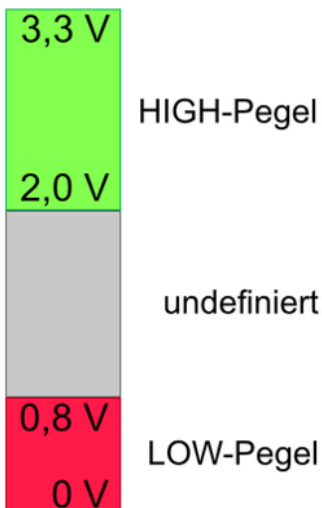


Pullup – Pulldown

Goal: Use of Pullups – Pulldowns

LESSON 1

Problem



A voltage level between 0V and approx. 0.8V at the input pin is recognised as LOW level (e.g. button not pressed) by a microcontroller, and a voltage level between approx. 2V and 3.3V as HIGH level (e.g. button pressed).

The voltage levels in between are not defined. Due to interferences in the environment, electrical charges, etc., more than 0.8V may be applied at the input pin although the button is not pressed (i.e., the button is mistakenly recognised as being pressed).

For this reason, a resistance (usually 10kOhm) must be applied to "pull down" the level to 0V. This resistance is referred to as **Pulldown**.

Please note:

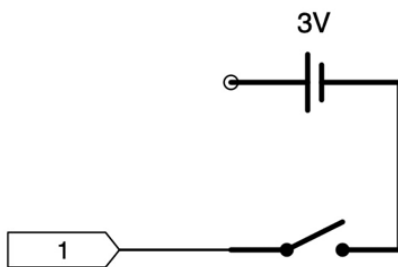
In an inverted circuit (i.e., 3.3V are applied at the input pin if the button is not pressed and 0V if it is pressed), the resistance is not pulled down towards 0V but "pulled up" towards 3.3V. For this reason, this resistance is referred to as **Pullup**.

LESSON 2

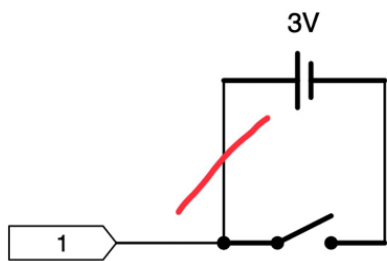
How are pulldowns and pullups used?

To ensure that the Micro Bit (or any other microcontroller) can recognise whether a button is pressed or not, a defined voltage (3V or 0V) must be applied at the input pin (e.g. pin 1).

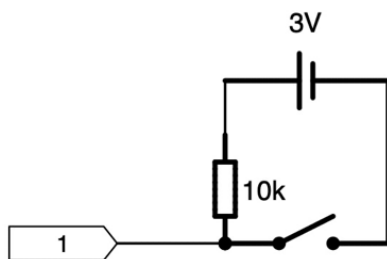
In our case, 0V are to be applied at pin 1 if the button is pressed.



In the first figure, the required 0V are applied at pin 1 if the button is pressed. If it is not pressed, however, the pin is "up in the air", i.e. no defined voltage potential is applied.



If the input pin is connected to the positive voltage supply (3V), the required 3V are applied while the button is not pressed, however, if the button is then pressed, a **SHORT CIRCUIT** occurs!!!



This short circuit is prevented by means of pullup "raising" the potential of the input pin (3V). If the button is pressed, the short circuit is prevented by the resistance of usually 10kOhm and the required 0V are applied.

Info

At most microcontrollers, these pullups are already integrated and can be applied on the software side. This way, costs (components and time) can be saved and the size of PCBs be reduced.