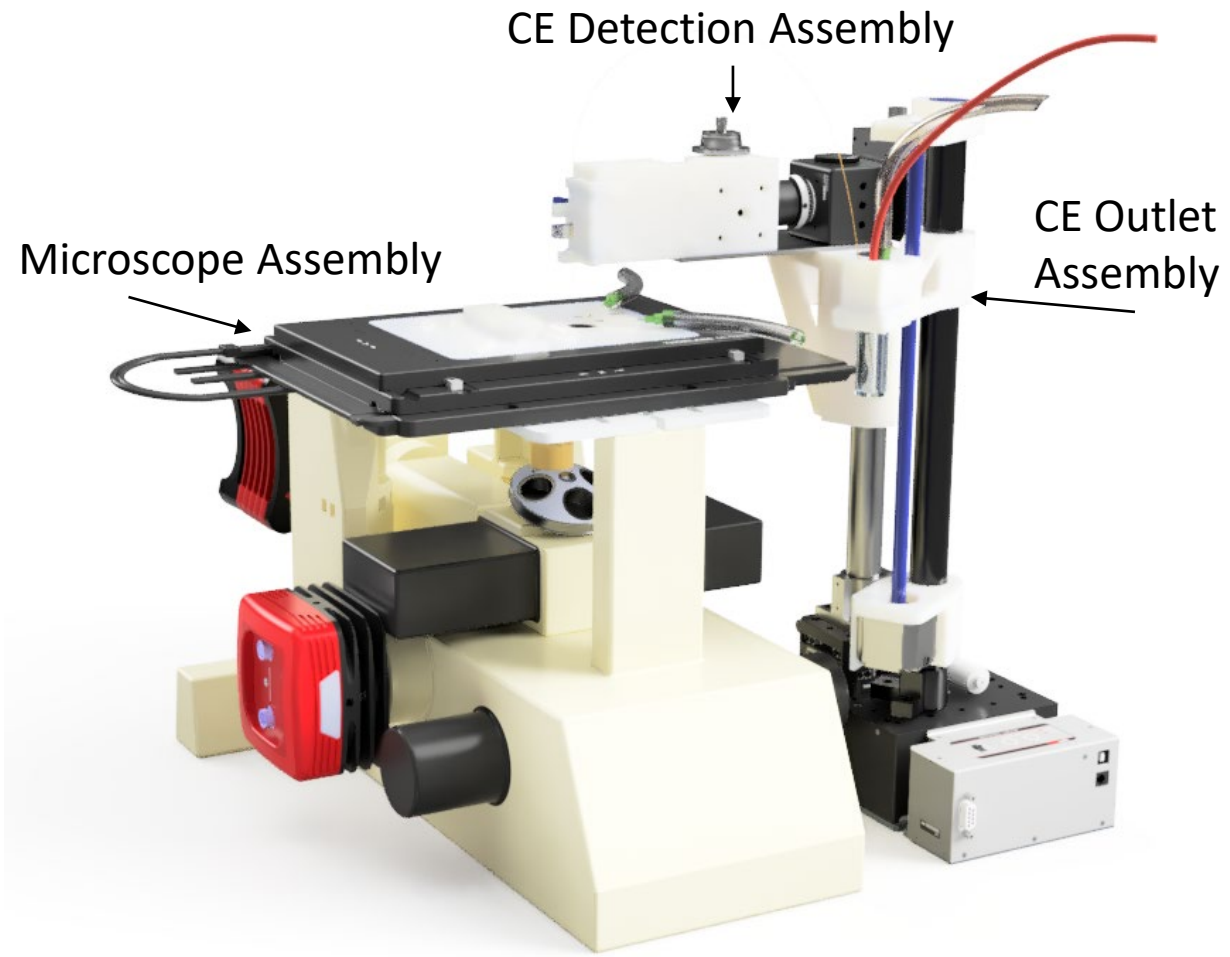
Instrument Overview

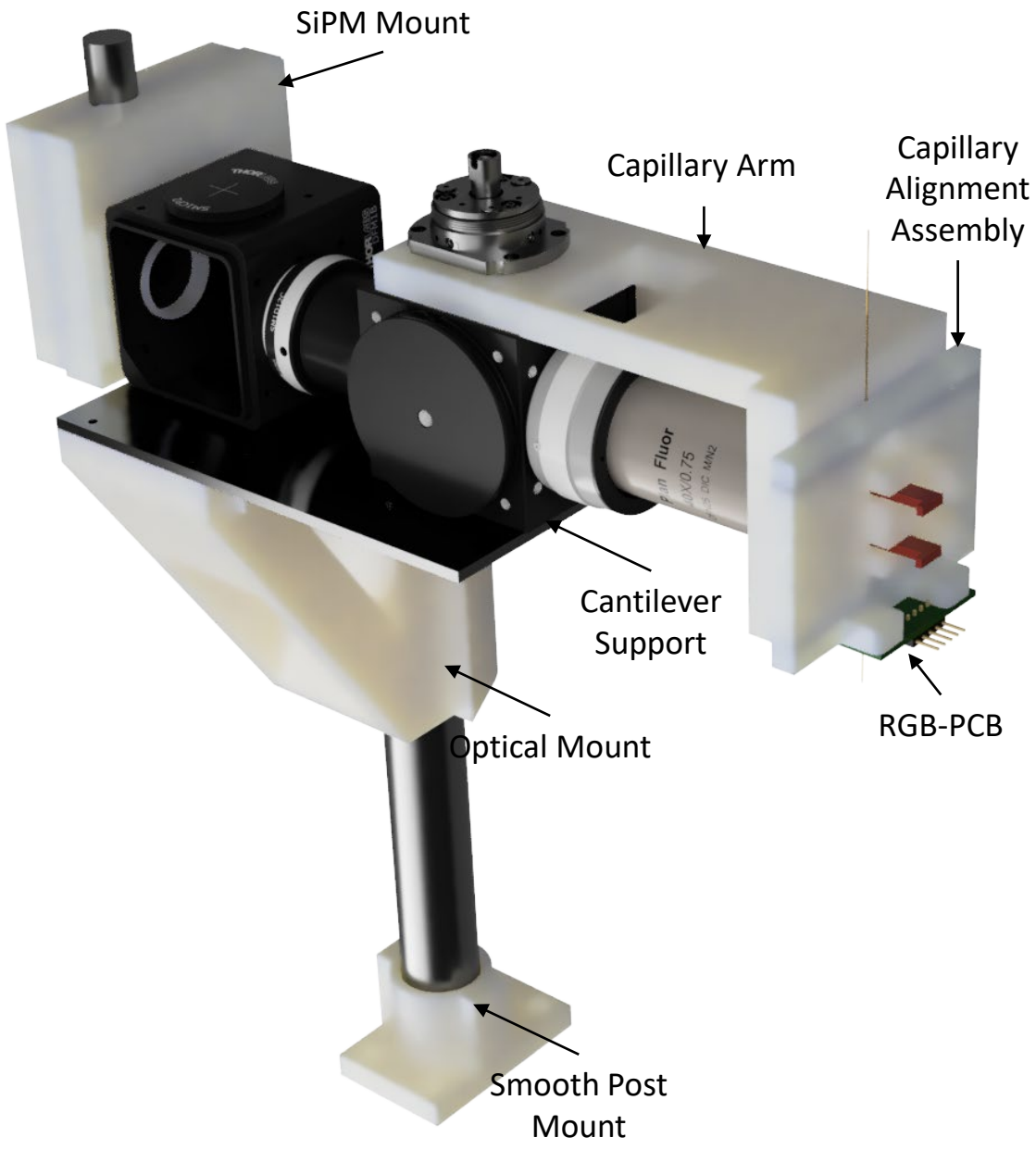
- Hardware setup can be divided into a few key assemblies:
  - Microscope Assembly
  - CE Detection Assembly
  - CE Outlet Assembly



