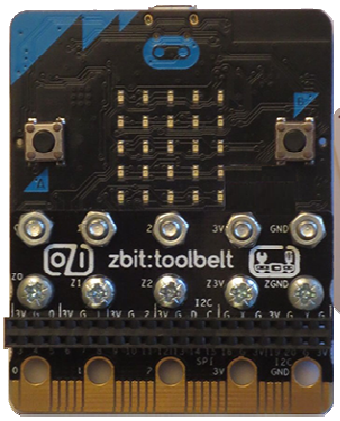
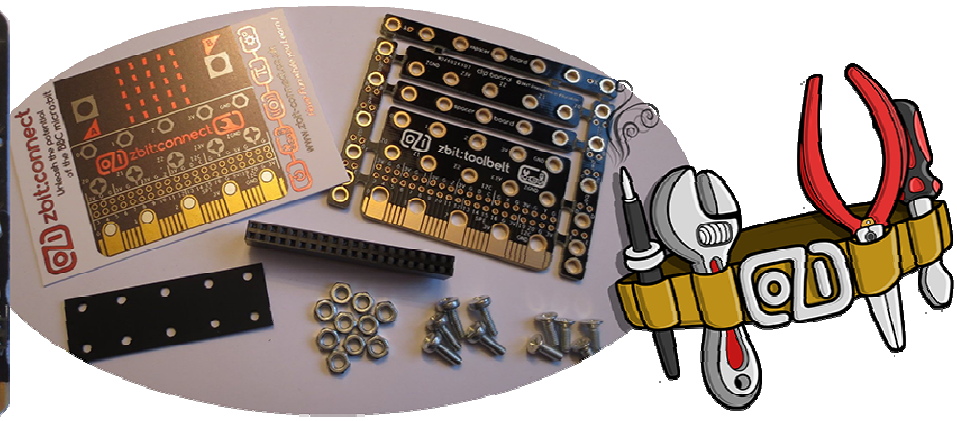
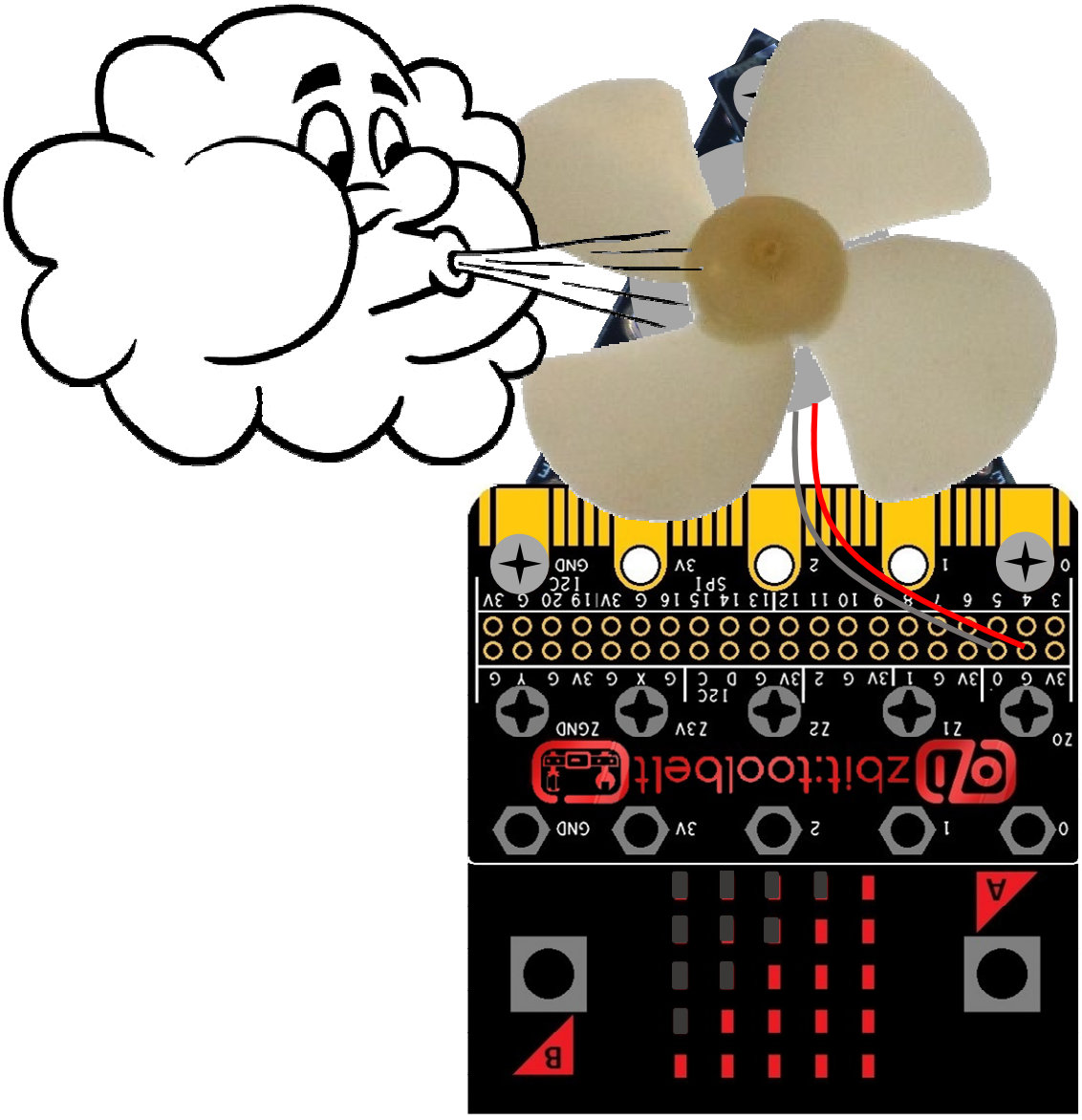
zbit:toolbelt

