Diamond Engraving Tool

ASSEMBLY GUIDE

(For soldering kit version of Diamond Engraving Tool)

The Diamond Engraving Tool is an optional accessory for The Original Egg-Bot Kit, http://egg-bot.com/

The Diamond Engraving Tool turns your Eggbot into a vibrated-tip diamond-point engraving tool, capable of light-duty marking and drawing on hard materials like glass, stone, and ceramic.

This assembly guide covers the procedures for putting together the engraver kit.
See page 3 for a list of tools required for assembly.

You can find the latest version of this manual at: http://wiki.evilmadscientist.com/Engraver

Support Forum: http://www.evilmadscientist.com/forum/

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Evil Mad Scientist

Engraver kit version 1.1
Assembly Manual v. 1.1b
6/19/2013

Diamond Engraving Tool

PLEASE READ THESE IMPORTANT SAFETY NOTICES ABOUT YOUR KIT

Caution: Please exercise appropriate care when building your engraver kit: The kit contains small parts and sharp parts (like the diamond). Keep out of reach of small children. Older children and teens may require adult assistance.

Caution: This is a soldering kit, which requires assembly by persons skilled in and familiar with good safety practice for soldering. Soldering irons and things heated by them can be extremely hot and can cause severe injury or start a fire. The soldering guidelines herein are not a substitute for proper training, nor for proper safety practice.

Caution: Dust created by engraving objects can be potentially hazardous. Assure good ventilation and take additional necessary precautions if you are engraving objects that can create hazardous dust.

Warning: The engraver is capable of cracking and shattering fragile objects like lightbulbs and christmas ornaments, which could potentially result in sharp, flying shards. Wear safety glasses, and do not allow children to operate the engraver without adult supervision.

STEP -1: Tool Checklist ("Before you get started...")

Essential tools: Needed to build the kit:

1. Soldering iron + solder

A basic soldering iron meant for electronics, with a reasonably fine point tip. We recommend one of this design-- a "pencil shape" soldering iron (not gun!) with a base that holds the iron and a wet sponge. A tip in good condition (a "tinned" tip) should get shiny when hot-- able to melt and wet to solder.

While you don't need an *expensive* one, your makes *a big difference* in the time needed to build the kit. (Seriously. If you use one that is old and busted, or a $10 radio shack iron, or that thing from the dollar store, you should expect to spend at least twice as long soldering!)

Our recommendation for a low-cost iron:
model WLC100 by Weller, about $40.

You'll also need some solder. Thin *rosin-core* solder (roughly .020 - .040" in diameter) is the most common type for electronic soldering, and is the only choice that is appropriate for electronic kits. Either standard (lead-bearing) or newer "lead free" solder types will both work just fine.

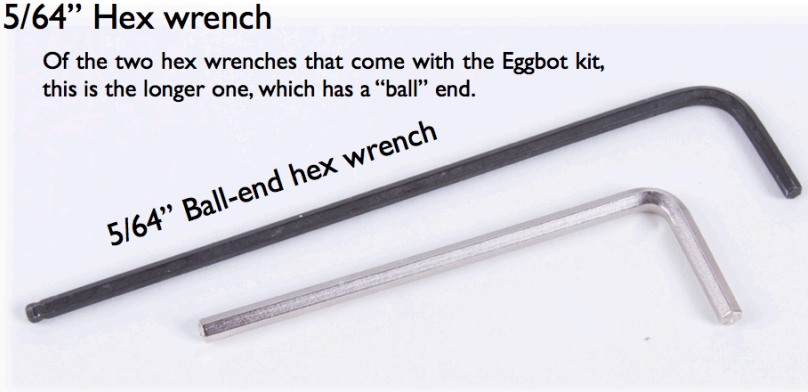
2. Angle flush cutters

Small nippers for for clipping loose wire ends close to the circuit board.

e.g., Sears Craftsman

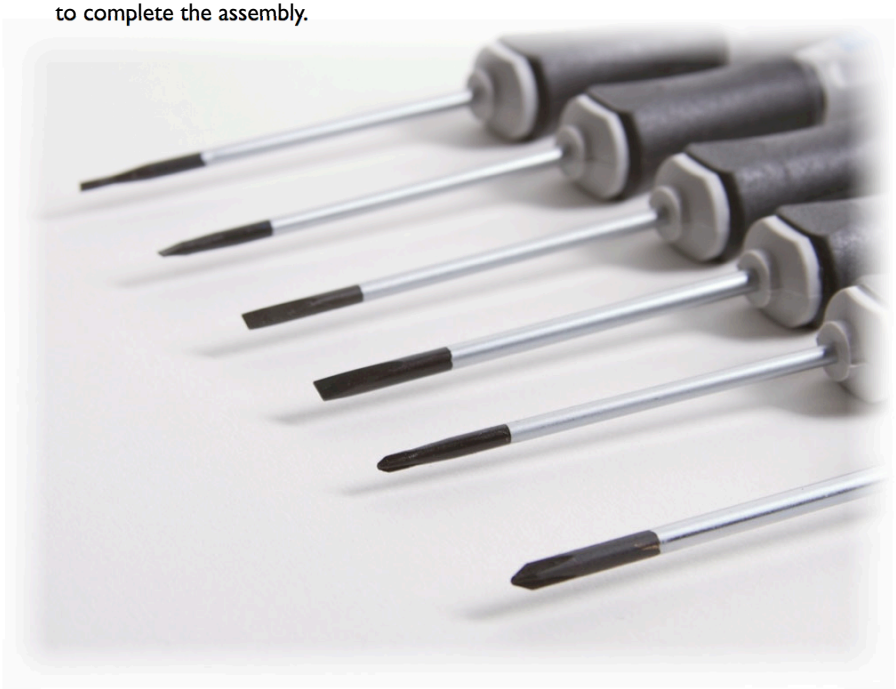
3. 5/64" Hex wrench

Of the two hex wrenches that come with the Eggbot kit, this is the longer one, which has a "ball" end.



4. Small screwdrivers

You will need both miniature Phillips and flathead screwdrivers to complete the assembly.

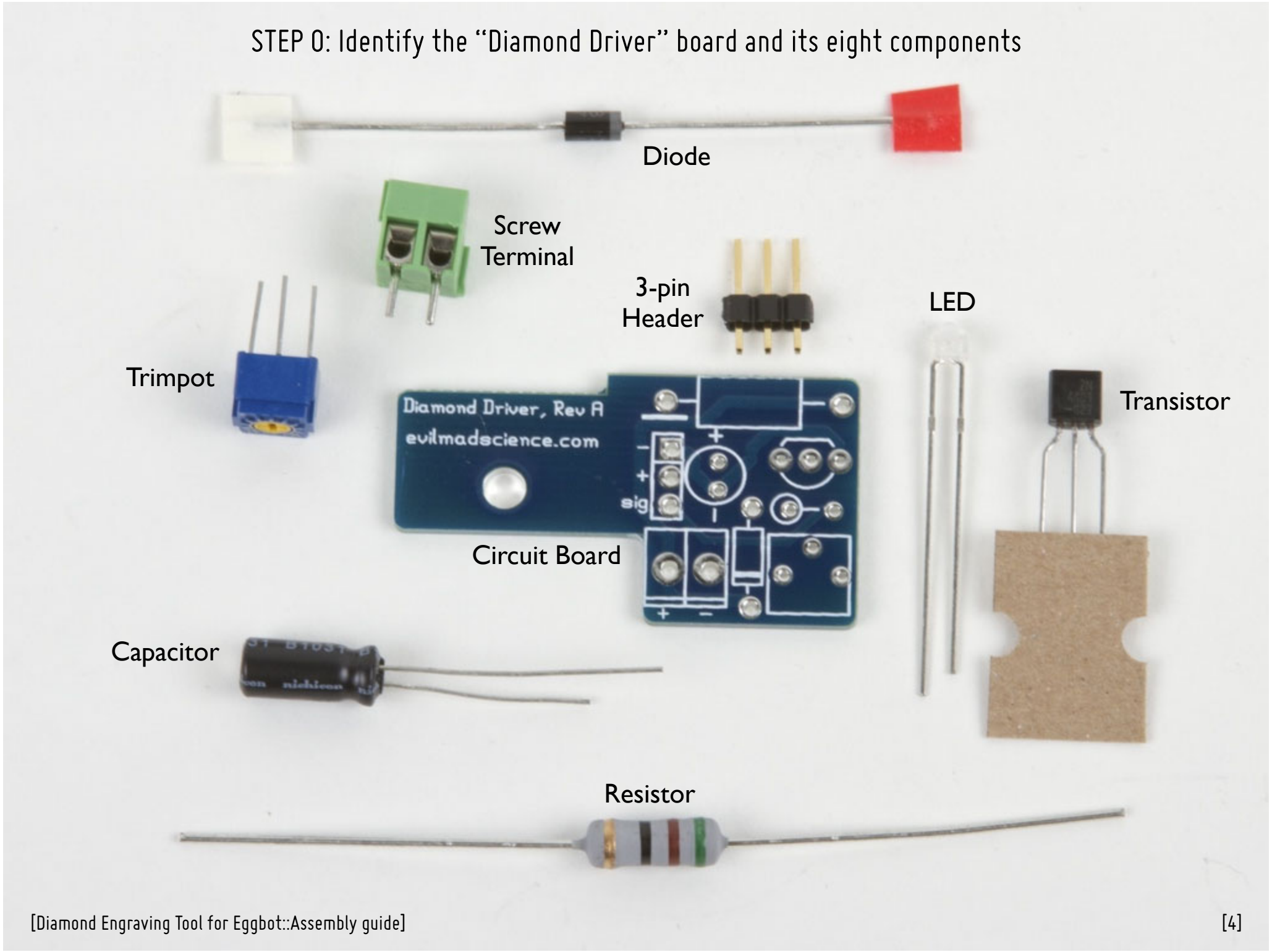


Possibly required: Have on hand, just in case

5. Small pliers with smooth jaws

If your engraving motor needs re-attachment, these will come in handy.

STEP 0: Identify the "Diamond Driver" board and its eight components

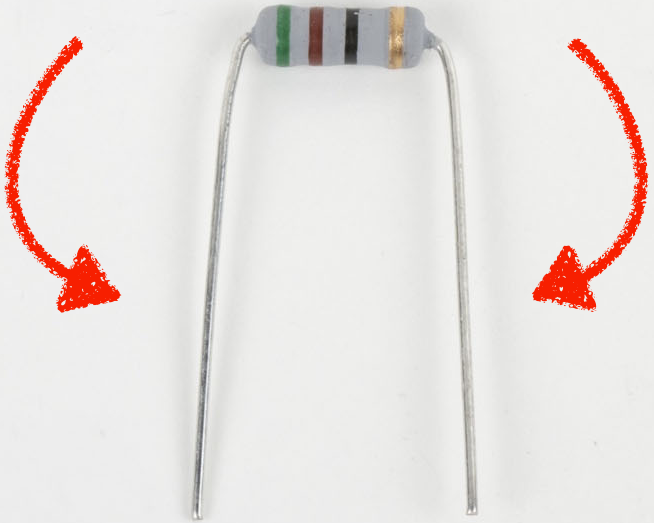


STEP 1: Add the resistor to the circuit board

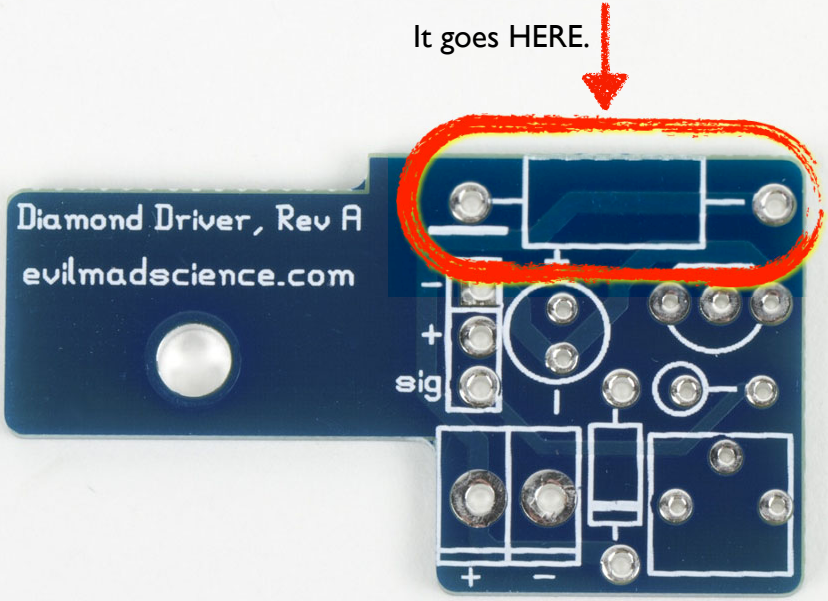
Our first assembly task will be to build the "Diamond Driver" circuit, by soldering the components to the circuit board.

The first component is this "plus-sized" resistor.

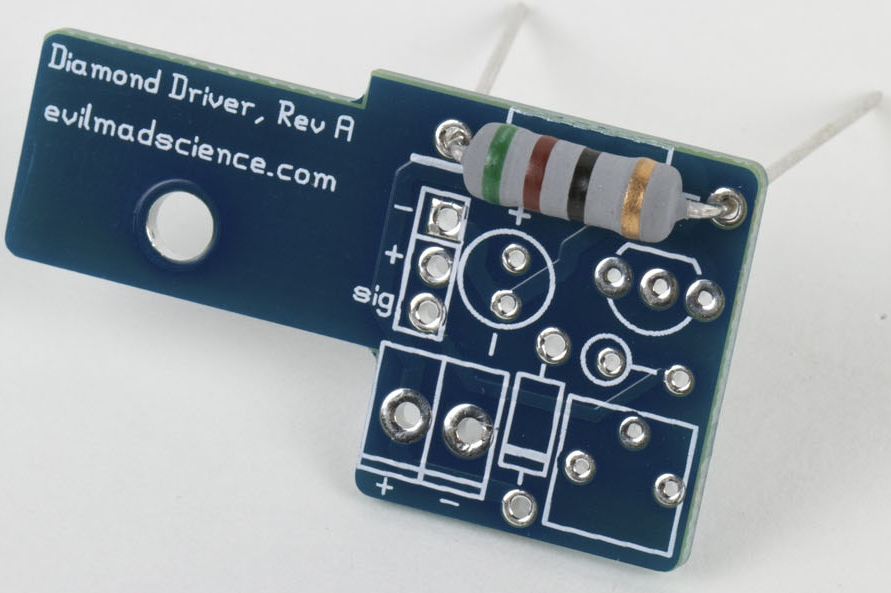
Bend its leads like so.



It goes HERE.



Insert the resistor as shown, and push it all the way flush to the circuit board.



STEP 2: Some hints on soldering

As the old Heathkit manuals say, "it is interesting to note" that the vast majority of problems reported with soldering kits turn out to be due to unreliable solder connections.