CE Detection Assembly Custom Parts

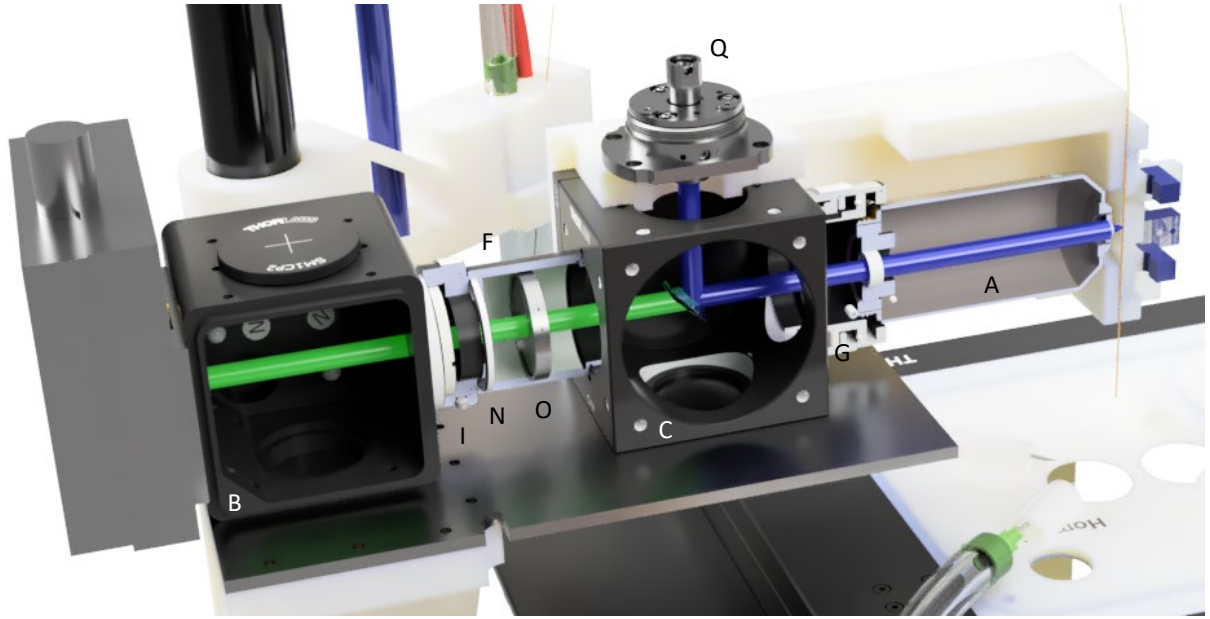
Custom Material List

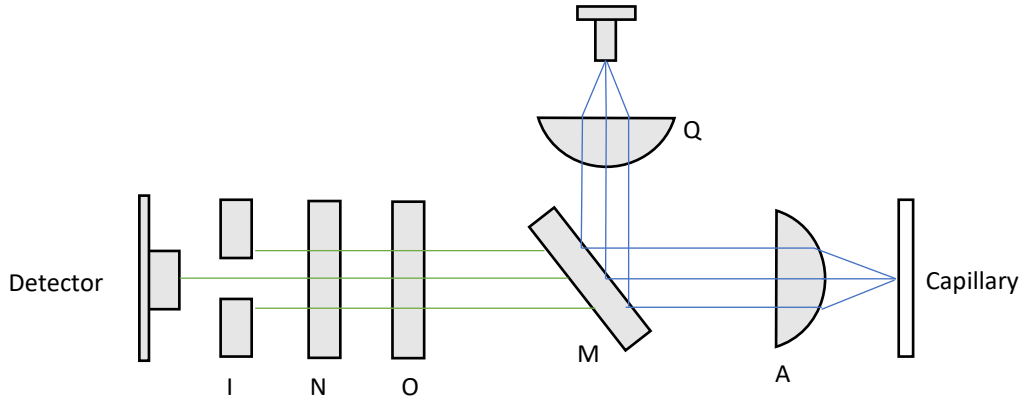
Object	Material	Fabrication
SiPM Mount	PLA/PETG	3D Print
Capillary Arm	PLA/PETG	3D Print
Cantilever Support	Aluminum	Mill
Optical Mount	PLA/PETG	3D Print
Smooth Post Mount	PLA/PETG	3D Print
Capillary Alignment Assembly	PLA/PETG	3D Print
RGB-PCB	FR4	EDA/PCB Fab.



