

## PCB Components and Assembly

### Power Board

- Teensy microcontroller: The main component on your power board is the [Teensy 3.2](#) (Figure 1). It runs on a 32-bit ARM microcontroller. An SD card sits on top of the Teensy that collects data. Solder the machine pins that will hold the Teensy.



Figure 1. Teensy Microcontroller

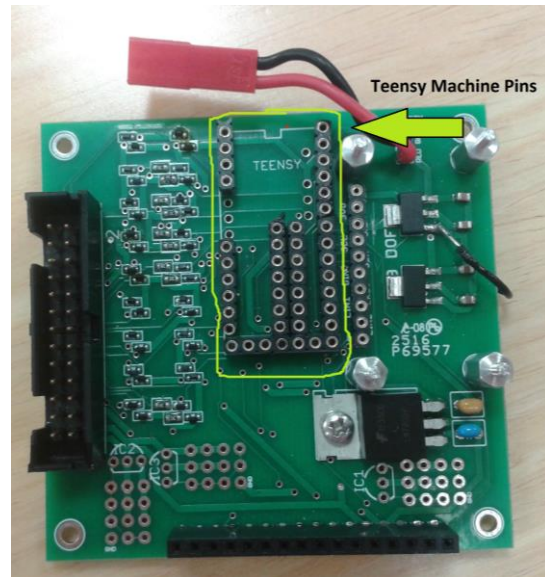


Figure 2. Teensy Machine Pins

- Lipo Battery: A 7.4V 1300mAh Li-Po battery will power your Teensy. Li-Po batteries are extremely dangerous and must be handled with care. Absolutely avoid shorting your battery. Doing so will generate a lot of heat that can melt anything connected to the battery. Solder the JST connectors for your battery on the board.

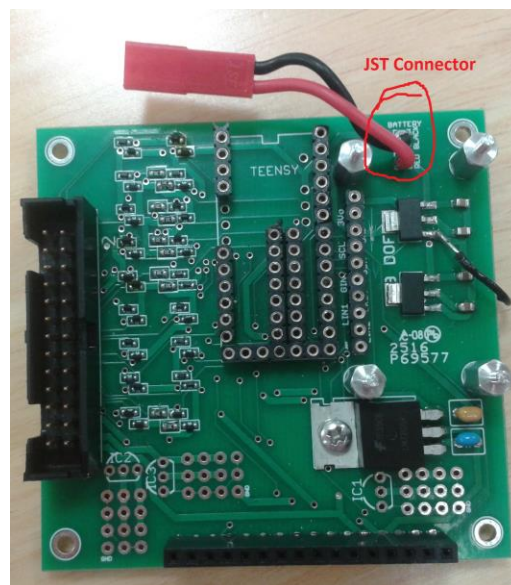


Figure 3. Battery JST Connector

- Adafruit IMU: The IMU (Figure 2) contains an accelerometer, gyroscope, and magnetic compass, each in three-axis. In total, it has 9 degrees of freedom (DOF). The IMU will be used to gather positional information to navigate your robot in future labs. Solder machine sockets and screw four standoffs for the IMU.



Figure 4. Adafruit 9-DOF IMU

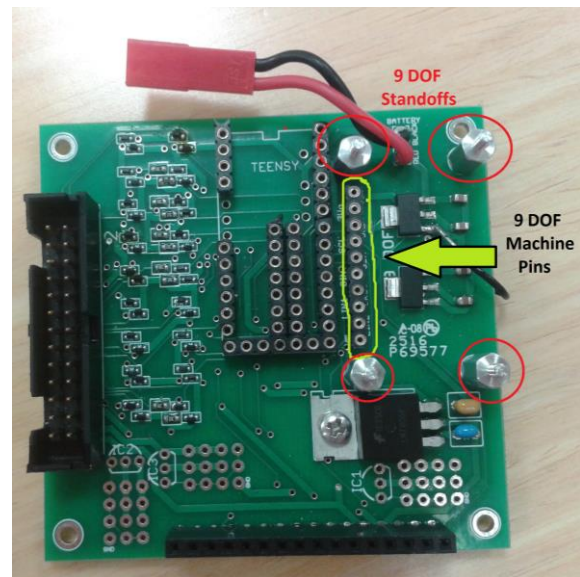


Figure 5. 9-DOF Assembly

- Protection Diodes: Part of your board is dedicated to protection diodes. The diodes protect sudden large voltages from destroying the Teensy. They are arranged as shown in Figure 3. These diodes have been soldered for you.