Before we go further, here's a quick refresher, with our suggested procedures for adding components to the circuit board. These procedures apply to most components in the kit.

Adding components to the circuit board

(0). Pre-form the leads of components if appropriate. (For example, like the resistor in the last step!)

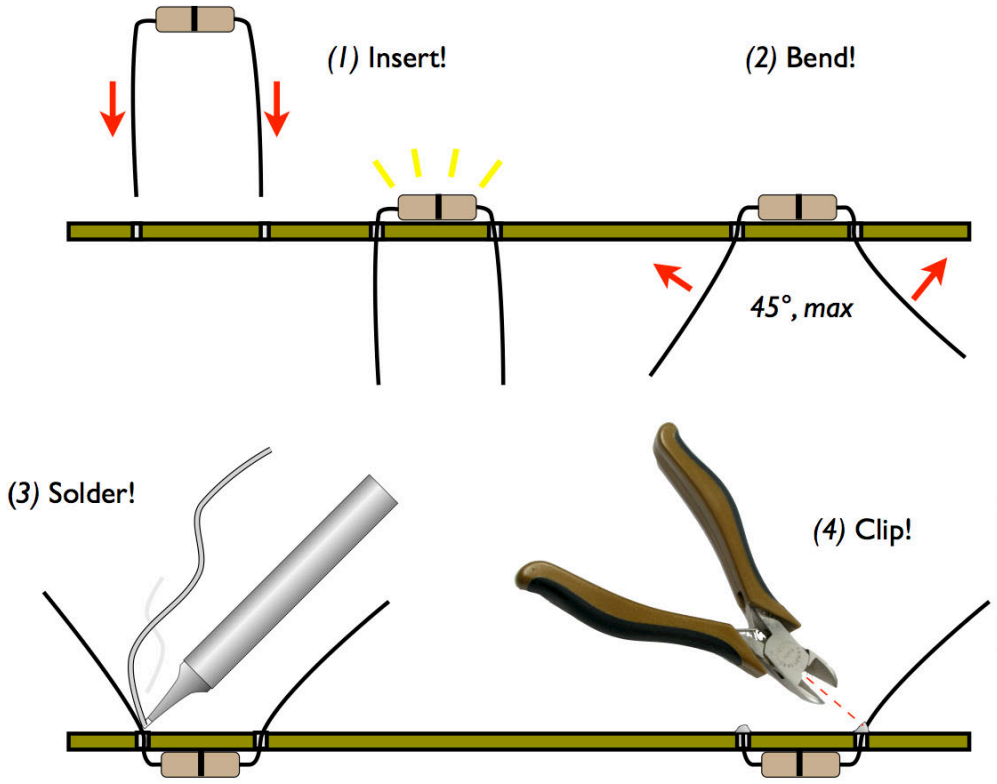
(1). Insert each component into the circuit board, from the top, at its given location. Push it flush to the board (Note that most of our components, like the diode, LED, and transistor, need to be inserted with a particular orientation.)

(2). If your component has flexible leads, *gently* bend the leads out, up to 45°, to hold it in place while you solder.

(3). One at a time, from the back side, solder the leads of the component to the circuit board.

- Your tip *needs* to be *shiny* (tinned). If not, melt some fresh solder against it and *quickly* swipe clean on a wet sponge.
- Place the solder against the joint that you wish to connect.
- Touch the iron to the solder and joint for about one second until the solder wicks into the joint.
- If you are using lead-free solder, or if the component has particularly thick leads– *like our resistor* – you may need as much as 2-3 seconds before solder wicks into place.
- The solder should melt to the joint and leave a shiny wet-looking joint. If not, let it cool and try again.

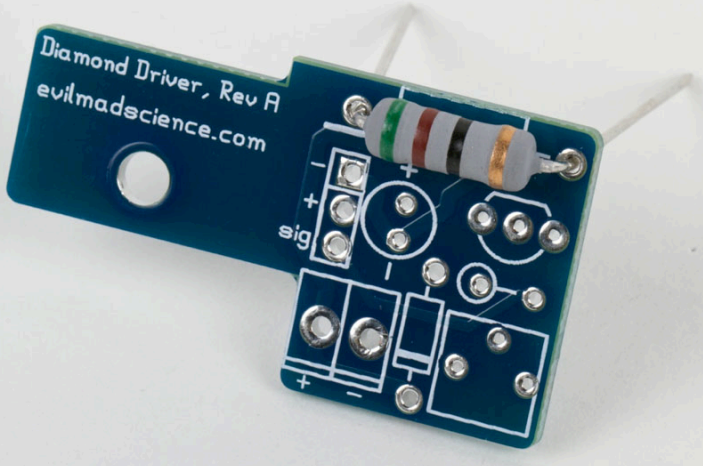
(4). If the component has long and/or or flexible leads, clip off the extra length, close to the board. (But not so close that you're clipping the board itself.)



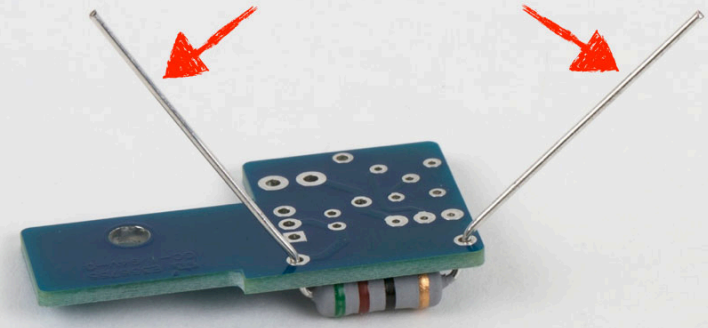
TO BE CONTINUED...

STEP 3: Doing that soldering thing...

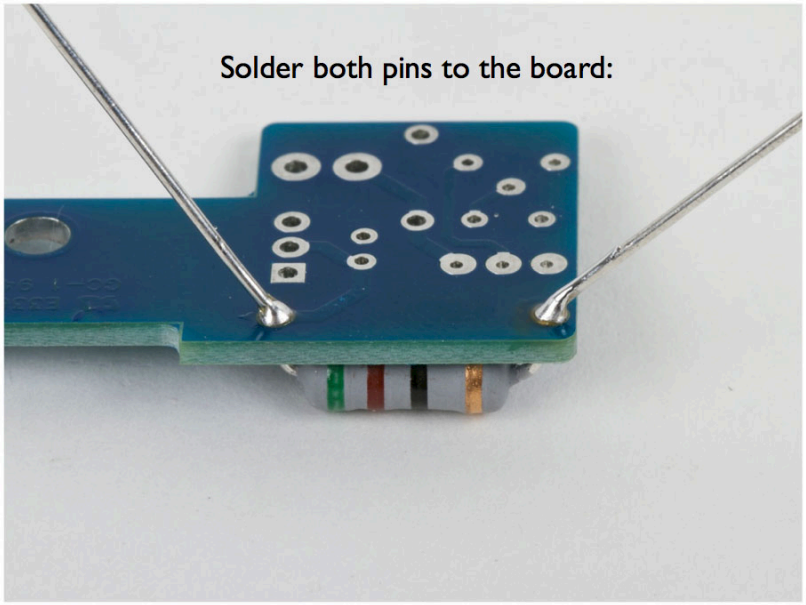
Here's where we were...



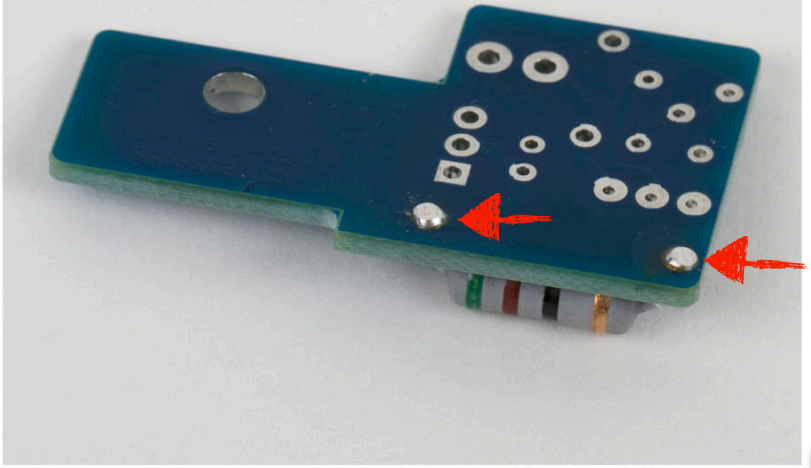
Flip it over, bend out the leads at 45°, to hold it in place while soldering.



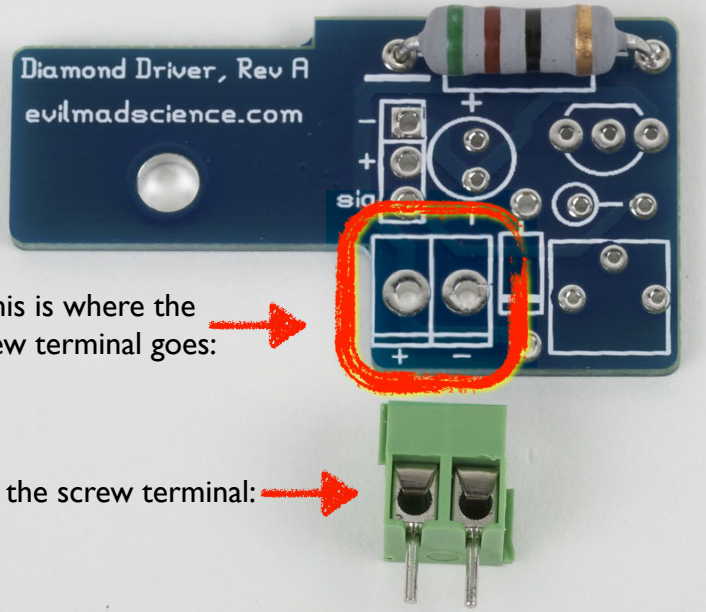
Solder both pins to the board:

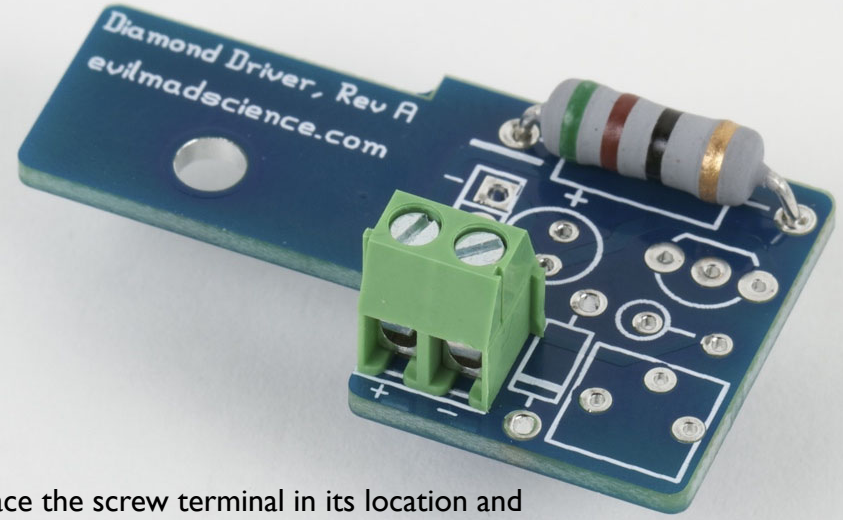


And finally, trim the leads flush.



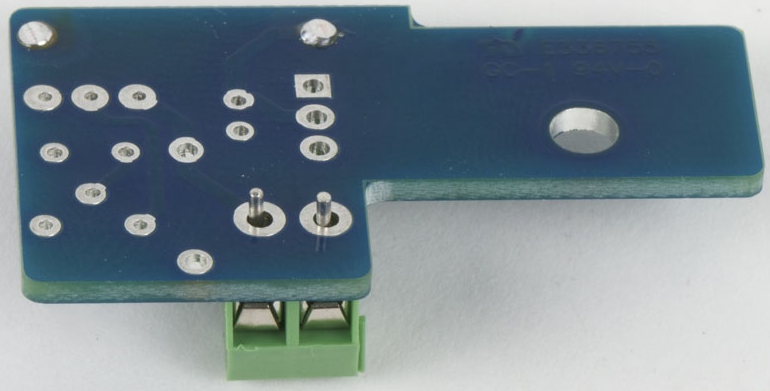
STEP 4A: Begin adding the screw terminal



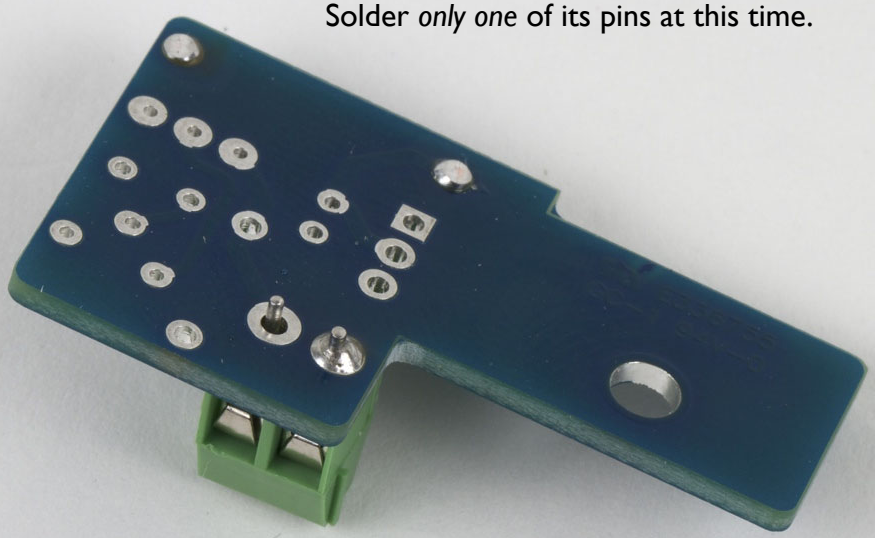


Place the screw terminal in its location and check the orientation. The side openings should face the +/- marks on the board.

