GENIE

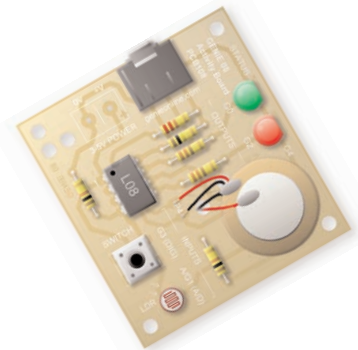## Welcome to the GENIE microcontroller system!

The activity kit is a great place to start. It provides you with a fun introduction to GENIE by allowing you to control outputs so that lights flash and sounds are made!

Battery connects here (red wire to '+V', black wire to '0V'). You can feed the wires through the two of the larger strain-relief holes to the left.

Download socket (the cable plugs in here so that the GENIE microcontroller can talk to the computer)

Battery power must be between 3 volts and 5 volts...

...that's 2 or 3 AA-sized batteries!
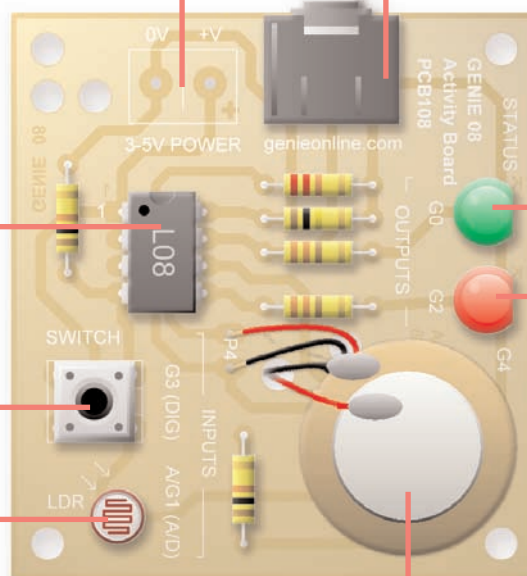
'LED' is short for 'Light Emitting Diode'

8-pin GENIE microcontroller (the magic bit!)

Green LED, controlled by output signal G0

Red LED, controlled by output signal G2

Push switch on input G3

Light sensor (LDR) on analogue input A1

'LDR' is short for 'Light Dependent Resistor'

Sounder, controlled by output signal G4

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Switch on the soldering iron. It will only take a few minutes for the iron to reach operating temperature. Once the soldering iron is hot, clean the soldering iron tip with a moist sponge.

Melt some solder at the chamfered end of the soldering iron tip. This is called 'tinning' and it will aid the flow of solder from the soldering iron to the copper track on the printed circuit board and component pins.

Take care when using a hot soldering iron!

Components List

This is what you will need:

Component	Quantity
8-pin GENIE microcontroller	1
GENIE 08 activity board (PCB108)	1
Download (3.5mm stereo) socket	1
8-pin DIL socket	1
Battery clip	1
3 x AA battery holder	1
6 x 6mm switch	1
Miniature light sensor (LDR)	1
Piezo sounder	1
Green LED	1
Red LED	1
330 ohm resistor *(orange, orange, brown, gold)*	2
10k ohm resistor *(brown, black, orange, gold)*	2
22k ohm resistor *(red, red, orange, gold)*	1
100k ohm resistor *(brown, black, yellow, gold)*	1

Fit each component onto the board. When fitting components such as resistors, you should use long-nosed pliers to bend the legs through 90 degrees. This will make them easier to fit.

Some of the components need to be fitted the correct way around:

- ◆ The 8-pin GENIE microcontroller should be positioned so that the notch points towards the download socket and the dot next to pin 1 is at the same corner as the '1' shown on the board.

- ◆ The green and red LEDs should be fitted so that the flat edges of the LEDs line up with the flat edges shown on the board.

To solder a pin, hold the soldering iron onto the board for a few seconds, then quickly touch the tip with a small amount of solder.

When using an uncased sounder, you should solder the sounder to the two points marked **P4**.

You should always remember to replace the soldering iron back into the stand after soldering and repeat cleaning the tip of the iron with the moist sponge before the start of each soldering operation.

