

Macroduino – Build Guide

Component List

The provided links are just suggestions, substitutes can be used, as long as they have the same specifications and form factors. Any changes beyond that would require changing the source code.

Qty	Component	Link
1	Arduino Uno	adafruit
1	- 12V Power Supply	amazon
1	- USB Cable	adafruit
1	Adafruit Motor Shield Kit	adafruit
1	- Stacking Header Kit	adafruit
1	Adafruit LCD Shield Kit	adafruit
	Camera Control Circuit	
2	- Sharp PC817 Optocouplers	mouser
2	- 330-ohm Resistors	mouser
1	- 3.5mm Stereo Audio Female Jack	sparkfun
	Shutter Release Cable	
1	High Torque NEMA 17 Stepper Motor	amazon
1	- 5mm Flexible Shaft Coupler	adafruit
1	Hejnar Photo Screw Adjusting Macro Rail	hejnarphoto
	Motor Bracket	
	- Option 1 - DIY	
1	- NEMA 17 Bracket	adafruit
1	- Spacer	DIY
	- Option 2 - TBD	

Assembly Instructions

Adafruit Motor Shield Kit

The benefit of Adafruit's kit is that it uses an I2C bus interface versus individual pins. The Arduino Uno has a limited number of I/O pins, so any chance to minimize is good. While there are additional connections on the shield that won't be used, this is the simplest way to control the motor. Adafruit's tutorial has complete assembly instructions - <https://learn.adafruit.com/adafruit-motor-shield-v2-for-arduino>.

NOTE - Be sure to install the optional stacking headers instead of the standard headers. Also, install the VIN power jumper. This will let you power the motor shield from the Arduino's DC power jack. You also need to clip off the extension so that it fits under the LCD shield.

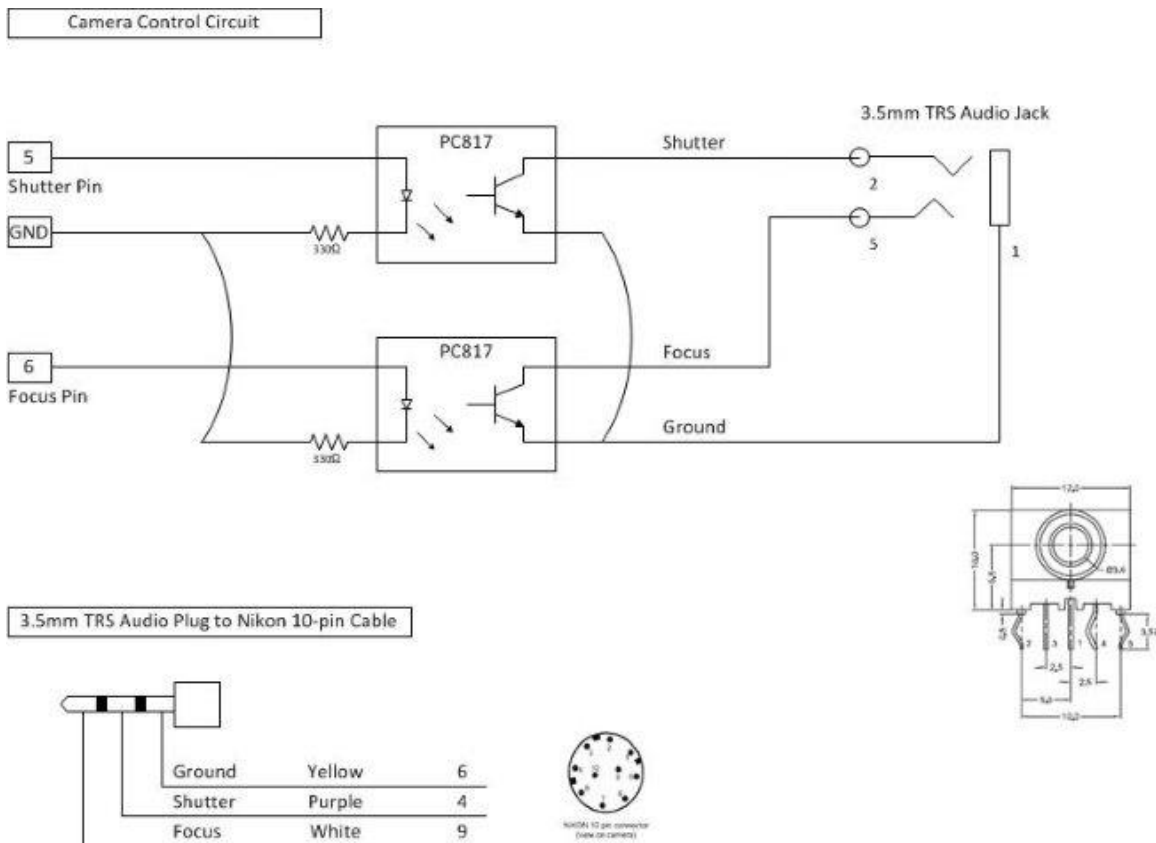
The Motor Shield will also hold the Camera Control circuit, but we'll get to that later.

Adafruit LCD Shield Kit

Like the Motor Shield, the LCD Shield uses the I2C bus. You can find Adafruit's tutorial at <https://learn.adafruit.com/rgb-lcd-shield>.

IMPORTANT NOTE – Take extra care to ensure that there is space between the reset button and the contrast potentiometer. Some older versions of this kit have a design flaw that makes it easy for a short circuit between these two parts to occur.