CE Detection Assembly Purchased Components

	Component	Company	Part number	Notes
A	40X Objective 0.75 NA	Nikon		
B	4-Way Mounting Cage	Thorlabs	C4W	
C	Cage Dichoic Filter Mount	Thorlabs	FFM1	
D	Rotatable Cover Plate	Thorlabs	B3C	
E	Blank Cover Plate	Thorlabs	B1C	
F	10 mm Lens Tube	Thorlabs	SM1L10	
G	External SM1 threads to internal M25x0.75 Thread (objective)	Thorlabs	SM1A12	
H	External C-mount to SM1 thread	Thorlabs	SM1A39	*PMT
I	Calibrated Iris Diaphragm	Thorlabs	SM1D12C	
J	SM1 Threaded Manual Shutter	Thorlabs	SM1SH1	*PMT
K	End Cap with SM1 Threads	Thorlabs	SM1CP2	
L	Non Roating adjustable SM1 Lens Tube	Thorlabs	SM1ZM	
M	Dichroic (488 nm)	Chroma	ZT488rdc-UF2 (IN036384)	25.5 x 36 x 2mm
N	Bandpass Filter (525 +/- 25 nm)	Chroma	ET525/50m (IN005750)	25 mm dia mounted
O	Notch Filter (488 nm)	Chroma	ZET488NF	25 mm dia mounted
Q	Fiber Receptacle Collimators	OZ Optics	HPUCO	
P	gasket tape	McMaster-Carr	95705K133	*PMT .02" thick
R	Optical post	Generic		25 mm Diameter