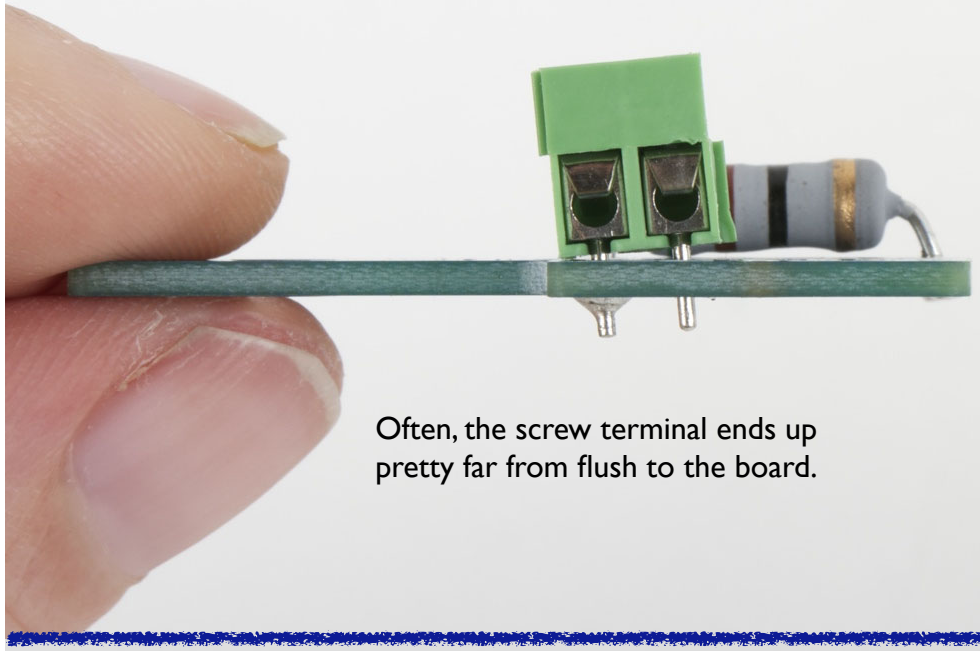
Flip it over.
The pins cannot be bent to hold it in place, so just rest the circuit board on the screw terminal



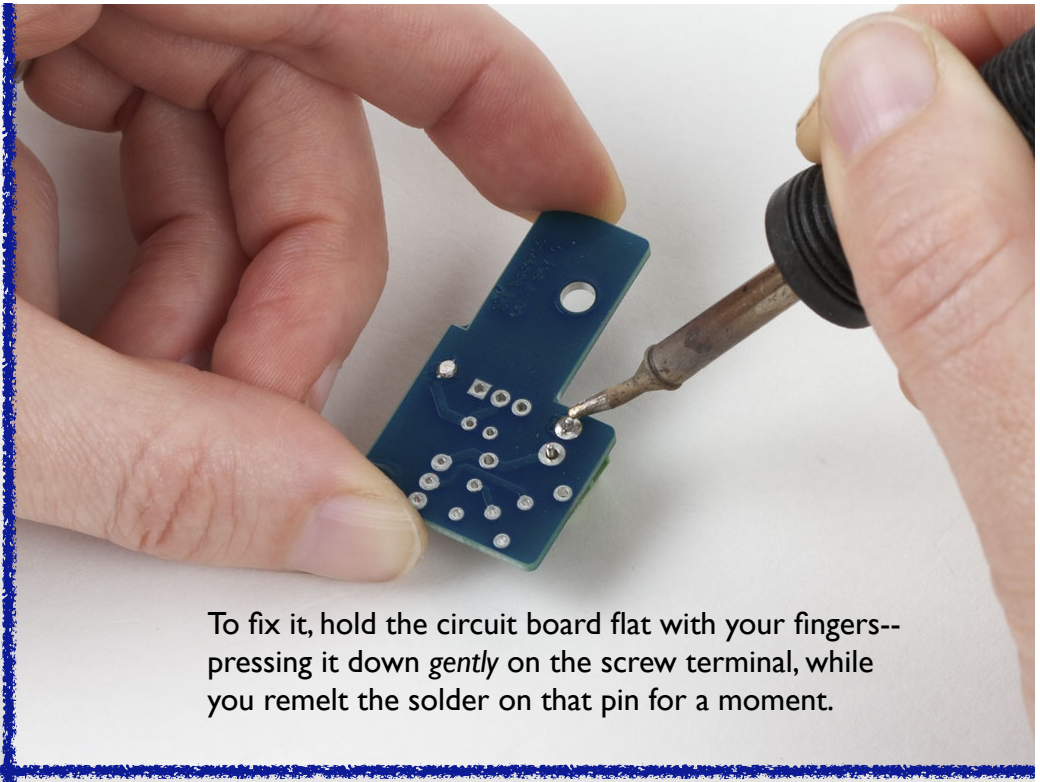
Solder *only one* of its pins at this time.



STEP 4B: Finish adding the screw terminal



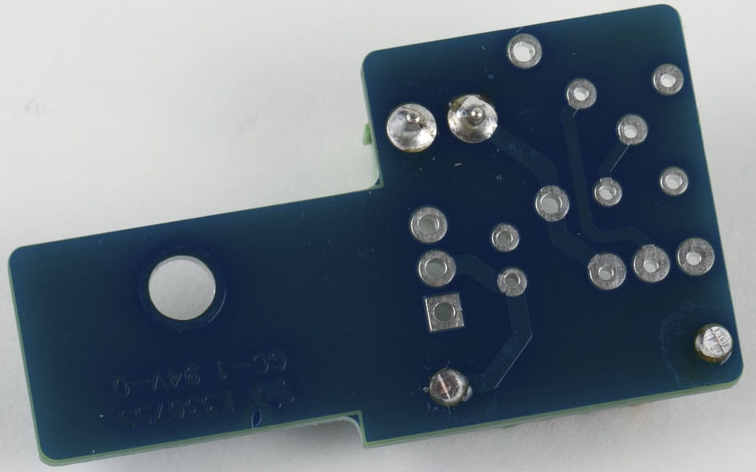
Often, the screw terminal ends up pretty far from flush to the board.



To fix it, hold the circuit board flat with your fingers--pressing it down *gently* on the screw terminal, while you remelt the solder on that pin for a moment.

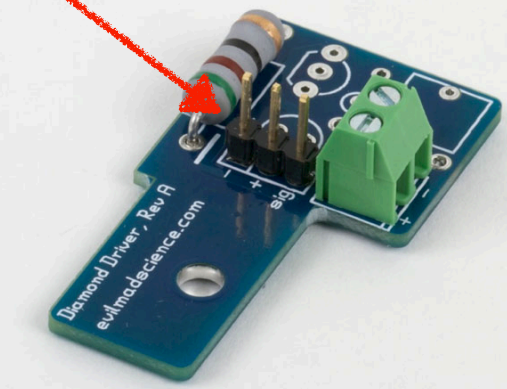
The circuit board should press the terminal into place, leaving it nice and flat.

Finish up the screw terminal by soldering the other pin and trimming the leads flush (to the extent possible).

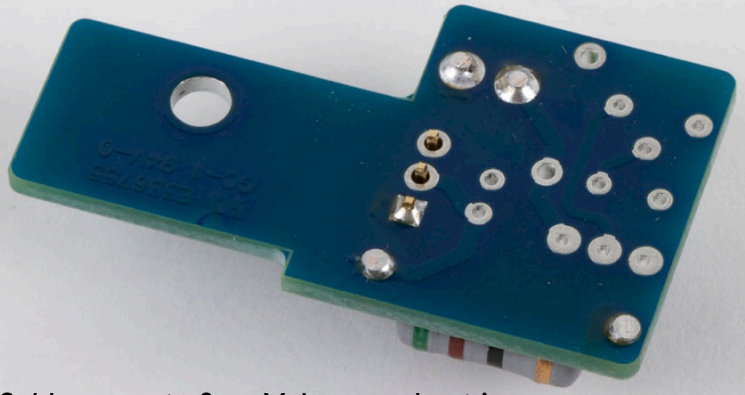


STEP 5: Install the 3-pin header

Insert the 3-pin header into its place:

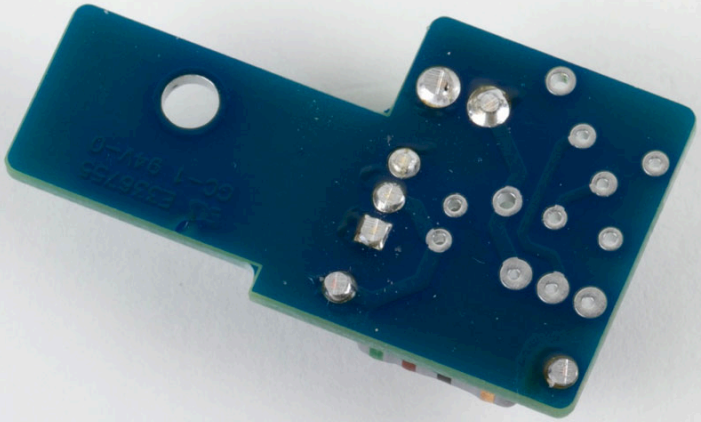


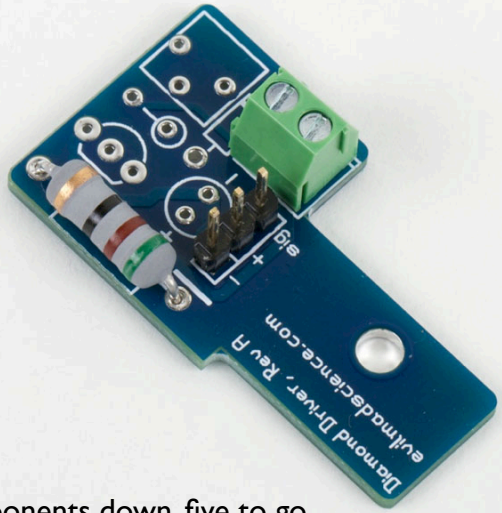
The pins cannot be bent to hold it in place, but the header is the same height as the screw terminal—so it should rest upright in place for soldering.



Solder one pin first. Make sure that it's straight (on the top side) before proceeding.

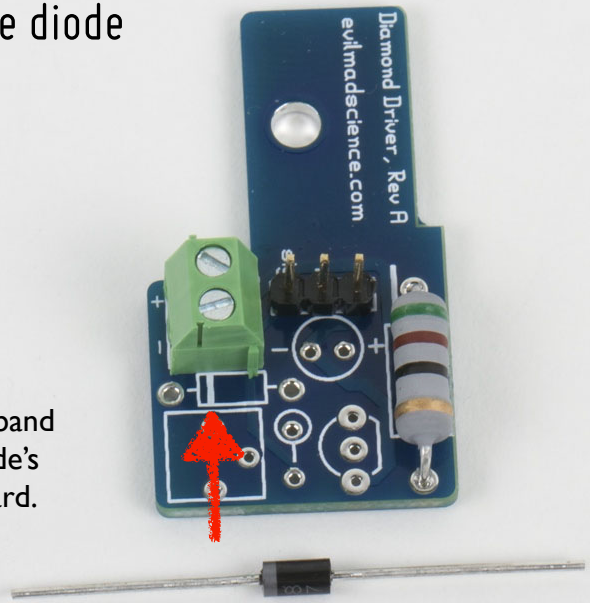
Once you've checked that it's straight, solder the other two pins. Trim all three flush.



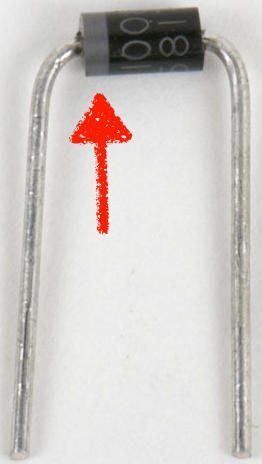


Three components down, five to go.

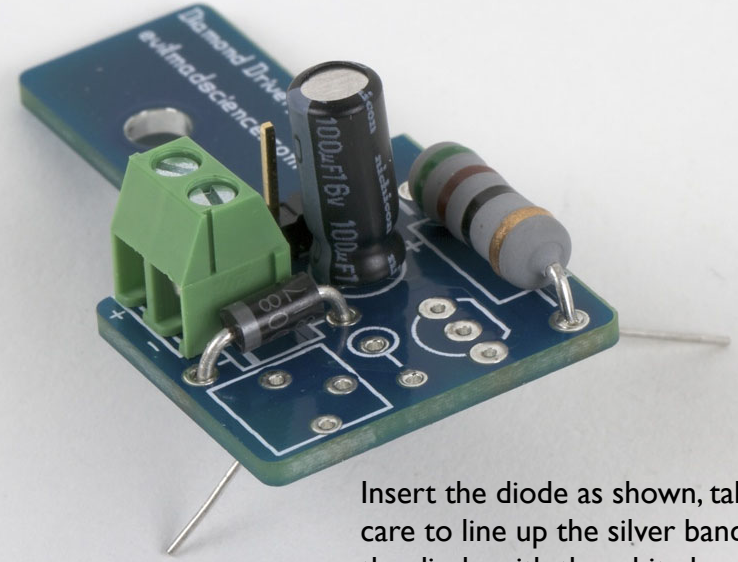
STEP 6: Install the diode



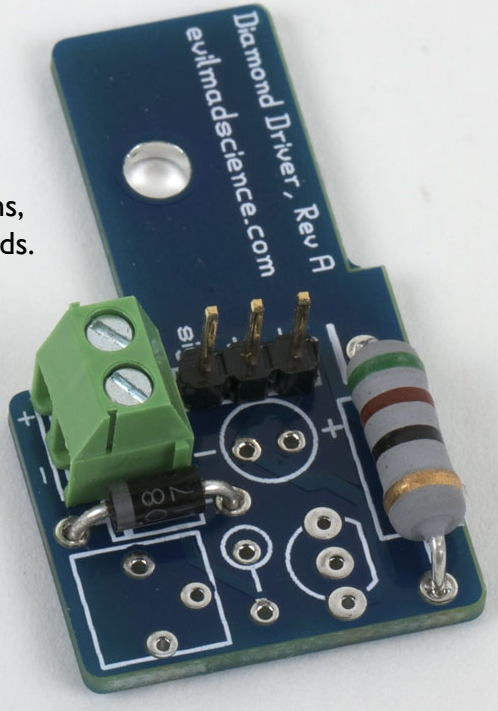
Notice the vertical white band across one end of the diode's location on the circuit board.



The diode has a band at one end, too.
That band needs to line up with the one on the circuit board.



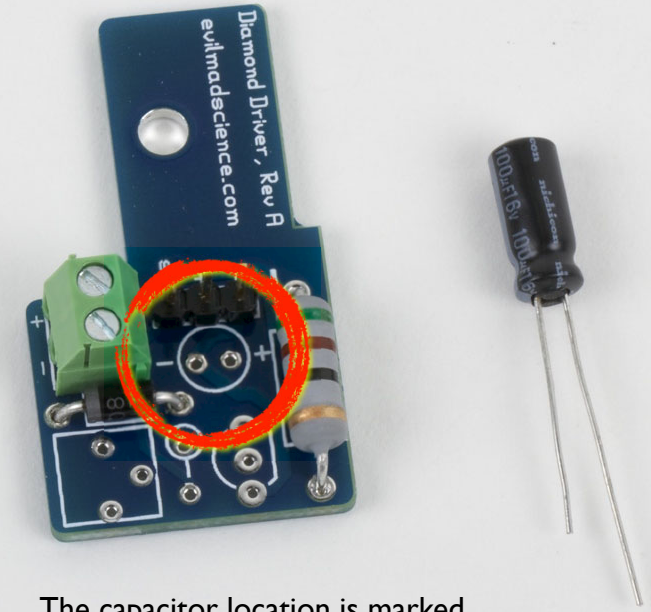
Insert the diode as shown, taking care to line up the silver band on the diode with the white band on the circuit board.



