

zbit:builder

for the BBC micro:bit



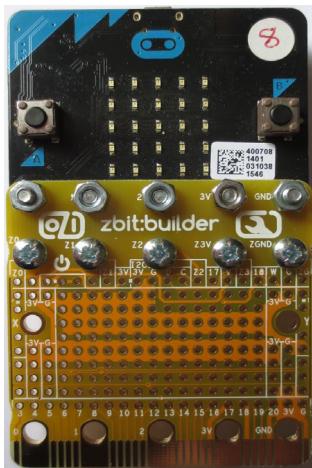
Have Fun while you Learn !



www.zbit-connect.co.uk

zbit:builder for the BBC micro:bit

The **zbit:builder** is a member of the **zbit:connect** family of add-on boards for the **BBC micro:bit** brought to you by *innovations in education.*



The **zbit:connect** family is designed to *unleash the potential of the BBC micro:bit* allowing your **micro:bit** to connect to **multiple** add-on boards attached in the 'X', 'Y' or 'Z' axis!

The **zbit:connect** family is designed to encourage an **understanding of software programming** by helping you learn how to **write code to control external electronics.**

The **zbit:connect** family is also designed to encourage an **understanding of electronics** by encouraging '**positive hacking**' such as modifying **zbit:connect** boards to change or enhance their capabilities and/or **attaching your own electronic designs** to the **micro:bit**.

And above all the **zbit:connect** family is designed for you to

'Have Fun while you Learn'

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zbit:builder Features

zbit:builder provides a compact way to add additional electronic components and modules to the **micro:bit** with access to **all GPIO**.

This is possible due to the **unique** way zbit:builder attaches to the **micro:bit**.

zbit:builder connects using the custom designed '**zbit:connector**' made from **advanced conductive elastomers**.

By using this small light weight connector, once attached,
zbit:builder feels like it is **part** of the **micro:bit**!

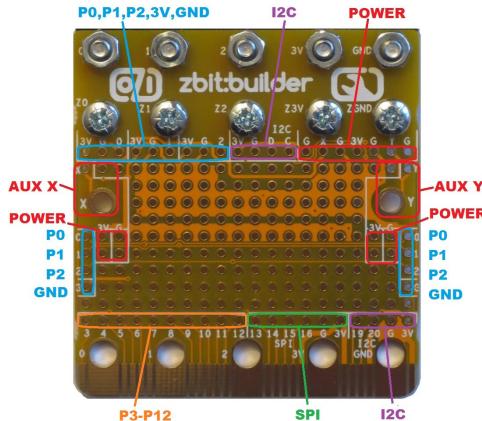
All micro:bit GPIO are made available on two **20 way connectors**.

The **Top Row Header Connector** gives access to GPIO **P0-2, I2C and Power**.

The **Bottom Row Header Connector** gives access to GPIO **P3-20 and Power**.

Pins up the sides give additional access to GPIO **P0-2, X, Y and Power**.

And the **micro:bit** compatible **Edge Connector** at the bottom allows you to add additional **zbit:connect** boards or other **micro:bit** compatible accessories



The main central area of **zbit:builder** is a 14 x 9 grid of solderable holes which have no internal connection. In this area you can solder...

- **Discreet Components**

- **Integrated Circuits (IC's)** in Dual-in-Line (DIL) packages

- 0.1" pitch **Connectors**

- **Electronic Modules**

...then connect to the **micro:bit's** **Power** and **GPIO** via the surrounding signal pins.

zbit:builder has space for:-

- up to **three 16 pin 0.3" DIL IC's** mounted vertically

- up to **two 28 pin 0.3" DIL IC's** mounted horizontally

- **one 36 pin 0.6" DIL IC** mounted horizontally

- **one 20+20 pin 0.1" pitch header** horizontally (with corner pins Gnd)

- **one Adafruit FeatherWing Module**

zbit:connect Family Features

zbit:builder shares many features with other board in the **zbit:connect** family.

Power pins 3V, G and Auxiliary Signals X & Y are available on the right of the **Top Row Header Connector** to give access to power. For instance this is where **zbit:powerUSB** module can be fitted to give increased **3V current** to power **Servos** and **Displays** and to supply **5V** on **Auxiliary Signals X & Y** to power some **Motors** and **Sensors**.

