

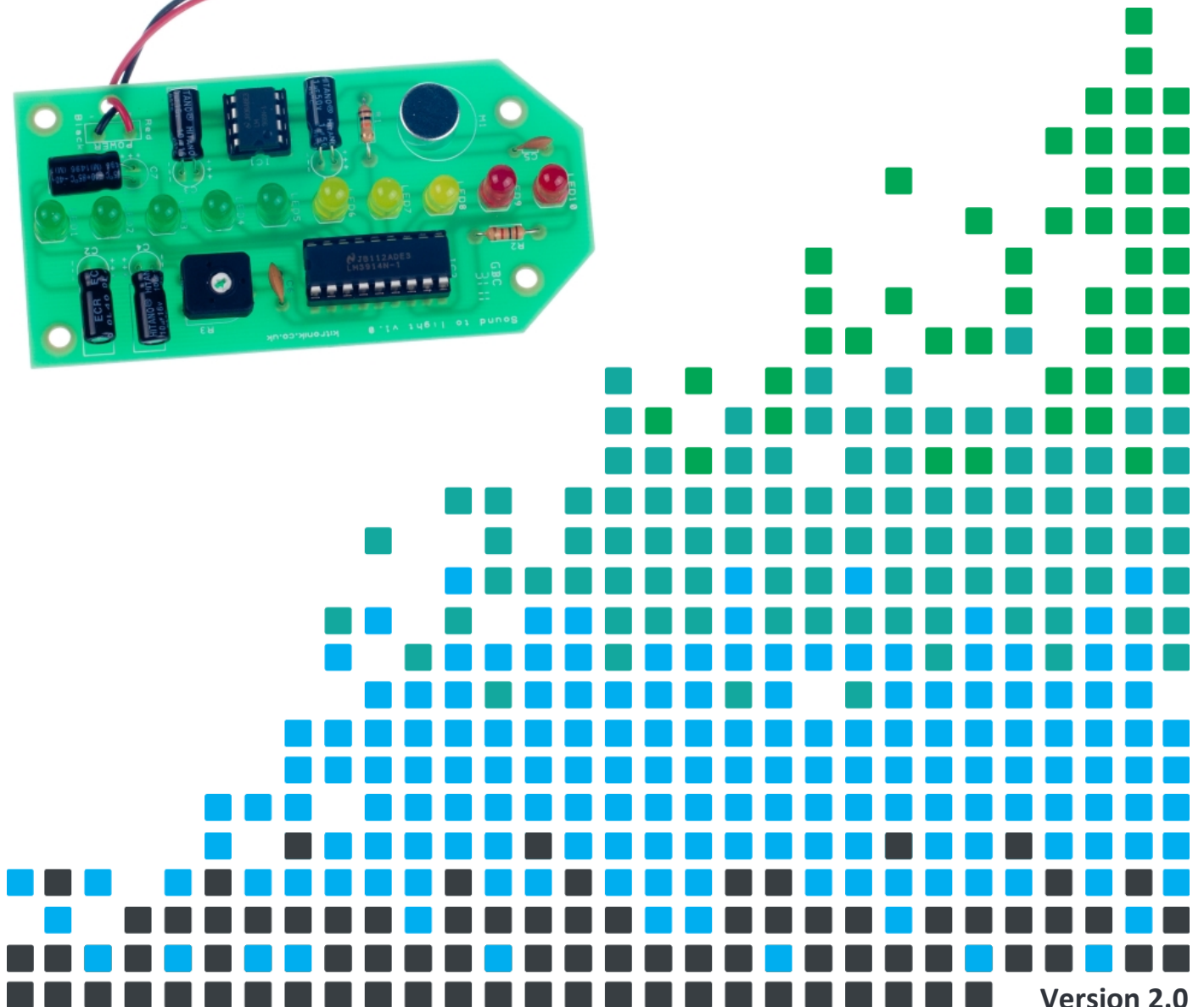
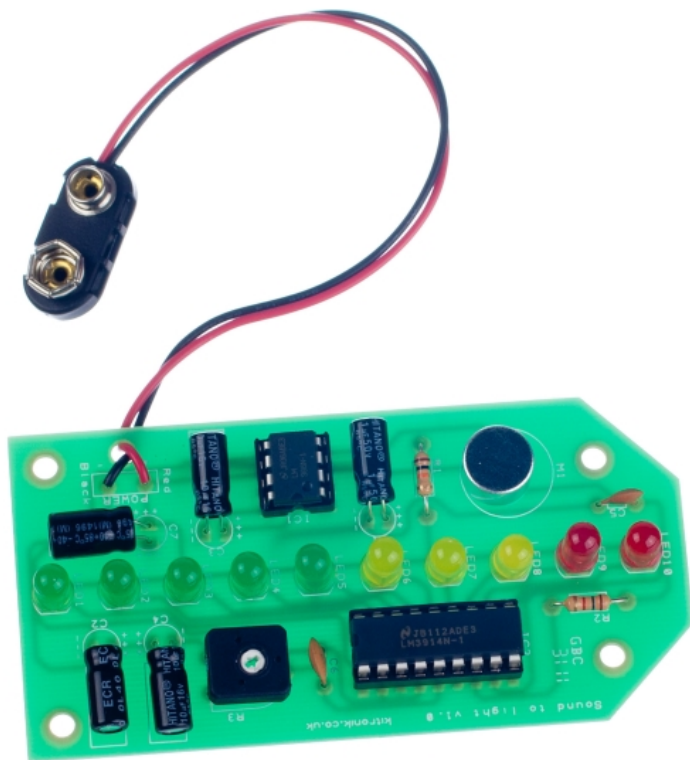


