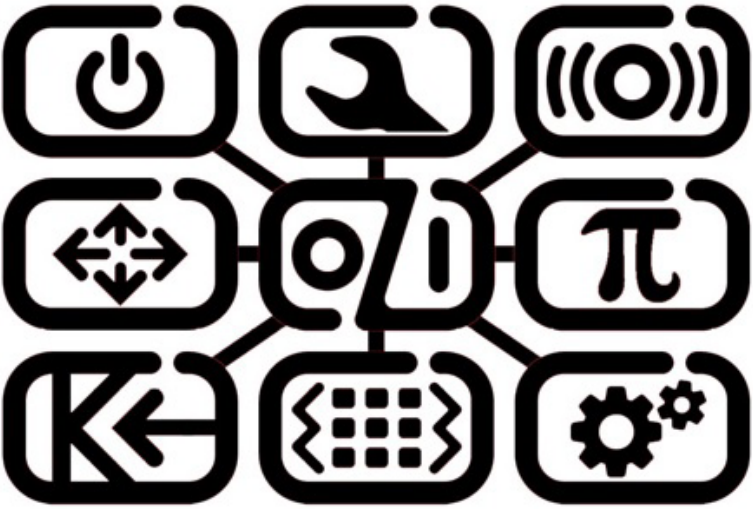
zbit:connect

Unleash the potential of the BBC micro:bit



Have Fun while you Learn !

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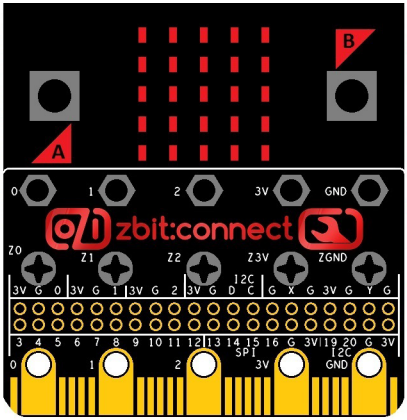
zbit:connect family guide

zbit:connect is a family of add-on boards for the
BBC micro:bit brought to you by
***i*nnovations in *e*ducation**.



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 to
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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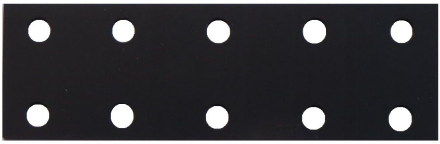
Introducing the zbit:connector

Central to the **zbit:connect** family is the ***zbit:connector***...



The **zbit:connector** is possibly ***unlike any connector you've ever seen!***

zbit:connector...
...has no plastic parts
...has no metal parts
...has no moving parts
...and requires no soldering!

It may have a modest appearance but it enables the design of **micro:bit** accessories not possible with 'regular' **micro:bit** connectors!

This ***unique custom connector***, designed by ***i*nnovations in *e*ducation,** is small and light weight allowing **zbit:connect** boards to be simply bolted to your **micro:bit** without the bulk and weight of a traditional edge connector.

The **zbit:connector** uses advanced elastomeric technology to electrically connect the ***small* edge connector** pads at the bottom of the **micro:bit** to pads at the top of the **zbit:connect** board.

The **zbit:connector** is *not* soldered.
Instead it is held in place by 5 x M3x8mm Panel Head Screws
with a further 5 x M3x8mm Countersunk Head Screws
to bolt the **micro:bit** to the **zbit:connect** board.

The screws provide mechanical fixing plus electrical connection
to the **micro:bit's *large pads*, P0, P1, P2, 3V** & **GND**.

The **zbit:connector** provides electrical connection
to the **micro:bit's *small pad* GPIO P3-to-P20**

With the electrical connections provided by the **zbit:connector** and the mechanical fixing provided by the screws the two boards are rigidly attached together so boards can be designed with a ***micro:bit compatible edge connector*** at the bottom allowing more **zbit:connect** boards to be bolted on, or allowing them to be plugged into **micro:bit accessories *from other manufacturers***.

zbit:connector technology

The **zbit:connector's *advanced elastomeric technology*** consists of fine layers of conductive carbon with adjacent insulating layers. The conductive layers electrically connect in the **Z-Axis,** so the small edge connector pads on the **micro:bit** are electrically connected to the small pads at the top the **zbit:connect** boards.

The conductive layers are made of carbon, so the connector introduces a small electrical resistance of about 50 ohms (typical).
In most applications this resistance is negligible compared to the input impedance of the **micro:bit's GPIO**.

