

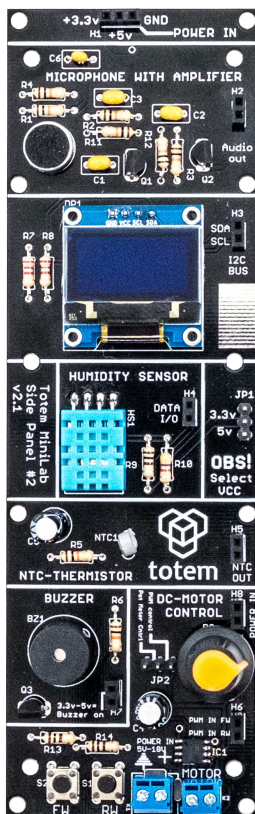


totem

Mini Lab

Sensor Side panel

Side panel 2



Totem Technology, UAB

ver 1.1

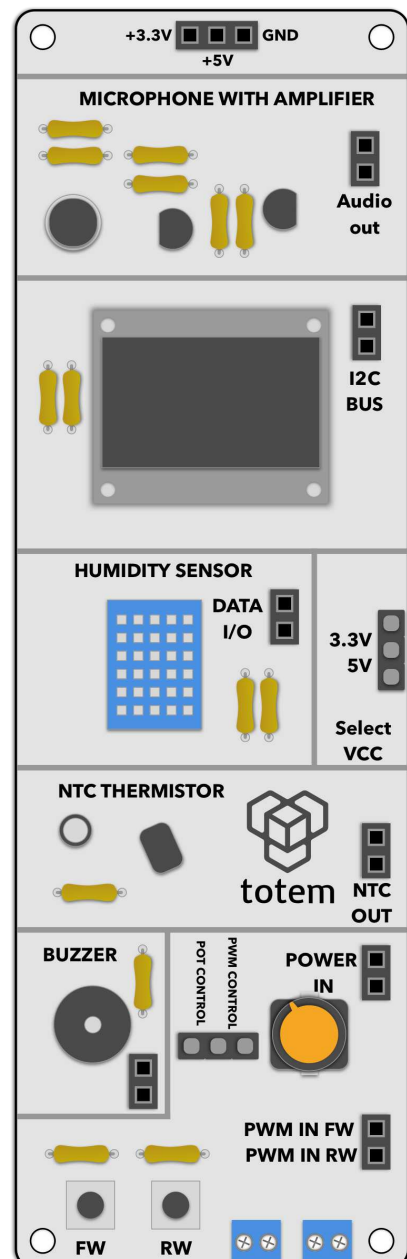
Overview

This is a getting started guide for a second expansion board for the Totem Mini Lab system. In this document we'll go over all of the available modules in the board, together with explanations on their interface with the Mini Lab as well as usage examples.

Side panels are meant to bring easy access to commonly used components that are difficult to wire on breadboards due to their dimensions, or require additional equipment to operate them. Side panels give a plug and play interface that lets users to concentrate on experiments or learning, rather than spending time solving issues on how to interface with the part.

This document is divided into sections where each separate module is described. In the side panel 2 these modules are available for use:

- **Microphone** — ready to use microphone module with integrated preamplifier that outputs currently measured sound pressure in 0 to ($V_{cc} - 2.5$) Volt range.
- **128x64 OLED display**— monochrome graphical screen controlled via I2C interface. Uses SSD1306 chip as a driver.
- **DHT11 humidity sensor** — digital composite sensor capable of measuring temperature and humidity. Uses single-wire serial interface for communication.
- **NTC thermistor** — a simple 10k thermistor that in the module works as a voltage divider, useful for making temperature sensors.
- **Piezo electric buzzer** — beeper module with integrated transistor driver. Produces sound when high level signal is applied.
- **DC motor driver module** — an h-bridge motor driver with integrated protections.



Modules

In the board only the supply power is shared between modules. Otherwise they're fully isolated from one another, and can be used independently. Logic level for digital signals have a jumper which selects the boards to work either at 3.3 or 5 V logic level. It's important for the side panel to have the same logic level as the controller board (e.g., TotemDuino), for best results.