for the BBC micro:bit





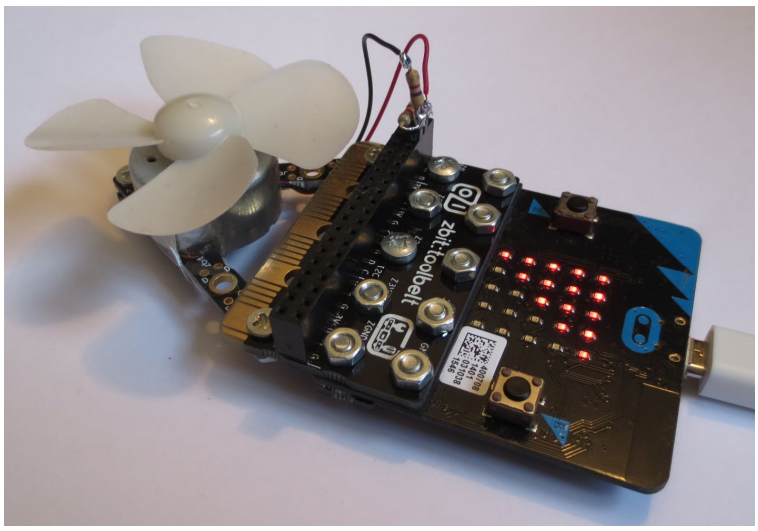
Example T4 – Wind Speed Meter on zbit:toolbelt



This zbit:toolbelt example shows you how to make a Wind Speed Meter using Kitronik Low Inertia Solar Motor, zbit:toolbelt and zbit:pwr:bars with the wind speed displayed on your micro:bit!

Parts required

1 x zbit:toolbelt
2 x zbit:pwr:bars
(included with zbit:toolbelt)
1 x Kitronik Low Inertia Solar Motor
(As included in Inventors Kit) or similar
1 x Kitronik Impeller Blades
(As included in Inventors Kit) or similar
1 x 2 pin 0.1" Header
1 x 4k7 Resistor
1 x 6k8 Resistor
3 x M3x6 countersunk screws
3 x M3 nuts
Sticky Tape
1 x BBC micro:bit !!!