The **zbit:connector** relies on the M3 screws to align it in place and to 'squash' the connector between the **micro:bit** and **zbit:connect** board thus ensuring the connection to the **micro:bit's *small pad* GPIO P3-to-P20**.

To ensure good electrical connection, the M3 screws should be screwed tight! – ***but not over tight!***

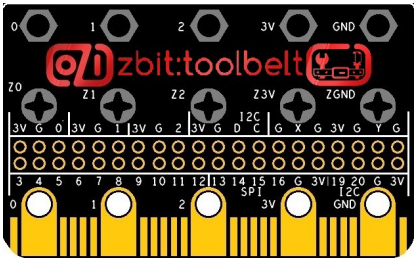
zbit:connectors are supplied separately!

Since not all applications ***require*** a **zbit:connector,**
they are supplied ***separately*** from the **zbit:connect *boards***.

See below for details of what applications ***require*** a **zbit:connector.**

Using zbit:connector with zbit:toolbelt

zbit:toolbelt is the smallest **zbit:connect** board compatible with the **zbit:connector.**



But whether a **zbit:connector** is ***required*** depends on your application!

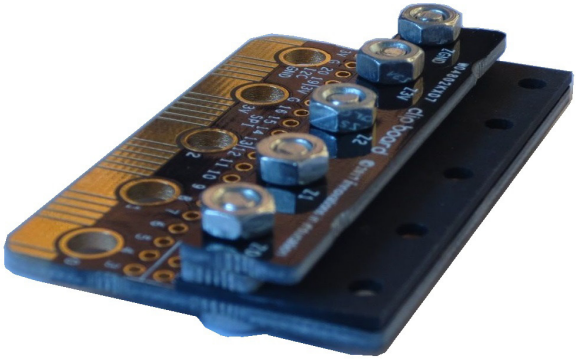
If your application only requires connection to the ***large pad*** **GPIO (P0, P1** and/or **P2)** the use of a **zbit:connector** is ***optional***!

But if your application ***requires*** connection to any ***small pad*** **GPIO (P3-P20)** the use of a **zbit:connector** with **zbit:toolbelt** is ***essential***!

And/or if your **zbit:toolbelt** is plugged into an accessory that ***requires*** connection to any ***small pad*** **GPIO (P3-P20)** the use of a **zbit:connector** is ***essential***!

Since the **zbit:connector** is supplied separately and requires no soldering, if your new project requires connection to **GPIO P3-P20**, a **zbit:connector** can easily be bolted on!

The picture below shows how **zbit:connector** is bolted to **zbit:toolbelt** before **zbit:toolbelt** is bolted to a **micro:bit. (**Full details are in the Instructions Manual for the individual boards)



The zbit:connect range

There are many boards in the **zbit:connect family** but they can be subdivided into the 4 categories below. ***(Note some are supplied fully soldered. Some may require some simple soldering)***

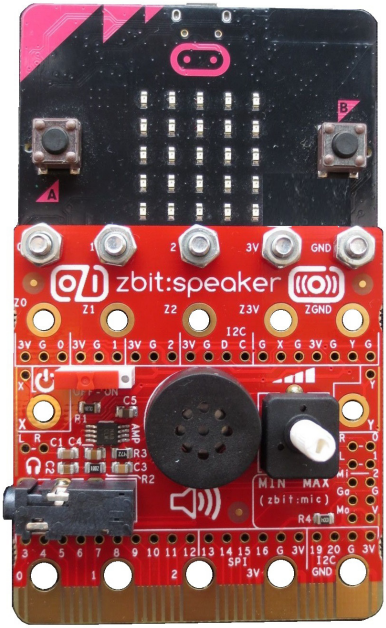
1) Full size zbit:connect boards

Features:-

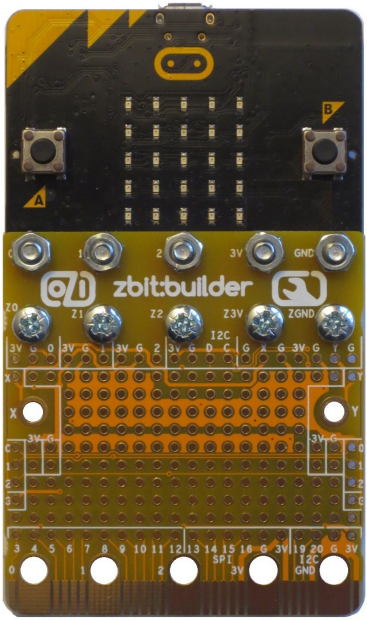
- **52x55mm** PCB's
- **zbit:connector compatible** edge connector at the top
- **micro:bit compatible** edge connector at the bottom
- **Top Row Header** for connection to P0, P1, P2, I2C, 3V, GND, X & Y
- **Bottom Row Header** for connection to P3-20, 3V & GND
- **Z0, Z1, Z2, Z3V & ZGND** fixing holes
- **X & Y** fixing holes
- Can connect to other **full size *or half size* zbit:connect boards** in **X, Y or Z Axis**
- Can be plugged into **micro:bit accessories from other manufacturers**