ESSENTIAL INFORMATION

BUILD INSTRUCTIONS
CHECKING YOUR PCB & FAULT-FINDING
MECHANICAL DETAILS
HOW THE KIT WORKS

HOW LOUD WAS THAT NOISE? FIND OUT WITH THIS

SOUND METER 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

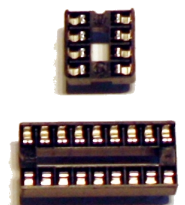
Start with the two resistors:
The text on the PCB shows where R1 and R2 go.
Ensure that you put the resistors in the right place.

PCB Ref	Value	Colour Bands
R1	10K	Brown, black, orange
R2	1.5K	Brown, green, red



2 SOLDER THE IC HOLDERS

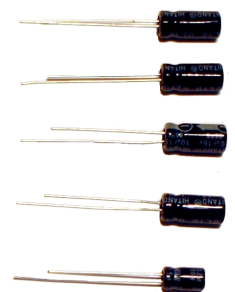
Solder the two Integrated Circuit (IC) holders into IC1 and IC2. When putting them into the board, be sure to get them the right way around. The notch on the IC holder should line up with the notch on the lines marked on the PCB.



3 SOLDER THE ELECTROLYTIC CAPACITORS

Now solder in the five electrolytic capacitors. Make sure that the capacitors are the correct way around. The capacitors have a '-' sign marked on them, which should match the same sign on the PCB. The leads should be bent so that the capacitors end up flat on the board. The capacitors have text printed on the side that indicates their value. The capacitors are placed as:

PCB Ref	Value
C1 & C2	1 μ F
C3 & C4	10 μ F
C7	220 μ F



4 SOLDER THE CERAMIC DISC CAPACITORS

The two ceramic disc capacitors should be soldered into the board as follows:

PCB Ref	Value	Text
C5	10nF	103
C6	100nF	104



5 SOLDER THE TRIMMER POTENTIOMETER

The trimmer potentiometer should be soldered into the board where it is marked R3.



6

SOLDER THE MICROPHONE

The microphone should be soldered into the board where it is marked M1.

The microphone is polarized (the two pins are off centre). For it to work the part must go inside the circle marked on the PCB.



7

SOLDER THE LEDs

The ten Light Emitting Diodes (LEDs) should be soldered into the board. The LEDs won't work if they don'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. You may want to solder them in at a specific height depending upon how you have designed your enclosure (if you are making one). LED1 to LED5 should be green, LED6 to LED8 yellow and LED9 and LED10 should be red.



8

ATTACH THE BATTERY CLIP

The PP3 battery clip should be attached to the terminals labelled 'POWER'. Connect the red wire to '+' and the black wire to '-' after feeding it through the strain relief hole.



9

INSERTING THE IC INTO THE HOLDER

The two ICs can now be placed into the IC holders, when doing this make sure that the notches on the ICs line up with the IC holder.



Checking Your Sound Meter PCB

Carefully 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 the leads are soldered.
- Pins next to each other are not soldered together.

