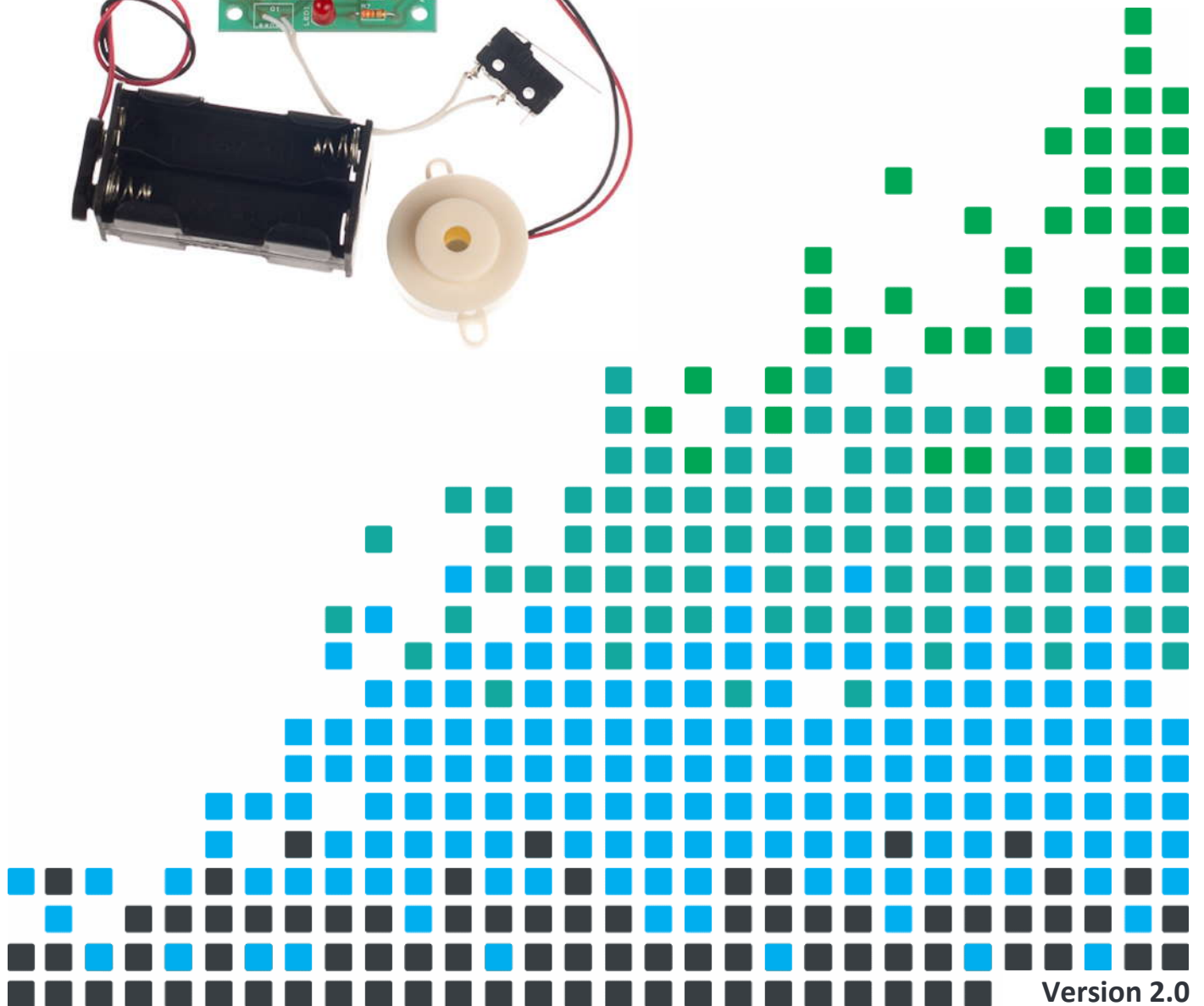
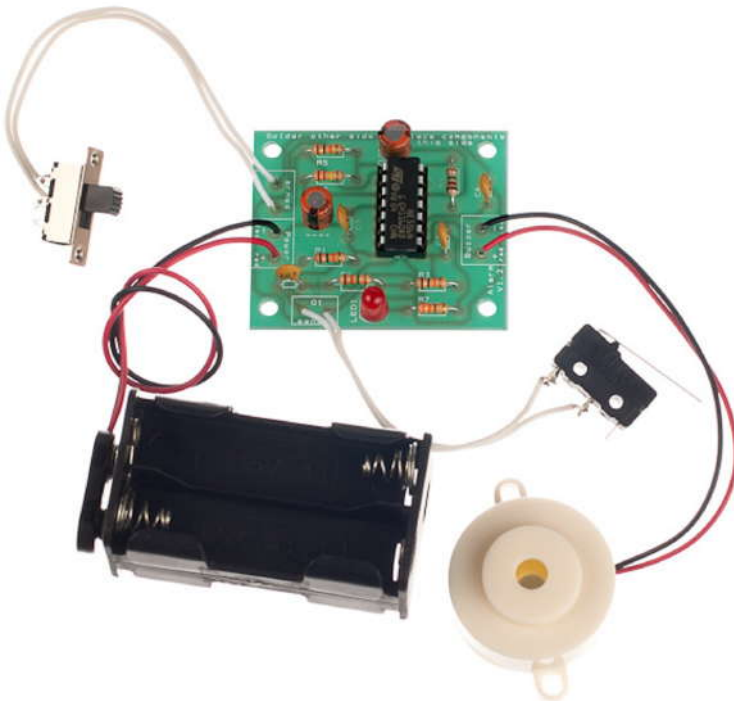
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WHAT CAN YOU PROTECT WITH THIS