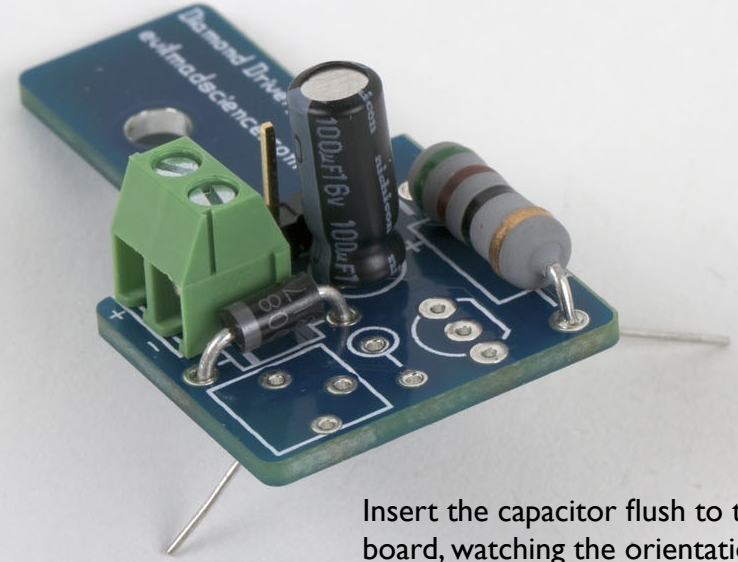
Solder both pins, and clip the leads.

STEP 7: Install the Capacitor

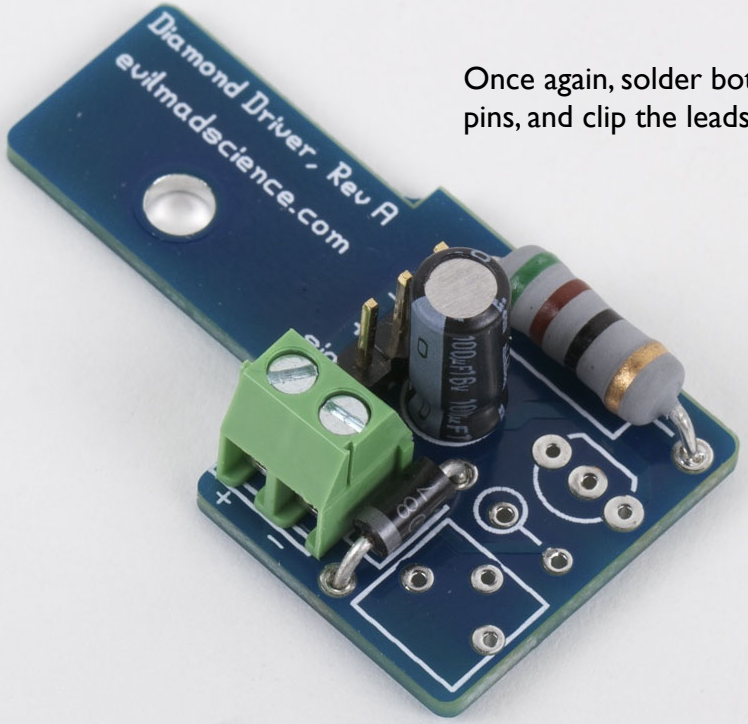
One side of the capacitor is marked with a prominent white stripe. This is the negative (–) side of the capacitor.



The capacitor location is marked with "–" and "+" for the two sides.



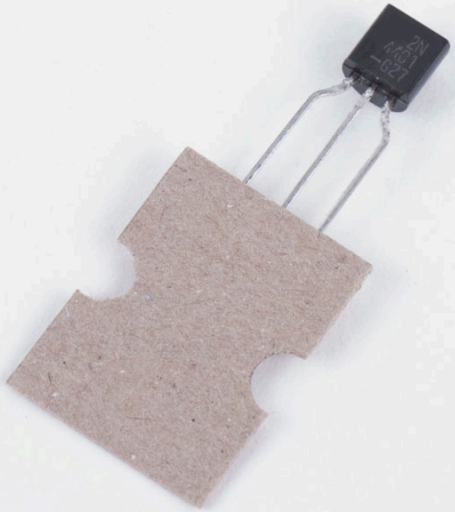
Insert the capacitor flush to the board, watching the orientation.



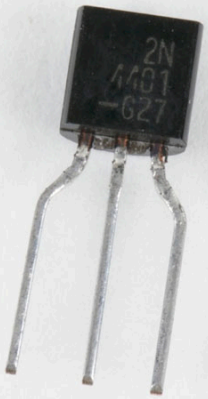
Once again, solder both pins, and clip the leads.

STEP 8: Install the Transistor

The transistor comes on paper tape.



Clip the leads, close to the tape, to free it.



The front side is flat (with writing on it), while the back side is curved.

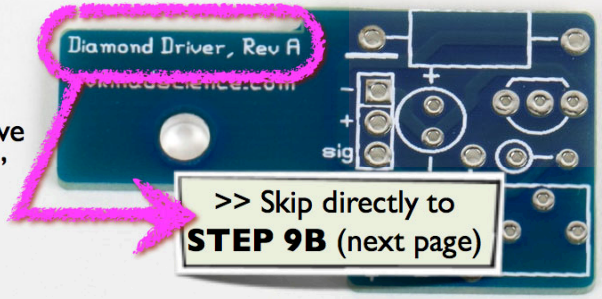
The transistor goes into the matching location on the circuit board, with the correct polarity: flat side to flat side.

Insert the transistor with the correct orientation. Solder all three leads, and clip them flush to the board.

STEP 9: Install LED

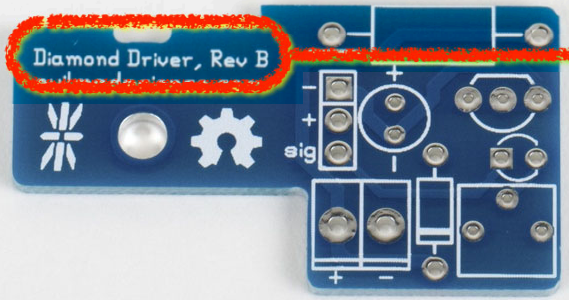
First, check your circuit board version:

If you have "Rev A"



>> Skip directly to **STEP 9B** (next page)

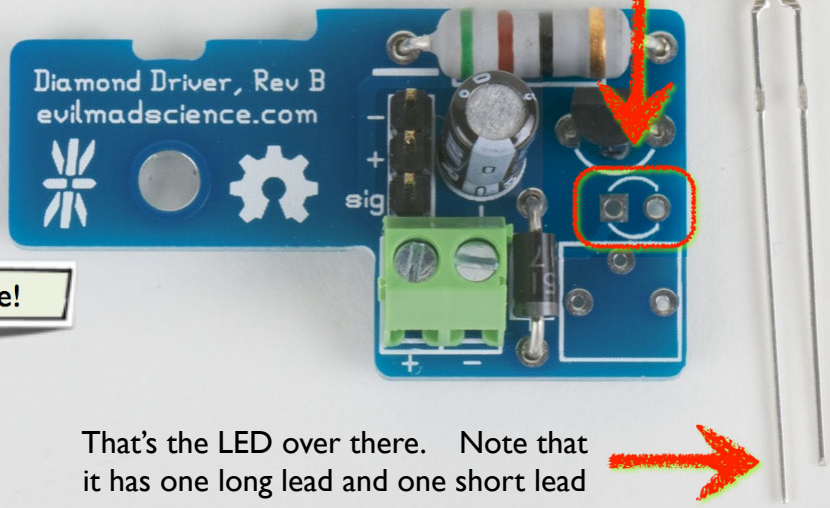
If you have "Rev B"



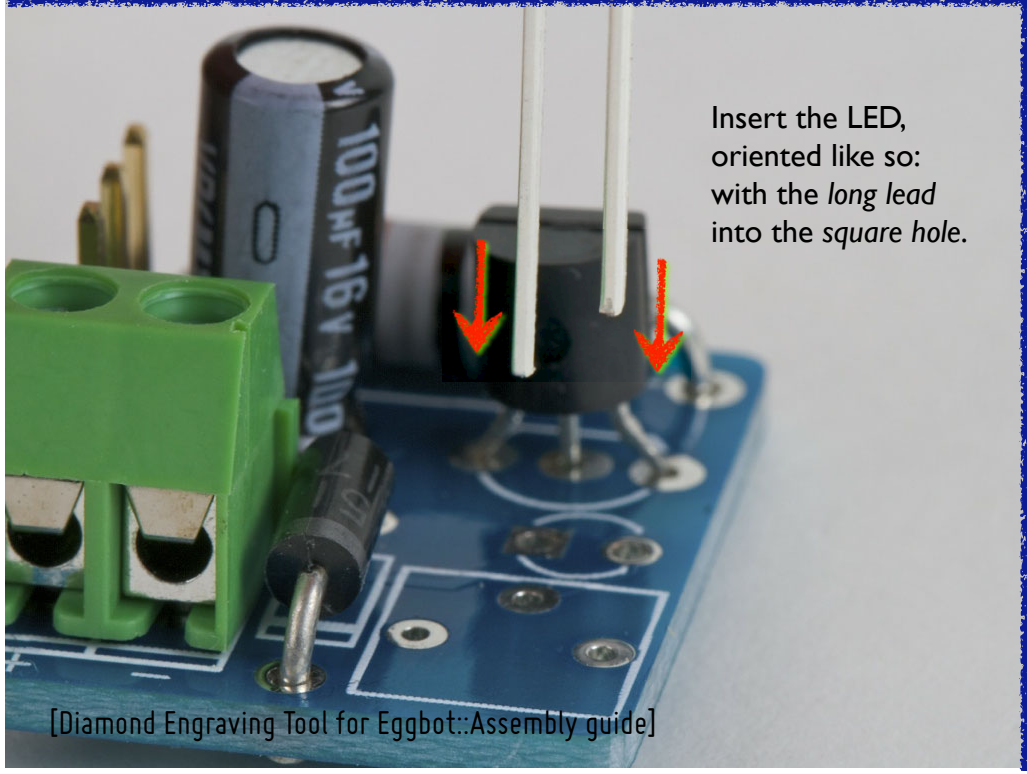
>> Proceed here!

The LED goes in this location, with a specific orientation.

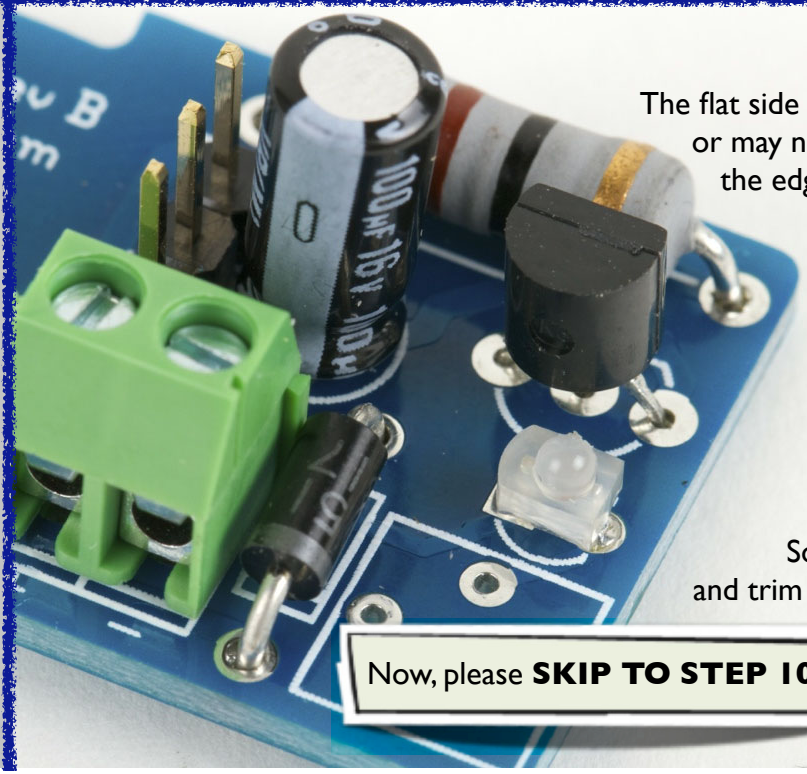
Note that this location has one "square" hole and one round hole.



That's the LED over there. Note that it has one long lead and one short lead



Insert the LED, oriented like so: with the *long lead* into the *square hole*.



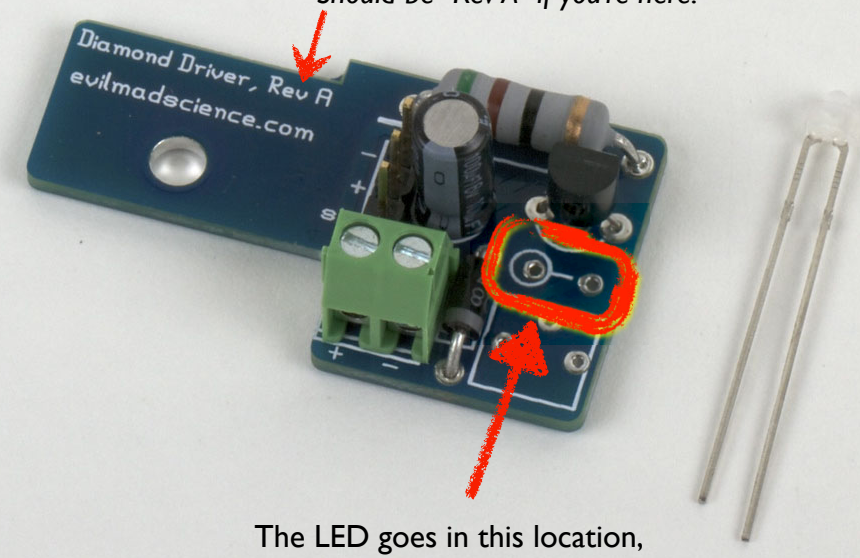
The flat side of the LED may or may not face towards the edge of the board; the long lead is the important thing to watch.

Solder both pins, and trim the leads flush.