Microphone

This module takes care of all things needed to drive the microphone, and outputs an analog signal in the **0..Vcc** range. Suggested uses for this module are reading the value with TotemDuino, or using it as an input to operational amplifiers.

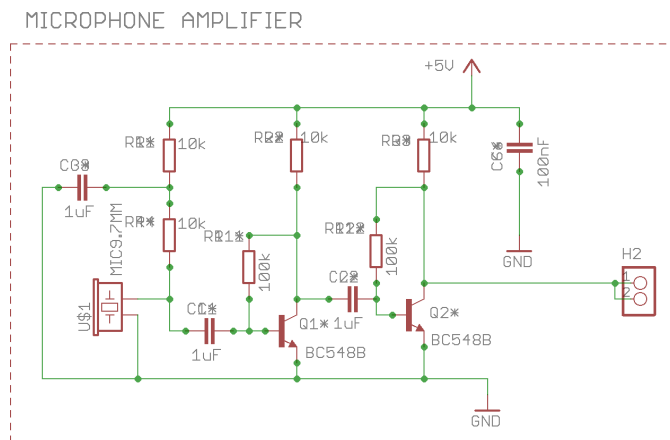


Fig. 1 Microphone module schematics



Display

Screen uses a SSD1306 chip for control. I2C interface with integrated pull-up resistors is used to interface with the driver. Works with both 3.3 or 5 V supply voltages, selected by jumper pin. Refer to the SSD1306 datasheet for interface specifics, or to Totem examples sketch for sample usage of the module.

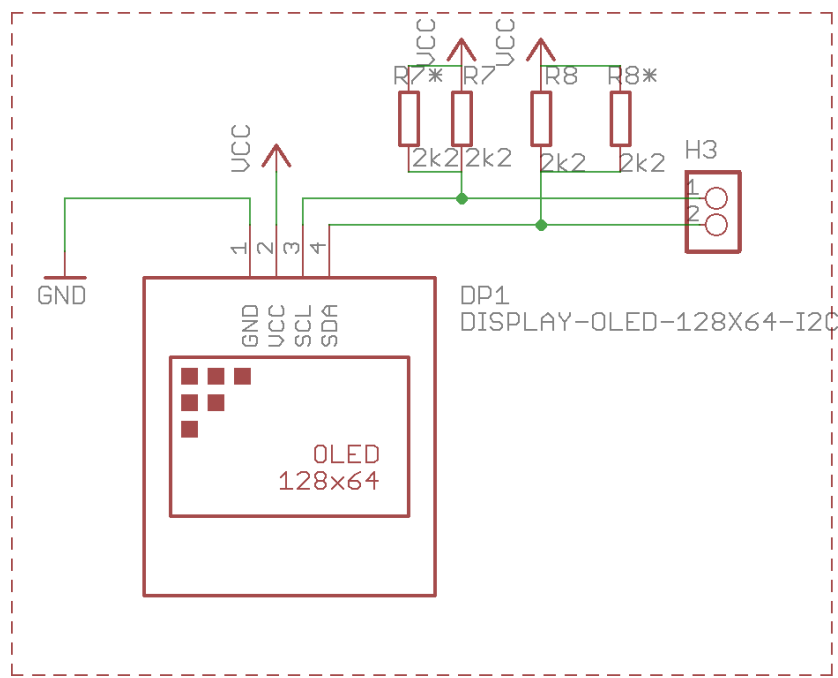


Fig. 2 Display module schematics



Humidity sensor

Digital, 16bit humidity and temperature sensor using one wire protocol. Accepted temperature range of -40 to 80 °C with 0.5% accuracy and humidity from 0 to 100% at 2-5% accuracy.

Can be used with 3.3 V or 5 V supply voltages, selected by jumper pin.

