

Lab 3 - UART, SPI & FW DUMP

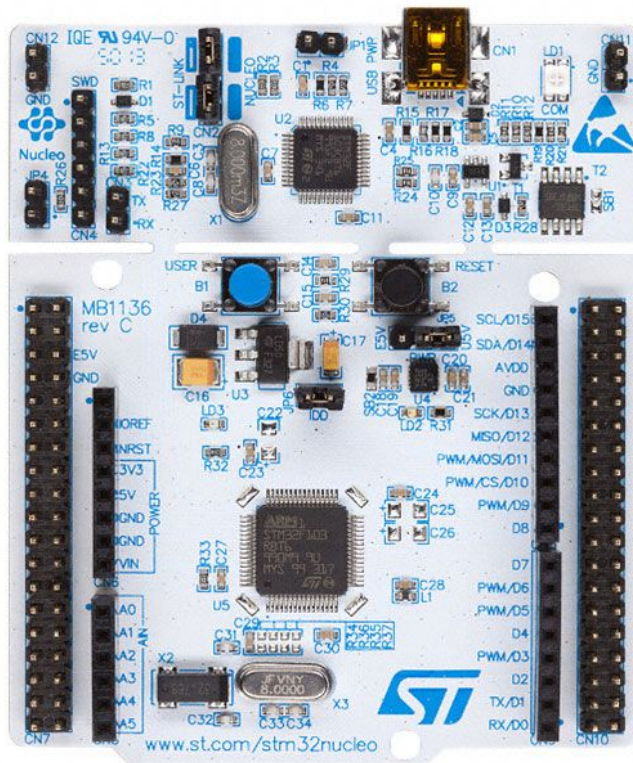
HS 2020

The Goals

- Get familiar with a logic analyzer
 - Learn to decode UART & SPI
- } Assignment 3A
- Learn to debug a microcontroller
 - Learn to dump firmware in different ways
- } Assignment 3B

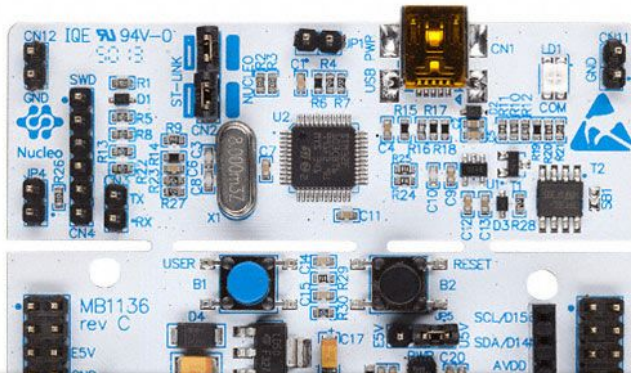
The Hardware

Nucleo STM32L152RE



The Hardware

Nucleo STM32L152RE



STM32L151xE STM32L152xE

Ultra-low-power 32-bit MCU ARM[®]-based Cortex[®]-M3 with 512KB Flash, 80KB SRAM, 16KB EEPROM, LCD, USB, ADC, DAC

