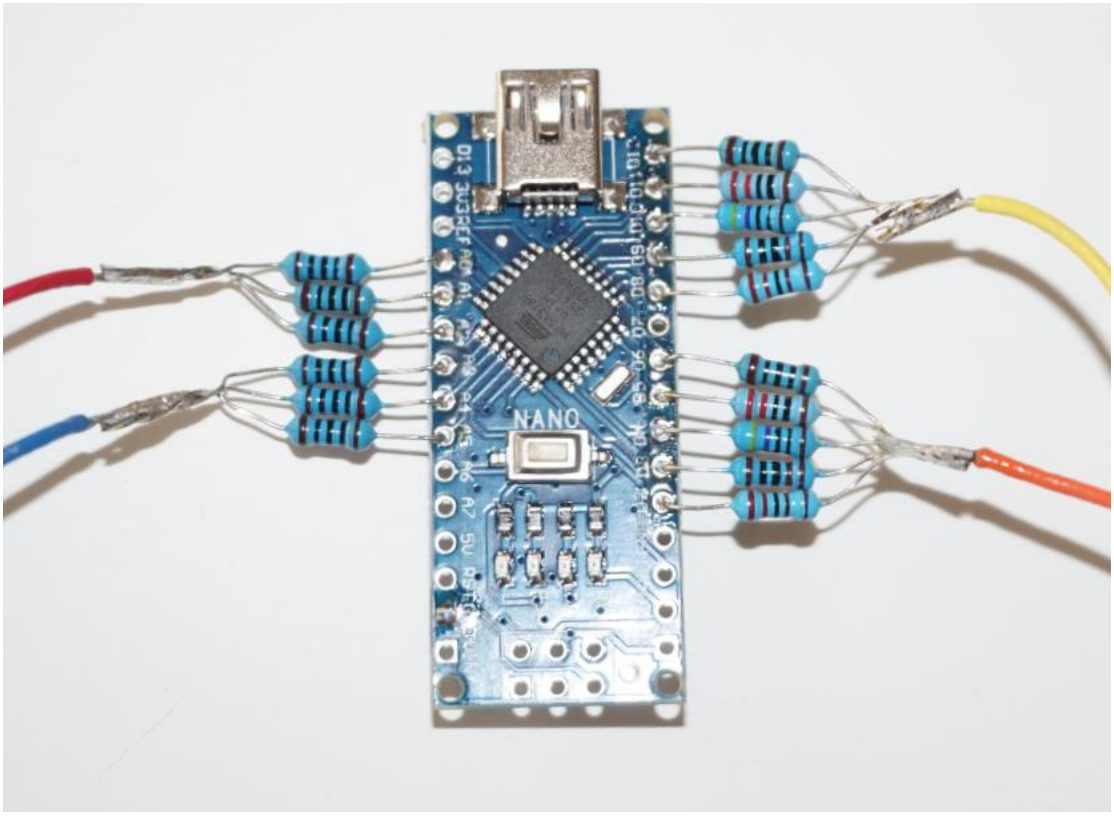

SIMPLE MOTOR CONTROL CIRCUIT

Description of an alternative motor control circuit for the Silent Desk Clock that does not use a circuit board

