



## Bus Pirate pull-up resistor guide

Bus Pirate v3b Firmware v5.10

<http://buspirate.com/tutorial/bus-pirate-pull-up-resistor-guide>

Generated 2019-01-23

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## Introduction

Pull-up resistors are used for open drain/open collector busses like 1 Wire and I2C. They're also handy for level translating between chips running at different voltages. The Bus Pirate has built-in 10K ohm pull-up. They are enabled/disabled with the W/w commands. The built-in pull-up resistors are powered from the Vpullup (Vpu) pin of the Bus Pirate IO header.

## How the on-board pull-up resistors work

[[Image:pullups-ii.png|450px|pullups.ii]]

The figure outlines the basic parts of the Bus Pirate on-board pull-up resistors.

- pull-up (or pull-down) voltage supplied through the Vpullup (Vpu) pin is fed into a CD4066 analog switch (<http://focus.ti.com/docs/prod/folders/print/cd4066b.html>) (IC3).
- 4066 analog switch distributes the pull-up voltage to four 10K resistors (R20-23) that connect to the MOSI, CLOCK, MISO, and CS bus pins.

## Connect a voltage to the Vpullup pin

```
1-WIRE>v
Pinstates:
1.(BR) 2.(RD) 3.(OR) 4.(YW) 5.(GN) 6.(BL) 7.(PU) 8.(GR) 9.(WT) 0.(Blk)
GND 3.3V 5.0V ADC VPU AUX - OWD - -
P P P I I I I I I I
GND 3.28V 5.00V 3.29V 5.00V L L L L L
1-WIRE>
```

**You must connect the Vpullup pin to a voltage.**

The pull-up resistors aren't hard-wired to a power supply, you can apply any voltage level that's needed (from ground to +5volts). Type 'v' in the Bus Pirate terminal to see the current voltage on the Vpullup pin.

When the main microcontroller (IC1) holds the 4066 enable pin at 0volts the pull-up voltage is blocked and nothing goes through the resistors. When the enable pin is high, the pull-up voltage is allowed through the 4066 and the resistors hold the bus pins at the level of the Vpullup pin.

## Activate the pull-up resistors

```
1-WIRE>P
Pull-up resistors ON
1-WIRE>p
Pull-up resistors OFF
1-WIRE>
```

p and P toggle the pull-up resistors off and on. 'P' enables the 4066, and the voltage on the Vpullup pin is applied to the 10K pull-up resistors.

## Warning: no voltage on Vpullup pin

```
1-WIRE>P
Pull-up resistors ON
Warning: no voltage on Vpullup pin
1-WIRE>
```

If you get the error "Warning: no voltage on Vpullup pin" check the voltage report (v) and verify that a voltage is attached to the Vpullup pin.

If you connected Vpullup to the Bus Pirate's 3.3volt or 5.0volt supply, be sure to use the 'W' command to enable the power supplies.

## Warning: pins not open drain

```
(1)>1
Select output type:
 1. Open drain (H=Hi-Z, L=GND)
 2. Normal (H=3.3V, L=GND)

(1)>2
Ready
2WIRE>P
WARNING: pins not open drain (HiZ)
Pull-up resistors ON
Warning: no voltage on Vpullup pin
2WIRE>
```

Pull-up resistors are generally used with open collector/open drain bus types. A warning is displayed when the pull-ups are enabled if the Bus Pirate is configured for normal pin output.

## More Information

Read more about pull-up resistors and the Bus Pirate's open collector output mode (HiZ):

- [Pull-up resistors, high impedance pins, and open collector buses]
- [Mixed voltage interfacing with the Bus Pirate]



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