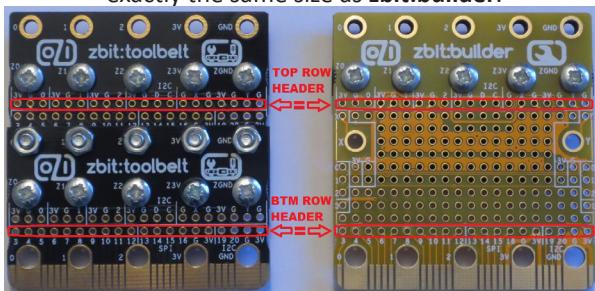
The 'Z' screws, whilst primarily used to secure the **zbit:connector** in place, can also be used add modules such as **NeoPixel Sticks** and **Rings** or to secure **zbit:toolkit** boards onto **zbit:builder**.

The '**xspacer board**' can be used to provide additional mechanical fixing points and/or attach to adjacent zbit:connect boards

The '**xy board**' can be used to provide additional mechanical fixing points and/or allow you to feed **external power rails** onto your **zbit:connect** board to power **motors** and **sensors** that require a higher voltage than the 3V supplied by the **micro:bit**.

zbit:builder is a '**full size**' **zbit:connect** board.

This means that **two** '**half size**' boards, such as **zbit:toolbelt**, bolted together are exactly the same size as **zbit:builder**.



Furthermore the **Top Row Header Connector** of **zbit:builder** is in the *same position* and has the *same pinout* as the **top row** of the **top zbit:toolbelt connector** and the **Bottom Row Header Connector** of **zbit:builder** is in the *same position* and has the *same pinout* as the **bottom row** of the **bottom zbit:toolbelt connector**, so they could be stacked or used to plug **zbit:toolkit** boards onto **zbit:builder**.

zbit:toolkit boards include:-

- zbit:thumb**
- zbit:trol**
- zbit:shaker**
- zbit:mic**
- zbit:jack**

Contents

1 x zbit:builder board

1 x spacer board

1 x clip board

1 x xspacer board

2 x xy board

5 x M3x8 Panel Head Screws

5 x M3x8 Countersunk Head Screws

10 x M3 Nuts

(zbit:connector* is an *optional* extra - sold separately)

***A zbit:connector is only required if the board needs to connect to the 'small pad' GPIO P3-20.**

For more information see the '**zbit:connect family guide**'

Tools Required

- Pozidrive Screwdriver
- Pliers
- Small File
- Wire Cutters
- Soldering Iron
- Solder

Assembly Instructions

The 5 individual PCB's are supplied as in single piece as shown. The PCB's are attached to each other by 'break-off' tabs.

1) Break off the smaller boards (**spacer board**, **clip board**, **xspacer board** and **xy board**) from the main **zbit:builder PCB**. Snap off both ends of the connecting 'break-off' tabs. This will require a pair of pliers.

(The **xspacer board** and **xy board** are for advanced applications - see '**zbit:builder Designer's Guide**' below)

2) File off any rough edges from where the break-off tabs were attached.

3) Solder electronic components or modules to the 14x9 grid of holes in the centre of **zbit:builder** and solder wires to the necessary GPIO and Power pins around the edges. **Before soldering ensure zbit:builder is the right way up! The front of the PCB has the logos and the 'zbit:builder' text.**

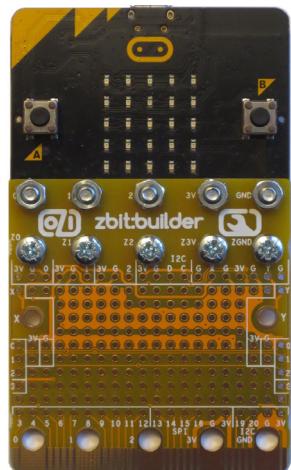
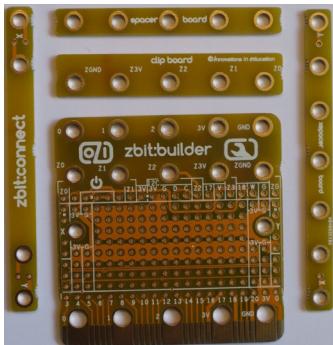
4) Attach the **zbit:connector**, **spacer board** and **clip board** with the **M3 pan head screws** as shown in the '**zbit:connector Assembly Diagram**' opposite. (If **zbit:builder** is being used *without* the **zbit:connector**, fitting the **spacer board** and **clip board** is *optional*).

5) Insert your **micro:bit** into the slot at the top of **zbit:builder** between the main **zbit:builder PCB** and the **clip board**. Use the **M3 countersunk head screws inserted from the back of the micro:bit** as shown in the '**zbit:connector Assembly Diagram**' to secure your **micro:bit** to **zbit:toolbelt**.

