

Twisty-Grip™

Build your own spinner

You will NOT find a simpler design anywhere else!

Over 100 color pictures!

TOOLS

These are the tools you will need. Some super-glue, a long nose-pliers, a watch screwdriver, and an allen wrench are what you need for a panel-mount spinner.

If you plan to mount pushbuttons, use a 1-1/8" bimetel hole saw (preferably without a mandrel) to cut the holes.

You will need soldering equipment (not shown) if you intend to install pushbuttons.

TOOLS



BILL OF MATERIALS

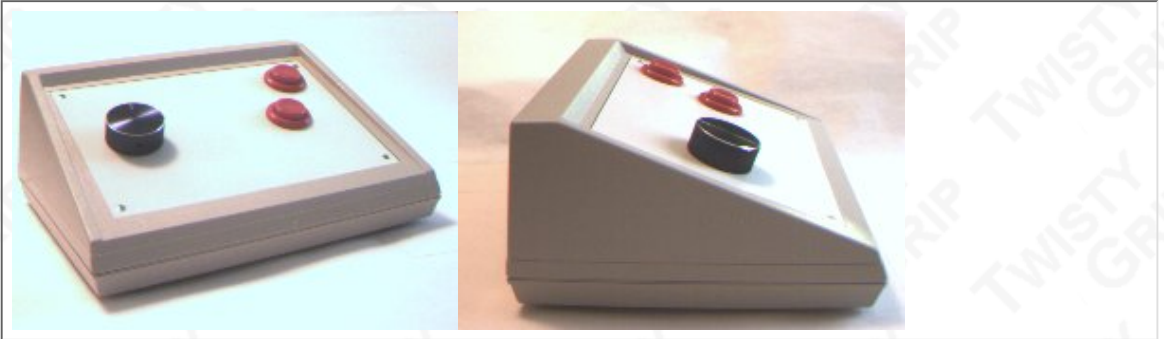
BILL OF MATERIALS

Part	Price	Part number	Supplier
Enclosure	12.49	-	Radio Shack
Standard knob	\$1.41	420094B1/4	http://www.apem.com
Arkanoid knob	10.91	KN1751	http://www.newark.com
Pushbuttons	\$1.25	53-9200-10	http://www.happcontrols.com
Mouse	\$9.87	-	Wal Mart
Paint	\$0.99	-	Wal Mart
Superglue	\$0.99	-	Wal Mart
Potentiometer	\$3.18	450D501-8	http://www.digikey.com
Optical encoder	\$2.47	CT-3001	http://www.digikey.com
Plastic sleeve	\$0.20	-	-
Metal collar w/set screw	\$1.75	-	-
Aluminum spacer	42.11	89F2624	Newark (pack of 100)
2.25" washer	\$0.55	-	Wal Mart
1.25" washer	\$0.10	-	Wal Mart
Plastic spacer	\$0.20	-	-
Countersink washer	\$0.05	-	Wal Mart
Wood screw	\$0.05	-	Wal Mart

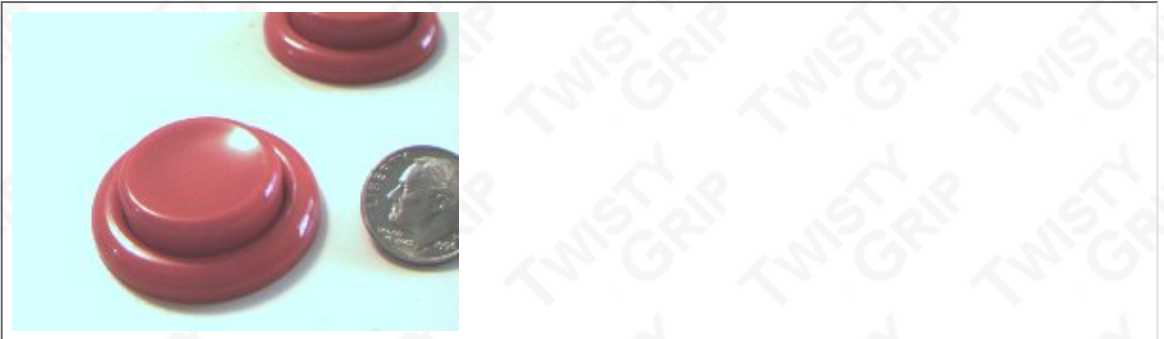
PARTS

PARTS

This is a Pan-Tec console from Radio Shack. The angled surface is perfect. It has a metal surface as shown above, so it will be difficult to drill if you don't have drill bits for metal.