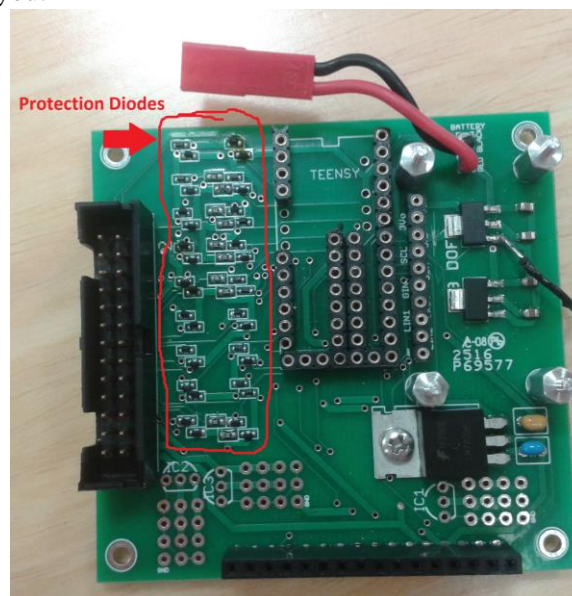


Figure 6. Protection Diodes

- Voltage Regulators: The Teensy and Adafruit 9-DOF IMU run on 5V so we have a 5V surface-mount (SMT) voltage regulator for them. Both bypass capacitors for the 5V SMT regulators are 10uF.

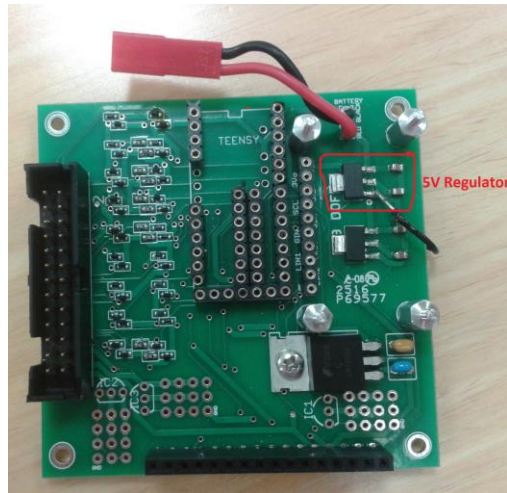


Figure 7. 5V SMT Regulator and Bypass Capacitors

There is a 5V through-hole regulator for your sensors. The 5V power for the Teensy and sensors are separated to protect the expensive Teensy from power surges. The values of the bypass capacitors are shown in Figure 8. Be sure to solder the back of the regulator. This solder plane will serve as a heatsink. Screw the top of the regulator to the board.

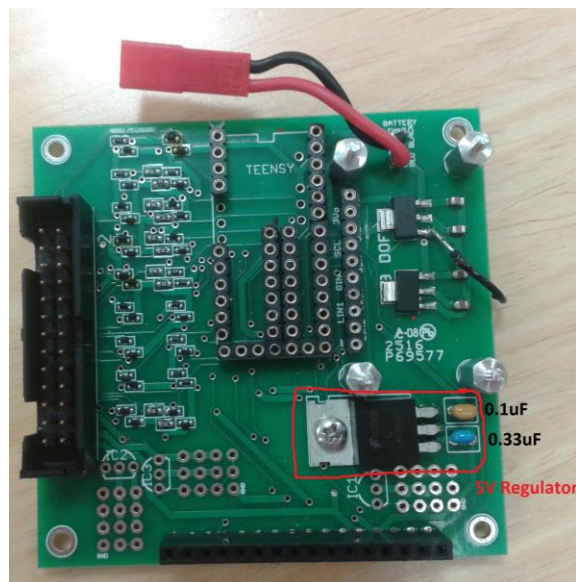


Figure 8. 5V Through-Hole Capacitor



There is a 3.3V SMT regulator for the protection diodes. Both bypass capacitors are 1.0uF.

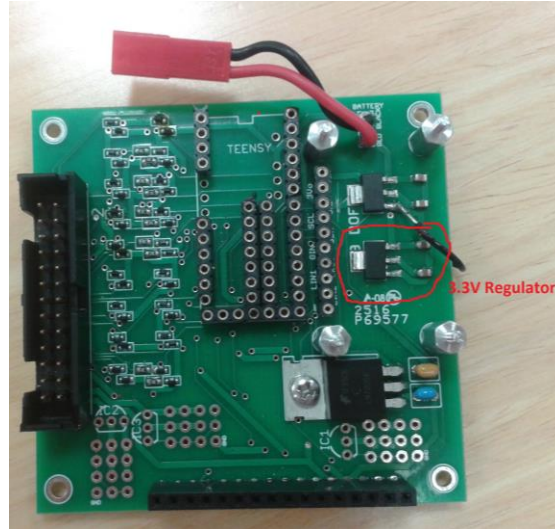


Figure 9. 3.3 SMT Regulator

Finally, there are three footprints for additional through-hole voltage regulators of your choosing. You will add these to your board in the final lab.