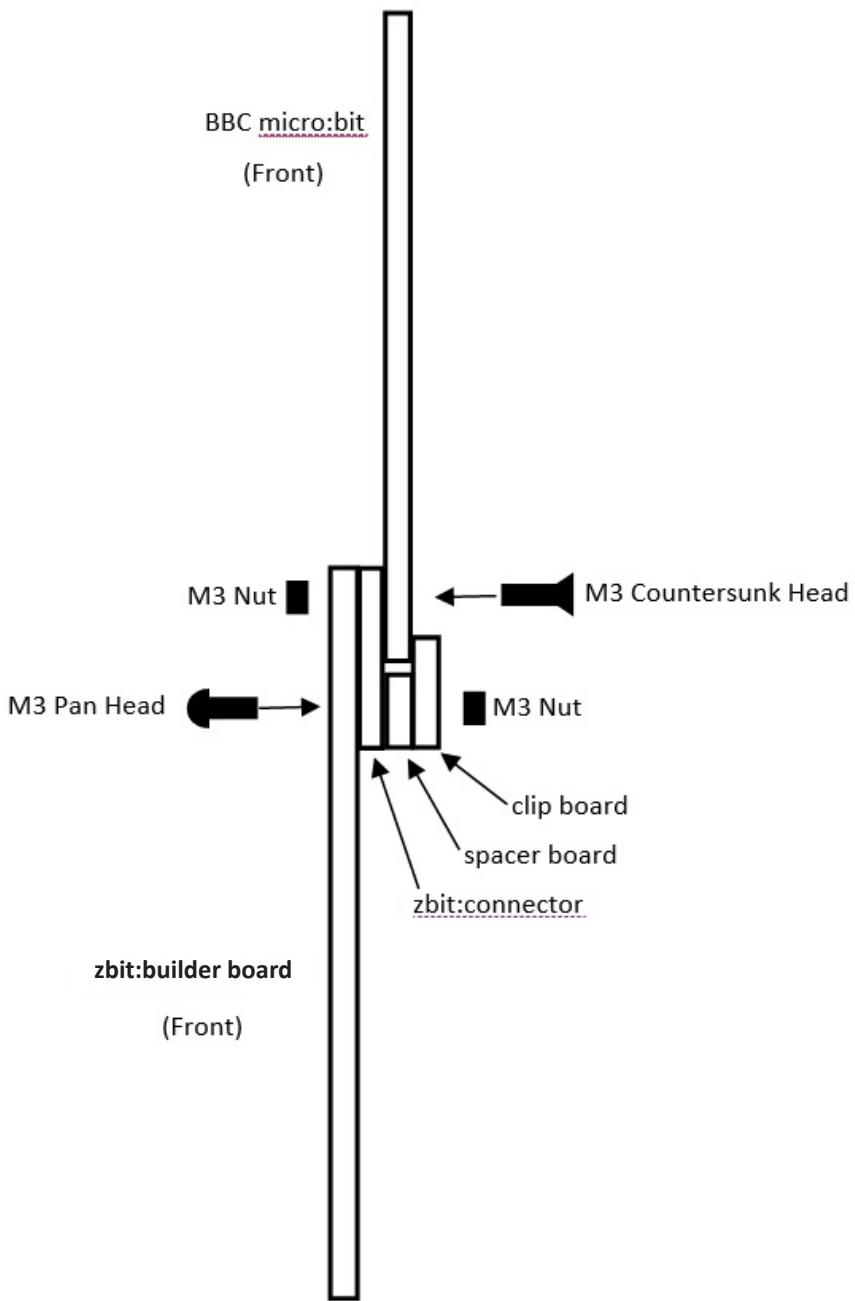
6) Tighten, but **don't over tighten** all screws.

zbit:builder is now ready to use !

Visit www.zbit-connect.co.uk for examples of what you can build with **zbit:builder** !

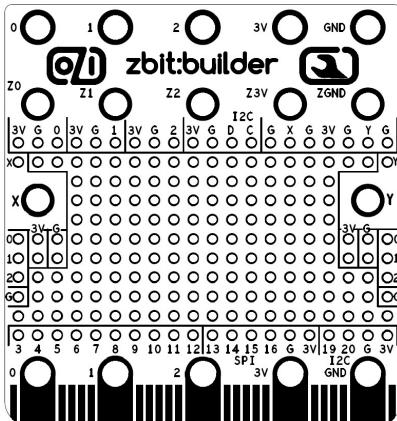


zbit:connector Assembly Diagram



zbit:builder Designers Guide

Designing Your Circuit. Print the zbit:builder PCB drawing below and use it to draw the positions of your components and the wires you need to solder to them. It is a good idea to complete your design in pencil before turning on your soldering iron!