Full size zbit:connect boards include:-

zbit:speaker



zbit:builder



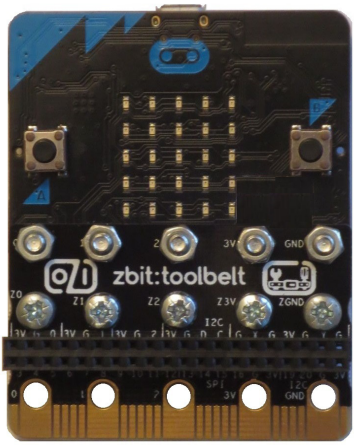
2) Half size zbit:connect boards

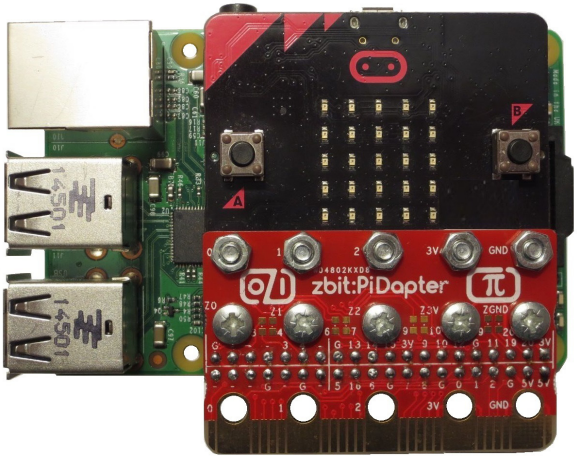
Features:-

- **52x33mm** PCB's
- **zbit:connector compatible** edge connector at the top
- **micro:bit compatible** edge connector at the bottom
- **Top Row Header** for connection to P0, P1, P2, I2C, 3V, GND, X & Y
- **Bottom Row Header** for connection to P3-20, 3V & GND**
- Top and Bottom Row Headers are adjacent hence a 2 row, **40 pin connector** can be fitted
- **Z0, Z1, Z2, Z3V & ZGND** fixing holes
- Can be connected to other **half size *or full size* zbit:connect boards** in **X, Y or Z Axis**
- ***Two* half size zbit:connect boards** bolted together are exactly the **same size as a full size board** (See picture on Page 9)
- Can be plugged into **micro:bit accessories from other manufacturers**

Half size zbit:connect boards include:-

zbit:toolbelt zbit:PiDapter





Note - **zbit:PiDapter's 40 pin connector** pinout is **compatible with the *Raspberry Pi***. It is ***not*** compatible with the **Top** and **Bottom Row Header** pinout other **zbit:connect** boards.

3) zbit:tool*kit* boards

These are small boards which plug into the **Top** and/or **Bottom Row Headers Sockets** of the main **zbit:connect** boards. They are primarily expected to be plugged into **zbit:toolbelt** or **zbit:kwikconnect:0:180** but if 20 way SIL Sockets are added to any '**Full Size**' **zbit:connect** board such as **zbit:speaker** or **zbit:builder**, they can be plugged into these boards too!

zbit:tool*kit* boards include:-

zbit:thumb

zbit:shaker

zbit:mic

zbit:power

4) Auxiliary boards

These are small boards to help mechanically and electrically interconnect the main **zbit:connect** boards. These are normally supplied with the **zbit:connect** board as **'snap-off' boards** but may also be available as optional extras.

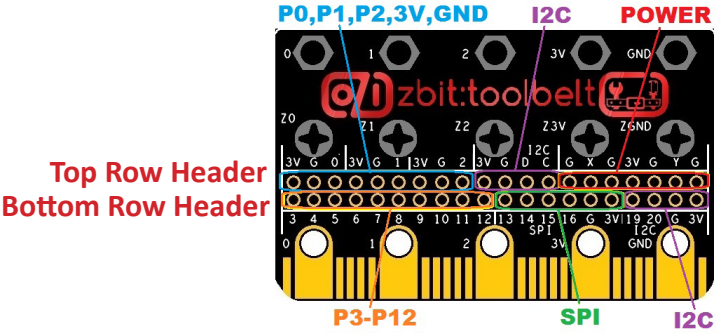
Auxiliary boards include:-

- spacer board
- clip board
- xspacer board
- xy board
- zbit:pwr:bar
- zbit:pi:fix

zbit:connect board features

Top and Bottom Row Headers

Full Size and **Half Size zbit:connect** boards (*except* **zbit:PiDapter**) have **Top and Bottom Row Headers *with the same pinout*** giving access to all of the **micro:bit's GPIO**