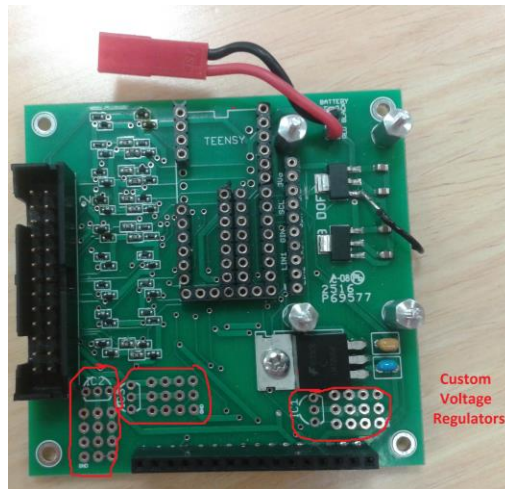


Figure 10. Additional Voltage Regulators

- Breakout Header Pins: A 16x1 female header connects power, motors, and temperature and pressure sensors from the Teensy to the E79 board. A ribbon cable header connects the Teensy to the sensors on your protoboard. Solder these two headers.

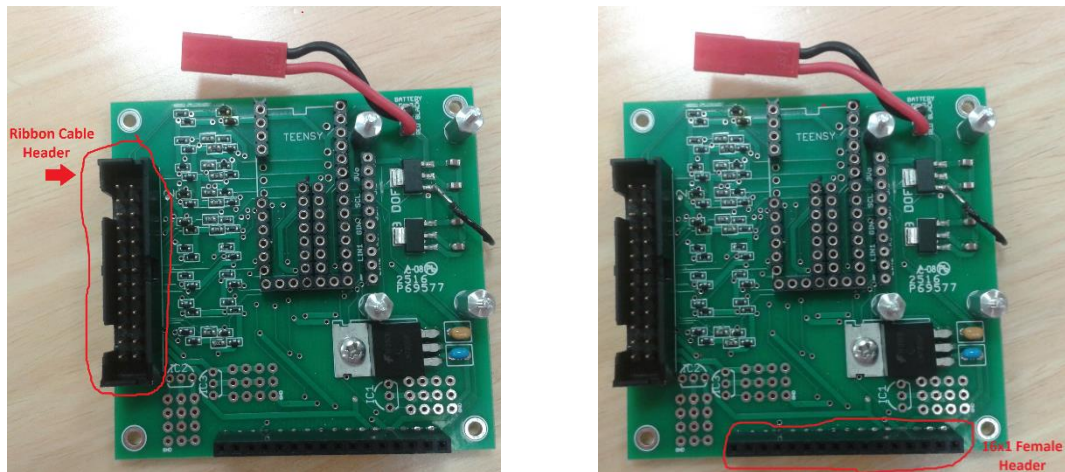


Figure 11. Header Connections to Protoboard and E79 Board

### Protoboard

The power rails and buses on your protoboard are labeled in Figure 12. It also have a ribbon cable header to receive the Teensy breakout and a SPST switch that resets your Teensy when pressed. You will not be working with the protoboard in this lab, but solder the ribbon cable header and switch (Figure 13).