The pushbuttons come from Happ and come in several colors. They need a hole that is exactly 1-1/8" across. A bimetal hole saw (the kind without a mandrel) is perfect. If you don't have one, you can drill a bunch of small holes in a circle to get the same effect.

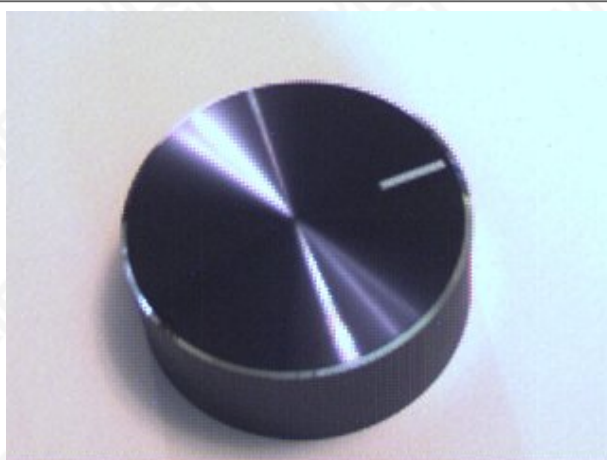


Get either of these mice at Wal-Mart (they're the same) for. It lets you use up to three buttons, is both PS/2 and 9-pin serial port compatible, and is plug-and-play compatible for



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Windows. It also includes a disk with DOS and NT drivers.



The knob TwistyGrip used was 1.56" and had an aluminum shell over phenolic (plastic).

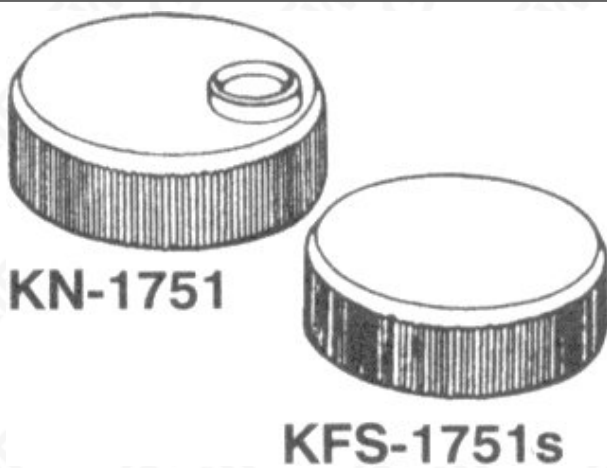
It has a very solid feel, and a cool silver trim around the top edge. Apem (formerly Mors/Asc) makes them.

Note that the knob has a separate collar and a small set screw that's easy to lose.