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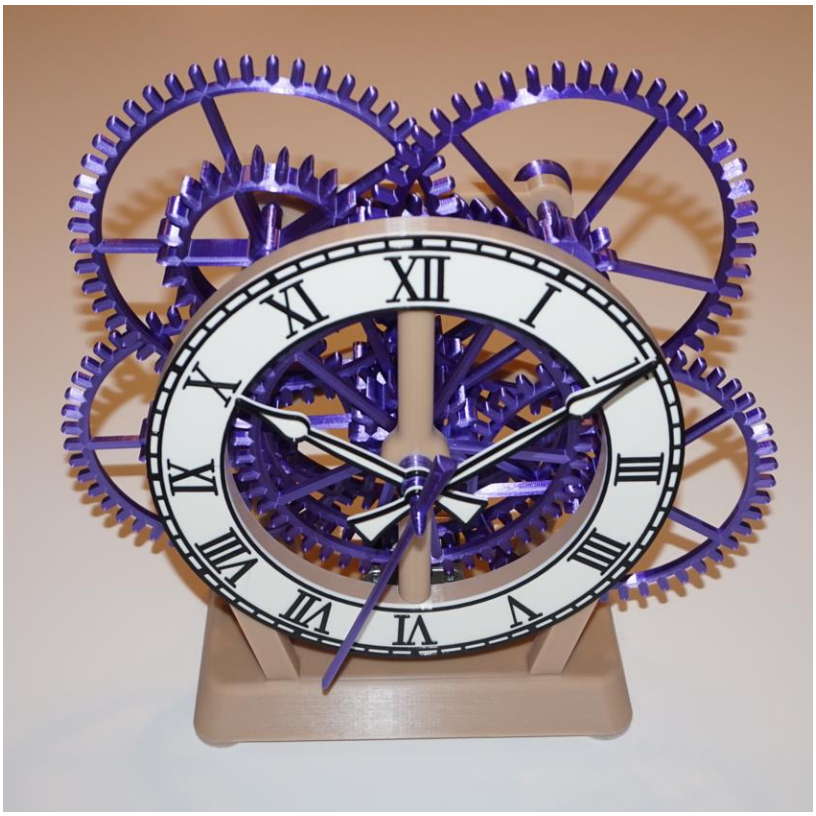
Description

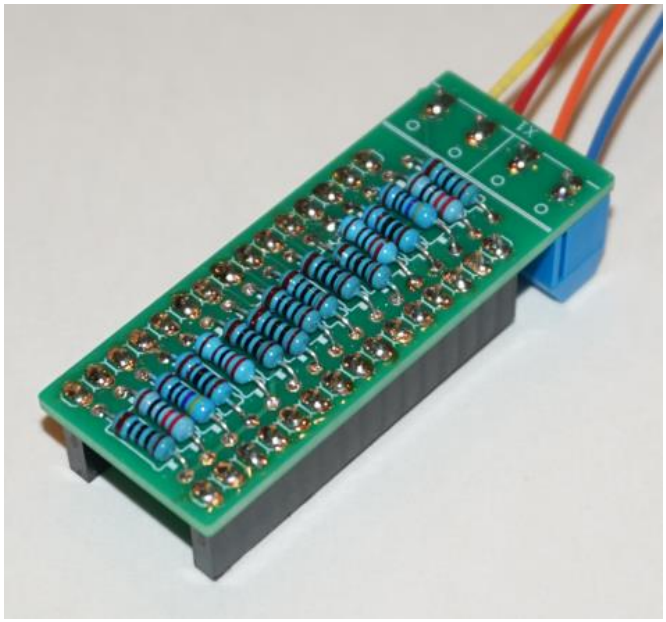
I have a small desk clock on MyMiniFactory (https://www.myminifactory.com/object/3d-print-183452) that utilizes a custom stepper motor control circuit. This was the best solution I could find the keep the clock running quietly. Stepper motors are inherently notchy and off the shelf motor controllers made the gears rattle. The custom design was made available as a kit on Etsy for a very nominal cost. The kit is small enough to be mailed within the US using normal letter postage, however many clock builders are outside the US with different customs rules for each country. I have been letting Etsy handle the details and they appear to be doing a great job. I don't care for the international shipping and customs overhead that triples the cost of the kit, so I am sharing a method to build your own controller.