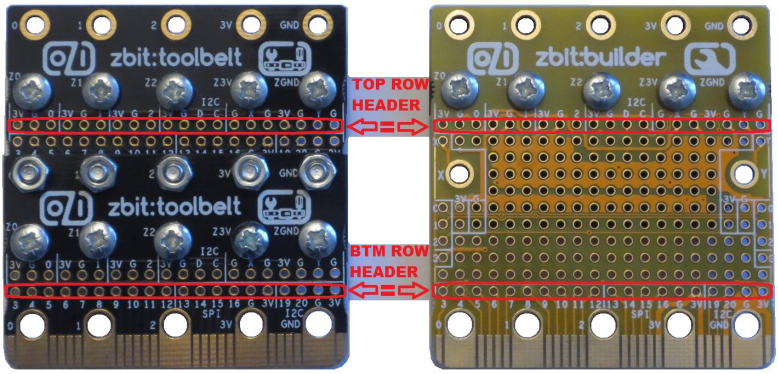


The 20 way '**Top Row Header'** provides access to **GPIO P0, P1 & P2, I2C, 3V** and **GND** plus **X & Y** Auxiliary Signals/Power Rails. It can be used to give local access to these **GPIO**, to allow **zbit:connect** boards to be stacked in the **X** or **Z-Axis** or to attach **zbit:tool*kit*** boards.

P0, P1 & P2 have adjacent **GND & 3V** pins allowing many 3 pin sensors, servos, etc to plug in.

I2C signals **'C' (SCL GPIO P19)** and **'D' (SDA GPIO P20)** have adjacent **GND & 3V** pins which can be used as a **4 pin I2C connector**.

The 20 way '**Bottom Row Header'** provides access to **GPIO P3-P20, 3V & GND.** Adjacent pins **P19, P20, GND and 3V** can be used as an second **4 pin I2C connector** and adjacent pins **P13-P16, GND & 3V** can be used as a **6 pin SPI connector**.



zbit:connect board features

I2C Connectors

The **Top Row Header** pins labelled **'C' (SCL GPIO P19), 'D' (SDA GPIO P20), GND & 3V** which can be used as an **I2C Connector** allow you to plug in a vast range of **I2C Boards.**

You could also **design your *own* I2C Board!**

And the **Bottom Row Header** pins labelled **P19, P20, GND & 3V** allow you to plug in a second **I2C Board.**

I2C boards are available from manufacturers such as **Adafruit** and **SparkFun** and include:-

Seven Segment Displays
Dot Matrix Displays
Bargraph Displays
Digital-to-Analog Converters
Analog-to-Digital Converters
Real Time Clock Modules
Light Sensors
Proximity Sensors
Gyro Sensors
etc

(***Note – These I2C boards don't always have the I2C signal and power pins in the same order as the zbit:connect board's I2C Connectors hence some rewiring may be required*** **- See zbit:toolbelt Example T3**)

3mm 'X' and 'Y' Holes

The 3mm **'X' and 'Y' holes** have three possible uses. They can be used as mechanical fixing points, for **auxiliary GPIO signals** or to feed **Auxiliary Power Rails** onto your **zbit:connect** board.

Used as **Auxiliary Power Rails** they could supply power to motors or sensors that require a higher voltage than the 3.3V supplied by the **micro:bit (**See **zbit:power)**

Used for **Auxiliary GPIO Signals**
they could connect **additional GPIO** between boards.

3mm 'Z0', 'Z1', 'Z2', 'Z3V' & 'ZG' Holes

The 3mm **Z0, Z1, Z2, Z3V & ZG holes** are primarily used to hold the **zbit:connector** in place. They are also used to hold some **zbit:tool*kit*** boards in place and/or to stack **zbit:connect** boards in the **Z-Axis**.