# ALARM KIT



## 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 seven resistors:  
The text on the PCB shows where R1, R2 etc go.  
Ensure that you put the resistors in the right place.

PCB Ref	Value	Colour Bands
R1, R3 & R5	10K $\Omega$	Brown, black, orange
R2	220K $\Omega$	Red, red, yellow
R7	330 $\Omega$	Orange, orange, brown
R4 & R6	1.2M $\Omega$	Brown, red, green



### 2 SOLDER THE CERAMIC CAPACITORS

Solder the four ceramic capacitors into C1, C3, C4 and C6. They can go in either position as they are all the same.



### 3 SOLDER THE ELECTROLYTIC CAPACITORS

Solder the two electrolytic capacitors into C2 and C5. They can go in either position but it is important that the '-' on the capacitor lines up with the '----' markings on the PCB.



### 4 SOLDER THE IC HOLDER

Solder the Integrated Circuit (IC) holder into U1. When putting this into the board, be sure to get it the right way around. The notch on the IC holder should line up with the notch on the lines marked on the PCB.



### 5 SOLDER THE LED

Solder the Light Emitting Diode (LED) into LED1. The alarm won't work if it doesn't go in the right way around. If you look carefully one side of the LED has a flat edge, which must line up with the flat edge on the lines on the PCB.



### 6 SOLDER THE BUZZER

The buzzer should be soldered into the 'buzzer' terminal. The red wire must go to the '+' terminal and the black wire must go to the '-' terminal.



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## FIT THE BATTERY CONNECTOR

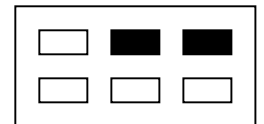
The battery connector should be soldered into the 'Power' terminal. The red wire must go to the '+' terminal and the black wire must go to the '-' terminal.



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## SOLDER THE ARM / DISARM SWITCH

Cut and strip two short lengths of wire. Solder these to an edge and the centre terminal on the same row of pins on the switch. The terminals that should be used are shown in black on the drawing, below. Now solder the other end of the wires to the PCB where it is marked 'armed'. It does not matter which way around the two wires go.



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## SOLDER DETECTION SWITCH

Look carefully at the sensor switch and you will see that it is marked COM (common), NO (normally open) and NC (normally closed). Cut and strip two short lengths of wire. Solder these to the COM and the NO terminals on the switch and solder the other end of the wire to the PCB connection marked Q1 (sensor).



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## PLACE THE IC INTO HOLDER

The IC can be put into the holder ensuring the notch on the chip lines up with the notch on the holder.



## Checking Your Alarm 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) 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 notch on the IC and the IC holder are in the same orientation as the markings on the Printed Circuit Board.
- All the resistors are in the right place.
- The red / black wires on both the power connector and buzzer are the right way around.
- The LED is in the right way around.
- Both of the electrolytic capacitors have the '----' marking on the PCB lined up with the '-' on the capacitor.