Now, please **SKIP TO STEP 10.**

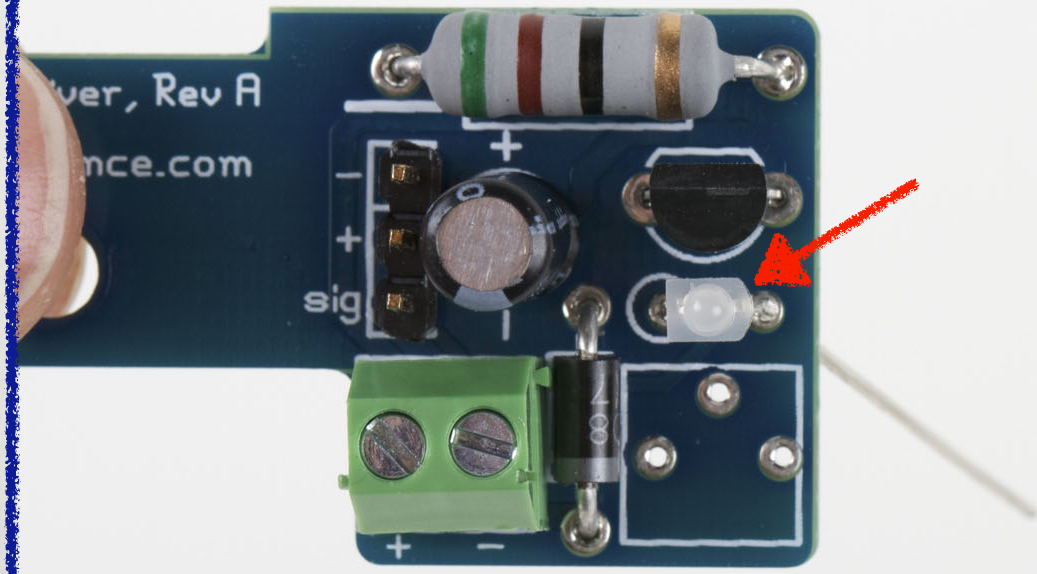
STEP 9B: The LED, continued

Should be "Rev A" if you're here!

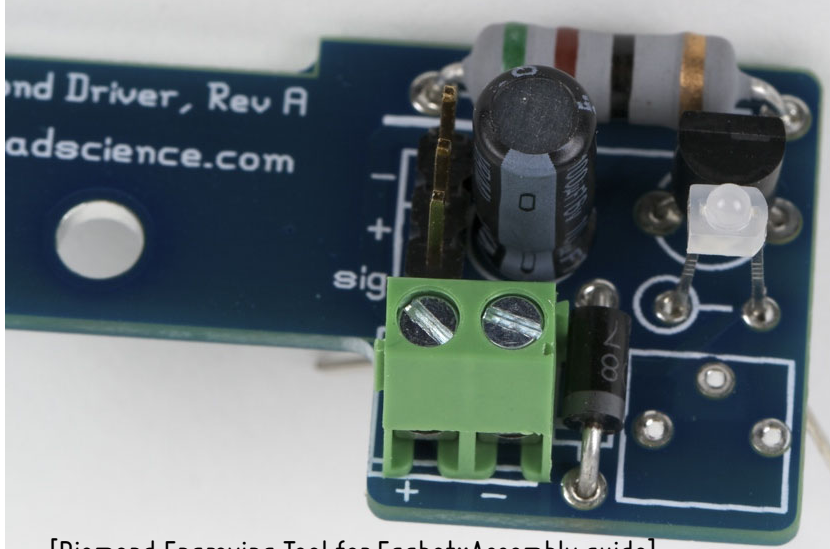


The LED goes in this location,
with a specific orientation.

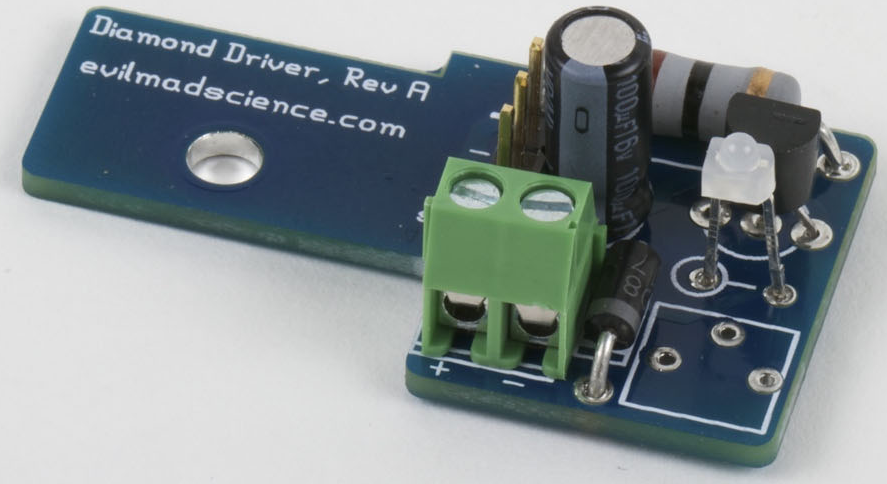
The *curved side* of the LED faces towards the outside of the board



The LED does not sit all the way flush to the circuit board; do not force it past the point where it seats.

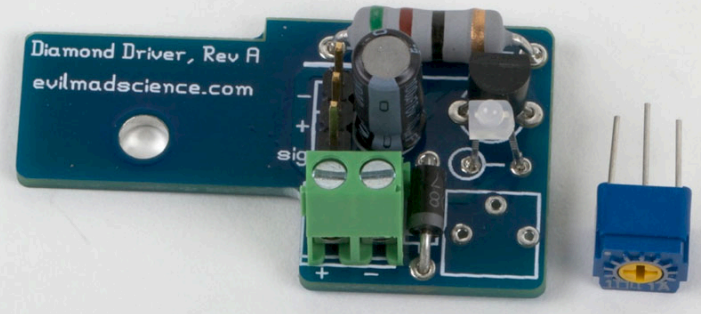


Solder both pins, and trim the leads flush.

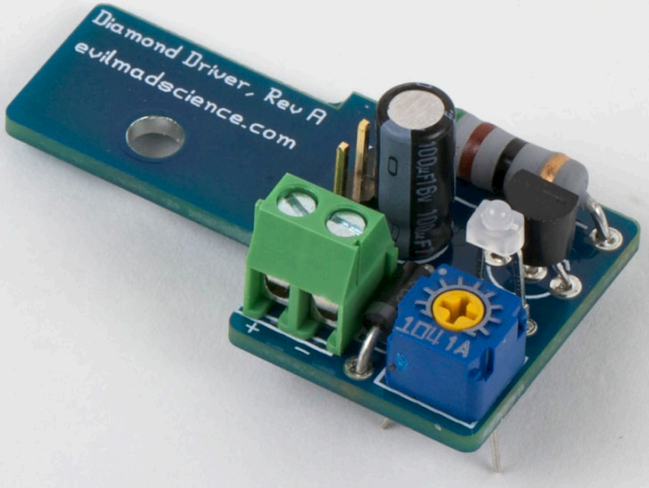


STEP 10: Install the trimpot

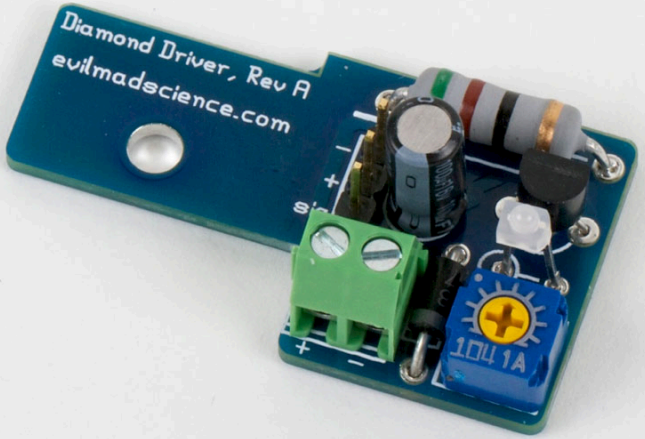
The last component is a trimpot, a small adjustable resistor.



The trimpot only fits into the board one way. Push it flush to the board.



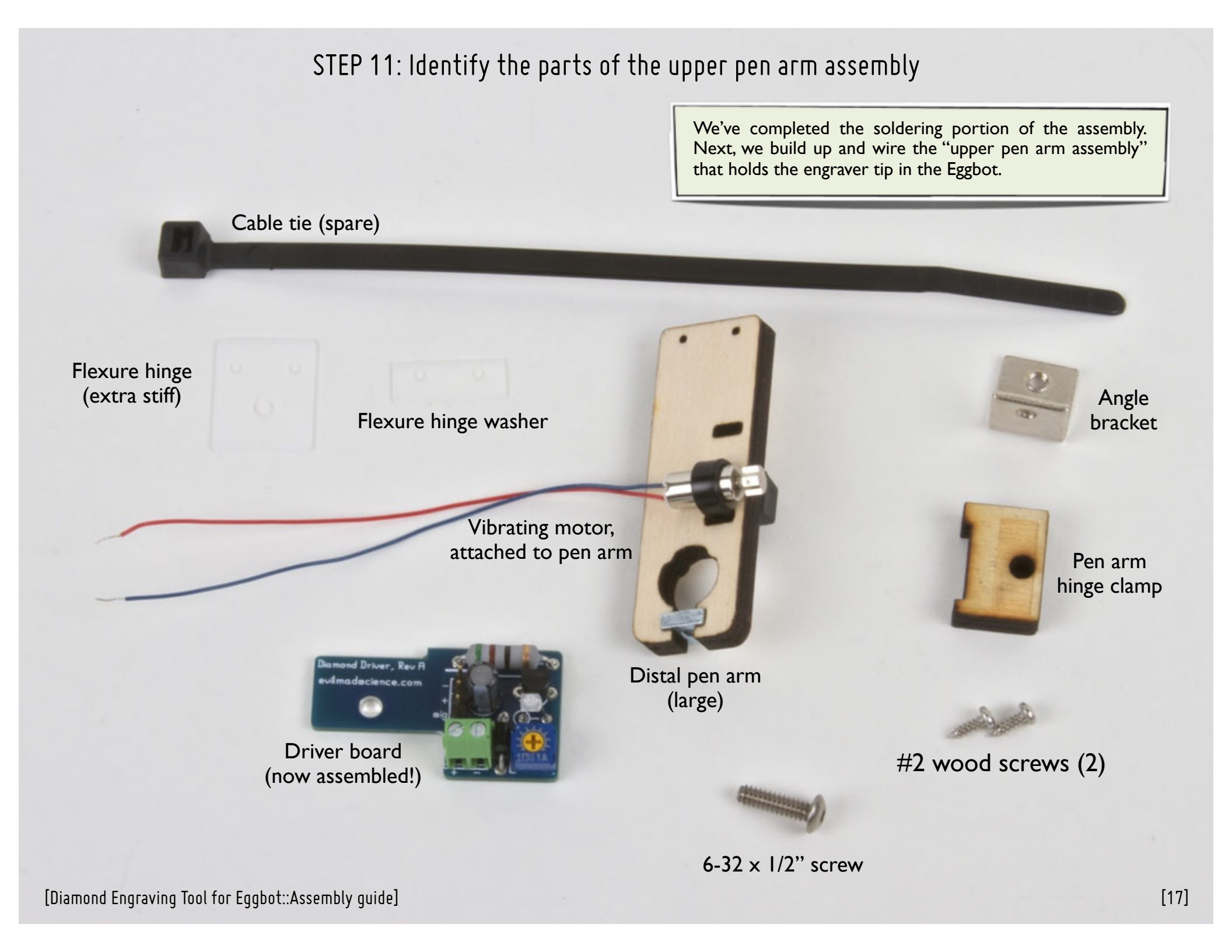
Solder all three leads and trim them flush.



This concludes the soldering portion of the kit. Double-check that all the leads on the bottom side are trimmed well.

STEP 11: Identify the parts of the upper pen arm assembly

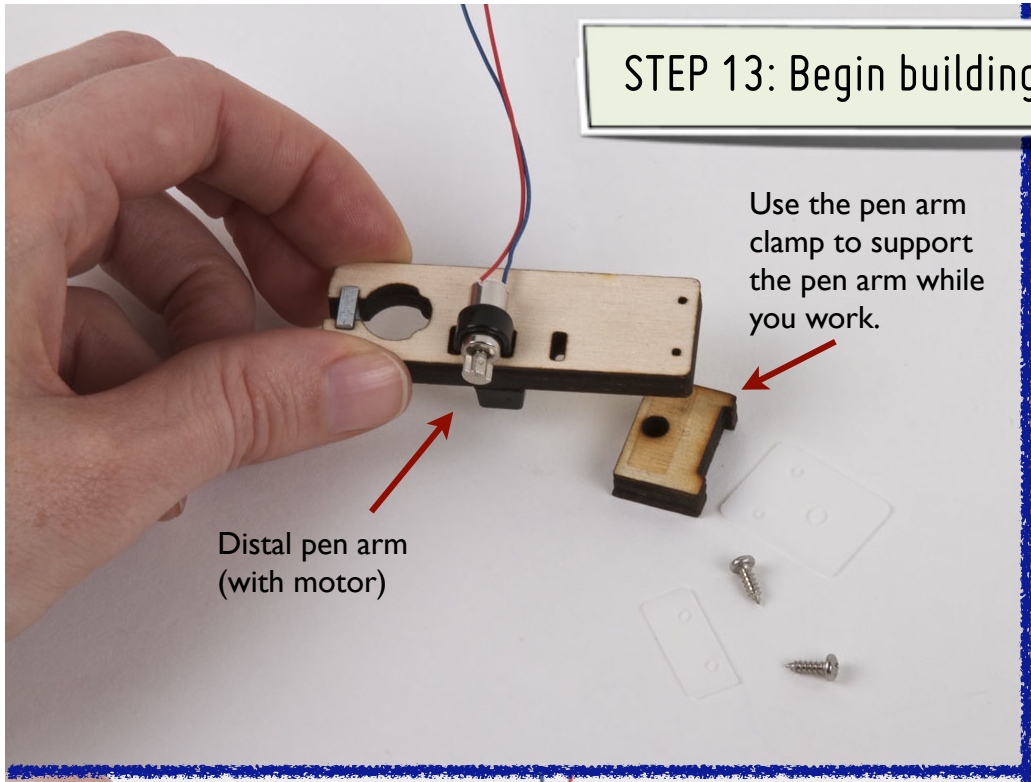
We've completed the soldering portion of the assembly. Next, we build up and wire the "upper pen arm assembly" that holds the engraver tip in the Eggbot.