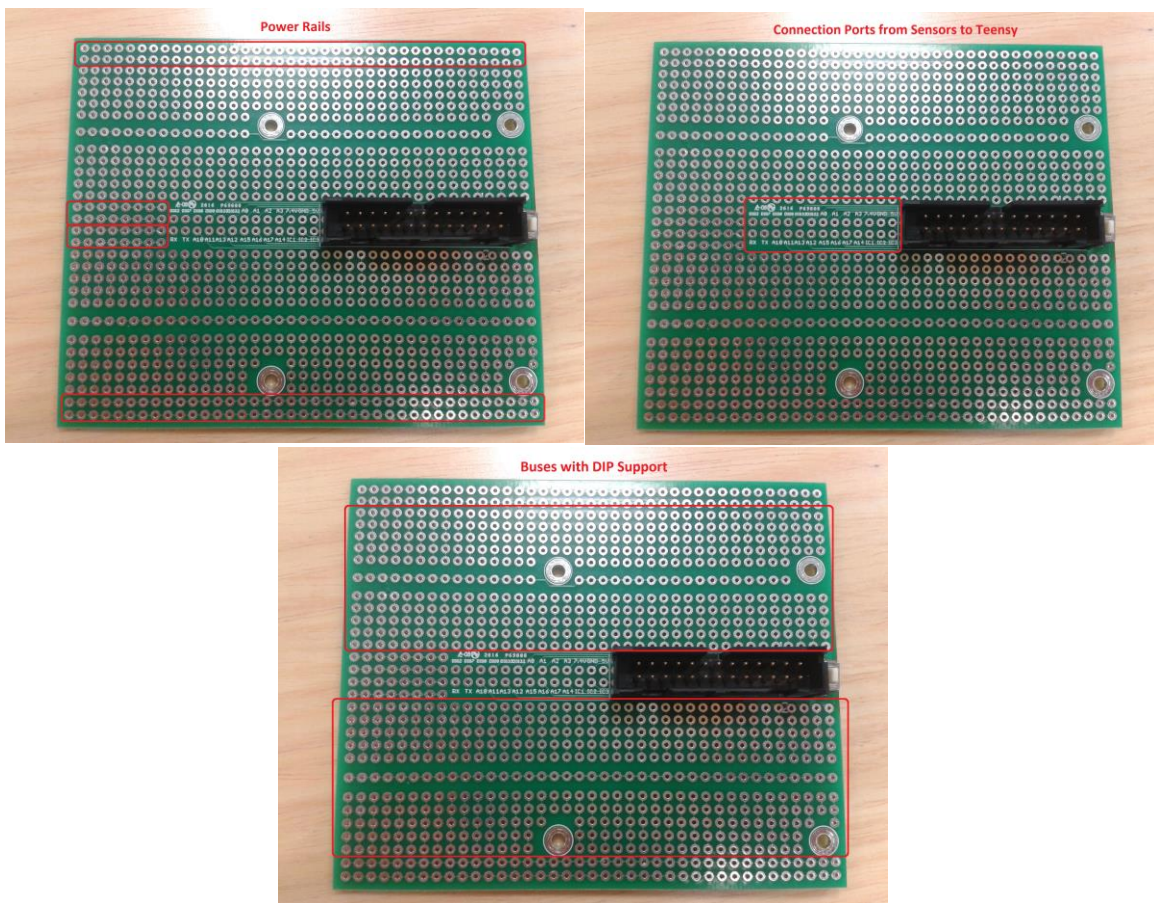


Figure 12. Protoboard Layout

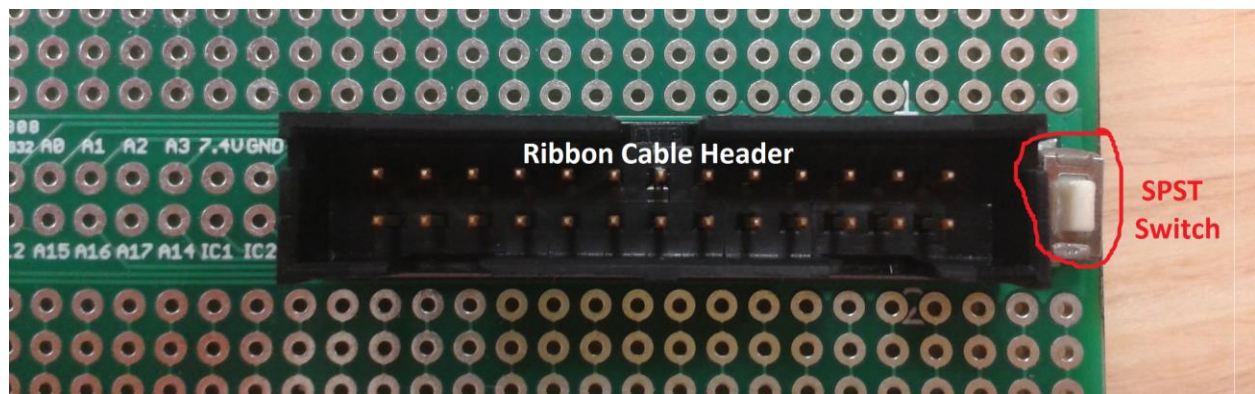


Figure 13. Ribbon Cable Header and SPST Switch