## Testing the PCB

- When the batteries are connected, either or both the disarm LED / the alarm sounder may start.
- To stop this, put the alarm into the disarmed state (push the slide switch so that it is at the end where the wires are connected).
- Now move the arm switch into the arm state (slide the switch the other way).
- Close the door switch; the LED should remain off.
- Open the switch and the LED should light, indicating that the alarm should be disarmed.
- After around 20 – 25 seconds the alarm should sound.

If your circuit does not function as described, use the fault finding flow chart to resolve the issue.

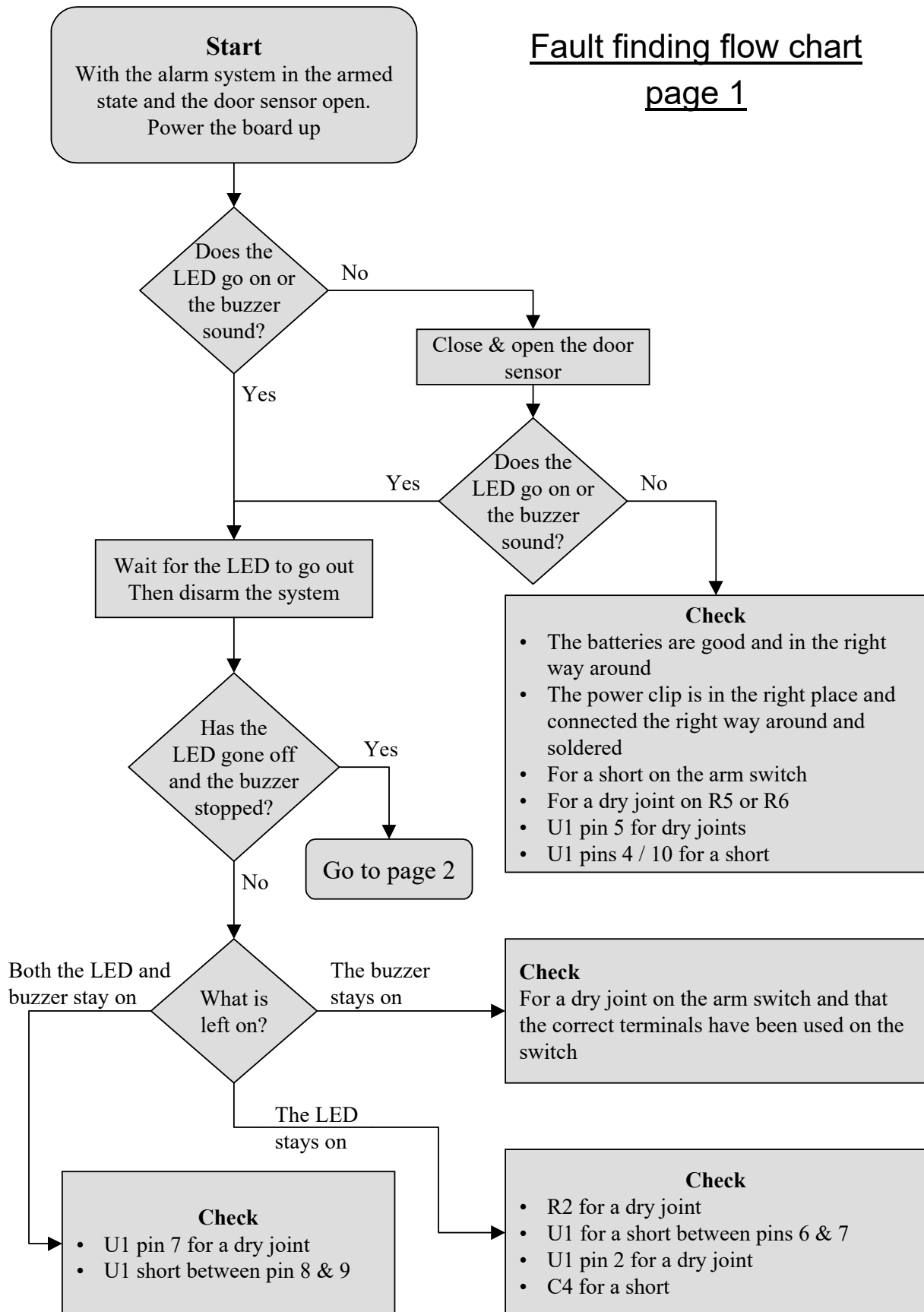
## Using the Alarm

- To arm / disarm the system use the arm switch.
- When exiting the alarmed area, move the arm switch to the arm position.
- Close the door behind you.
- Upon entering the alarmed area you have 20 –25 seconds in which to disarm the alarm.
- The LED will light to indicate that the alarm needs to be disarmed.
- Disarm it by moving the arm switch into the disarm position.
- Should the alarm not be disarmed in the given time, the buzzer will sound (this will continue for 2 minutes or until the alarm is disarmed).