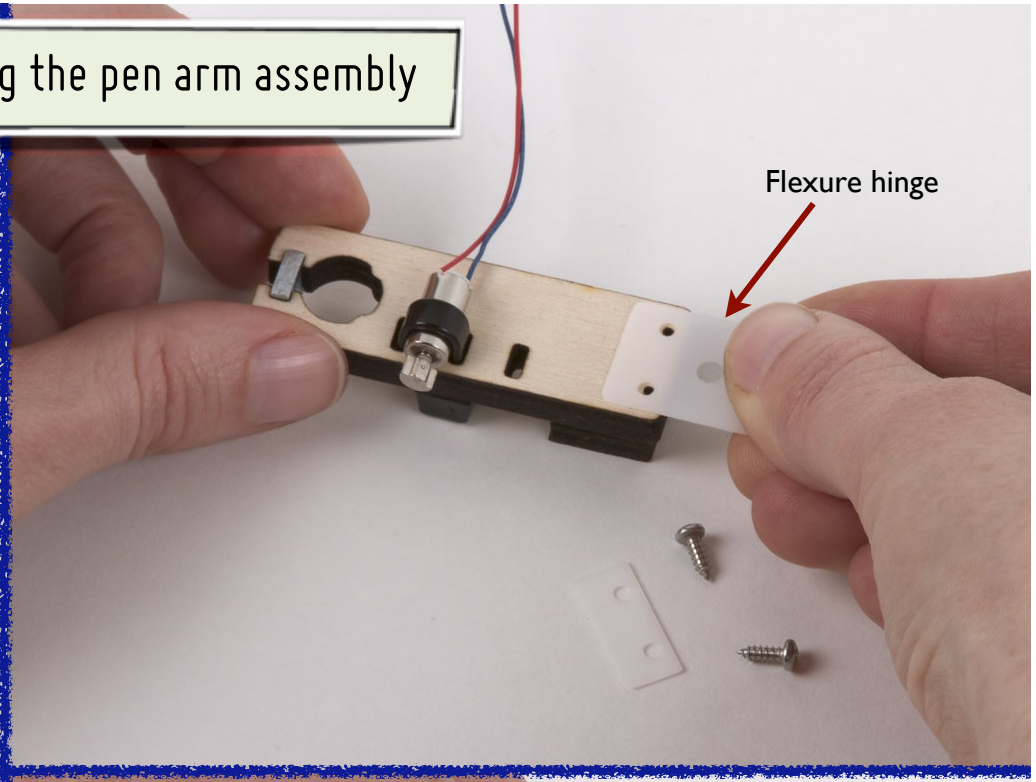


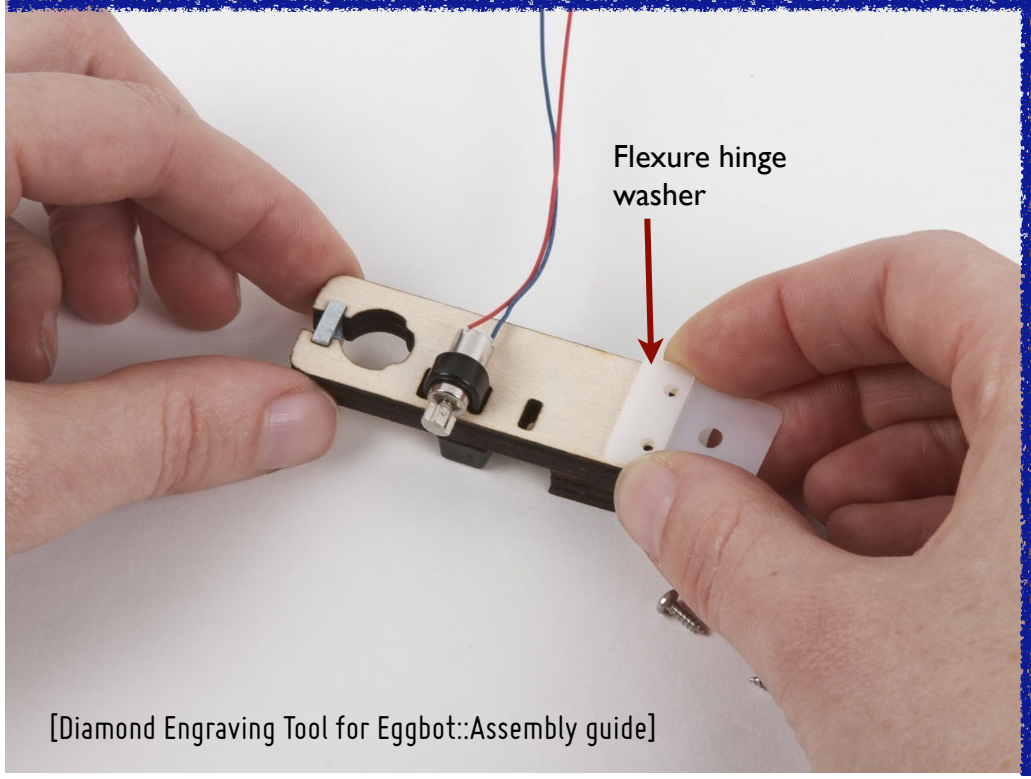
STEP 12: Make sure that the motor is attached to the pen arm.

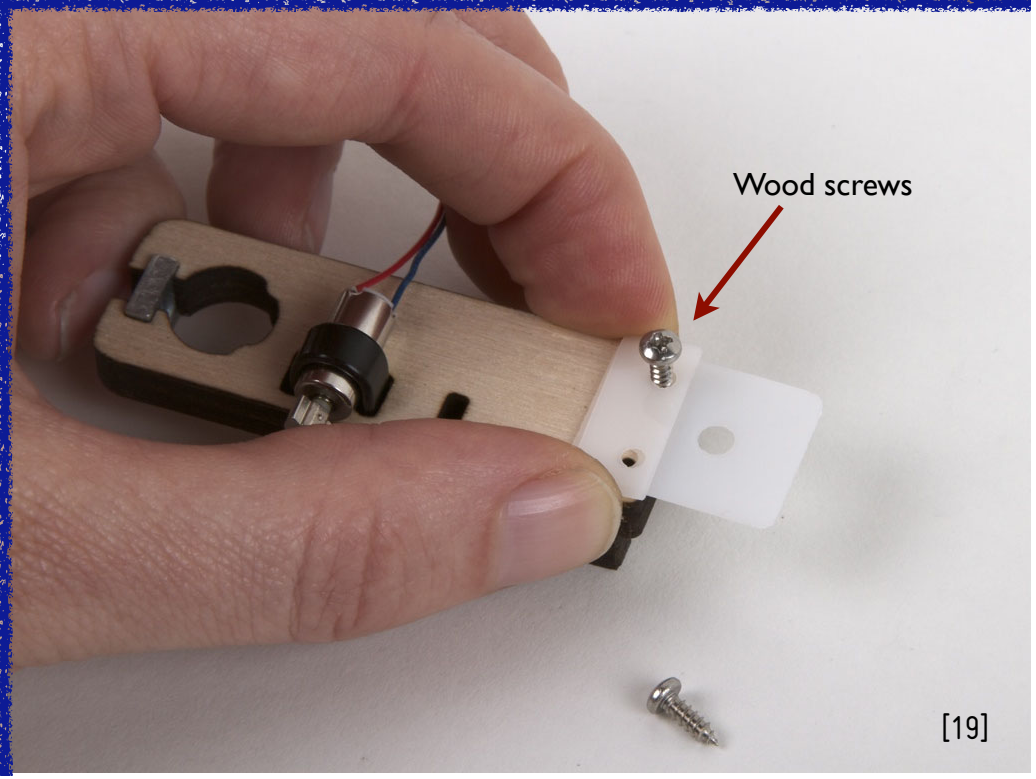
The vibrating motor should be firmly attached to the pen arm piece, with a high-tension cable tie. If it is *not* attached, or if you need to replace it for any reason, please see Appendix A of this instruction set.