Datasheet - production data

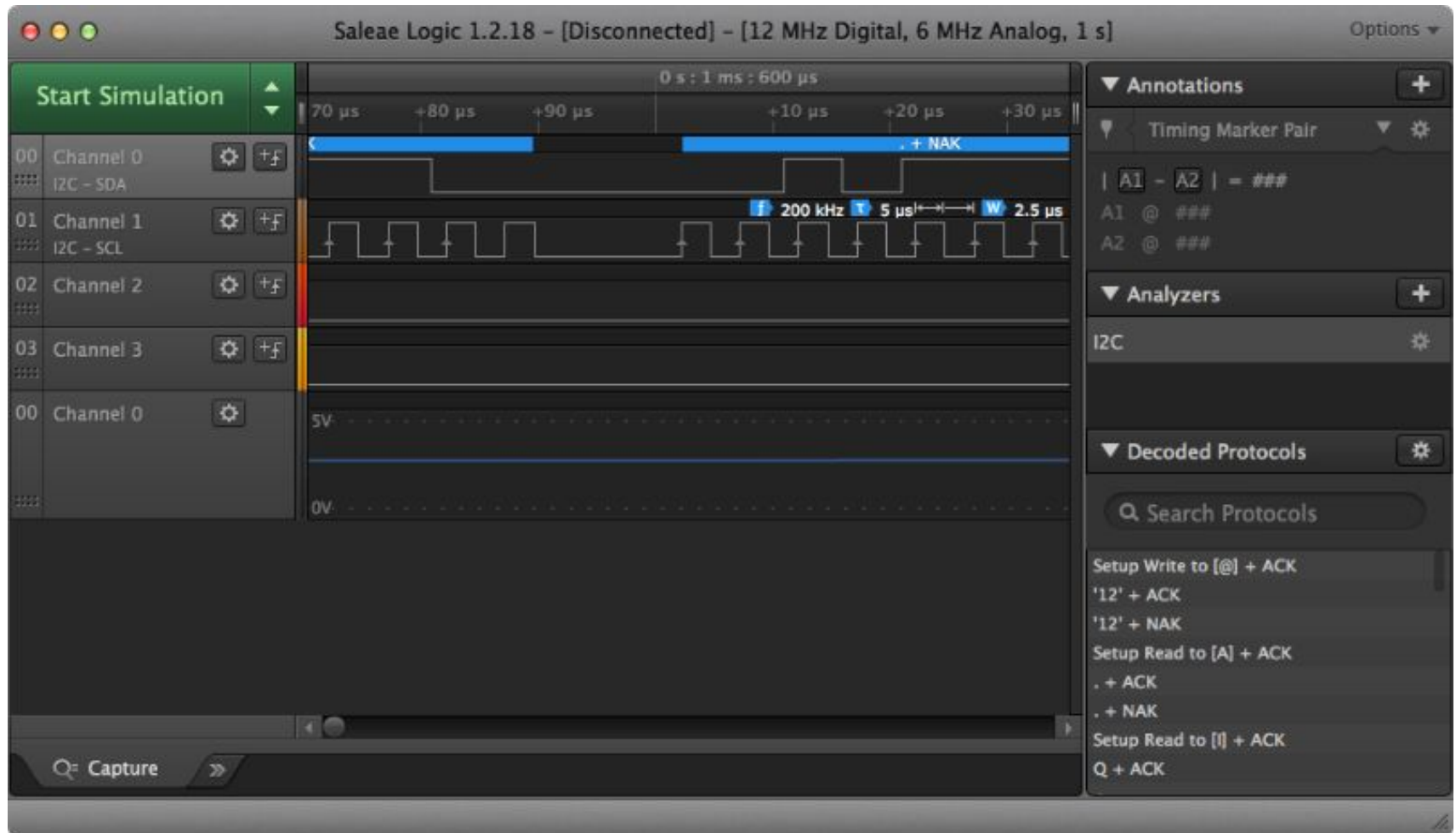
The Hardware

The included jumper wires are not very reliable.

If possible, use the other ones!