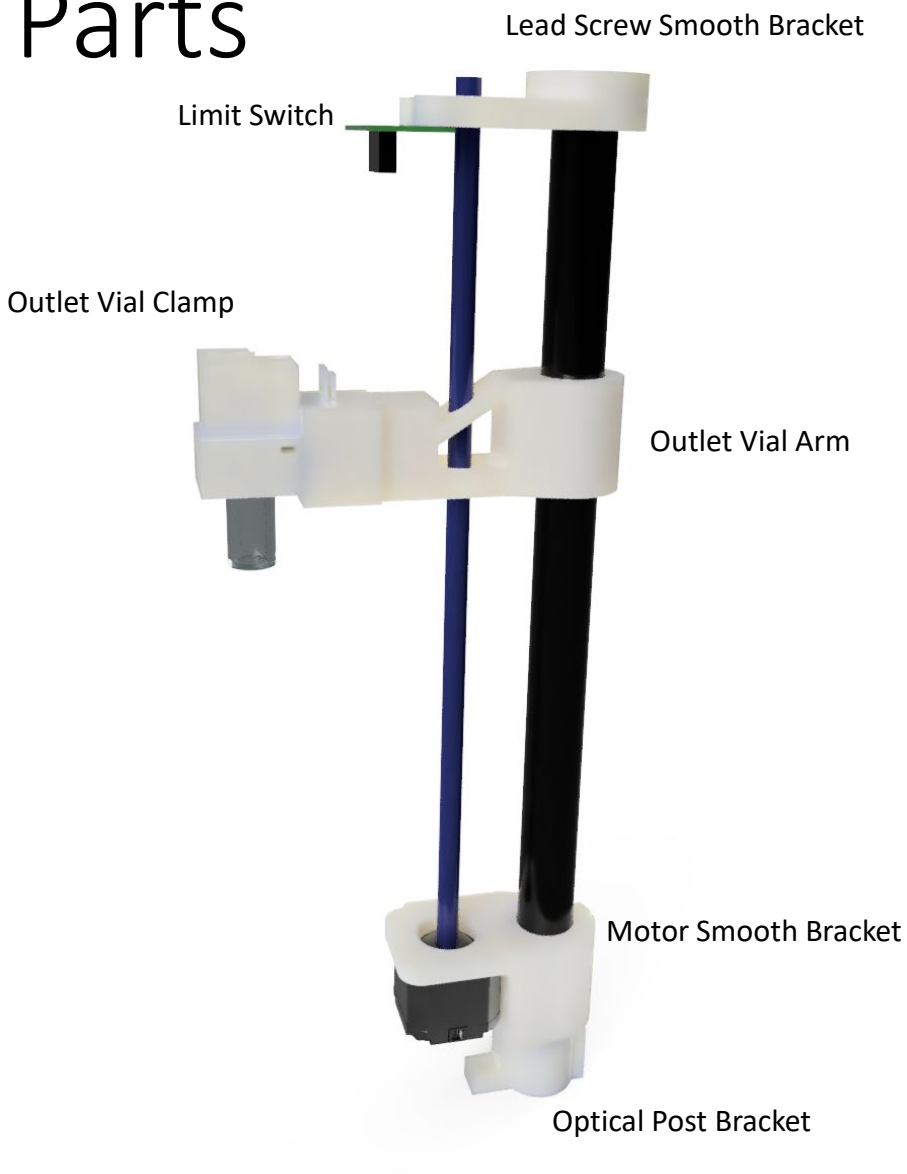




* Items needed for Hammatsu PMT detector. Can be ignored when using SiPM

CE Outlet Assembly Custom Parts

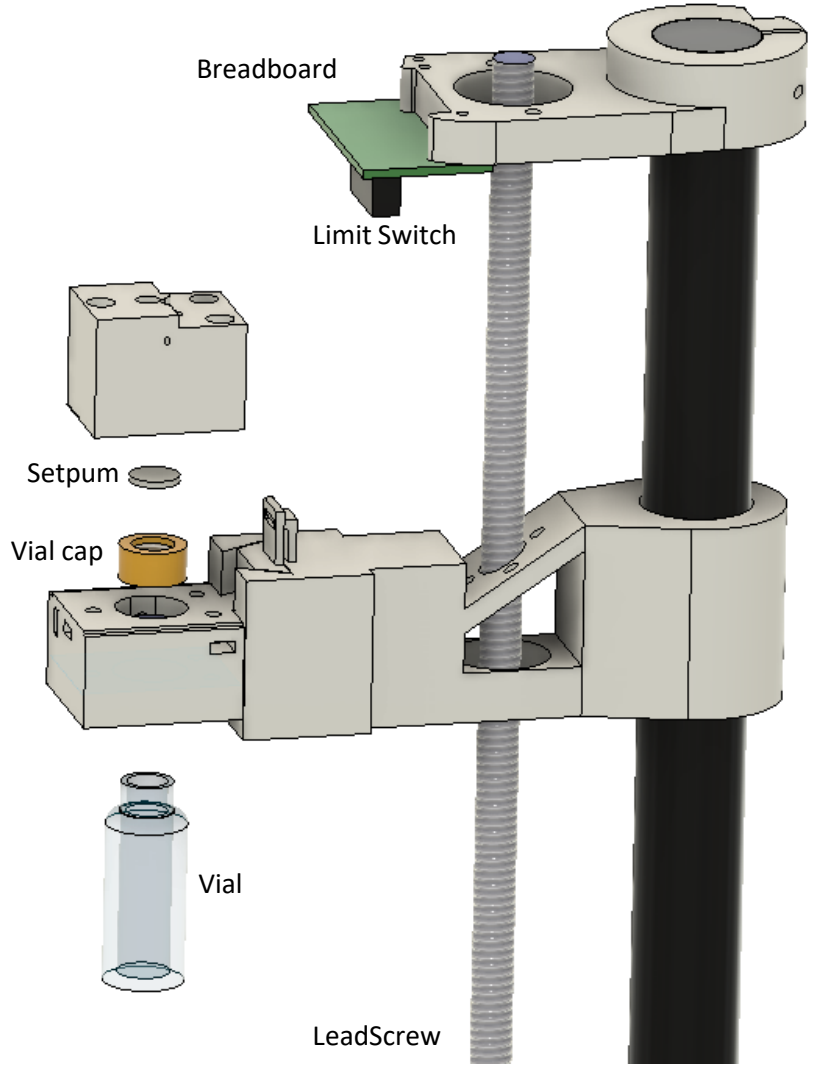
Object	Material	Fabrication
Outlet Vial Arm	PLA/PETG	3D Print
Outlet Vial Clamp	PLA/PETG	3D Print
Lead Screw Smooth Bracket	PLA/PETG	3D Print
Motor Smooth Bracket	PLA/PETG	3D Print
Optical Post Bracket	PLA/PETG	3D Print
Limit Switch	Breadboard	Snips/Scissors