STEP 13: Begin building the pen arm assembly

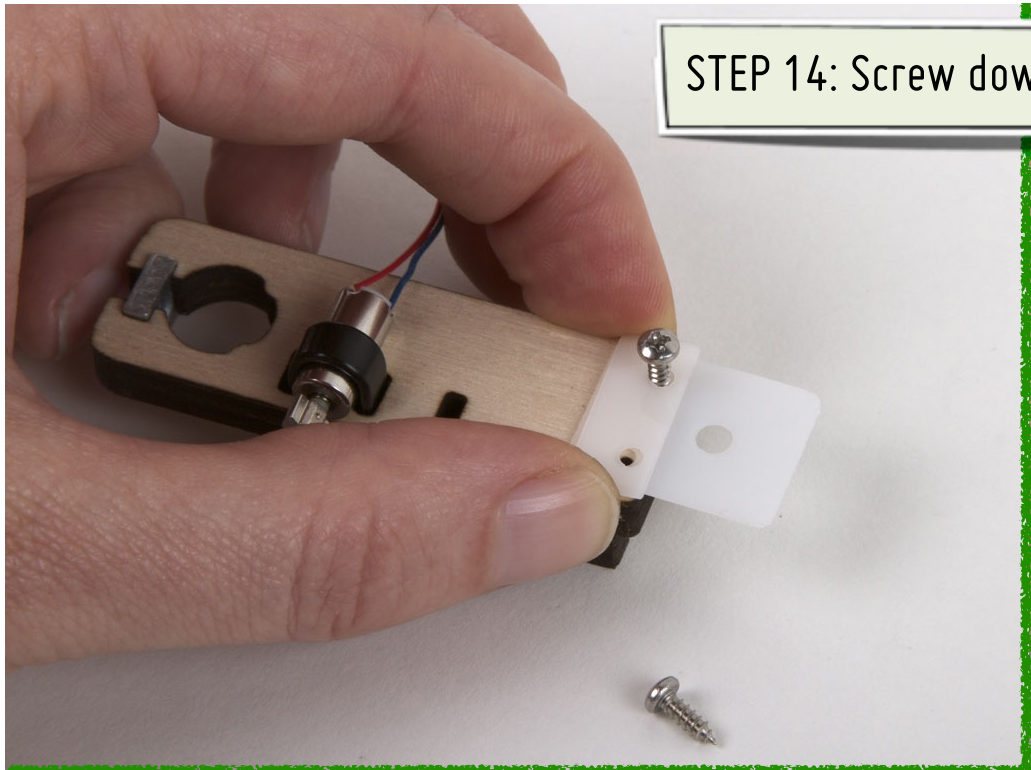


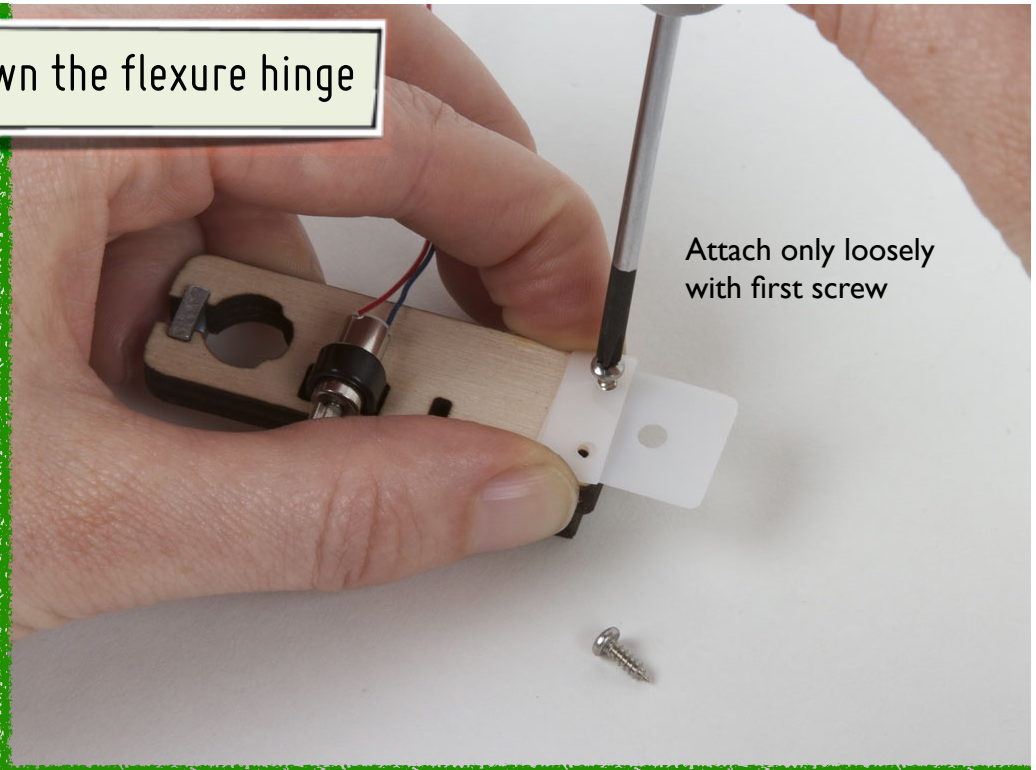




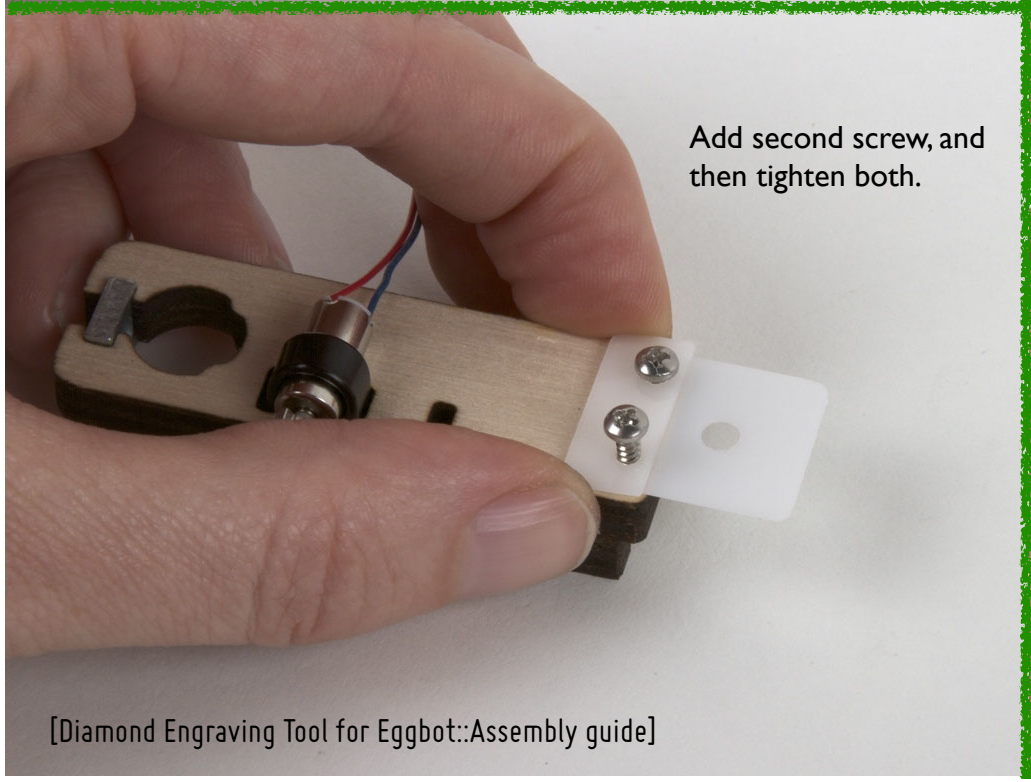


STEP 14: Screw down the flexure hinge

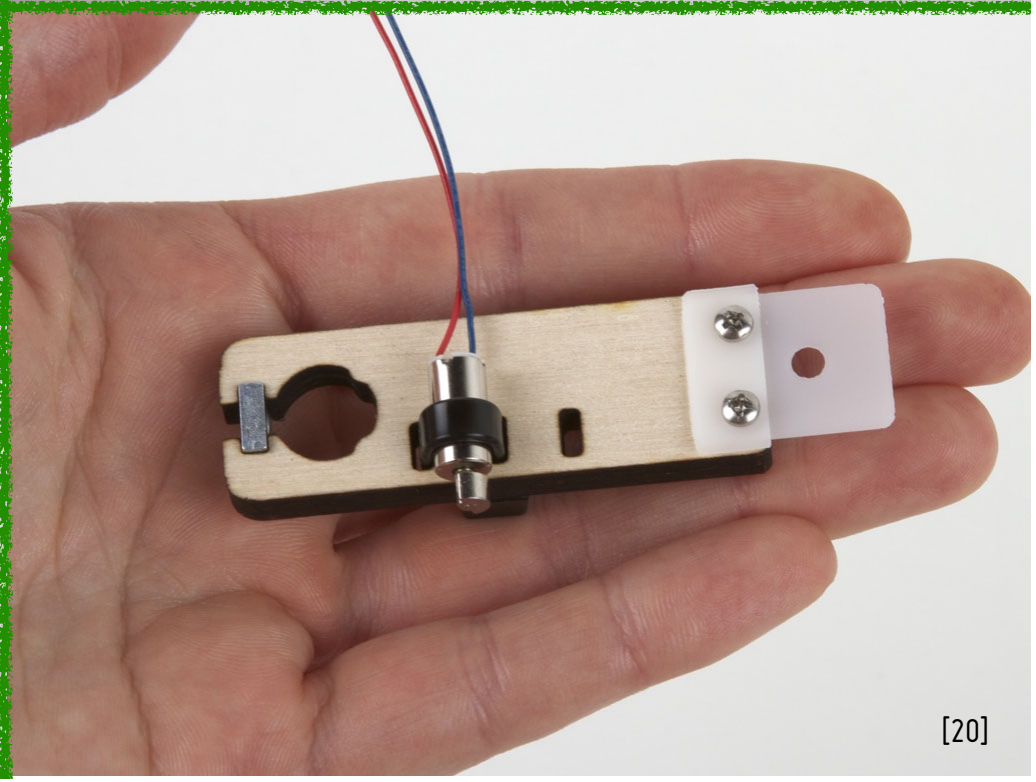




Attach only loosely with first screw

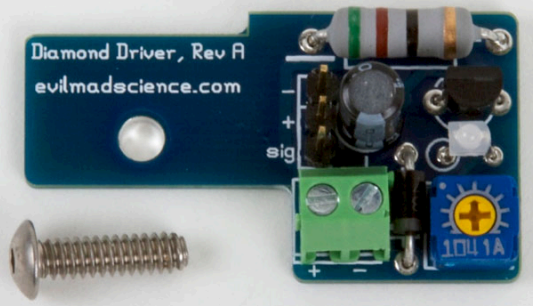


Add second screw, and then tighten both.

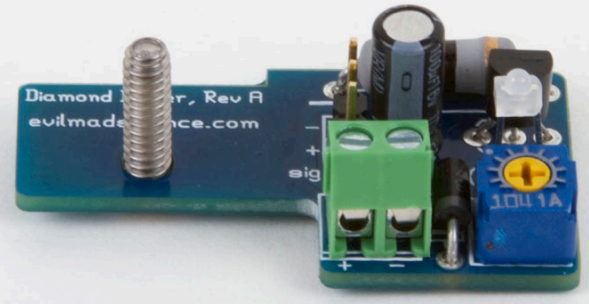


STEP 15: Continue building pen arm

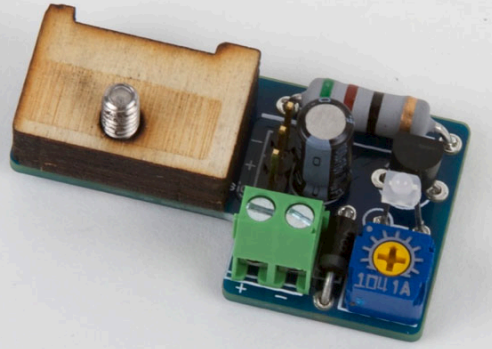
The 6-32 x 1/2" screw is the long one that comes with the engraver kit.



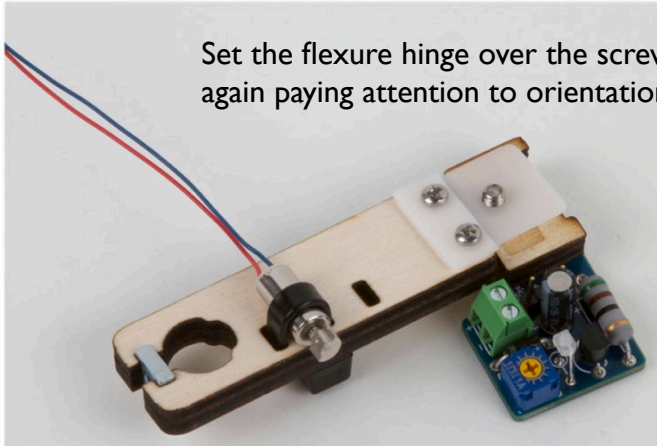
Place it upwards through the hole in the driver board.



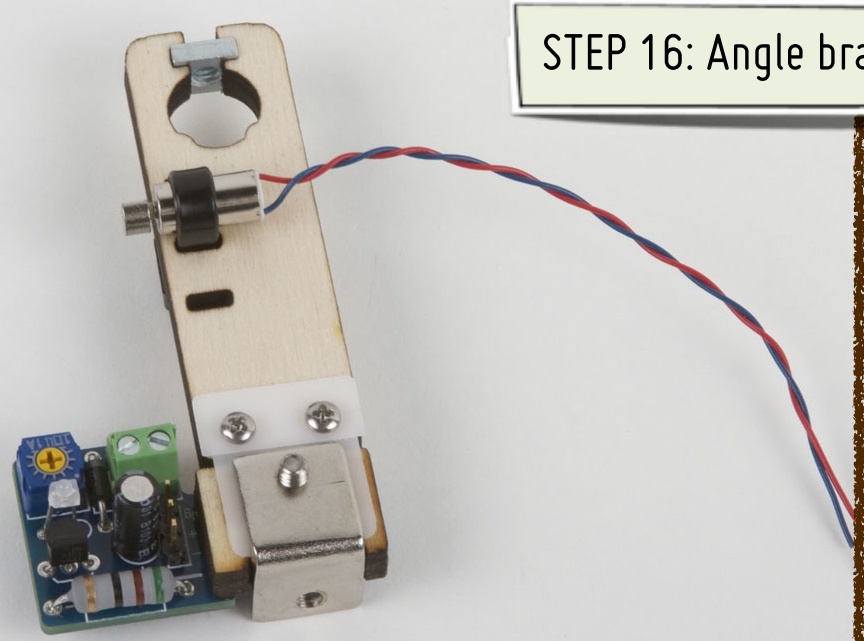
Set the pen arm hinge clamp over the screw. Note the orientation.



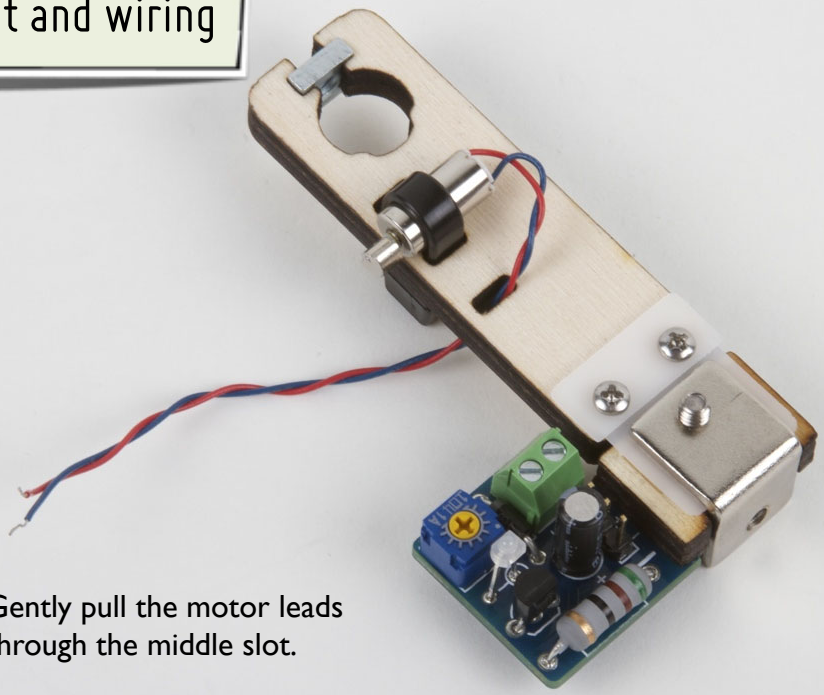
Set the flexure hinge over the screw, again paying attention to orientation.



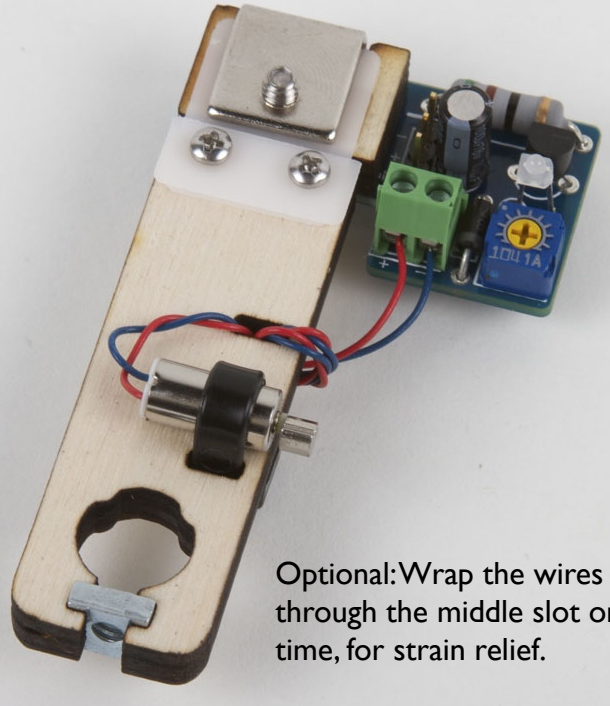
STEP 16: Angle bracket and wiring



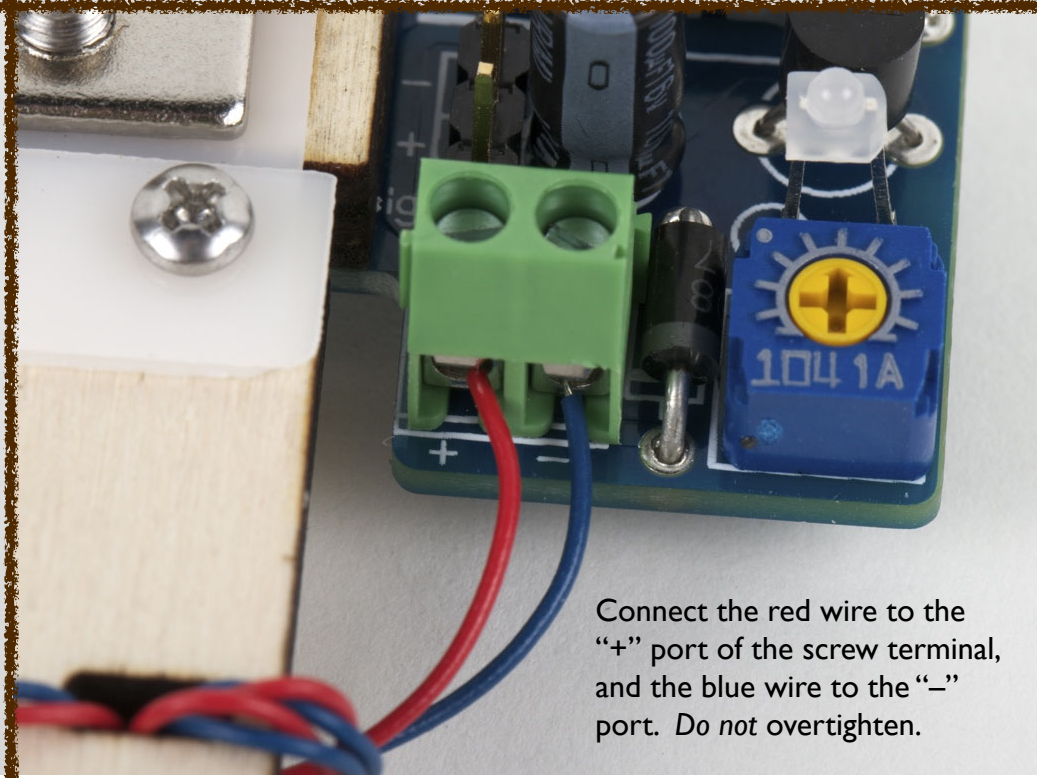
Add the angle bracket over the flexure hinge, and tighten it down with the 6-32 x 1/2" screw.



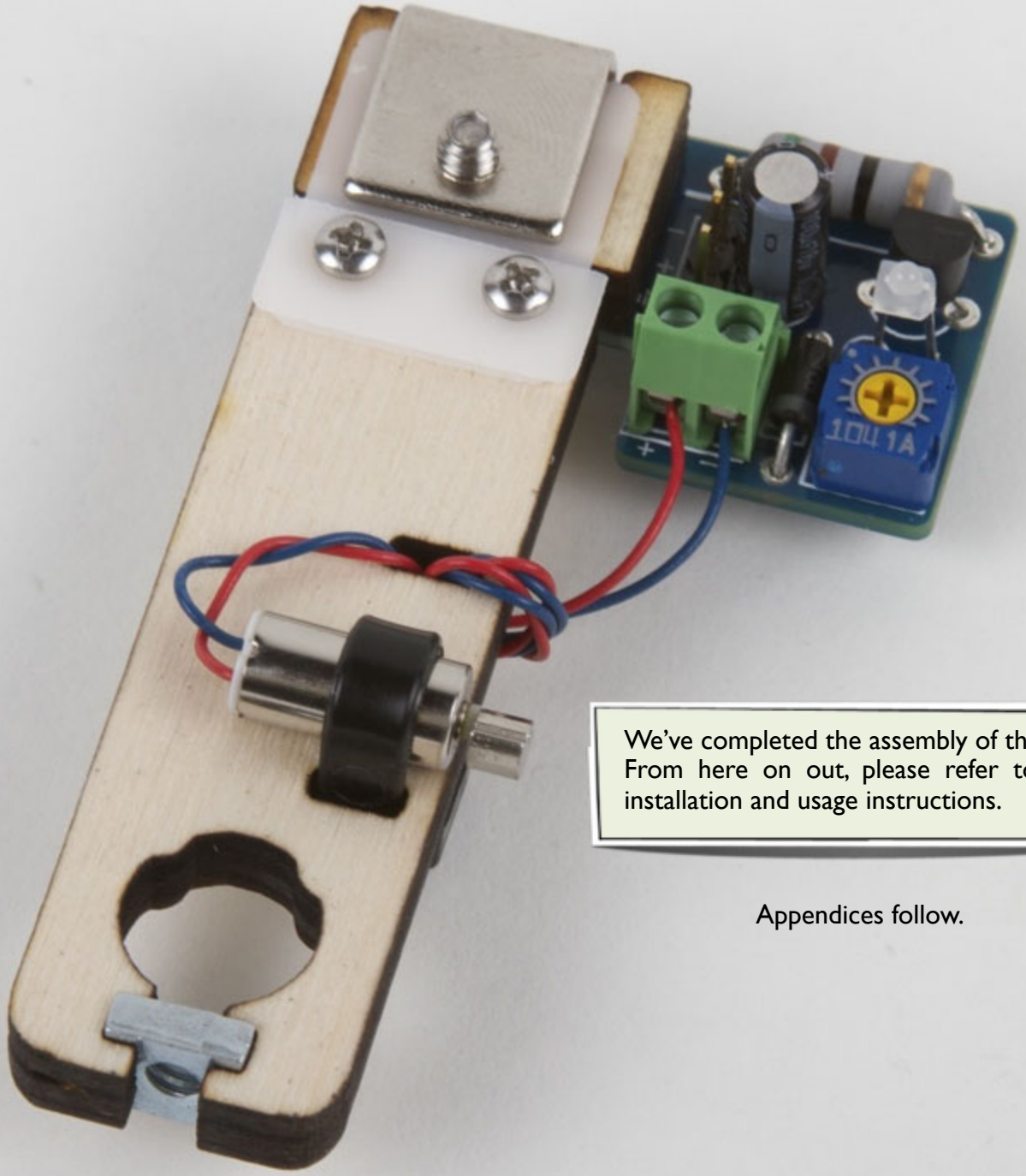
Gently pull the motor leads through the middle slot.