Using a Motor as a Generator to Measure Wind Speed

A Motor, such as the Kitronik **Low Inertia Solar Motor** included with the 'Inventors Kit' can also be used as an Electrical ***Generator***. If the Motor's Fan Blades are blown it will output a voltage on its Red & Black wires with the voltage varying in proportion to the wind speed. (This is the same principle used by Wind Turbines). Since the Motor is being used as a generator, the ***positive*** voltage will be on the ***black*** wire. This voltage can be monitored by one of the Analog GPIO on the **micro:bit** with the voltage level (and hence the wind speed) displayed on the **micro:bit**.

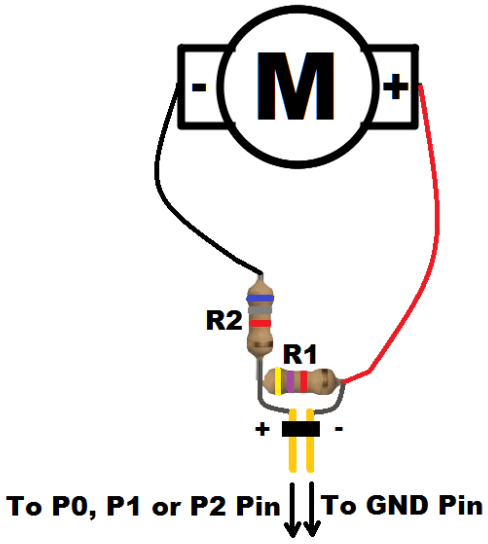
Wiring the Motor ready to plug into zbit:toolbelt

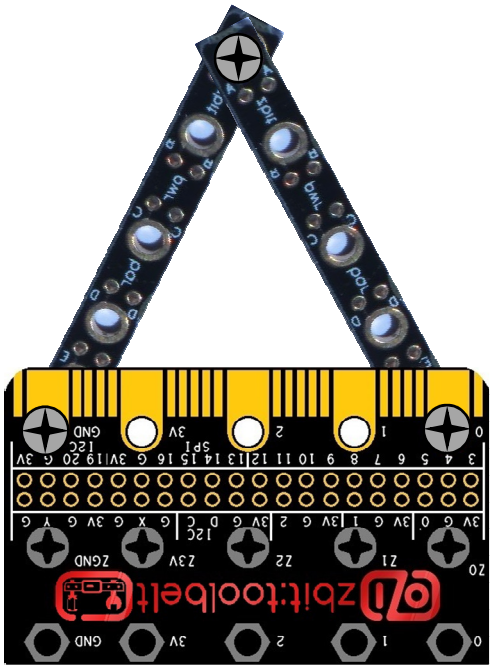
The Kitronik **Low Inertia Solar Motor**, when used as a Generator, can generate voltages up to ~8V depending wind speed. Two Resistors are used as a 'potential divider' to reduce the voltage presented to the micro:bit's GPIO. These resistors will also limit any current into the micro:bit's GPIO to help prevent any damage should the voltage ever go outside the GPIO's 0V - 3.3V range.

Assembly Instructions

Refer to the electronics assembly diagram opposite

1) Solder the 4k7 Resistor 'R1' between the two Header pins
2) Solder one end of the 6k8 Resistor 'R2' to Header '+' pin
3) Solder the ***BLACK*** wire from the Motor to the other end of Resistor R2
4) Solder the ***RED*** wire from the Motor to Resistor R1 and Header '-' pin*





Assembly Instructions (cont)