Fitting IC's. The grid is designed to fit through hole components with a pin spacing of 0.1 inches (2.54mm). For IC's that come in surface mount packages it is recommended you buy small adapter PCB's with the surface mount pads for your device broken out to pins on a 0.1 inch pitch.

I2C bus. There are **two I2C Connectors**, one marked **3V G D C** along the **Top Row Header Connector** and one marked **3V G 20 19** along the **Bottom Row Header Connector**. They are connected to **3Volts, GND, SDA, SCL** respectively. These allows you to connect to various **I2C Displays and Sensors**, such as 7 segment displays, LCD displays, 8x8 Matrix Displays, Bargraph Displays, etc. If an I2C board has its pins in a different order, either solder it to the main grid and add link wires to the I2C pins or make an adapter as described in **zbit:toolbelt Example T3**.

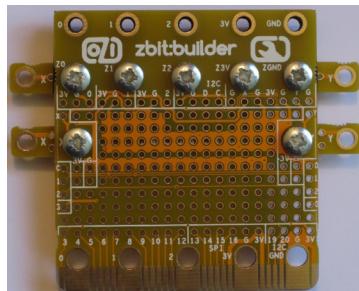
SPI bus. Pins marked **13 14 15 16 G 3V** along the **Bottom Row Header Connector** can be used to connect to **SPI bus** devices. P13-16 are normally programmed to carry SPI signals **SCK, MISO, MOSI** and **CS** respectively but **SPI bus** pin assignement on the micro:bit is software configurable so any set of 4 GPIO could be used.

3V Power and GND. Pins marked **3V** are connected to **3Volts**. Pins marked **G** are connected to **Ground**.

X & Y Auxiliary Signals/Power Rails. Pins marked **X & Y** are intended for Auxiliary Signals or Power Rails. Some Sensors or Robot Motors require a higher voltage than the **3Volts** provided by the BBC micro:bit. These **X & Y Auxiliary Signals** could be used to supply additional power rails. Power or signals supplied via the '**X**' fixing hole is available on the '**X**' pins and vice-versa. Power or signals supplied via the '**Y**' fixing hole is available on the '**Y**' pins and vice-versa. The **xy board** can be used to connect Auxiliary Signals or Power Rails between boards. See below

WARNING! The micro:bit is a 3.3V device. Connecting higher voltages to its GPIO could damage the micro:bit. If using higher voltages to power motors and sensors, ensure no signals greater than 3.3V are directly connected to the micro:bit.

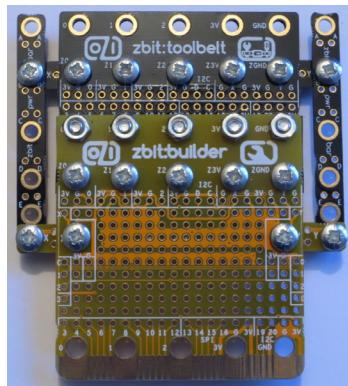
xspacer and **xy boards**. The **xspacer** board can be fitted in place of the **spacer** board and the **xy board** can be bolted to the 'X' & 'Y' holes as shown.



These can be used to:-

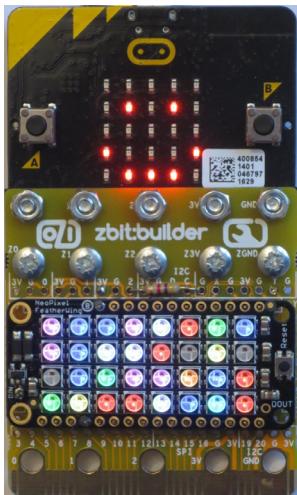
- provide additional mechanical fixing points
- bolt adjacent zbit:connect boards together
- connect **external power rails** and/or **auxiliary signals** to 'X' & 'Y' pins

For example, used in conjunction with **zbit:pwr:bars supplied with zbit:toolbelt** the **xy** board could be used to connect **external power rails** and/or **auxiliary signals** from one **zbit:connect** board to another.

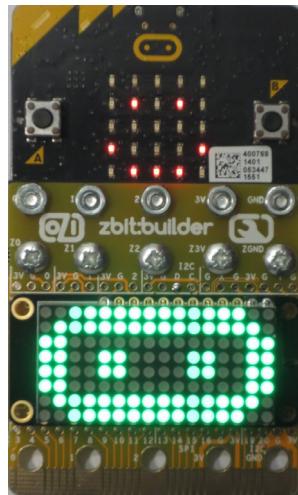


zbit:builder Examples

zbit:builder is very versatile. Below are some examples for how **zbit:builder** can be used.



Adafruit NeoPixel FeatherWing



Adafruit 8x16 DotMatrix FeatherWing

Full details of how to build these examples can be found on the web site.