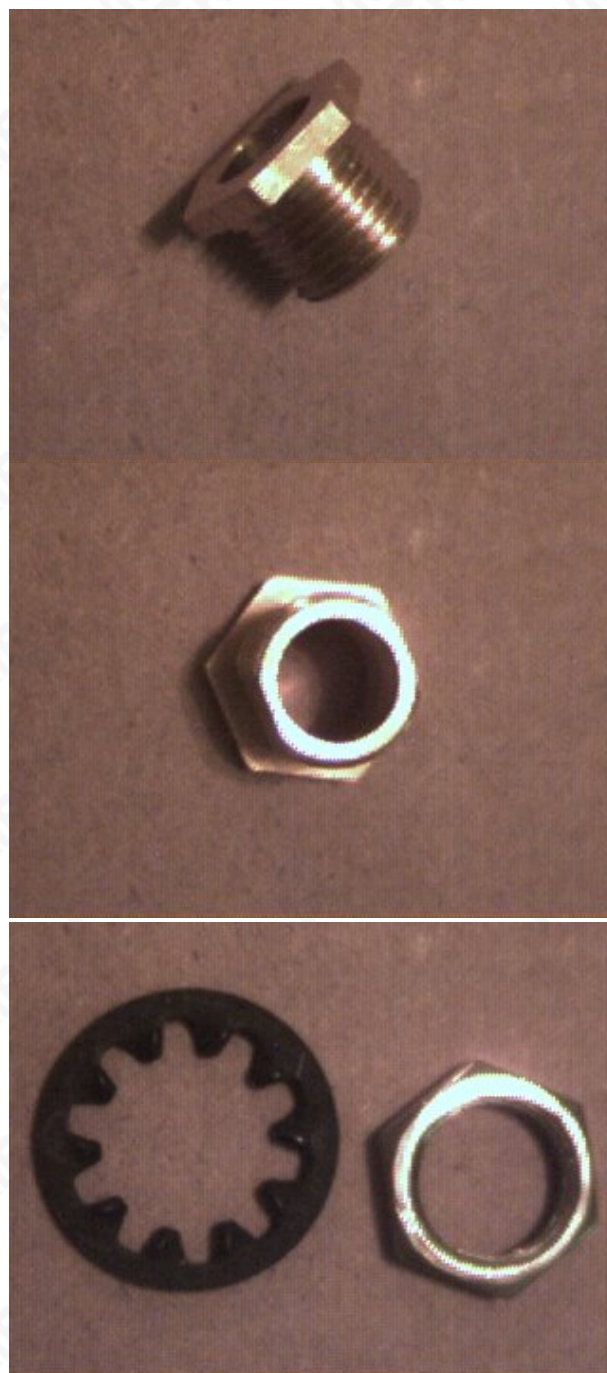


Occasionally, an Arkanoid freak would request one of these knobs. They're 1.75" across and .625" high. Augat and Alcoswitch makes them. You can order them through Newark Electronics.

They are NOT cheap...\$10.91 not including shipping.



This is a brass sleeve that came from an optical encoder. We prefer this type of sleeve because it fits a 1/4" shaft perfectly. Keep the mounting hardware! You may need it later.



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If you can't find the brass sleeve, a plain potentiometer housing will do. Just make sure it does NOT come from RADIO SHACK. The potentiometer housing and shafts from Radio Shack are molded together.



This is a plastic spacer with an inner diameter of 1/4". It has an outer diameter of 1/2". Note that there are NO BALL BEARINGS in this design. The shaft simply slips into the brass sleeve and plastic spacer and turns very freely. If your panel is metal or is very thin, you won't need this spacer, just the brass sleeve.

If you can't find this spacer, you can use a brass sleeve on both sides of your panel to achieve the same stability for the shaft.



This is a 1/2" outer diameter by 1/4" inner diameter metal collar with set screw. You don't really need it unless you want to attach a heavy flywheel to your knob.

A plastic spacer of the same size will do...just remember to use a lot of glue!

The metal collar has a set screw that's easy to lose. To remove the set screw, you need an allen wrench.





This is a 1" x 1/4" aluminum spacer (also called a standoff or post). It's threaded because you'll need to use more than one if your panel is over 1/4" thick. Try to find ones that can screw into each other. If you can't you'll have to cut a 6-32 screw or shaft (shown) to attach the two.

If your panel is thin (metal or 1/4" wood), only one spacer is necessary.

This is the flywheel. It's a washer with a 2.25" outer diameter and about 1" inner diameter. This turns out to be the perfect weight. Any larger, and your fingers get a workout. Any smaller, and the knob may not keep spinning when you let go of it.



Because the flywheel has a large hole in the center, we need this 1.25" washer to hold it to the shaft.

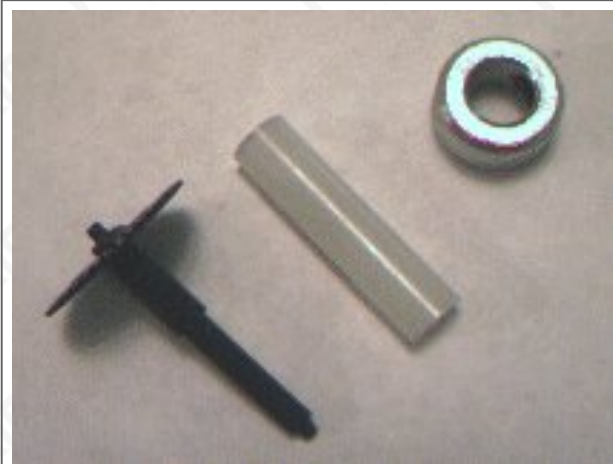
You'll need another one like this to prevent the plastic sleeve from falling through the mounting hole.