Finally, cut off any excess wire or component legs for a tidy finish.
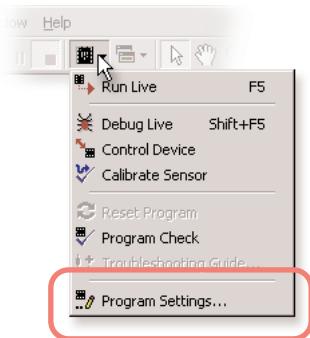
For your project to work, you need to tell the GENIE microcontroller what it should do.

This involves writing a sequence of commands in a **flowchart**. Your flowchart is then sent down the cable and stored on the GENIE chip. By changing the flowchart, you can vary how the GENIE behaves.

First, you need to tell the software which type of chip you are using. To do this, click on the **Microcontroller** button on the toolbar and choose **Program Settings**.
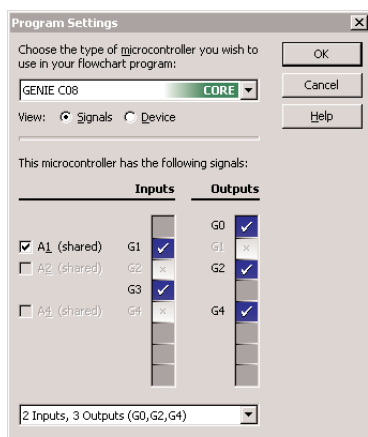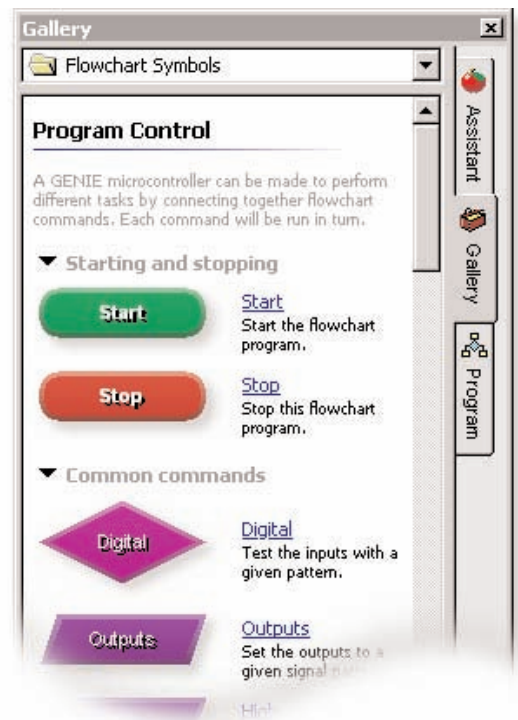
Select an 8-pin **GENIE** chip.

In the same window, choose the '**2 Inputs, 3 Outputs (G0, G2, G4)**' setting to tell GENIE which inputs and outputs you need. Click on **OK** when you are ready.

Available Signals

These are the **input and output signals** available in your flowchart:

Input	Description
A1	Light sensor (LDR)
G3	Push switch

Output	Description
G0	Green LED
G2	Red LED
G4	Sounder

You can now decide which commands you want your GENIE to perform. To do this, drag commands from the **Gallery**.

See the next worksheet for flowchart ideas.

Telling the GENIE your wishes 4

Turning lights on and off

You can use GENIE to turn lights on and off.

| High | Use the **HIGH** command to turn a single light on. |

Use the **HIGH** command to turn a single light on.

Use the **LOW** command to turn a single light off.

Use the **OUTPUTS** command to control more than one light.

There are two lights on the activity kit, a green LED on output **G0** and a red LED on output **G2**.

Double-clicking on an output command allows you to control a light (or several in the case of the OUTPUTS command), for example:
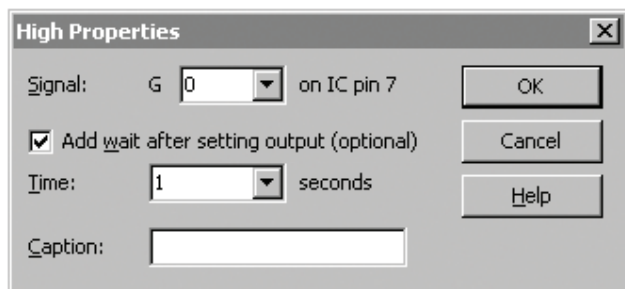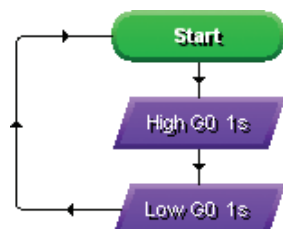
This will light the green LED that is connected to output G0.