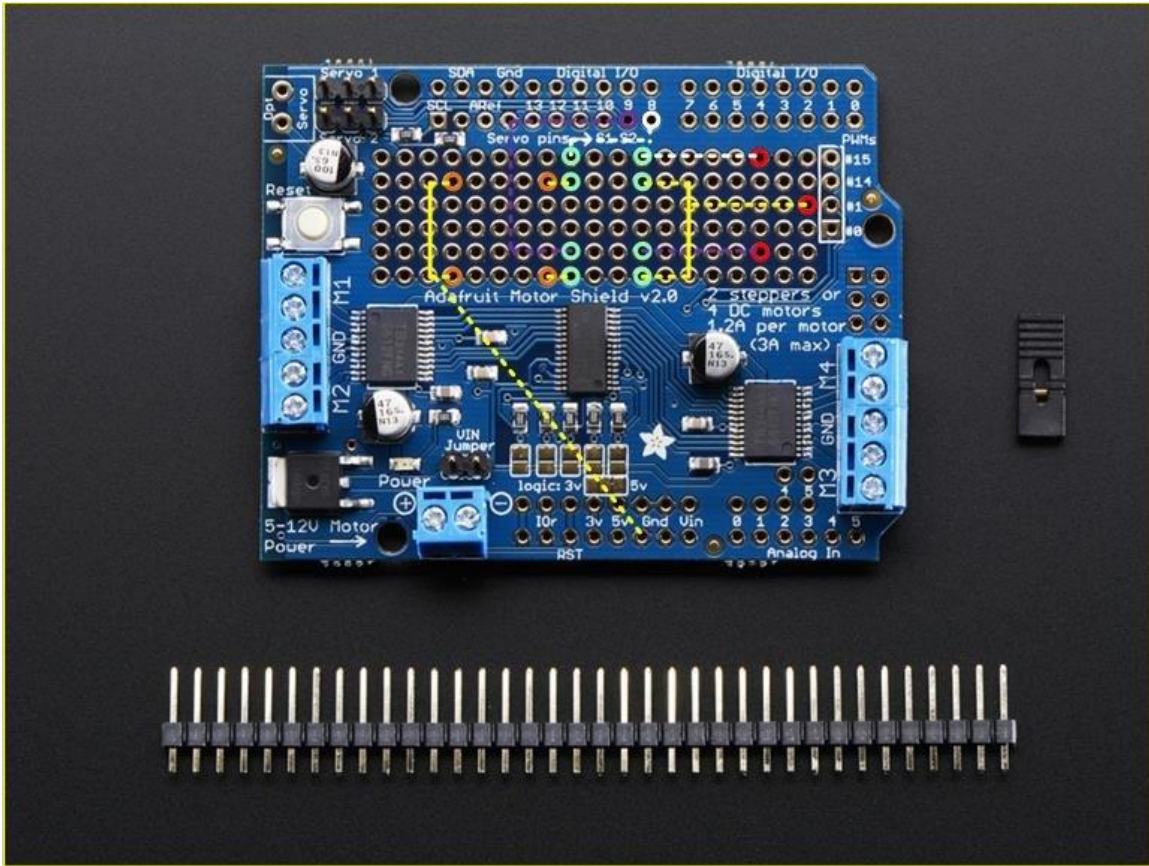
Camera Control Circuit



At the heart of this circuit is the Sharp PC817 Optocoupler. This little wonder keeps the camera completely isolated electrically from the Arduino. There are many examples of similar circuits on the Internet that use transistors, but wiring them incorrectly could potentially damage your expensive camera gear.

There is a difference between Nikon and Canon (and possibly others) in that Nikon cameras require you to activate the focus (aka a “half press”) for a short time before activating the shutter release (aka a “full press”). This circuit is designed to work with the Nikon specification, but **should** work for both systems.

You could make this into a separate shield, but there is a small expansion area on the Motor Shield that we can use for this simple circuit.



Step 1 – Audio Connector

Datasheet - <https://www.sparkfun.com/datasheets/Prototyping/Audio-3.5mm.pdf>

Jack Pin 1 = Ground

Jack Pin 2 = Focus

Jack Pin 5 = Shutter

The jack should be placed on the top of the shield so the Jack Pin 1 is aligned with Arduino IO Pin 2 and the Jack Pins 2-5 are aligned with IO Pin 4. The red circles indicate how to place the jack. It should be as close to the IO pins as possible, this will make it easier to solder the other connections.

Turn the shield over and solder all the jack pins.

Step 2 - Optocouplers

Datasheet - <http://www.mouser.com/ds/2/365/PC817XNNSZ0F-185038.pdf>

Place the optocouplers on the top of the shield, three or four rows away from the audio jack, so that the two collector pins are aligned with Jack Pins 2 and 5.

The light green circles are where to place the PC817 optocouplers. Polarity is critical; the notch in the top should be facing to the left. The part number printed on it should also be oriented the same way as the text on the board.

Turn the shield over and solder all the optocoupler pins

Step 3 – Connect the Optocouplers to the Audio Jack

Looking at the bottom of the shield, if you placed the optocouplers correctly, you should be able to connect the two collector pins straight forward to Jack Pins 2 and 5.

Turn the shield over so you are looking at the top. Using a jumper wire, bridge the two emitter pins

Turning to the bottom once again, connect the emitter pin inside the two collector pins to Jack Pin 1.

Step 4 – Resistors

Turning to the top again, place the two resistors in line with the optocouplers' cathode pins. The orange circles are where to place the resistors. They have no polarity. Use another jumper to connect the two resistors.

Turn the board over and connect one end to the Arduino's GND pin.

Step 5 – Focus and Shutter Pins

The white, purple and yellow traces are the connections between the various components. Dotted lines indicate that it should be done from the bottom of the board.

There's a slight error with the long, diagonal, yellow line. It should actually be to the hole directly above it. Where it's shown now is the location of the pin.

Shutter Release Cable

There are many ways to accomplish this, but the bottom line is that you need a cable with one end that attaches to your camera and one that has a male 3.5mm stereo plug on the other.