Shown: optical wagon wheel (also called light chopper, interrupter, etc.) that will come out of the mouse.

In the middle is a plastic spacer. We stopped using plastic spacers and started using aluminum ones for a tighter feel.

Another shot of the metal collar.



The knob cannot sit flush on the panel, so you'll need this plastic spacer with a 1/4" inner diameter and 1/2" outer diameter. You can use one of these to replace the metal collar, but the flywheel may wobble a little.

If you can't find this spacer, you can make a substitute by stacking up a bunch of little metal washers.



You may want to use a wood screw and a 1/4" countersink washer to hold the retaining wire down. Most of the wires in our units were simply glued down.

You can glue the retaining wire down if all of your measurements are EXACT.

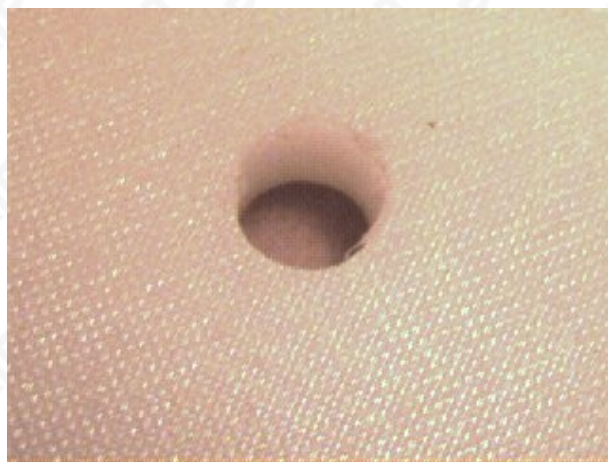
Other parts that you will need that are NOT shown: #10 rubber bands and wire from a coat hanger.



SUB-ASSEMBLIES

SUB-ASSEMBLIES

Drill a 1/2" hole where you want the spinner to be. Please note that the dial is exactly 1.525" across. Make sure you can turn the knob without other instruments getting in the way.

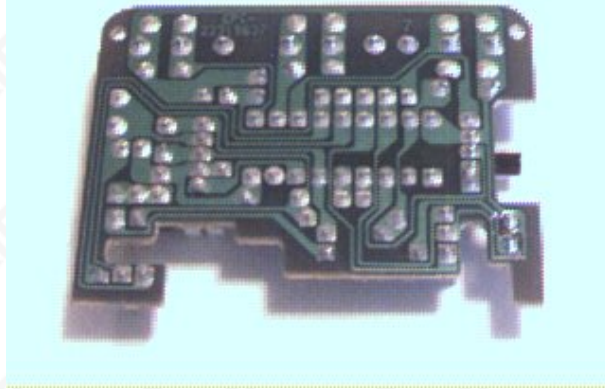
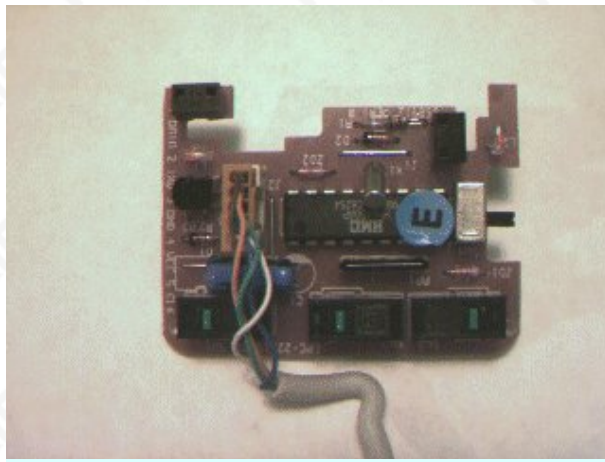


Open the mouse housing. It is held together by only one screw.

There are tabs on the front of the mouse that hold the halves together. You can separate them without breaking anything if you slide the top back. If you just can't get it open, then go ahead and break it open (the parts you need are safe).



Remove the printed circuit board (PCB). Make sure the switch is positioned as shown, which puts it in MS mouse mode (plug-n-play).

