FocusStepper Arduino Build

Parts & Retailers

Arduino Uno:
https://www.sparkfun.com/products/11021

https://www.adafruit.com/products/50

Stepper Drivers:
DRV8825 https://www.pololu.com/category/154/drv8825-stepper-motor-driver-carriers-high-current

Stepper motors:
I have had good experience from omc-stepperonline. Ships from china via express shipping.

Currently using this motor http://www.omc-stepperonline.com/9deg-nema-17-bipolar-stepper-motor-09a-36ncm51ozin-17hm150904s-p-267.html

https://www.sparkfun.com/categories/246

Blue tooth parts (Optional, just exclude for pure USB usage):
Bluetooth serial slave http://www.amazon.com/gp/product/B0093XAV4U

Selector switch to enable and disable bluetooth or USB. If using a bluetooth modal, you must select the serial device to use before boot.

Other parts:
100uF or greater capacitor

22ohm resistor

4n35 or any 4n3x/4n2x optocoupler

2.5mm TRS plug for Canon/Pentax cameras. A whatever the heck plug Nikon users need ;)

1a 9v or greater Power supply plus additional power jack. If a motor that is <9v is used, a voltage regulator should be used after the decoupling capacitor. The Arduino's power jack is not used because of the power requirements (See schematic)

Notes

Motor selection and microstepping:
In order for a motor to microstep well, the the stepper driver's decay rates must be tuned for the specific motor used. Since the driver being used for this project can not have custom decay rates set, we are stuck with what we have. Therefore all motors may not microstep evenly, or be able to microstep at smaller microstep values. It is up to the user to test the motor and see what microstepping modes work for the selected motor. My current recommendation is to aim for a motor close to 1a, and to keep the motor under your chosen power supply's limit.

Further reading about decay:
Overview of slow, fast, and mixed decay modes http://ebldc.com/?p=86
TI paper for adaptive decay(not used on this project, but gives good information) http://www.ti.com/lit/wp/slyy066/slyy066.pdf

Remember that in operation, smaller microstepping values will lead to lower torque for the same power consumption. Smaller microstepping values also allow for faster motor speed. If you can not achieve the RPM needed, you might be able to achieve it with a smaller microstepping value.

Stepper driver tuning:
How the driver is tuned will partially dictate what microstepping values will operate well, and the temperature at which the motor operates.

Pololu provides a brief video for tuning their stepper drivers, located here
https://youtu.be/89BHS9hfSUk

As an alternative, you can also adjust the current by listening to the motor carefully while it is powered and idle. Adjust the current to the point where the motor is at its quietest, and Bob's your uncle you have a ridgy-didge didgeridoo.

Power Supplies:
Be sure to use a quality power supply, or one that you have tested. Many cheaper power supplies advertise power they can not actually supply or use peak values.

Heat:
Remember that stepper motors can get hot while running. Stepper motors CAN and WILL burn you, so be careful around them. Some motors can operate up to 100C, while others should not be operated above 60C. Check your spec sheet for its max temperature rise if you are concerned about the amount of heat it is generating.

Schematic

DRV8825

$\overline{EN}$	VMOT
MS1	GND
MS2	2B
MS3	2A
$\overline{RST}$	1A
$\overline{SLP}$	1B
STEP	VDD
DIR	GND

C1
100µF

12v 1a

M1

ROB-08420

Uno R3

Arduino
Uno
(Rev3)

RESET	D0/RX
RESET2	D1/TX
AREF	D2
ioref	D3 PWM
	D4
A0	D5 PWM
A1	D6 PWM
A2	D7
A3	D8
A4/SDA	D9 PWM
A5/SCL	D10 PWM/SS
	D11 PWM/MOSI
	D12/MISO
	D13/SCK
N/C	

3V3 5V VIN

GND

Bluetooth Module

Bluetooth
Mate
Silver

CTS_5V	TX_5V
	RX_5V
	RTS_5V

VCC

GND

R1
220Ω
±5%

Bluetooth Switch

Camera Shutter

4N35

NC

Shutter Cable

SLEEVE

RIGHT

LEFT