In addition to changing the output, you can also add a delay (GENIE programs run very quickly and without a wait, sometimes the lights change too fast for you to see!).

The flowchart on the right uses the HIGH and LOW commands to turn the green LED on and off.

It loops back to make the flashing repeat.

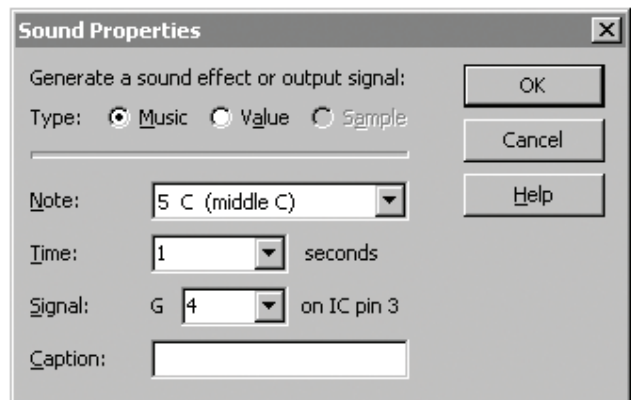## Making sounds or playing tunes

GENIE microcontrollers can make sounds and also play musical tunes.

Use the **SOUND** command to play a single note.

Use the **TUNE** command to play a whole musical tune.

The activity kit has a sounder connected to output **G4**. To make a sound, you could use the SOUND command as follows:

This would play the note middle C for one second.

By playing two different notes (one after the other, as shown on the right), you can create an alarm. In this flowchart, the green LED is also flashed to give a visible as well as audible alarm.
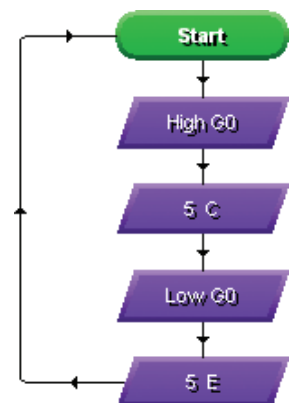
You can use the TUNE command to play a whole tune such as a mobile telephone ring tone. For better quality sound and music, you may wish to consider the GENIE 14 Audio Kit.

Responding to the push switch

Some types of input signal, such as push switches, can only be either on or off. These are known as **digital** signals.

 Use the **DIGITAL** command to respond to a digital signals.

The DIGITAL command allows you to make a decision based on whether a digital signal is either on (pressed) or off (not pressed).

When a digital signal is on, it has the value '**1**' whereas when it is off, it has the value '**0**'.

Double-click on the command to select which digital inputs you wish to check. GENIE will follow the '**Y**' (yes) path when the digital signal matches the chosen pattern, otherwise it will follow the '**N**' (no) path.
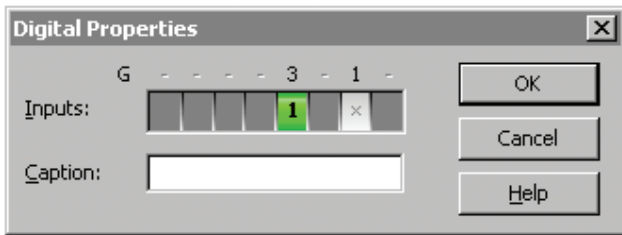
The above pattern will test if the push switch on is pressed. You can see below how to use this in a flowchart: the green LED on output G0 will light whenever the switch is pressed.
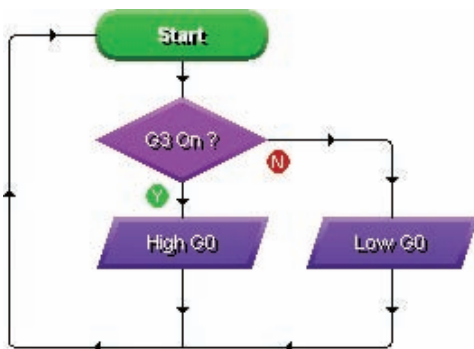
Responding to the light sensor

Other types of input signal, such as temperature or light, can be at a number of different levels. These are known as **analogue** signals.