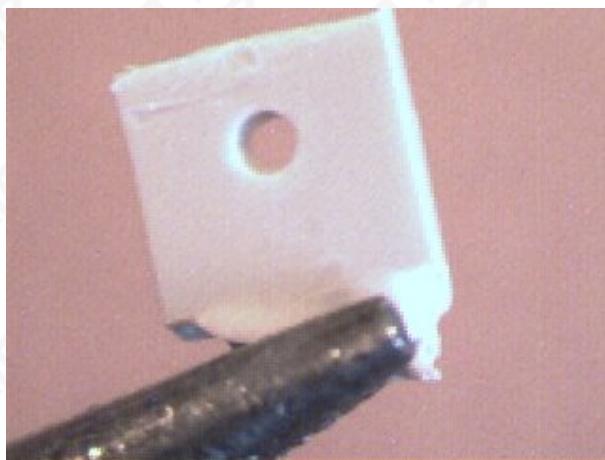


You may discard the top half of the mouse. You'll need to remove two parts from the mouse base before you discard it:

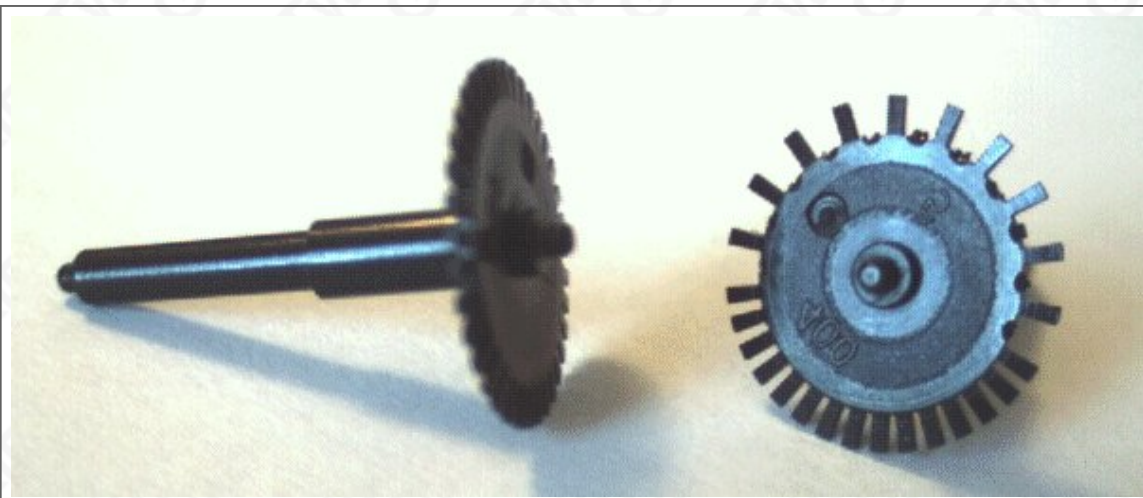
- 1) One optical wagon wheel.
- 2) One of the plastic tabs holding the wheel.



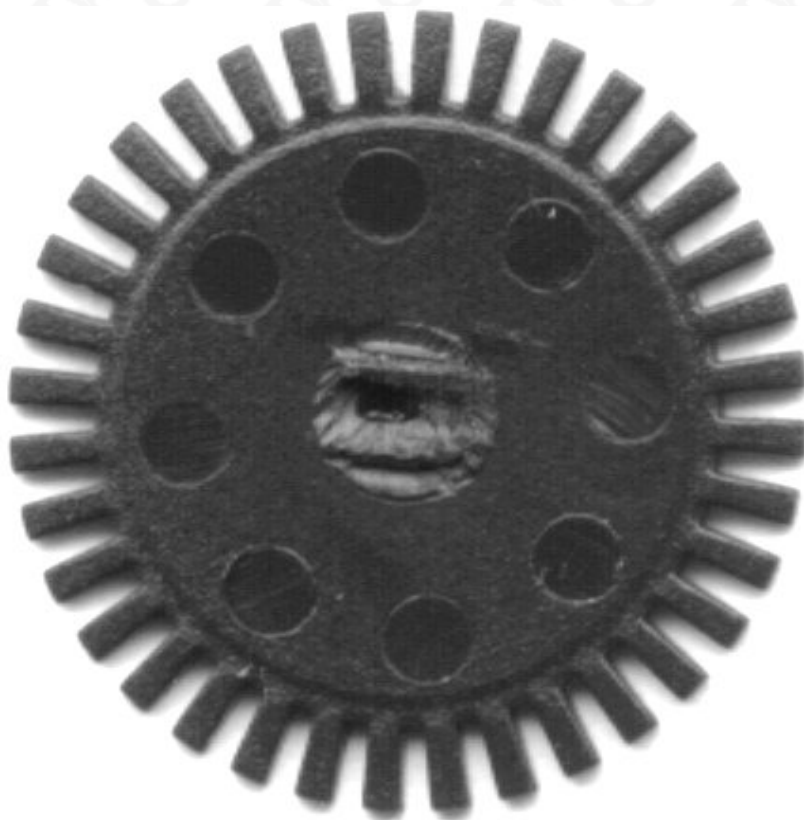
Break off one of the plastic tabs that holds one of the optical wheels in place.