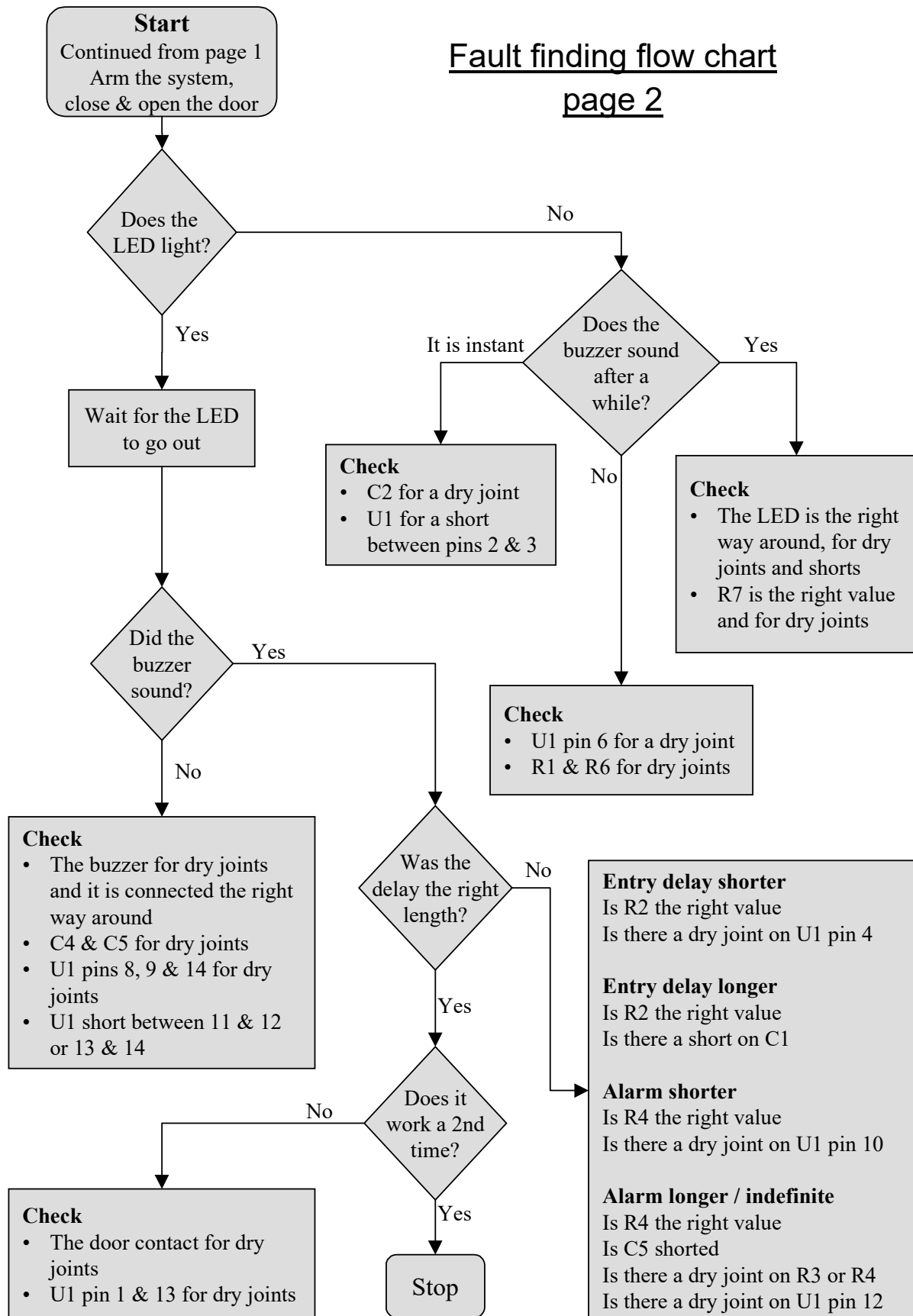


## Fault finding flow chart

### page 1



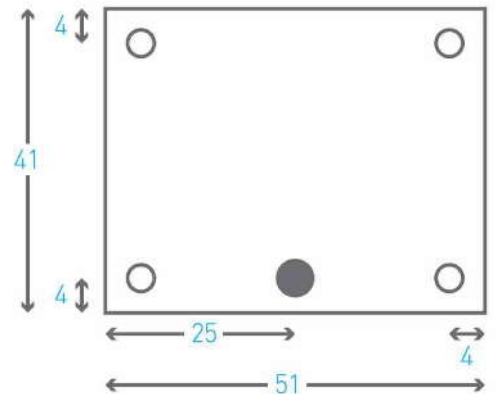
## Fault finding flow chart page 2



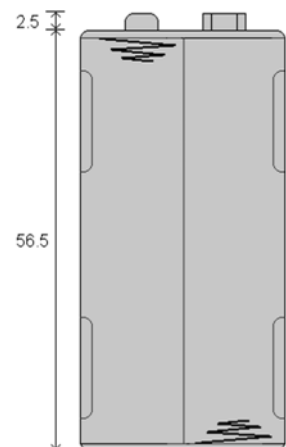
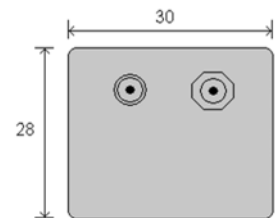
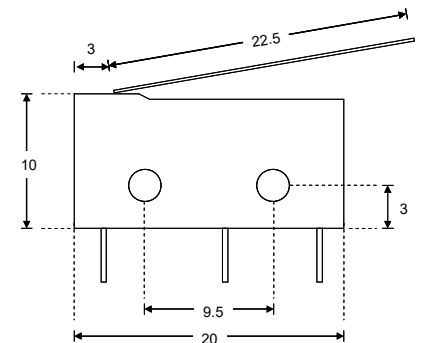
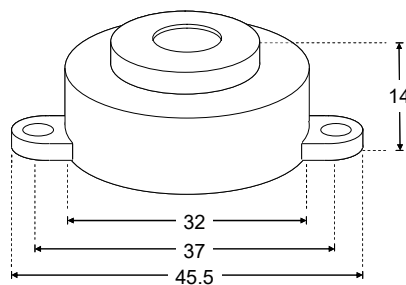
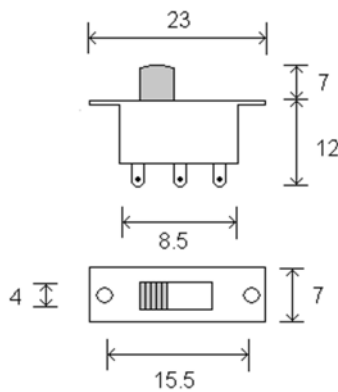
## Designing the Enclosure

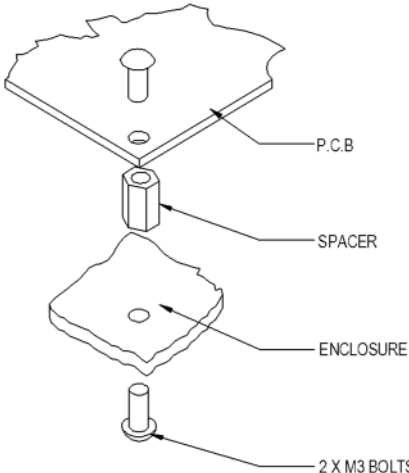
When you design the enclosure, you will need to consider:

- The size of the PCB (right).
- Where the detector switch will be (below right).
- Where the arming switch will be (below left).
- Where the buzzer will be mounted (below centre).
- Where the 5mm LED indicating the alarm needs disarming is to be mounted (shown on PCB dimensions image right).
- Access to the batteries to allow them to be changed (bottom right).