 Use the **ANALOGUE** command to respond to analogue signals.

The ANALOGUE command allows you to check if a signal lies within a given range.

With GENIE, analogue levels can vary between **0** (the lowest level) and **255** (the highest).

Double-click on the command to select a sensor to check and a range. GENIE will follow the '**Y**' (yes) path when the signal is in range, otherwise it will follow the '**N**' (no) path.

For example, to test if the light sensor on analogue signal A1 is between 0 and 100, you should enter the following:
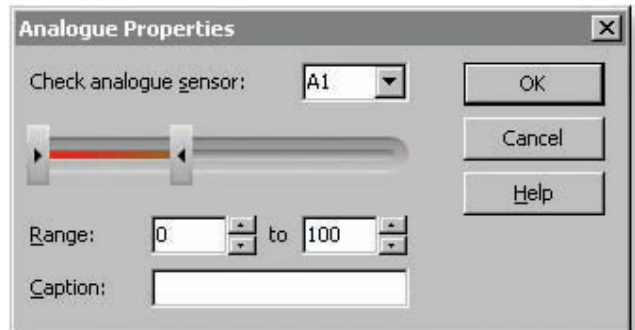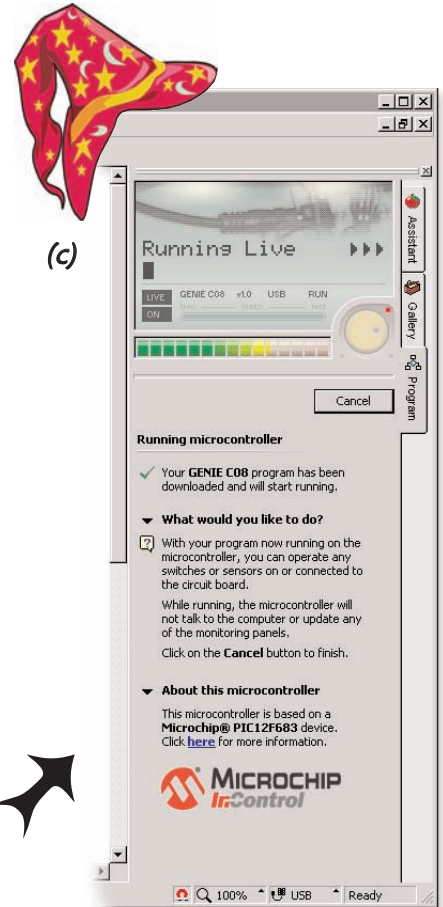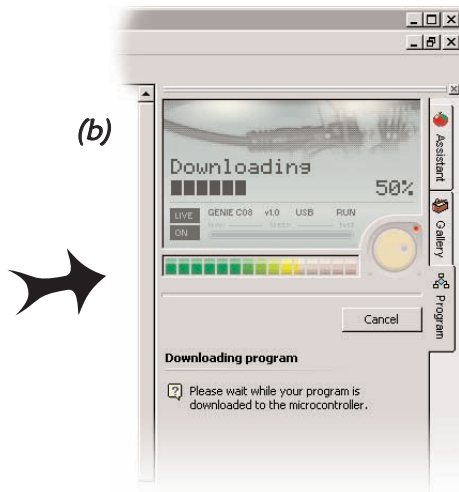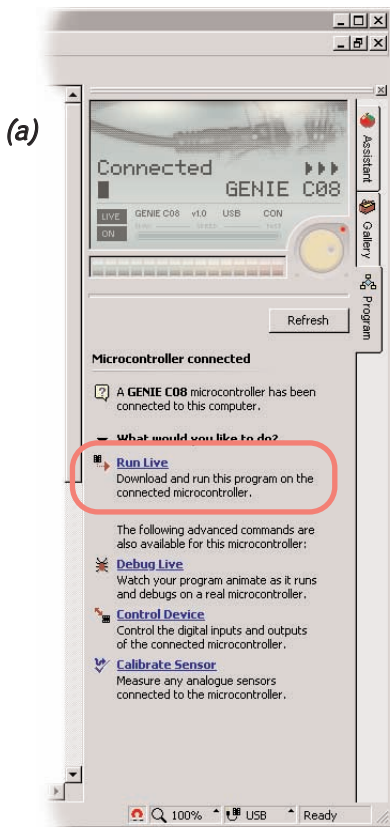