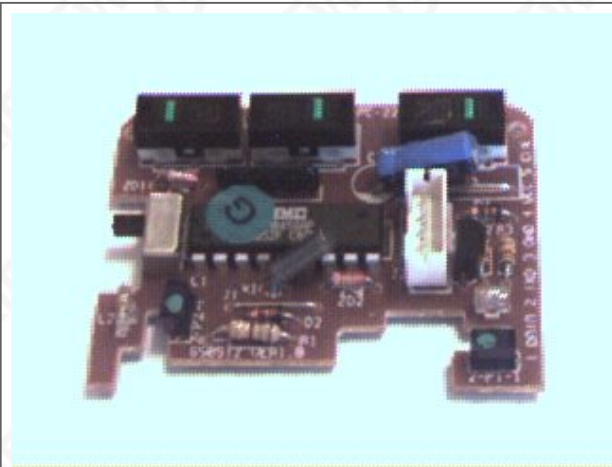
If you keep all the spokes on the optical wagon wheel, there is a good chance the spinner will not take fast spinning very well. It will jitter. Break off every other spoke (partly shown on the right) to get much better responsiveness. Keep the other wheel just in case you make a mistake.

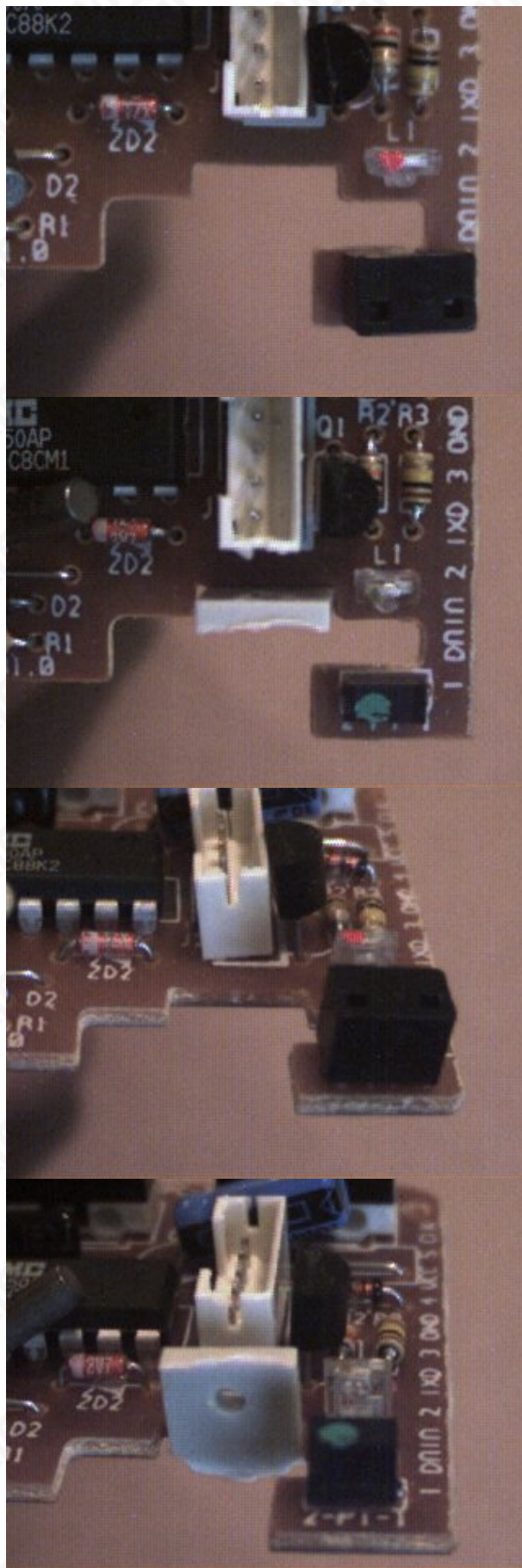