Check the top of the board to ensure that:

- The '-' on the capacitors match the same marks on the PCB.
- The colour bands on R1 are brown, black, orange.
- C1 and C2 are a $1\mu\text{F}$ capacitor and C7 is a $220\mu\text{F}$ capacitor.
- C5 is marked 103.
- All of the LEDs match the outline on the PCB.
- The battery clip red and black wires match the red & black text on the PCB.
- The notch on the small IC is next to the LEDs and the notch on the large IC is next to C6.

Trimming the gain resistor (R3)

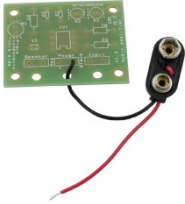
Turn the trimmer fully anti-clockwise. Then in a quiet room, slowly bring it back in a clockwise direction until just LED1 is left illuminated.



Adding an On / Off Switch

If you wish to add a power switch, don't solder both ends of the battery clip directly into the board, instead:


1

Solder one end of the battery clip to the PCB, either black to '-' or red to '+'.


2

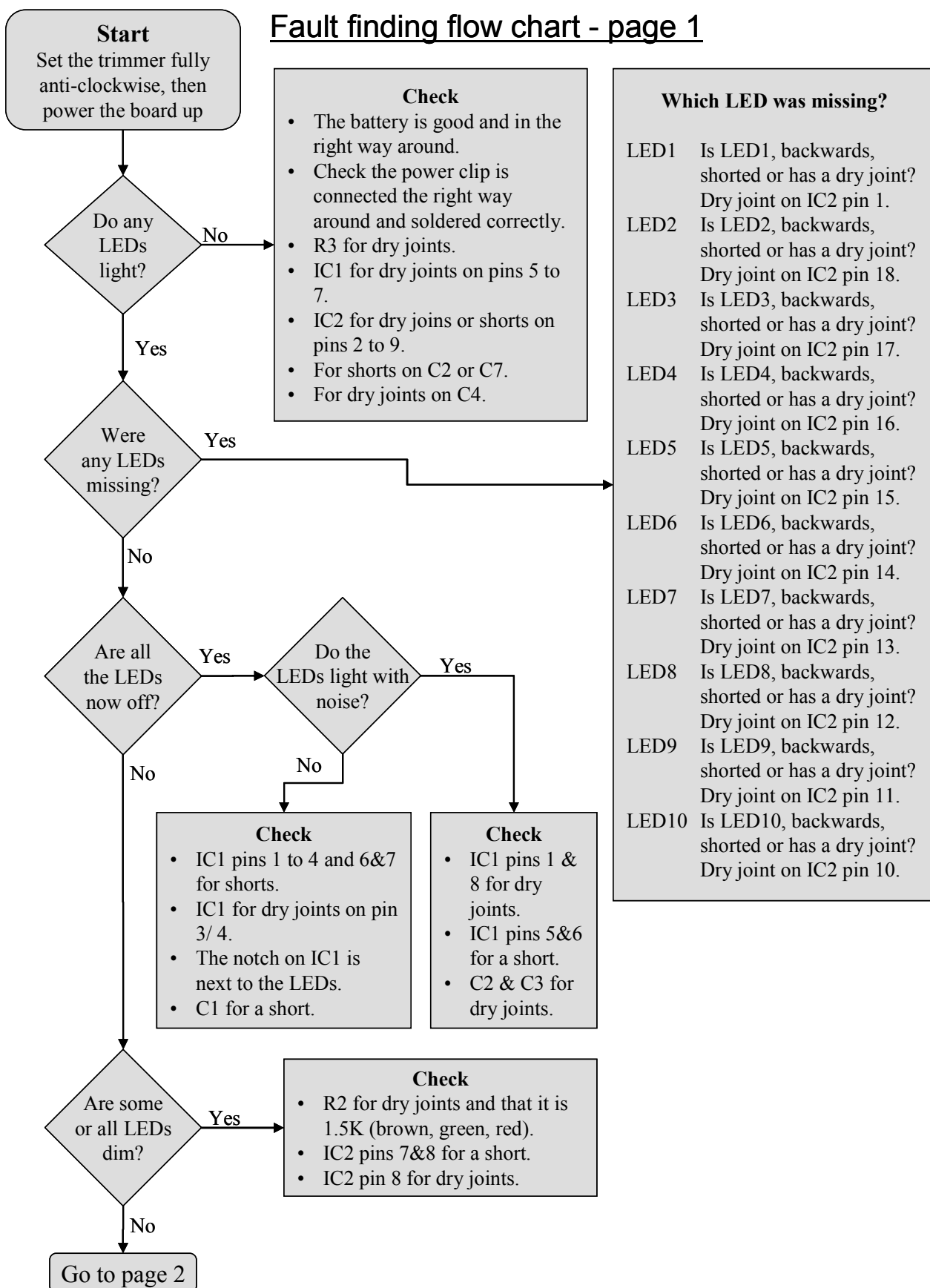
Solder the other end of the battery clip to the on / off switch.