In a flowchart, this would look like:

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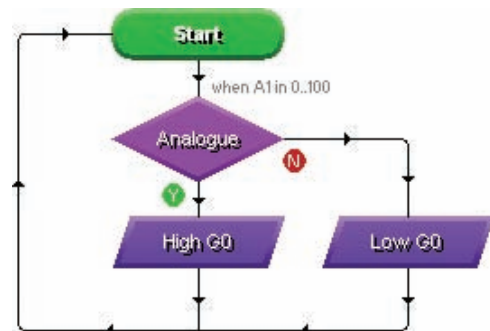
GENIE

Once you have written your flowchart program, you need to store it on the GENIE chip. Here's how you do it:

1 Wire-up the built GENIE circuit board and connect up a suitable battery power supply.

2 Plug the GENIE cable into the download socket on the GENIE circuit board.

3 Once done, the **Program** panel in the software will then show a 'Connected' message (see picture a).

4 Click on the **Run Live** option. Your flowchart will be transferred onto the GENIE chip—this is known as **downloading** (see picture b).

(c)

Running microcontroller

✓ Your **GENIE C08** program has been downloaded and will start running.

▾ **What would you like to do?**

With your program now running on the microcontroller, you can operate any switches or sensors on or connected to the circuit board.

While running, the microcontroller will not talk to the computer or update any of the monitoring panels.

Click on the **Cancel** button to finish.

▾ **About this microcontroller**

This microcontroller is based on a **Microchip® PIC12F683** device. Click **here** for more information.

(a)

Microcontroller connected

A **GENIE C08** microcontroller has been connected to this computer.

▾ **What would you like to do?**

Run Live
Download and run this program on the connected microcontroller.

The following advanced commands are also available for this microcontroller:

Debug Live
Watch your program animate as it runs and debugs on a real microcontroller.

Control Device
Control the digital inputs and outputs of the connected microcontroller.

Calibrate Sensor
Measure any analogue sensors connected to the microcontroller.

(b)

Downloading program

Please wait while your program is downloaded to the microcontroller.

The green status LED on the activity kit will flash as the download takes place.

It tells you everything is OK!

As soon as the program has been downloaded you will see the above screen (c) and GENIE will start running your flowchart.

Your GENIE project is now ready to go! You can disconnect the cable and use your GENIE board away from the computer.

✓ Finished!

NWC
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If you are unable to connect to a GENIE microcontroller or download a program, you should go through the following troubleshooting hints and tips.

A Run the GENIE troubleshooting tool

The GENIE troubleshooter will automatically check your cable and software to ensure that the computer can access the GENIE cable.

To run the GENIE troubleshooter, choose **Troubleshoot GENIE...** from the **Help** menu of the Circuit Wizard or GENIE software.

If that option is not shown in your version of the software, you can download it separately from **www.genieonline.com/cable**.

Step through the on-screen instructions.
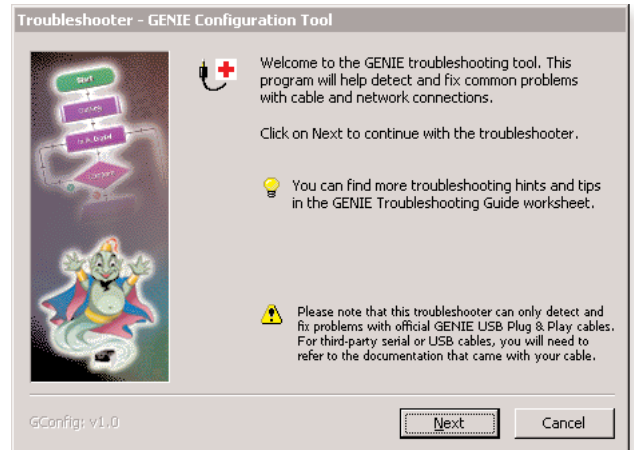
B Step through the following checklist of common problems

Cable

• Circuit Wizard, GENIE Design Studio and the GENIE Programming Editor software all check and report problems involving the cable. If given, follow through on the on-screen advice.