This is a 600 DPI picture of the light chopper. Some people ruined theirs trying to break off the spokes. It turns out if you print this out on a transparency 1=1, it's an amazingly good replacement.



Locate the opto-interrupter module on the lower right-hand corner. Note the cutout where the optical wagon wheel rested.



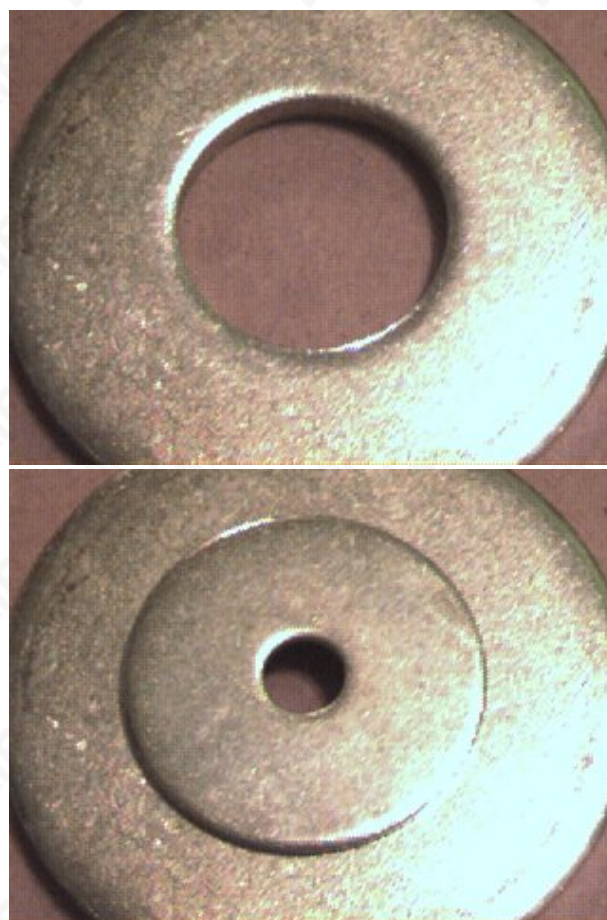
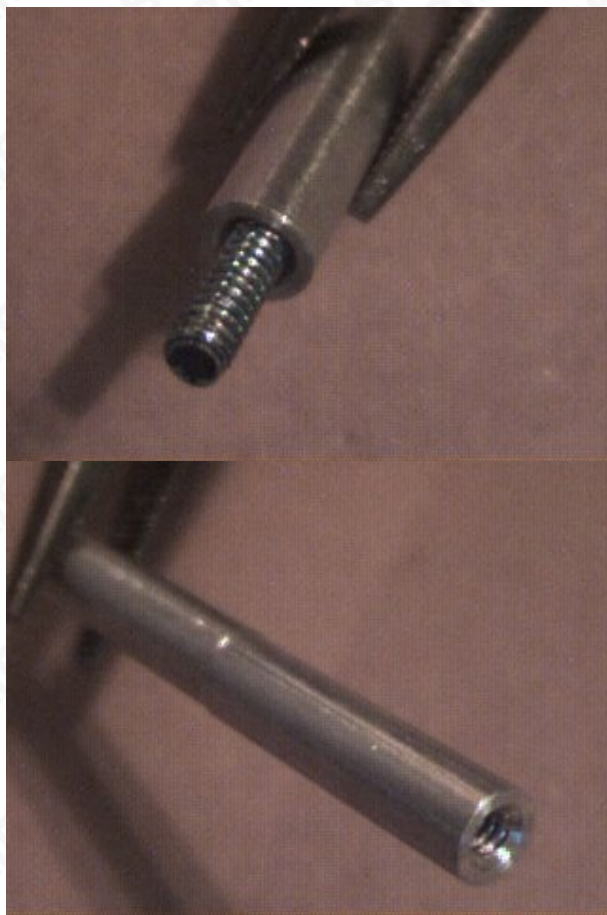


Here is a close-up of the opto-interrupter.