3

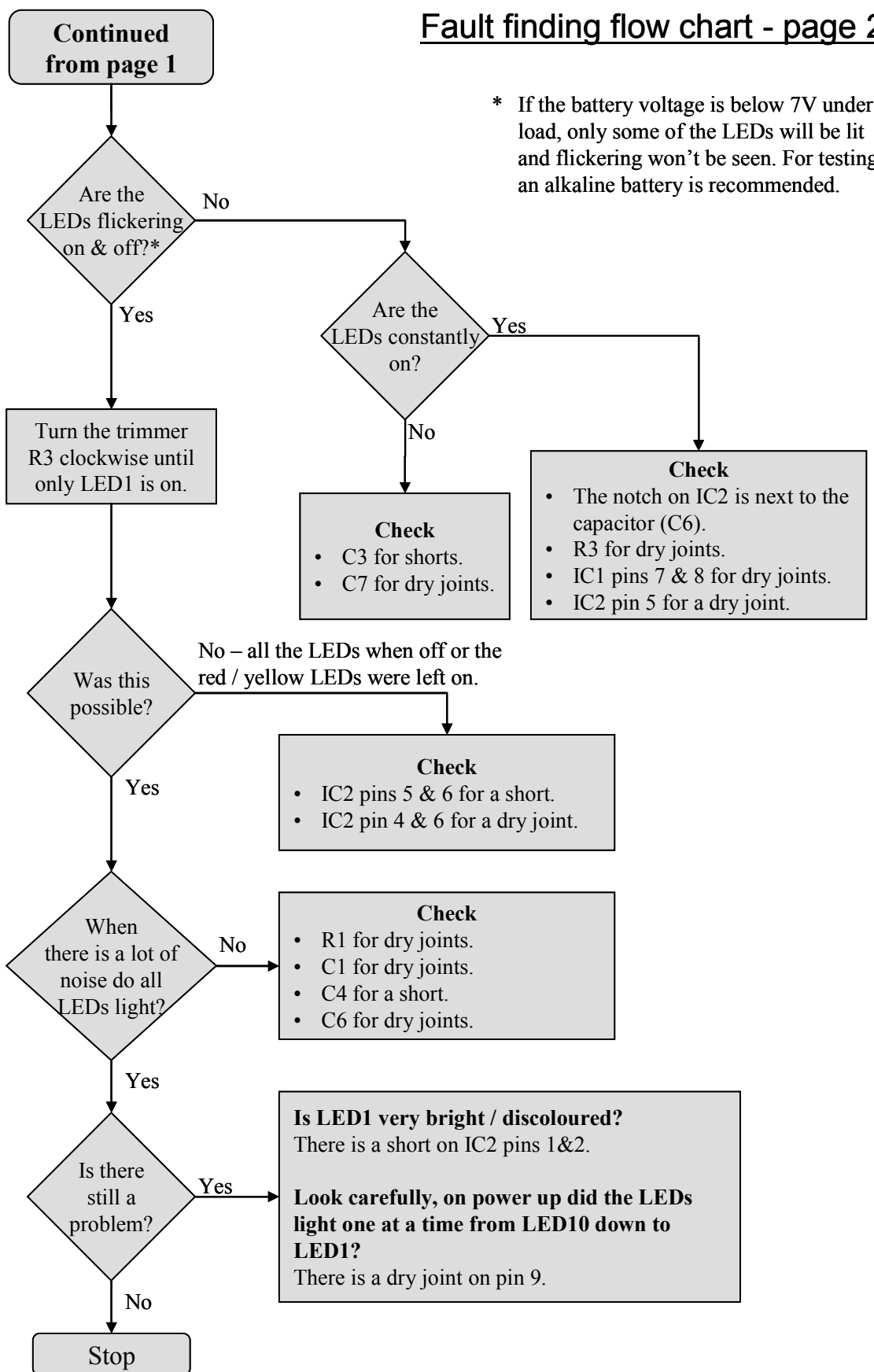
Using a piece of wire, solder the remaining terminal on the on / off switch to the remaining power connection on the PCB.