• Unplug the cable, wait a few seconds and then plug it back in. Windows can occasionally fail to detect that a cable has been inserted.

Power

• Check that the voltage of the battery is sufficient. For this board, the battery voltage should be in the range of 3 volts to 5 volts.

• Check the voltage level across the power connections (+V and 0V) on the board. This can identify if there is a problem with the battery clip or battery holder. Ensure that the wiring has not become loose and the batteries are properly seated in the holder.

Circuit

• Try plugging the cable into another GENIE board if you have one available. When powering up this circuit, the green STATUS LED should flash once (when properly connected it will flash repeatedly).

• Try with another GENIE microcontroller if possible.

• Visually inspect the board for bad solder joints or cases where soldering has incorrectly bridged pins together. Note that for the download socket, the two left-most pins should be connected together, as should the two right-most pins.

For more troubleshooting hints and tips, please read the separate **GENIE Troubleshooting Guide**.
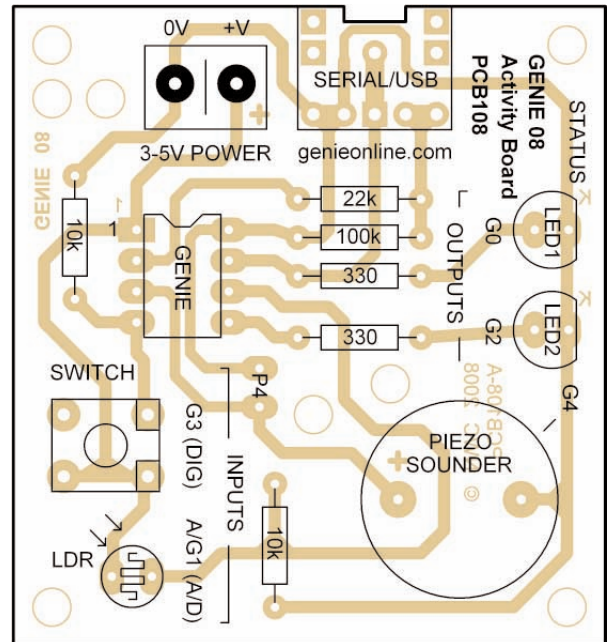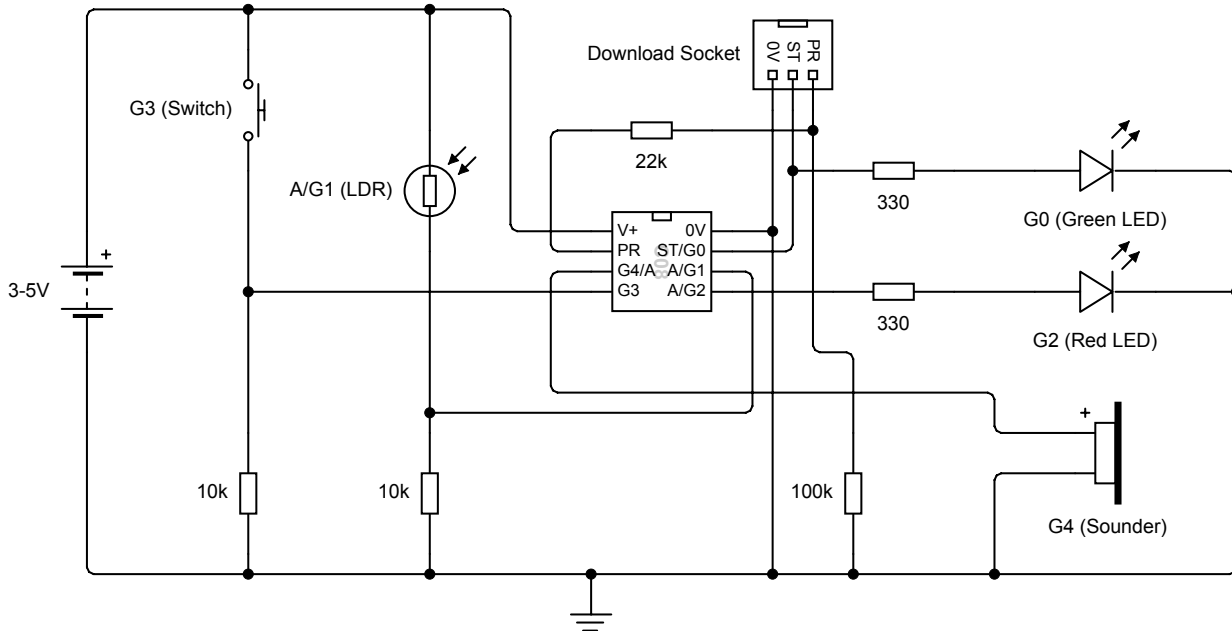
The technical bit... it's only needed if you want to learn more!