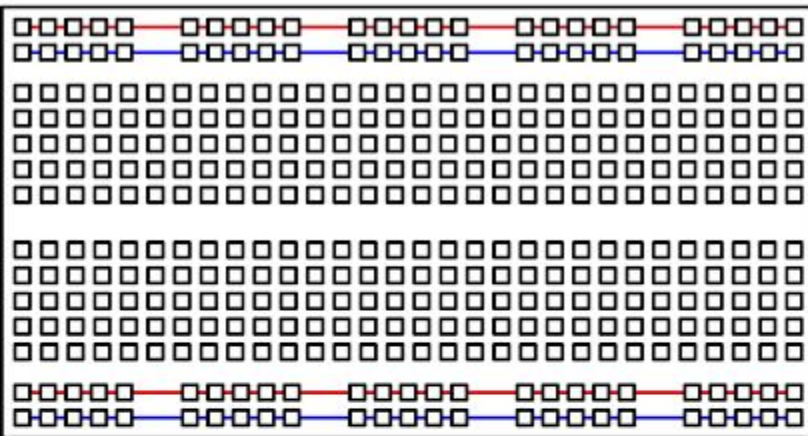


The Hardware

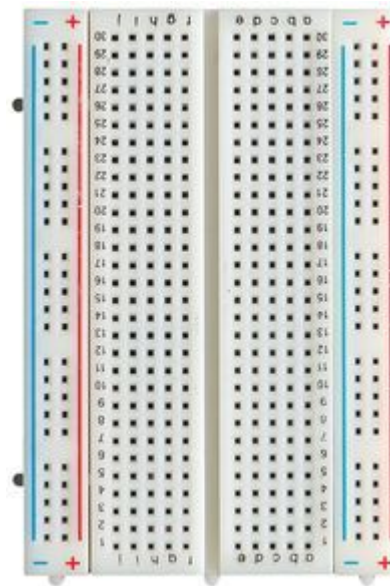


The Hardware

Top View of Breadboard



Interconnect View of Breadboard

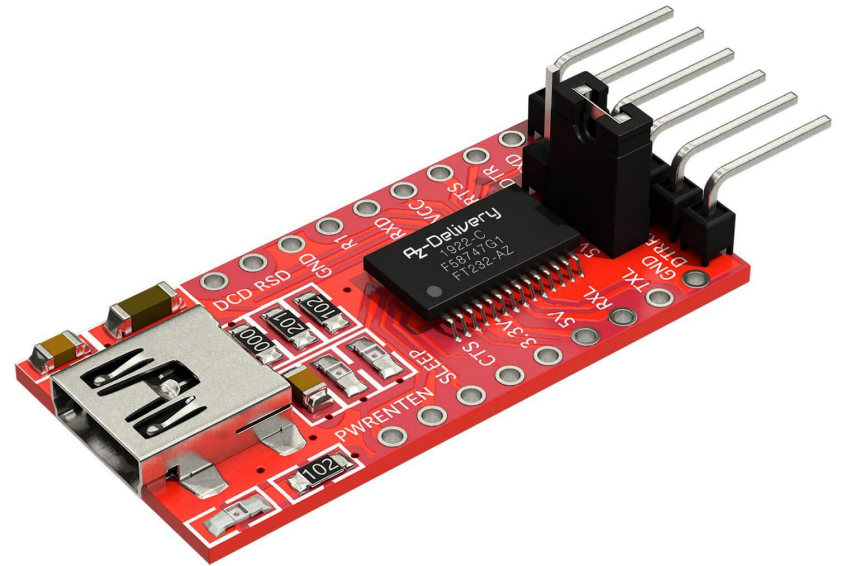


Breadboard is needed for making “T” connection for assignment 3A Part 2 (aka SPI decoding)

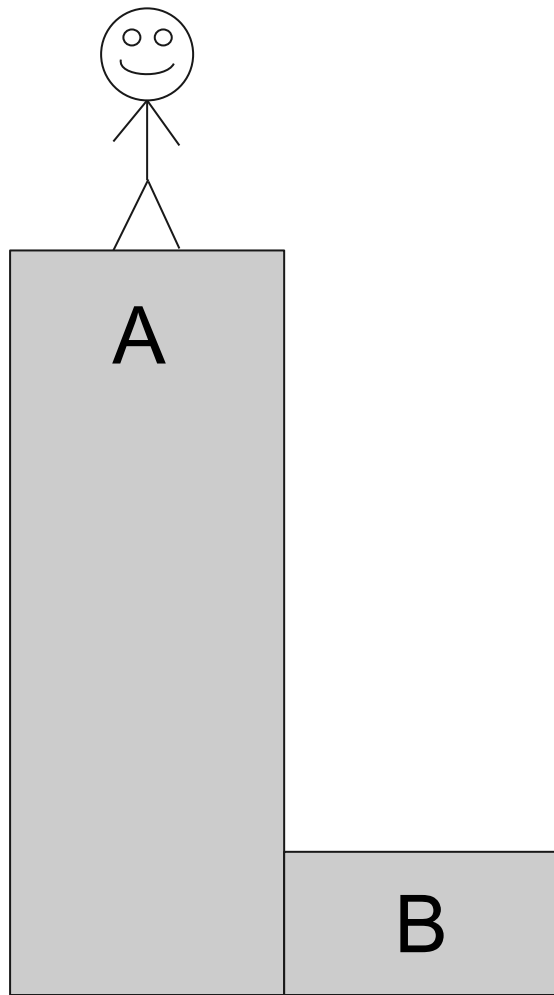
The Hardware

The FTDI Adapter must be used for Part 2 of assignment 3B.

Feel free to use it as
different UART
interface.



Warning: short circuit

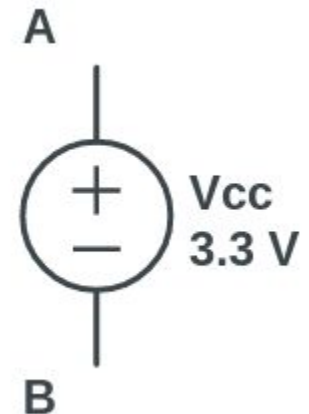


Mr. Stickman wants to reach B.