Technical drawings of all of these items are illustrated on this page, which should help you design your enclosure. All dimensions are in mm.





**Mounting the PCB to the enclosure**

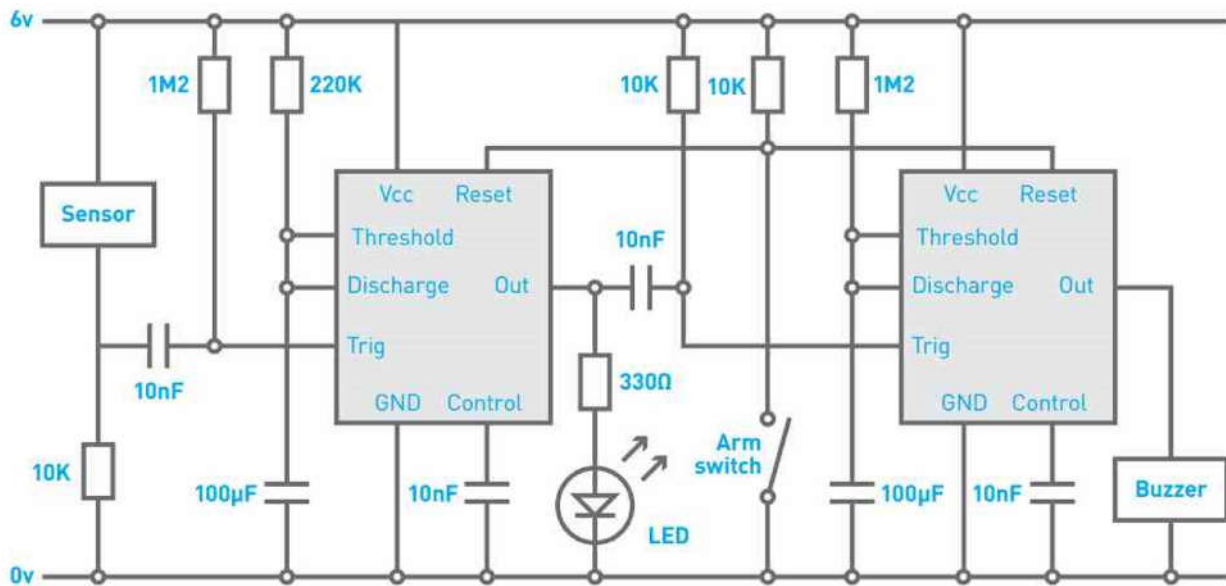
The drawing to the left shows how a hex spacer can be used with two bolts to fix the PCB to the enclosure.

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





## How the Alarm Works



555 Timers coloured in grey

The alarm is based around the 556 Timer. This is simply two 555 Timers in the same chip.

The 555 Timer is a versatile IC (Integrated Circuit) and can be used to form many circuits. One of these circuits is a monostable timer. This circuit produces a single pulse when triggered. This means that the Out pin is high and causes the LED to light.

To trigger the circuit the Trig input must go from a high to a low voltage. When the door switch is closed, the Trig input is high and the circuit is not triggered. When it opens, the Trig input is taken low and the output pulse starts.

The duration of the pulse generated is determined by the RC constant formed by the resistor and capacitor connected to the Threshold input. When the trigger line goes low, the Discharge pin is used to start the 100µF cap charging. When it is charged the Out pin changes from high to low. The first 555 Timer is used to provide the entry delay, which is the time you have to disarm the alarm before it triggers. When this times out (100µF x 220KΩ = 22 seconds) the output goes low and causes the second 555 Timer circuit to start and the LED to go out. The second timer turns the buzzer on for two minutes (100µF x 1.2MΩ = 120 seconds).

When the Arm switch is closed, the circuit is held in reset and the alarm is disarmed (off). When the switch is open, the 10KΩ resistor connected to both Reset inputs pulls them to 6V and the circuit is active.

Irrespective of the state of the alarm the 556 Timer IC uses around 10 mA current. This means that a typical battery life will be about one week.



## 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/2101](http://www.kitronik.co.uk/2101)



This kit is designed and manufactured in the UK by Kitronik

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