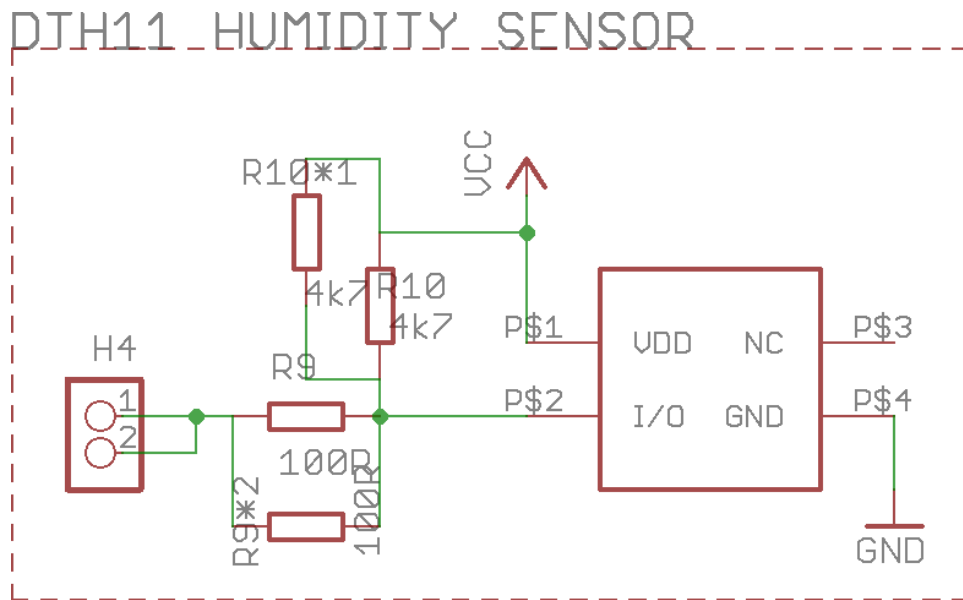
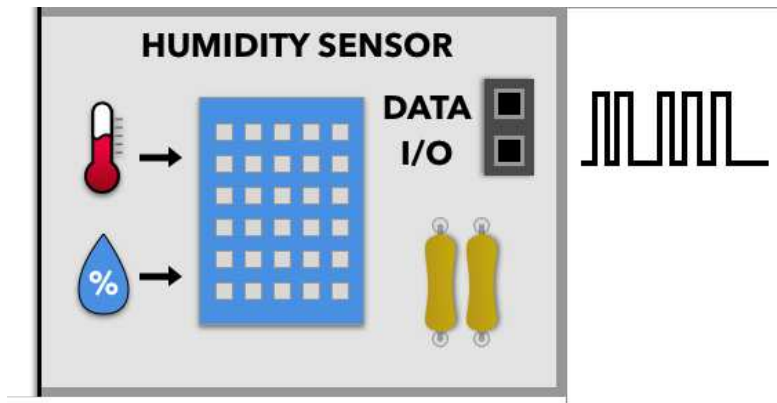


Fig. 3 Humidity module schematics



NTC thermistor

Negative temperature coefficient (NTC) thermistor working in voltage divider configuration. At room temperature (25 °C) has 10k resistance. Can be used from -40 to 125 °C temperature.

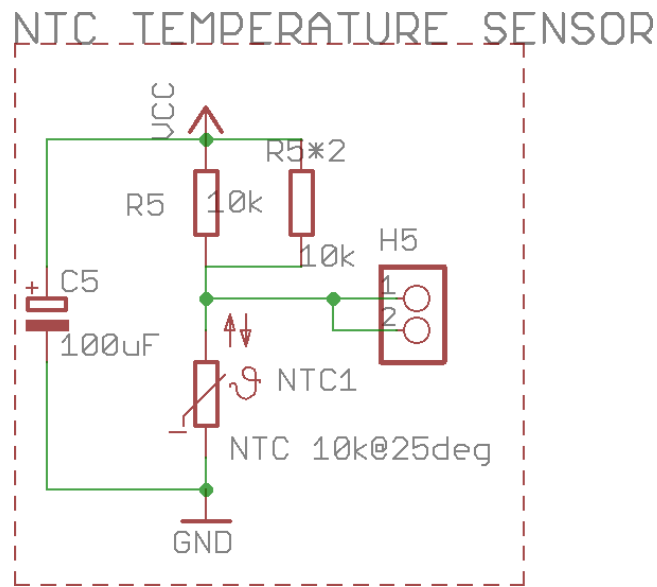
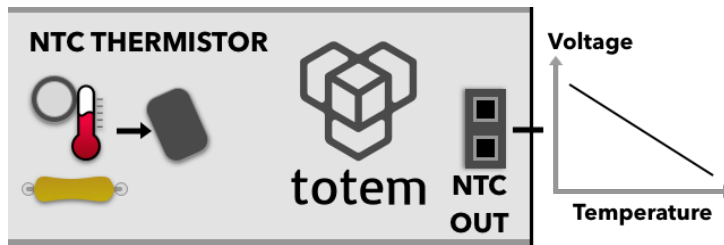


Fig. 4 Thermistor module schematics



Buzzer

An active piezo electric buzzer with transistor driver. Powered from 5V supply voltage. Active logic level in its input activates the buzzer.