Silent Drive Desk Clock

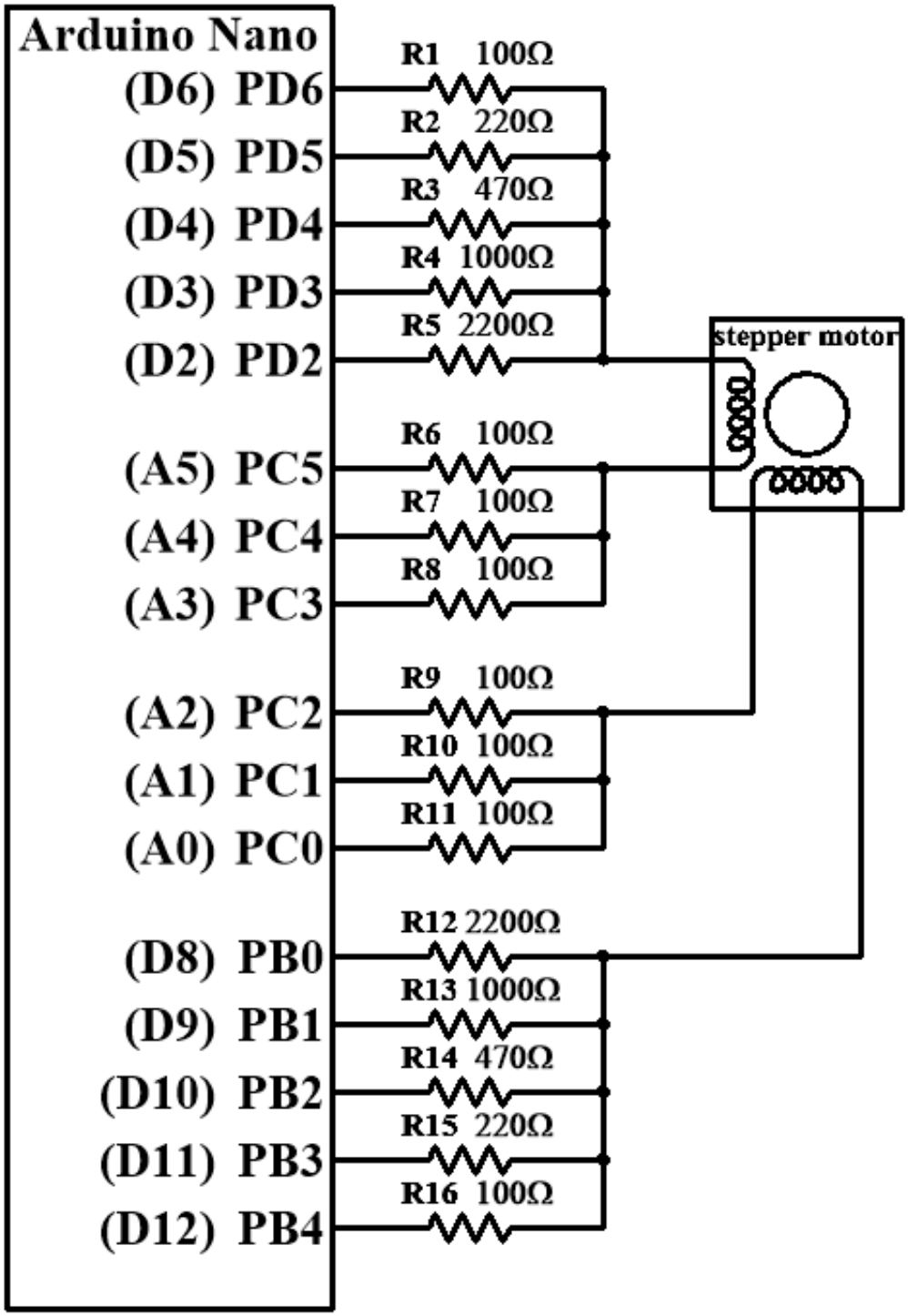
The cleanest solution uses the small circuit board that is shown on the right. This is the kit that is available on Etsy. The board contains only a few resistors and some headers that plug onto the Arduino Nano.

It is a fairly simple circuit using resistors to control the motor current. This solution has 64 position micro-stepping and really helps make the clock run smoothly.