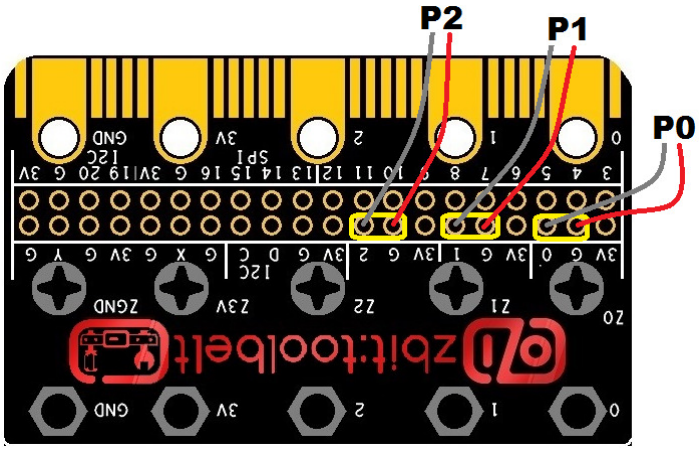
Refer to the mechanical assembly diagram opposite

5) Bolt the two **zbit:pwr:bars** to the ***BACK*** of zbit:toolbelt using M3 countersunk screws inserted from the ***FRONT*** of holes 'GND' and 'P0'
6) Bolt the two **zbit:pwr:bars** to each other using M3 screw and nut to create an 'A' frame.
7) Use **Sticky Tape** to secure the Motor to the 'A' frame
8) Fit the **Impeller Blades** to the Motor Spindle
9) Plug the **2 pin Header** into the **zbit:toolbelt** connector with the **'-' (Red Wire*)** pin plugged into a **GND** pin and the **'+'** pin plugged into **P0,P1** or **P2**

* NOTE - Since the Motor is acting as a ***Generator***, the ***Red*** Wire is now the ***negative*** and the **Black** Wire is the ***positive***!

Plugging Motor into zbit:toolbelt

This diagram shows the 3 valid positions on the **zbit:toolbelt** connector where the 2 pin Header can be plugged. These will connect the Motor to the **micro:bit's** Analog GPIO **P0, P1** or **P2.**
Note that the **RED Wire** pin of the Header plugs into a **GND** pin!

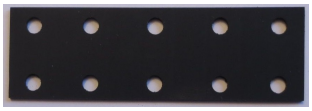


Testing the Wind Speed Meter

It is recommended that the output voltage of the Wind Speed Meter is tested before attaching your **micro:bit**. This will require a Voltmeter.

1) With **zbit:toolbelt** disconnected from your **micro:bit**, connect the Voltmeter's '**Common**' probe to the **GND** pad and '**Voltage**' probe to the **P0, P1** or **P2** pad on **zbit:toolbelt** connected to the Motor
2) Blow on the **impeller** to make it spin and monitor the voltage
3) Check the voltage is ***positive*** and is in the range ***0V - 3.3V*** depending upon impeller speed
4) If the voltage exceeds 3.3V increase the value of R2 to 8k2 or 10k

Connect zbit:toolbelt to your micro:bit

For this project the use of the zbit:connector...  ...is *optional* as it only connects to ***a 'large pad'*** GPIO **P0, P1 or P2**
See **'zbit:connect family guide'** for more details

Python Example Code

Download the Python example program **`Python-Wind-Speed-Meter-15-LED.py`** from www.zbit-connect.co.uk and load it onto your micro:bit.
The example code 'reads' the analog voltage from the Motor on **P0** and displays the 'Wind Speed' as a Triangular Bar Graph on the **micro:bit's** display.
If you are using P1 or P2 change the line **`wind = pin0.read_analog()`** to **`pin1`** or **`pin2`**.

Blow on the impeller and the 'wind' speed should be displayed on the micro:bit. The higher the wind speed the more LED's will be 'on' up to a maximum of 15 LEDs.

Press the 'A' Button on the micro:bit to displays the 'peak' wind speed.
Press the 'B' Button on the micro:bit to return to displaying the 'current' wind speed.

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Have Fun while you Learn!

www.zbit-connect.co.uk