This scenario is called **open circuit**. No current is flowing so it is Intrinsically safe

$$V = R \cdot I$$

$$R = \text{inf}$$

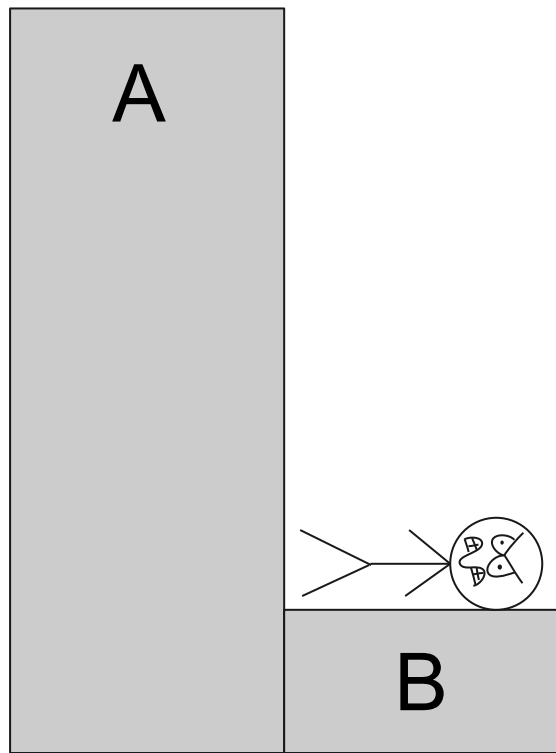


Warning: short circuit

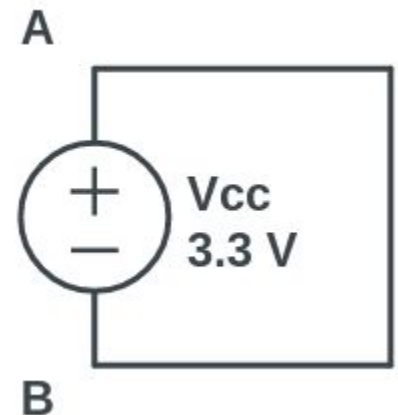
Mr. Stickman crashes into the floor due to the potential difference between A and B.

The “air resistance” is so low that he reaches an high speed while falling.

This is called **short-circuit** and the high current may damage components



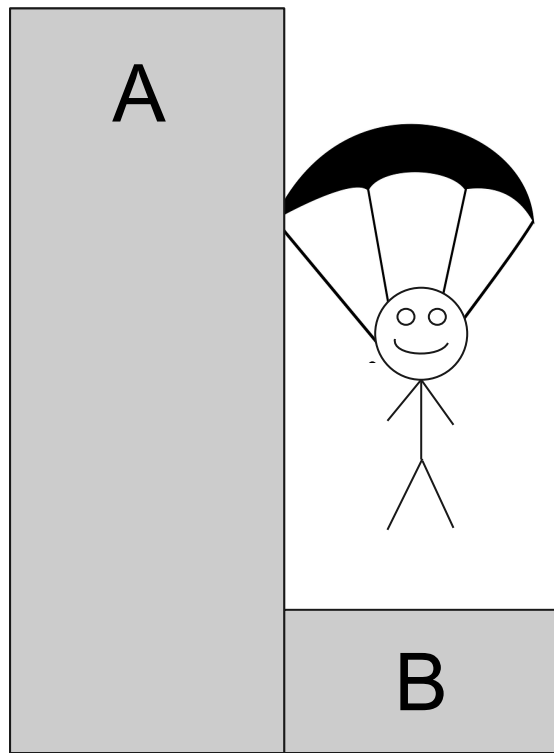
$$V = R \cdot I$$
$$R = 0$$



Warning: short circuit

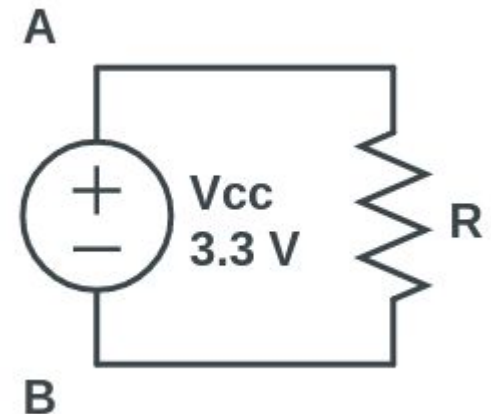
Mr. stickman decides to use a parachute to increase his air resistance.