This is the **circuit diagram**. It shows how all of the components in the circuit are connected. You can compare it to the layout of the components on the actual circuit board (shown below it).
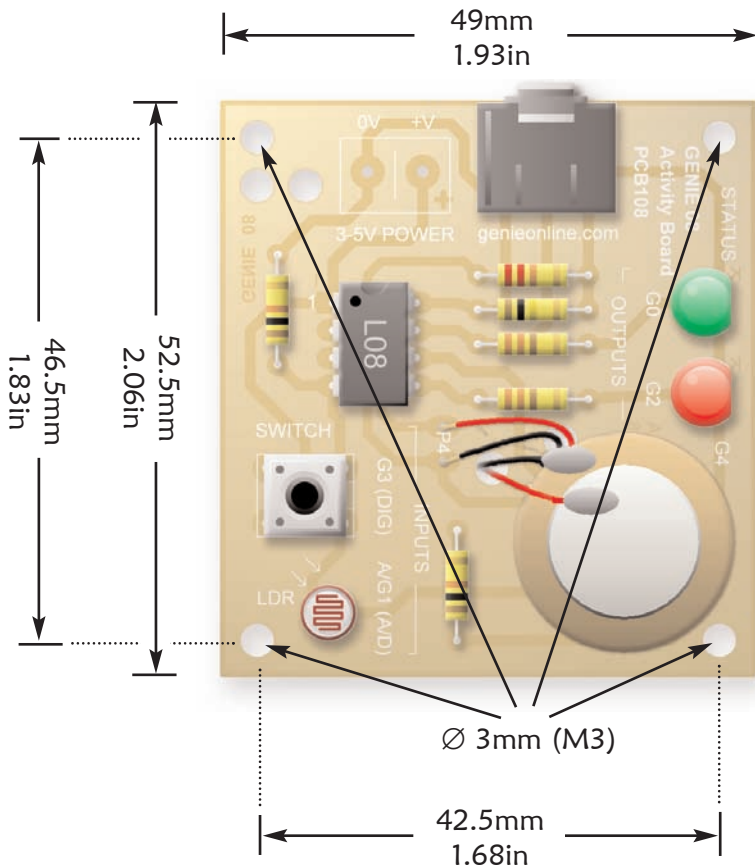
Physical dimensions and mounting

The diagram below shows the physical dimensions of the printed circuit board (PCB). This information is important to know when you are embedding the circuit into another project or container.

49mm
1.93in

52.5mm
2.06in

46.5mm
1.83in

∅ 3mm (M3)

42.5mm
1.68in

Height

The PCB's height including components, legs and soldering, is approximately 15mm (0.6in).

Mounting

The four large holes in the corners of the PCB (indicated by the arrows) are designed for mounting. They have a diameter of 3mm, suitable for use with M3-sized screws.

The other two large holes, located at the top-left of the PCB, are of the same size but are instead intended to act as strain-relief holes for an off-board battery clip.

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