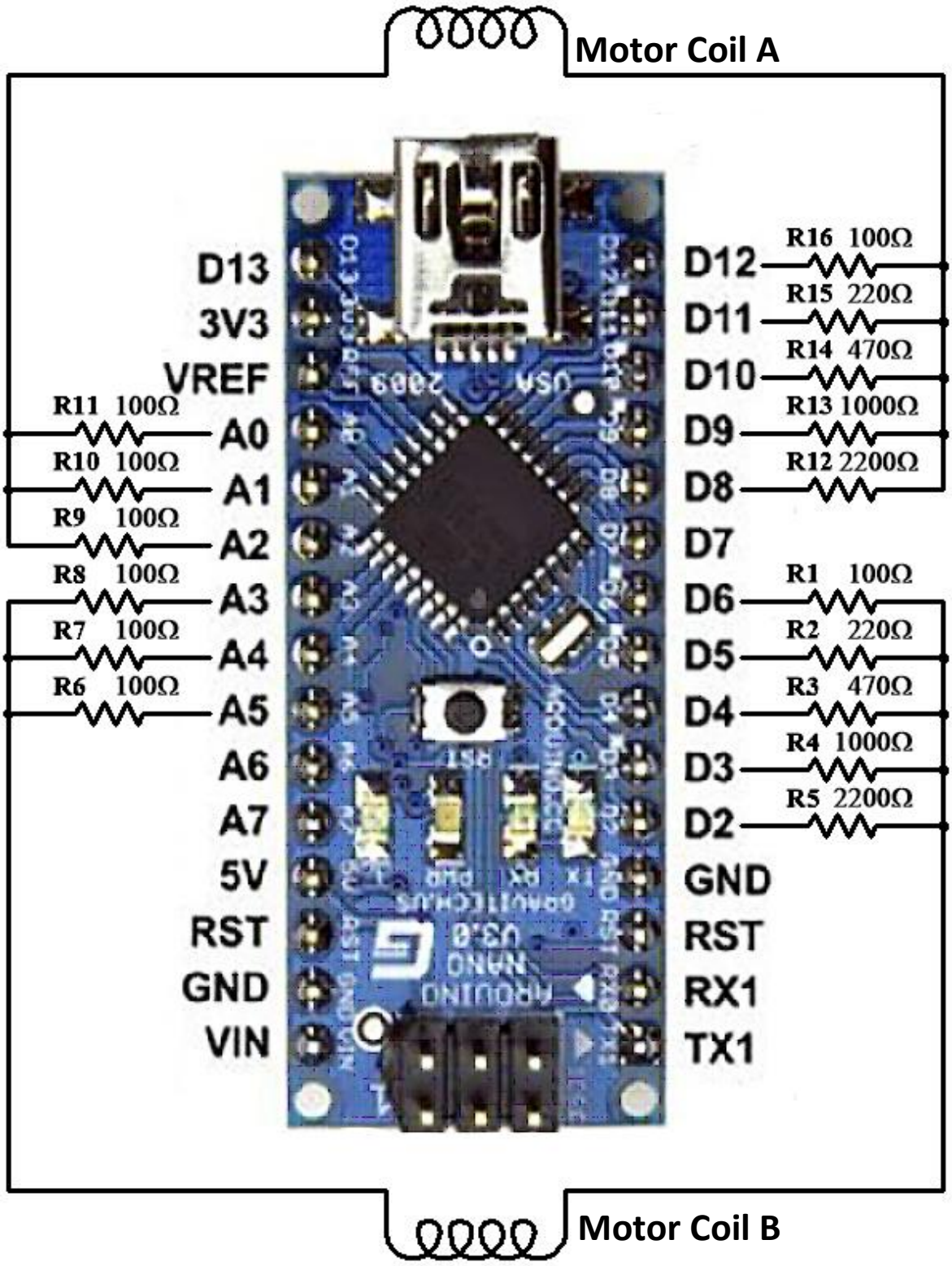
Custom Motor Control Circuit

Here is the schematic for the motor control board. The Arduino Nano drives the stepper motor directly through resistors to limit the current. The currents are well within the safe operating range of the Arduino Nano. There is just enough power to run the clock without so much torque that the exposed gears become a safety risk.