If the resistance is big enough (In our setup greater than 30 ohms) the current is small enough to not damage any component.



$$V = R \cdot I$$

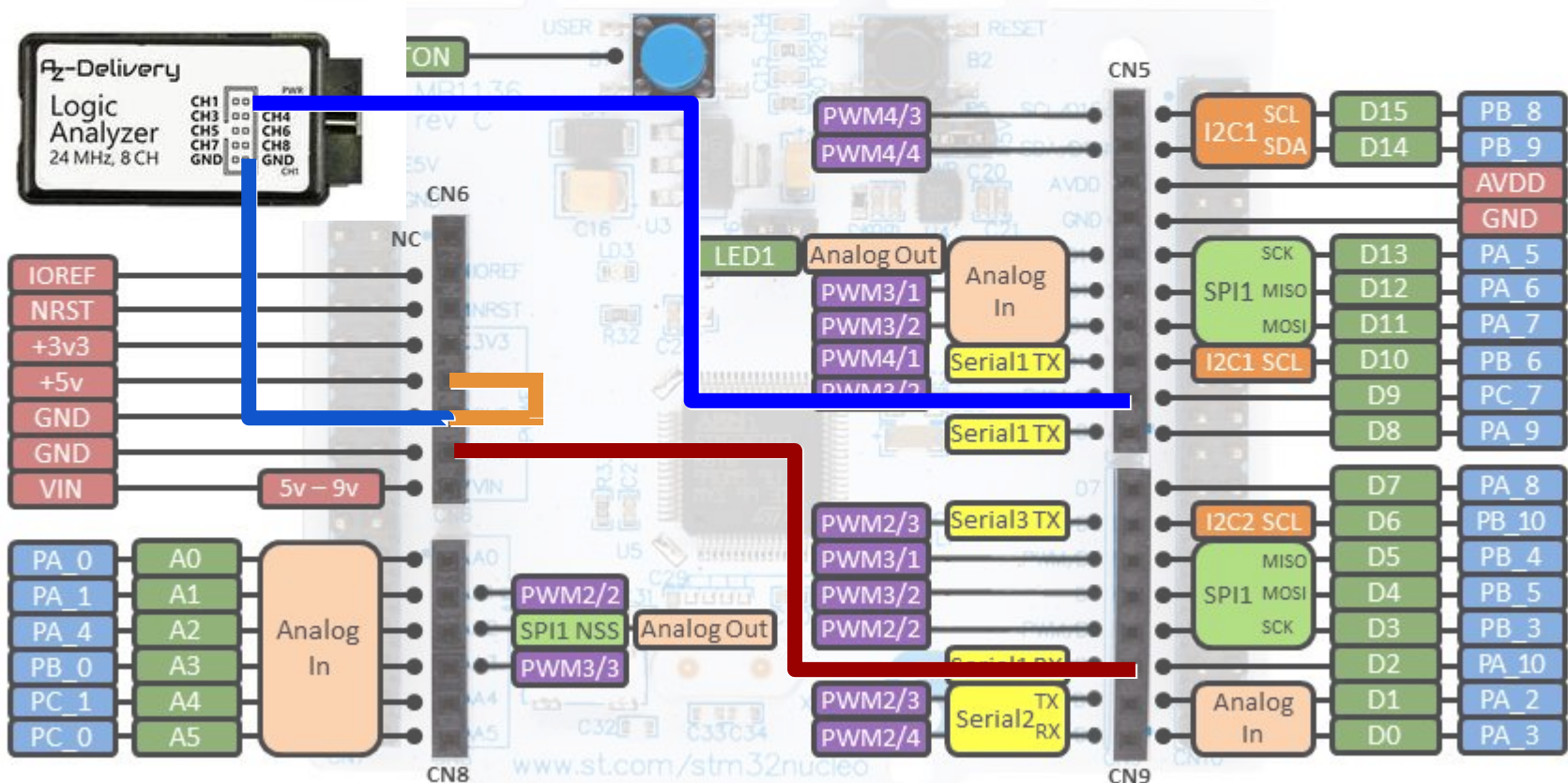
$$R \gg 0$$



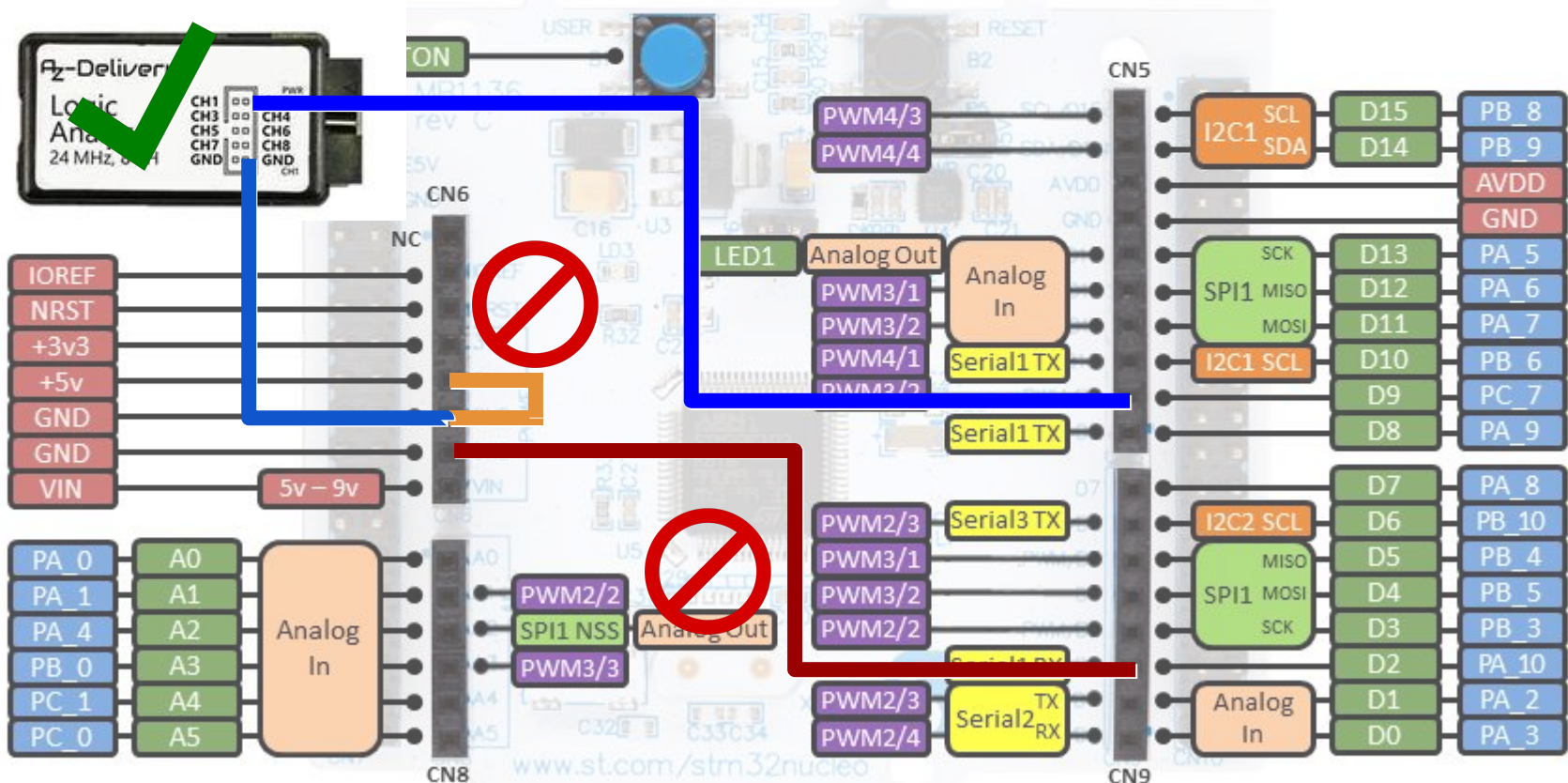
Warning: short circuit

- **NEVER** connect pins at 3.3V or 5V to ground. This will cause a so called short-circuit and it can damage your device permanently.
- **NEVER** leave dangling wires, you may inadvertently create a short-circuit.

Warning: short circuit



Warning: short circuit



Assignment 3

- **Part A1** (2 points)
 - UART decoding using the logic analyzer
- **Part A2** (3 points)
 - SPI decoding using the logic analyzer
- **Part B1** (1 points)
 - Setting up a debug environment
- **Part B2** (4 points)
 - Dump firmware present on the NUCLEO target

Assignment 3A remarks

- The assignment guide is full of **hints** and **troubleshooting** sections. Please read them carefully before asking for help.
- Remember to use the logic analyzer as your first debugging tool. Be also prepared to share your connections and traces because this will be our first request during office hours.

Assignment 3B remarks

- Documentation is your best friend! Have a look the linked Application Notes and datasheets!
- For bootloader FW dump methodology probe the TX/RX lines with your logic analyzer. It helps to verify that both sides are communicating correctly