BUZZER CIRCUIT

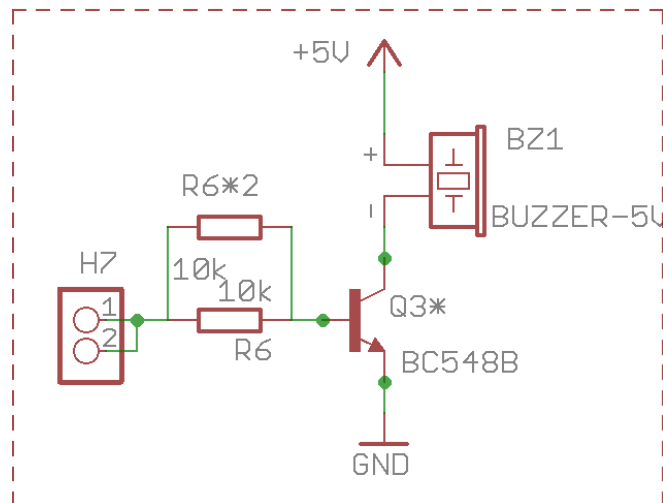
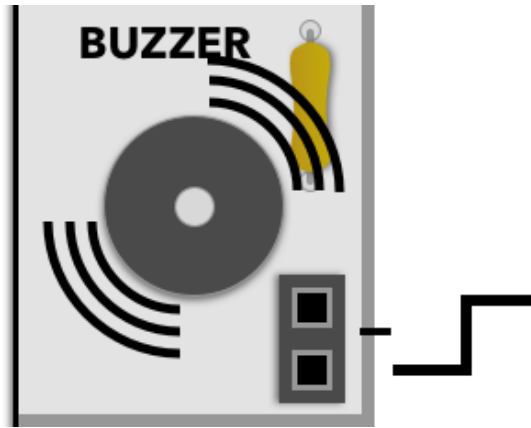


Fig. 5 Buzzer module schematics



DC motor driver

An h-bridge motor driver powered by BD6220F chip. Can be controlled from integrated buttons and potentiometer or accepts logic level inputs. Can be used in pulse width modulation (PWM) mode for controlling motor speed.

Depending on the input state, motor can receive four different working modes:

Input A	Input B	Motor state
LOW	LOW	Idle
LOW	HIGH (PWM)	Rotation A
HIGH (PWM)	LOW	Rotation B
HIGH	HIGH	Brake

Driver contains protections against over-current, short-circuit conditions. Jumper **JP2** on the module controls the input reference (maximum voltage applied to the motor) source - when in **PWM control** mode the reference voltage equals supply voltage, when in **Pot Meter Cntrl** mode the reference voltage is controlled by potentiometer.