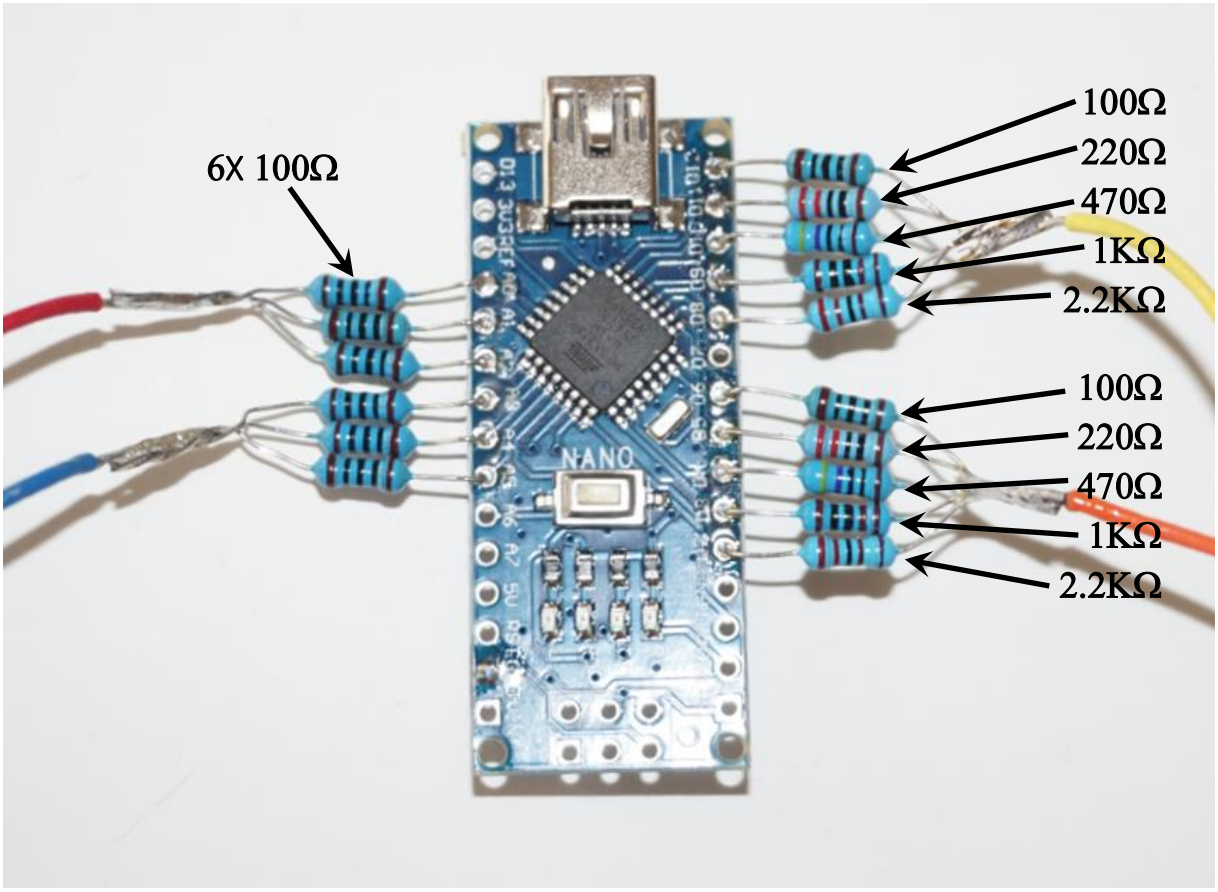
Control Board Schematic

Here is the same schematic re-drawn as they are positioned around the Arduino Nano. Notice how easily they fan out with no crossing wires. This should be easy to build without using the circuit board.



Control Board Resistor Layout

This is how the hand wired circuit looks like by directly soldering the resistors to the Arduino Nano. Follow the resistor positions as shown on the previous page. The resistors on the left are all 100Ω. The resistors on the right are 100Ω, 220Ω, 470Ω, 1KΩ, 2.2KΩ, skip a pin, then repeat the pattern. You will need to provide the resistors, but the values are fairly common and might be available locally. 1/4W resistors are shown, but the design should also work with 1/8W or 1/2W resistors.



