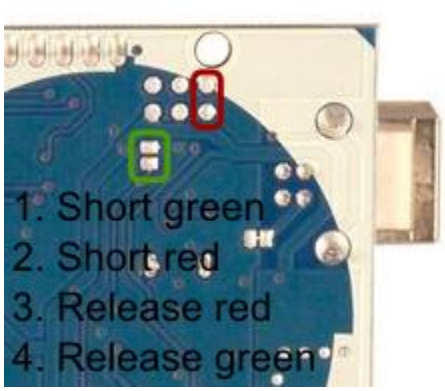
Part 1 – Programming the Arduino

Everything is pretty well documented in the code files themselves, but there are some things you need to know about changing the firmware on the Arduino. Megajoy is a custom firmware for the ATMega 16u2 IC that changes the USB serial communication with the host computer. The Megajoy firmware treats the Arduino Mega as a USB HID 2 'joysticks' – each with 32 digital inputs* and 6 analog inputs. While the Arduino is acting as a joystick, you cannot upload code. In order to upload code, you must reflash the firmware of the ATMega 16u2 chip with the stock firmware, and in order to use the Arduino as a joystick, you must flash the Megajoy firmware.

You will need to add the Megajoy Arduino library to the Arduino IDE of the computer you are working from. The library file is in the Megajoy code folder.

Part 1a – Flashing the Firmware

1. Plug the Arduino into the computer via USB (ideally with nothing connected, but it isn't very important)
2. Change the Arduino to DFU mode by following the steps in the picture (below)
    a. To verify that the Arduino is in DFU mode, check device manager for a device labeled "Arduino Mega DFU"



3. Run either the "MegaJoy – Attack!" (to flash the joystick firmware) or "TurnIntoAnArduino" (to flash the stock firmware) file found in the MegaJoy code folder. The CMD window should show that the process completed successfully.

Part 2 – The Boards

All of the circuit boards were designed using Eagle PCB design software. If you need to make boards in the future, you can get an educational version of the software for free.

The tutorial used to learn the software can be found here:
https://learn.sparkfun.com/tutorials/how-to-install-and-setup-eagle?_ga=1.85980057.1490931352.1430357896

* - Due to the driver's station software, only the first 12 digital inputs of each Megajoy joystick are supported. If more than 12 digital inputs are needed, they must be split between the two joysticks.

All the files for the current boards are found in the Eagle files folder of the Driver's Station documentation. There are also screenshots of each board for easy reference. Every pin is labeled and can be easily traced.

All button, LED, and switch connectors are RJ12 6 pin connectors.

The majority of the switches and buttons were purchased from Sparkfun , and the datasheets can be found there.

All SMD resistors are 0603 sized.

Part 3 – Programming the Arduino ProMini 328s

The smaller Arduinos used to control the LED strips and the 7-Segment display are Arduino ProMini 328s. These Arduinos do not have a separate microcontroller to control USB communication, so they must be programmed using another microcontroller as an intermediary between the computer and the ProMini. The team currently does not have one, but any USB FTDI cable can be used to program these Arduinos (be careful with these, I bought a cheap one from China and the new drivers issued by FTDI recognized a counterfeit IC and rendered the cable useless). Should you need to reprogram these Arduinos, I recommend buying an FTDI cable from Sparkfun or seeing if Nikhil has one you can borrow.

The code for these two Arduinos is found in the Arduino code folder.

Part 4 – Power Delivery

The main source of power for the system is the 12v Li-ion battery. This was a cheap Chinese battery so it's very likely it will fail soon. Any decent capacity 12v rechargeable battery will be an adequate replacement. This battery is routed directly to the VIN pin on the Arduino Mega so that the Mega will use its onboard voltage regulator for power. The battery is also routed directly to the +12V pin on the LED strips and the large 5V regulator on the LED strip board. This regulator supplies power to all of the buttons, LEDs (other than the strips), and displays.

Each board has two sets of power pins (+5V and GND). This is to allow the boards to be daisy chained together for power delivery. +5V power should originate from the LED strip board and terminate with the board that pulls the least current (a button or switch breakout).

* - Due to the driver's station software, only the first 12 digital inputs of each Megajoy joystick are supported. If more than 12 digital inputs are needed, they must be split between the two joysticks.

Part 5 – Wiring

All buttons and switches are wired with CAT3 6 conductor cable terminated in RJ12 6 conductor jacks. There are several custom wires for the seven segment display and other components. You should be able to determine wire order and identification from the PCB schematics.

* - Due to the driver's station software, only the first 12 digital inputs of each Megajoy joystick are supported. If more than 12 digital inputs are needed, they must be split between the two joysticks.