Fault finding flow chart - page 1



Fault finding flow chart - page 2

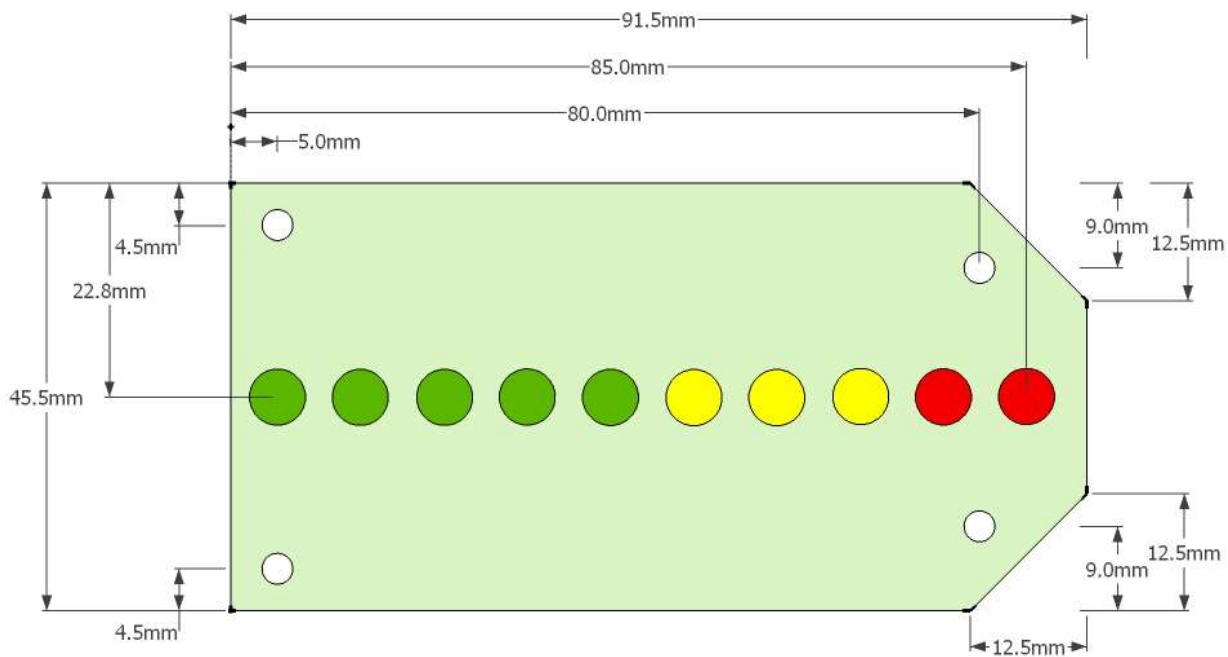


Designing the Enclosure

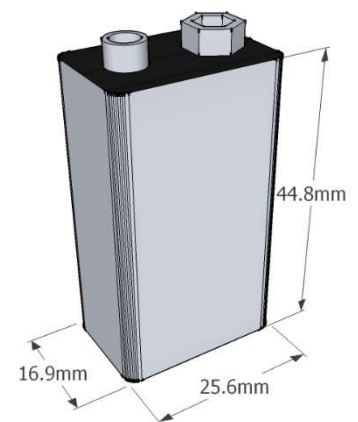
When you design the enclosure, you will need to consider:

- The size of the PCB (below, height including components = 9mm).
- How big the 9V PP3 battery is.