CE Outlet Assembly Purchased Components

Object	P/N	Supplier	Notes
2.54 mm Pitch Connectors	HDB-635	Hilitchi, Amazon	Any standard crimped 2.54 mm connectors
Limit Switch	DBWDKG-FT01	MUZHI, Amazon	Any standard SPDT Switch
Lead Screw w/ Motor and nut	RDX3D060	Redrex, Amazon	Any leadscrew + motor combo*
Vial, Cap, and Septum	27340	MilliporeSigma	Can be swapped with other 4 mL open top screw cap vials with PTFE/Silicon septum.
M3 Nylon Screw	92492A721	McMasterCarr	16 mm L
M3 Screws + Hex Nuts	M3-0420F-SS305	Iexcell, Amazon	Generic assortment of lengths
Arduino Uno		Arduino	
PowerSTEP01	X-NUCLEO-IHM03A1	Mouser	
12 V Power Supply		SmoTecQ, Amazon	The driver can power 12-48V so choose a power supply suitable for your motor.

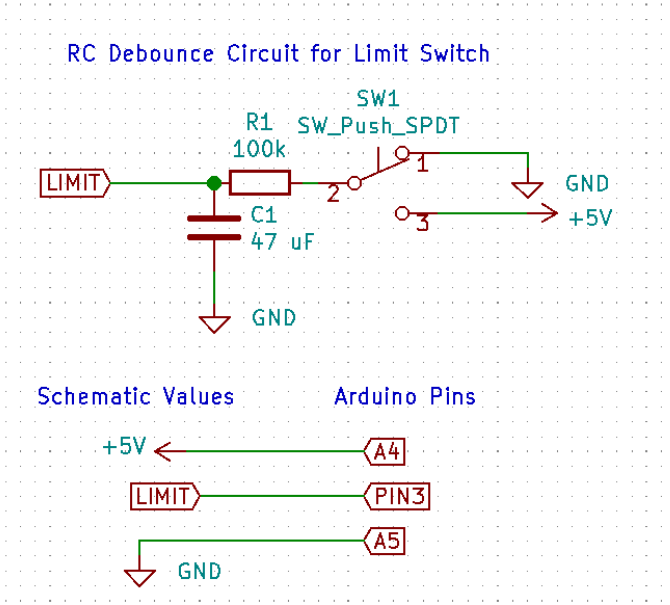
* 8 mm lead on the lead screw and 1.8° step for the motor will not require adjusting the OutletControl.ino code.



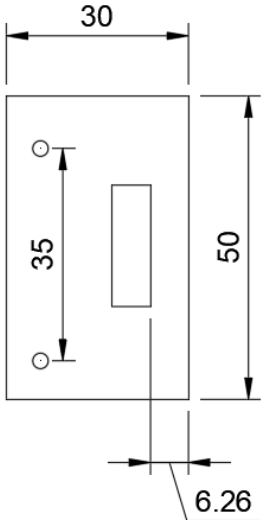
Exploded view of the outlet assembly.

Limit Switch for Outlet

- Simple through hole bread board can be used.
- Most generic single pull double throw (SPDT) limit switches will work.
- Breadboard can be cut with box cutters or snips. To rough dimensions specified.
- Breadboard will need to have two holes drilled for 3M mounting spaced 35 mm apart, 3.1mm diameter.