They can also be used for auxiliary connection to **P0, P1, P2, 3V & GND.**

zbit:connect board features

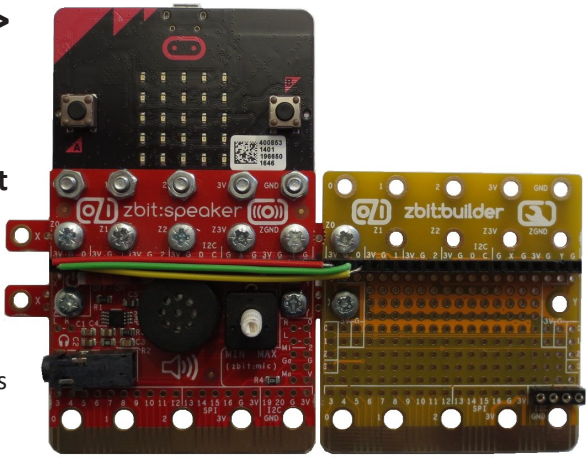
Boards can be attached in the X, Y or Z-Axis!

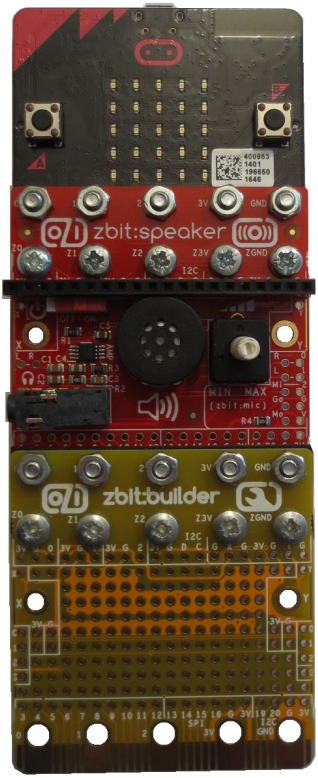
X-Axis ----->

The **Xspacer** and /or **XY Board,** together with the **Top** and/or **Bottom Row Headers** allows you to add other **zbit:connect** boards in the **X-Axis**.

Extra Parts shown

1 x Xspacer Board
1 x XY Board
2 x 20 way SIL Sockets
4 x M3x6mm Pan Head Screws
4 x M3 Nuts
3 x Link Wires



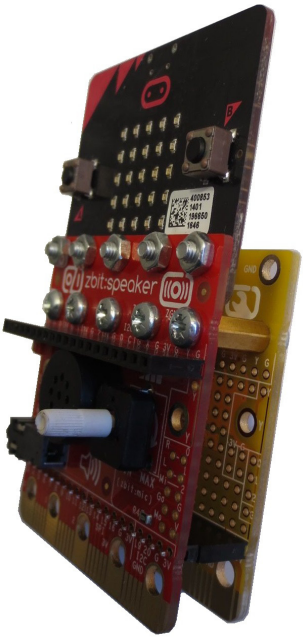


<----Y-Axis

The **micro:bit** compatible **Edge Connector** at the bottom of the **zbit:connect** boards allows you to add additional **zbit:connect** boards (or other **micro:bit** compatible boards) in the **Y-Axis**.

Z-Axis --->

The **'Z' screws** together with the **Top** and/or **Bottom Row Headers** allows you to add other **zbit:connect** boards in the **Z-Axis**.



Extra Parts shown

1 x 20 way SIL Sockets
1 x 20 way SIL Header
5 x M3x6mm Pan Head Screws
4 x M3x11mm Threaded Spacers

Why are the boards called ‘z’ bit?

There are 3 reasons why the boards are called **‘z’ bit**.

Firstly, the elastomeric **zbit:connector** is known as a ***‘Z-Axis’* connector** as it **conducts electricity** in the **Z-Axis**.

Secondly, whilst in Binary a ‘**Bit**’ can be a ‘**0**’ or a ‘**1**’, in electronics a **GPIO** can have ***3 different states***!
When configured as an ***output*** it can be set to drive ‘**Low**’ indicating a **Binary ‘0’**, or drive **‘High’** indicating a **Binary ‘1’**. However, when configured as an ***input*** it is set to **‘High Impedance’**. This is often represented by the letter **‘Z’**.

So **in *electronics* a ‘Bit’ can be a ‘0’, ‘1’ *or* ‘Z’**.

And **thirdly**, just as...
‘k’ stands for **‘kilo’** (10^3) So a **kilobit** or **kbit** means **1,000 bits**
and...
‘M’ stands for **‘Mega’** (10^6) So a **Megabit** or **Mbit** means **1,000,000 bits**
and...
‘G’ stands for **‘Giga’** (10^9) So a **Gigabit** or **Gbit** means **1,000,000,000 bits**

‘Z’ stands for **‘Zetta’** (10^{21}) - so a **Zettabit** or **Zbit** is **1,000,000,000,000,000,000,000 bits**!

...which is hopefully the number of* micro:bits *that are produced to get the whole world coding!!!

‘Have Fun while you Learn’

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