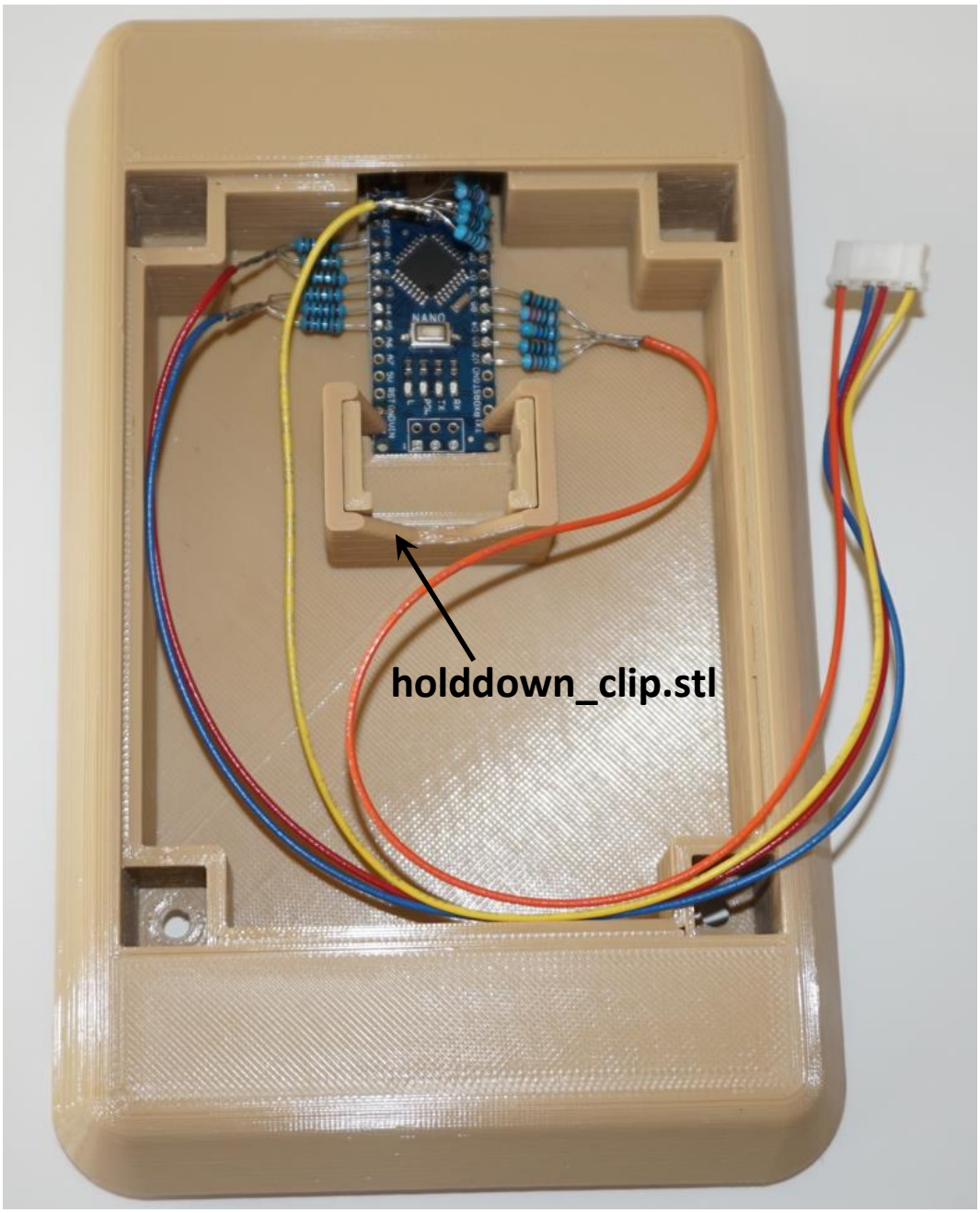
Hand Wired Control Board

Leave about 1/4” (6mm) of space between the Arduino and the resistor body. Solder the resistors onto the Arduino, clip the tail on the back of the board, twist the outside ends of the resistors together, and solder the motor wires. It is really simple.

The stepper motor used in this example has a connector on the motor body, so the wires can be soldered directly to the resistors at this time. If your stepper motor does not have a connector, then you will need to pass the wires through the printed motor mount before soldering to the resistors.

The final step is to add the finished assembly into the clock base. If you are using the base with the power plug on the side, then the resistors will need to be bent over slightly as shown in the picture below. Keep a gap between the resistors and the mini USB port. The base with the power plug in the back is a better solution with more room for the resistors, but either solution will work.

One last concern is that the Arduino Nano is not held down firmly when using this hand wired solution. A small clip (holddown_clip.stl) has been added to hold the Arduino Nano in place. This clip is not needed when using the small circuit board.



Complete Solution