Optional: Wrap the wires around through the middle slot one more time, for strain relief.



Connect the red wire to the "+" port of the screw terminal, and the blue wire to the "–" port. *Do not* overtighten.



We've completed the assembly of the kit. From here on out, please refer to the installation and usage instructions.

Appendices follow.

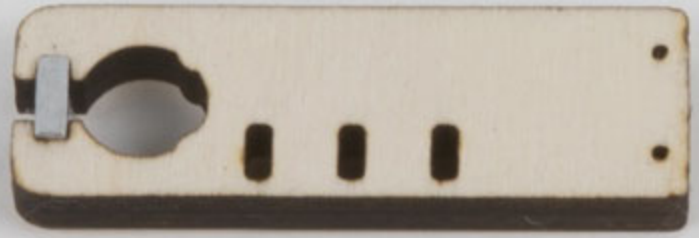
Appendix A: Attaching the vibrating motor to the pen arm (Part I)

The vibrating motor should be firmly attached to the pen arm piece, with a high-tension cable tie. If it is *not* attached, or if you need to replace it for any reason, please follow these instructions to replace it.

Note: Do not remove the attached motor unless there is a good reason to do so.

Cable tie (spare)

Vibrating motor



Distal pen arm (large)

If there is still a cable tie attached to the distal pen arm and you need to remove it, you can do so with scissors or a wire clipper.

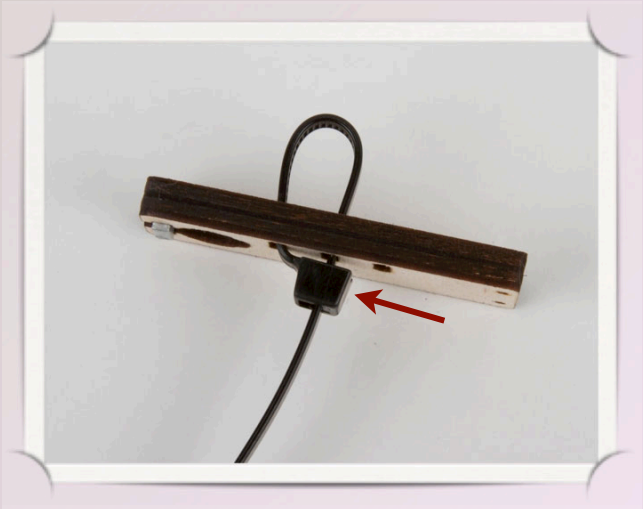
Appendix A: Attaching the vibrating motor to the pen arm (Part 2)

Orient the pen arm as shown, and slide the cable tie through the slot closest to the end.

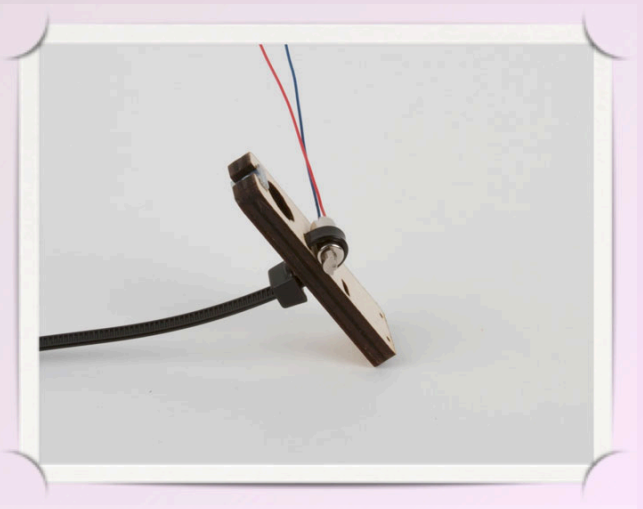
Wrap the cable tie around and through the middle slot of the pen arm. Double-check that the cable tie ends are correctly oriented.

Slide the cable tie end through its latch, closing the loop.

Begin to pull the loop closed. But, be careful not to pull it too far closed.



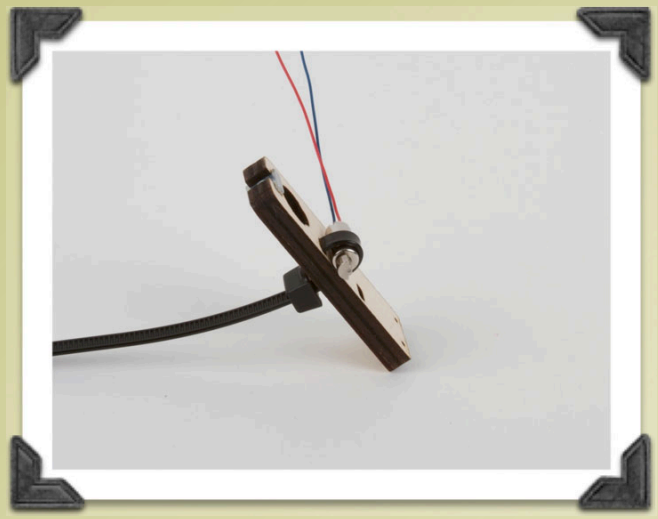
Check the orientation of the latch as you tighten the loop.



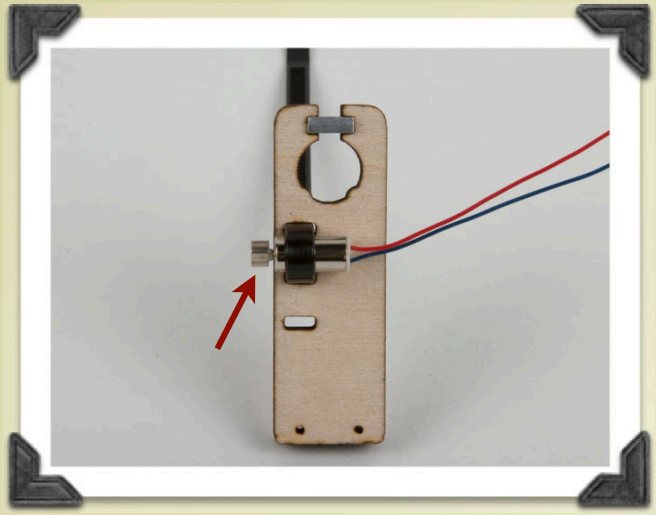
Fit the motor into the loop, when the loop is tight enough to hold it.

(To be continued...)

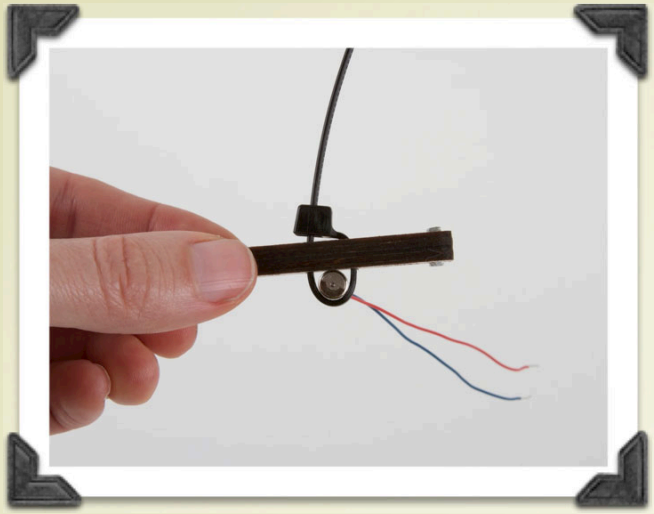
Appendix A: Attaching the vibrating motor to the pen arm (Part III)



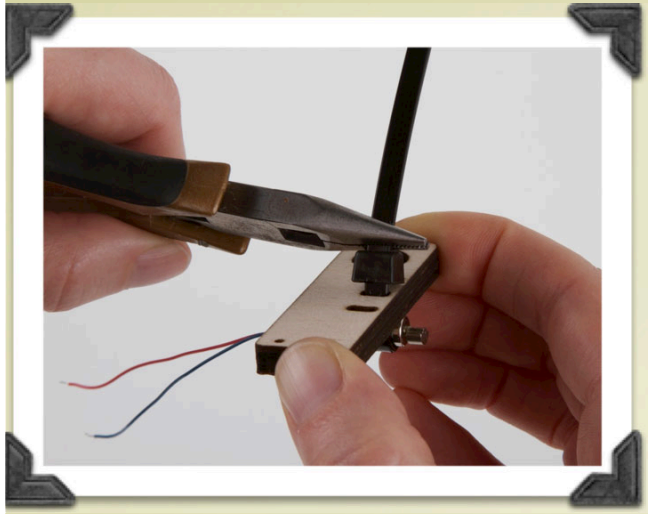
Check the orientation of the motor and wires.



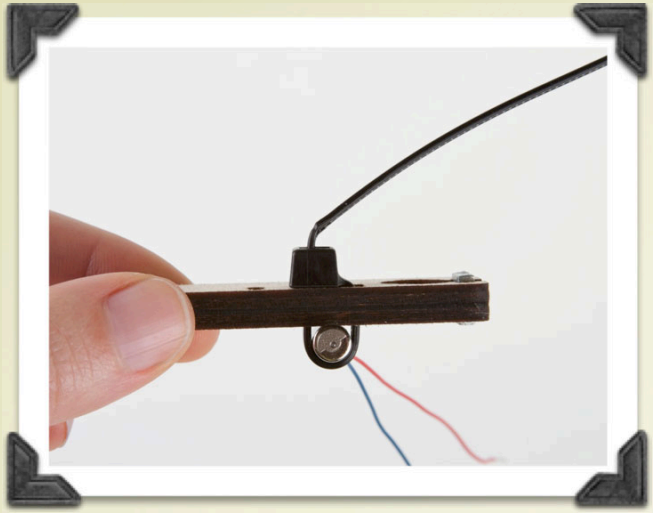
The eccentric (offset) weight on the end of the motor should hang off the end of the pen arm, so that it is free to rotate.



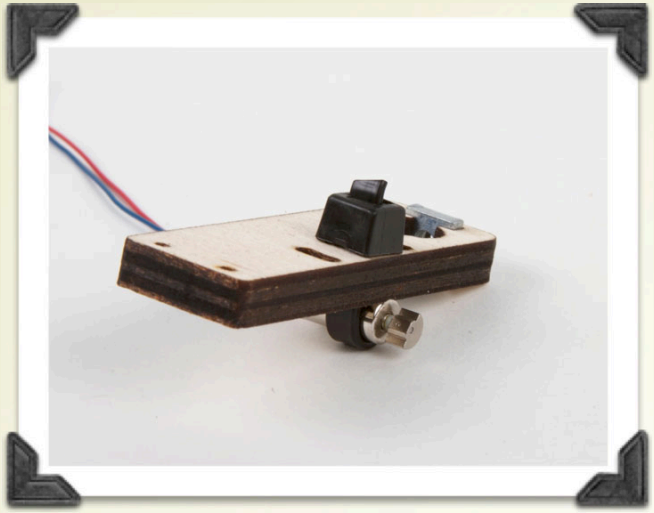
The motor is now in the correct location, but we still need to tension the cable tie.



Use smooth-jawed pliers, in a twisting motion, to tighten the cable tie.

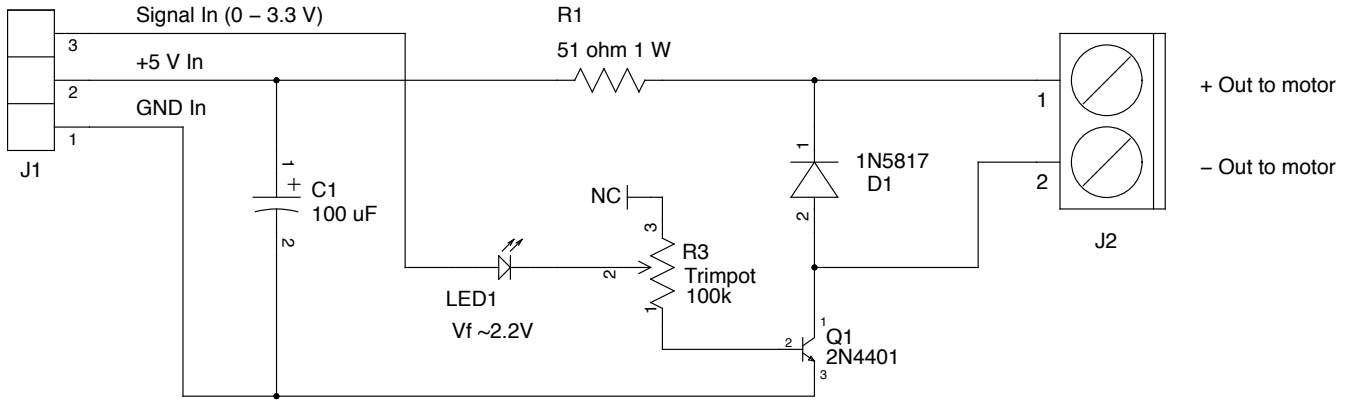


The motor should be fixed in place well enough that it cannot slide.



Trim the cable tie end with scissors or wire clippers.

Appendix B: Driver board circuit diagram



Note: Signal input is NOT 5 V tolerant.

Eggbot Engraving motor driver	
TITLE	
FILE:	REVISION: A1, June 2011
PAGE 1 OF 1	DRAWN BY: Windell H. Oskay