H-BRIDGE MOTOR DRIVER

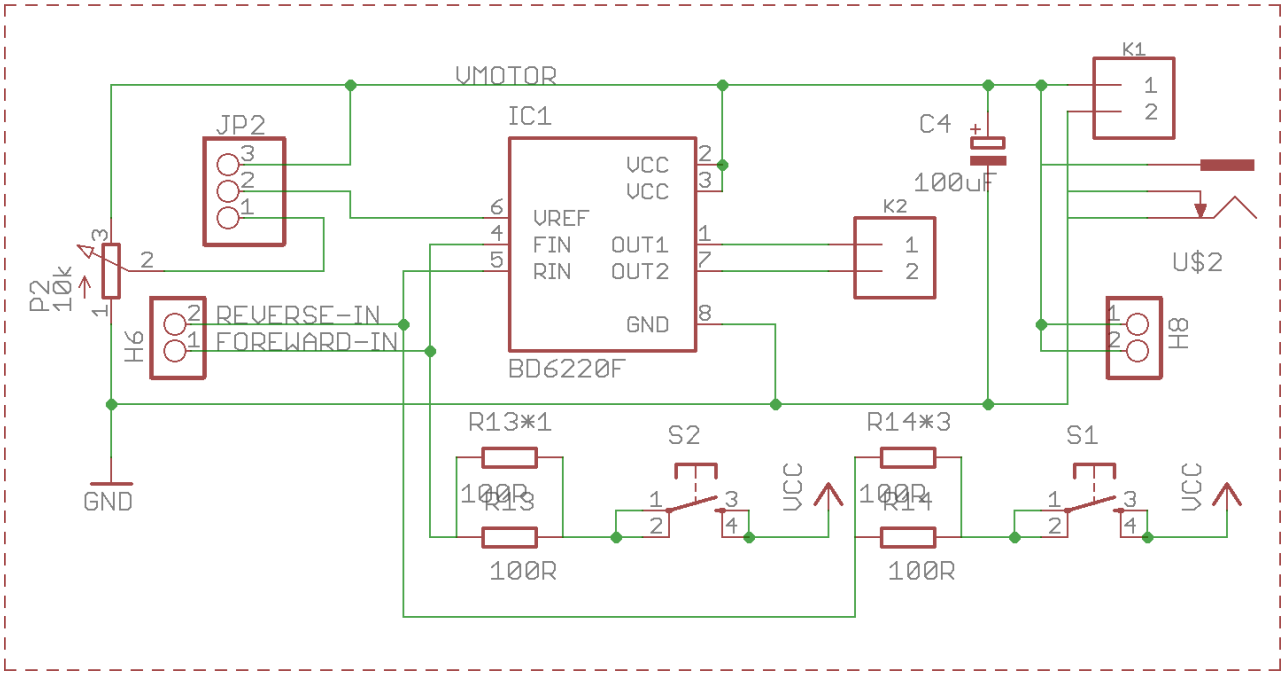
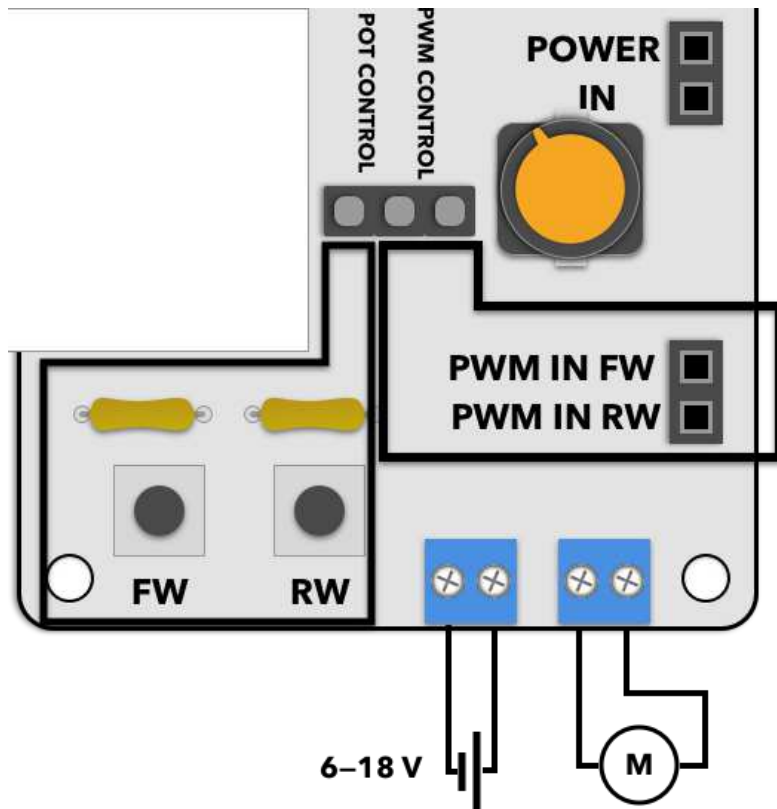