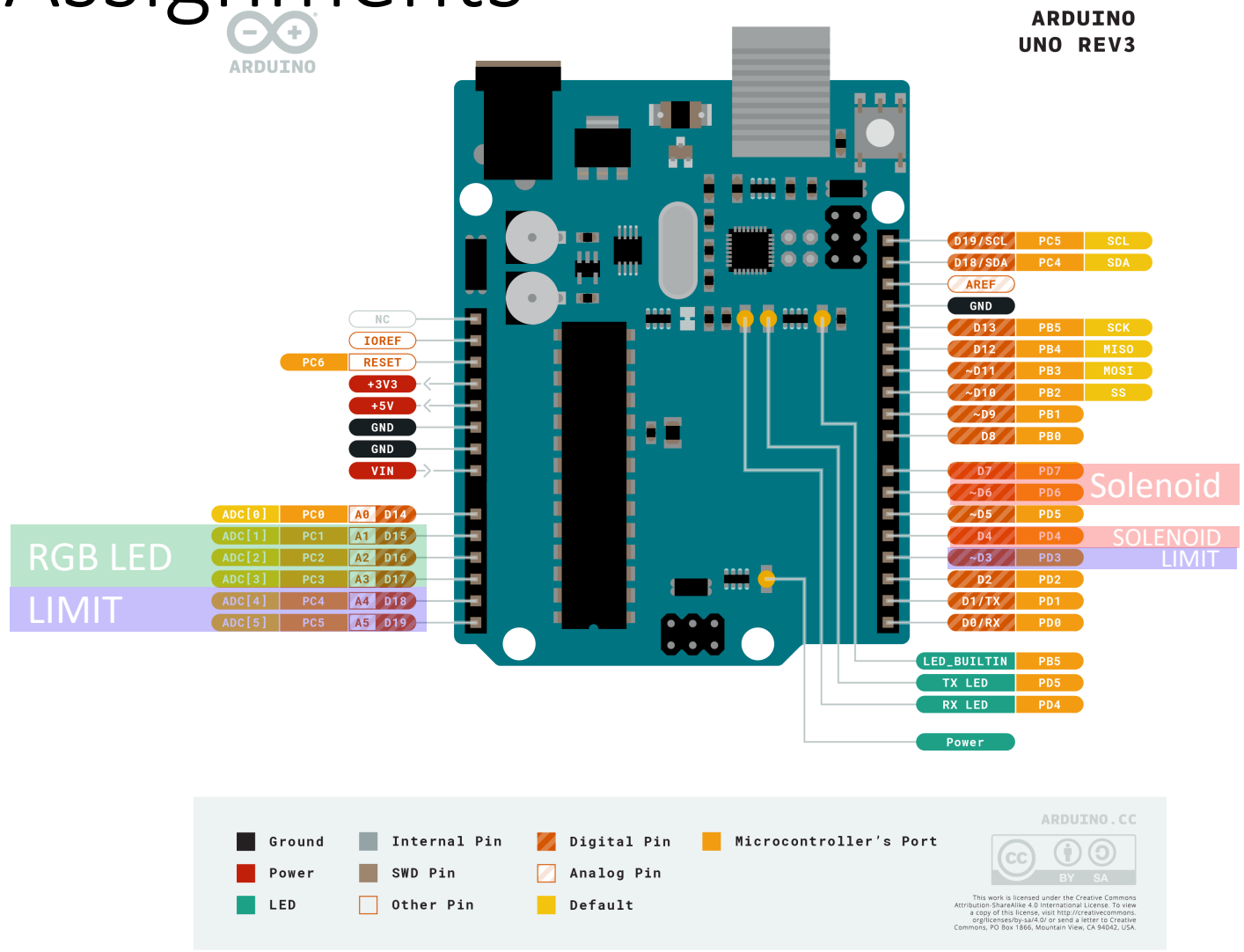
Wiring diagram for Limit Switch



Breadboard dimensions in mm

Outlet Arduino Pin Assignments

- Place the X-Nucleo ontop of the Arduino Uno.
  - *Pin spacing is the same for Nucleo and Arduino Uno.*
- 3 Wires are reserved for the limit switch (A4, A5, D3).
- 3 Wires are reserved for the inlet RGB LED (A1, A2, A3)
- 3 Wires are reserved for the Solenoid (D4, D6, & D7)
- Wire the stepper motor to the Nucleo output screw terminals (A+/A-, B+/B-).
  - Each coil of the stepper motor is indicated by A or B. Identify which leads correspond to the same coil using an Ohm meter.
- Connect the 12 V power supply to the Nucleo power screw terminals (Labeled GND and +V).



https://store.arduino.cc/usa/arduino-uno-rev3