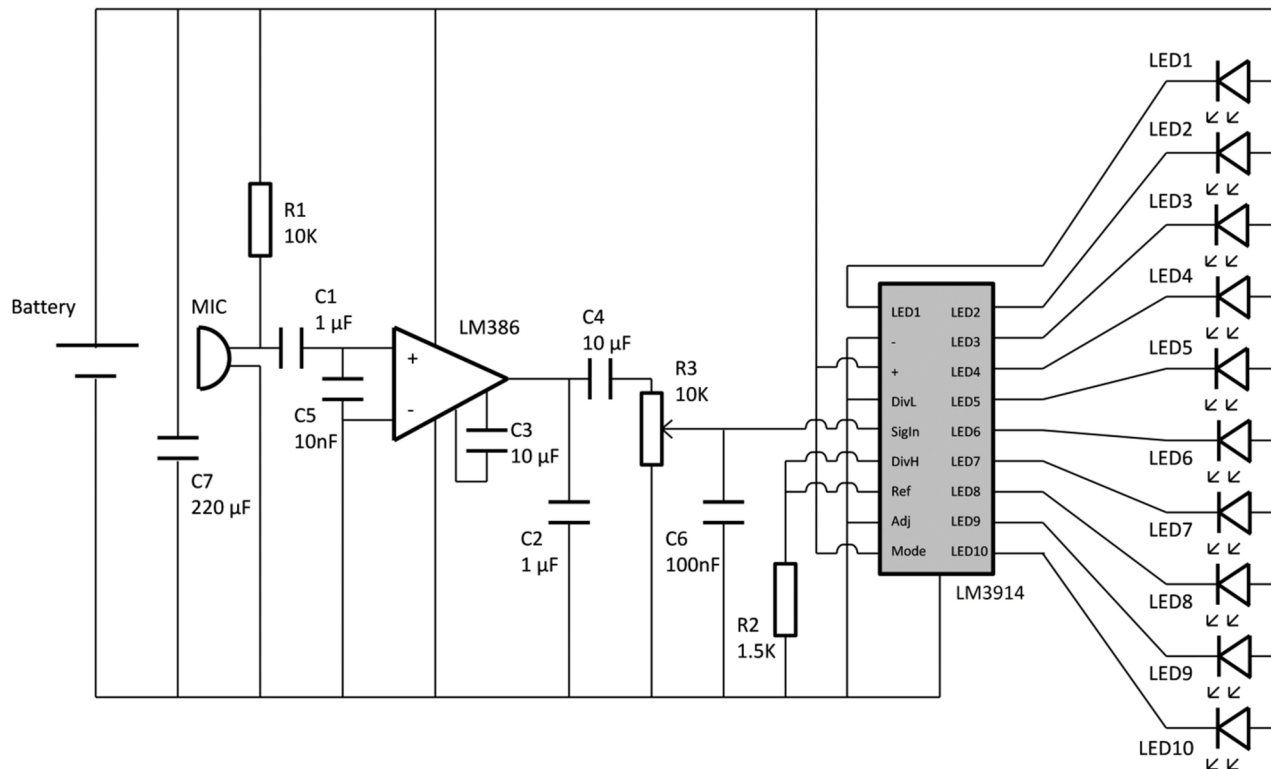
This technical drawing of the sound meter PCB should help you to plan this.



<p>P.C.B</p> <p>SPACER</p> <p>ENCLOSURE</p> <p>2 X M3 BOLTS</p>	<p>Mounting the PCB to the enclosure</p> <p>The drawing to the left shows how a hex spacer can be used with two bolts to fix the PCB to the enclosure.</p> <p><i>Your PCB has four mounting holes designed to take M3 bolts.</i></p>
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How the Sound Meter Works



The sound meter circuit uses a microphone to detect sound and then uses a number of LEDs to indicate the how loud the sound is.

First of all the sound is detected by the microphone. This is then fed into the LM386 op amp via capacitor C1. This capacitor removes any DC offset from the signal generated by the microphone. The op amp amplifies (increases) the signal to a level that can be used. This is because the signal from the microphone is very small. The gain of the LM386 in this circuit is 200 and is set by capacitor C3.

The amplified signal is then filtered again by capacitors C2 and C4, which remove any DC off set and high frequency noise.

The LM3914 chip then looks at the size of this signal and lights up the relevant number of LEDs. It does this by generating a 1.2V reference voltage. A proportion of this is then fed into 10 comparators (inside the LM3914). Each comparator, in turn, is fed with a slightly lower proportion of the 1.2V reference voltage. For example the first comparator will get the full 1.2V, the next 1.1V, the next 1.0V, etc. The comparators are also then fed the amplified signal from the microphone. If this signal is bigger than the comparators reference voltage, then the comparator turns on its LED. The louder the sound, the bigger the signal from the microphone and the more LEDs come on.

Resistor R3 is used to adjust the amount of signal fed to the LM3914 chip and can, therefore, be used to adjust the scale to the desired level.



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/2142



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