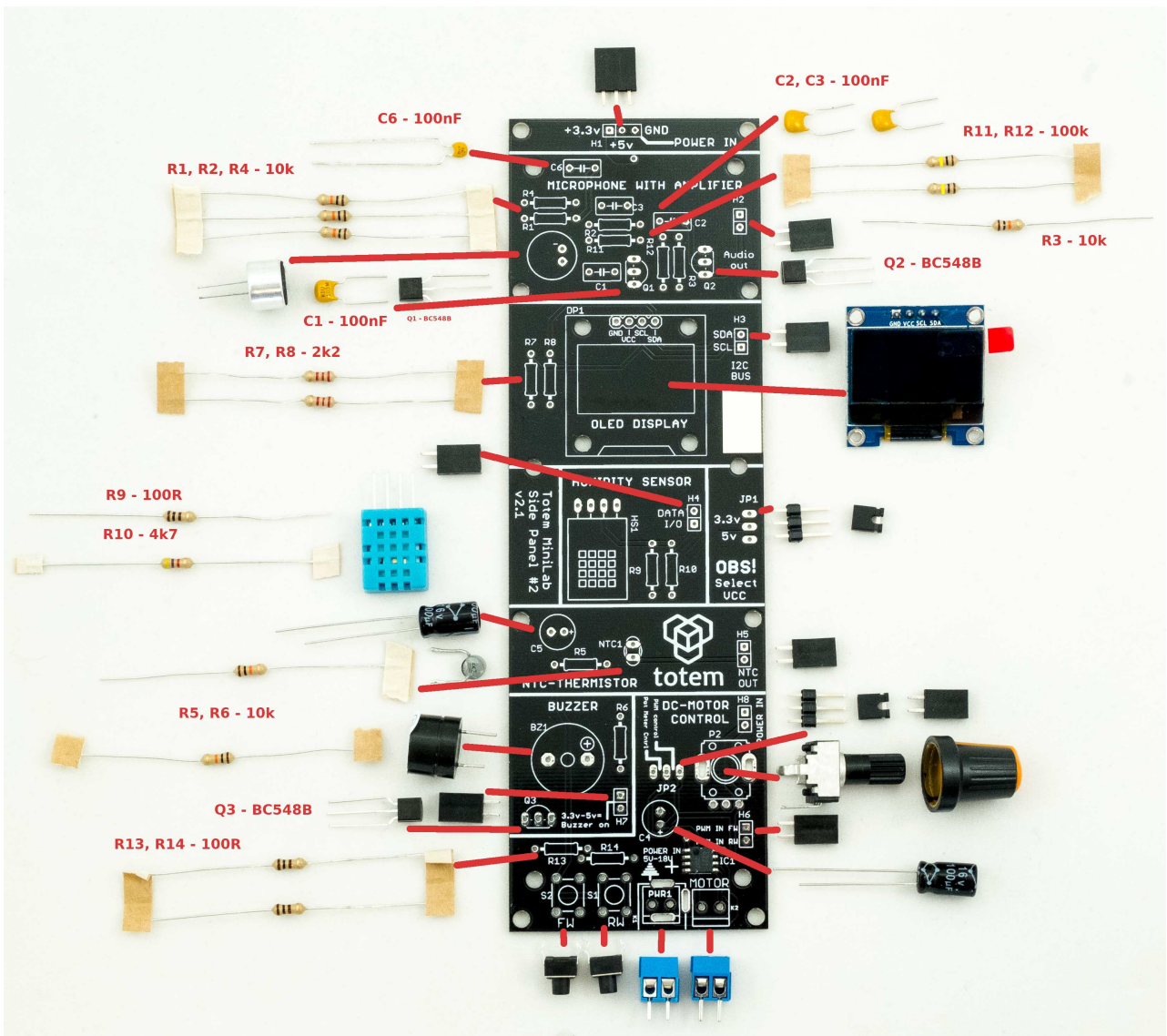
Fig. 6 Motor driver module schematics



Assembly

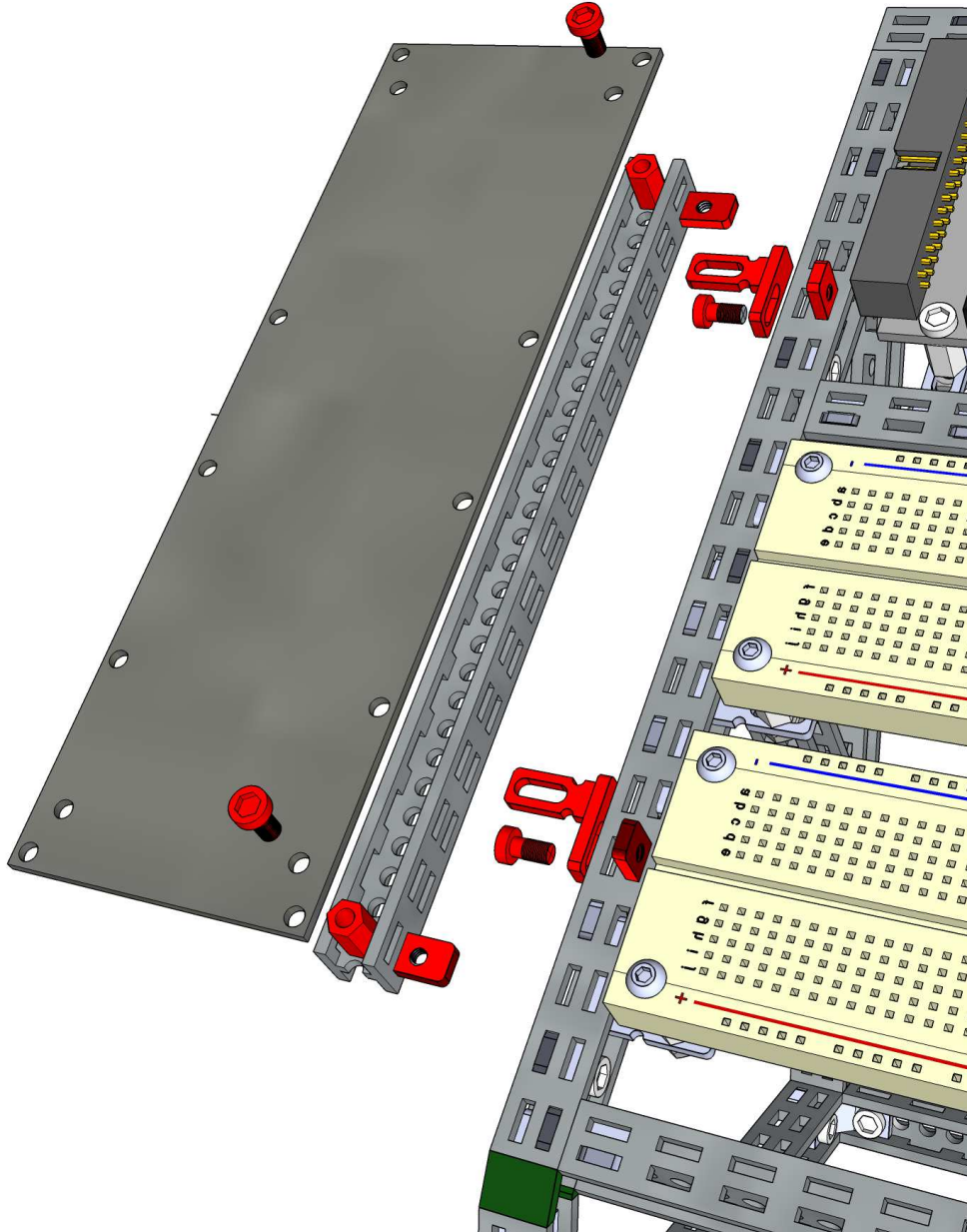
This section guides through the steps for assembling your side panel.

Side panel 2 comes with the motor driver chip already soldered on the board, as this is an SMD part which is a little bit more difficult to solder than usual through hole components. As usual, we recommend starting your assembly from the smallest components such as resistors, and working your way up with larger ones. That way when you flip the board to solder the contacts, they will not fall out from their place. Use the following guide for assembly:



Mounting

We suggest using the following guide for side panel mounting to the Mini Lab workbench:



In this case, the sub-assembly can be easily taken off by sliding the pins from the sockets. If a more permanent assembly is needed, nuts and screws can be used to fix the sidepanel in place.

Schematic