Glue the plastic tab you just broke off to the printed circuit board as shown.

It must be located just below the white socket. Make sure the tab is perfectly horizontal or the spokes of the optical wagon wheel will break off when they scrape against it.

Connect the two aluminum shafts. Superglue them together because they will separate with just a little use. If your panel is thin (metal or 1/4" wood), only one spacer is necessary.



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Look at this sequence. This is how the metal parts stack up.

The actual method of centering the parts are described below.

Use super-glue to attach the parts (don't worry, superglue will hold the parts very well).

First, loosely insert the knob onto the shaft. Next, put the collar on the end of the shaft. Tighten the set screw.

Glue the 1.25" washer on the collar. Make sure it's perfectly centered by gently rotating it.

Place the flywheel on the 1.25" washer. Don't glue it on until it's perfectly centered.



Make sure the plastic sleeve does not "stick" when it rubs against the metal collar.

Attach the knob and spin it quickly. The aluminum spacers should be smooth enough to allow the shaft to turn freely.

Repeat for the brass sleeve.

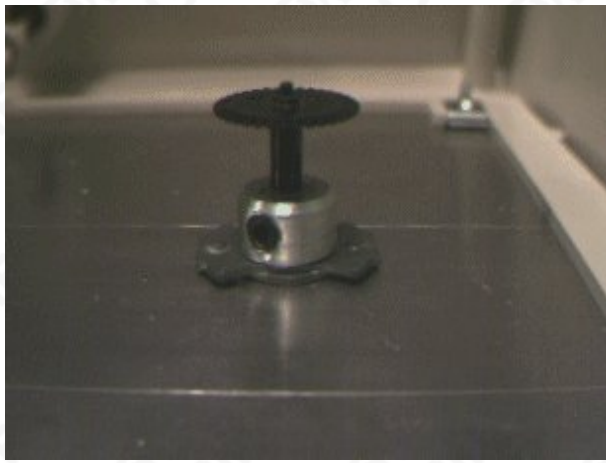


Insert the optical wagon wheel down the center of the shaft.

Apply a drop of super glue to hold it in place AFTER you have read the rest of this guide.

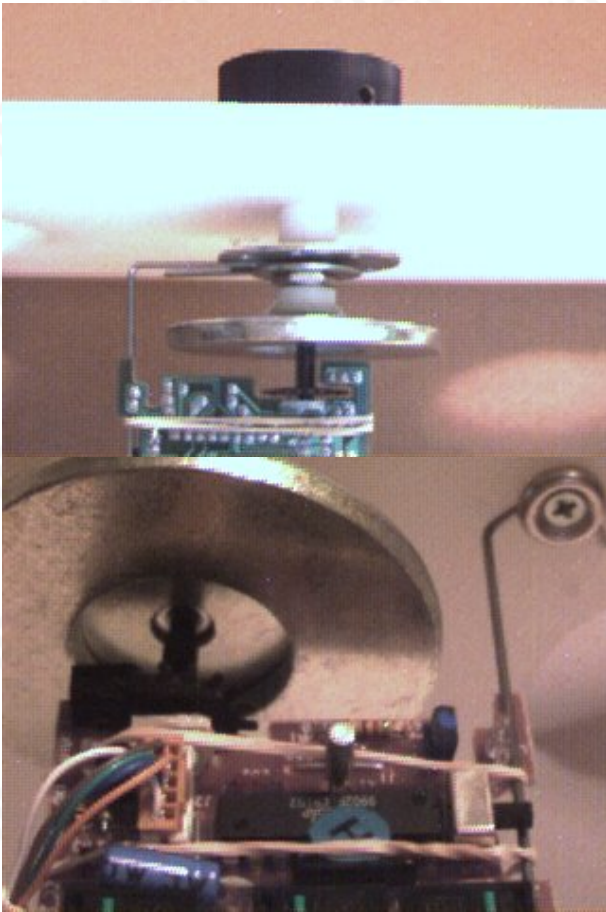


If you don't want a flywheel, then your work is MUCH simpler. The assembly will look like this (using a regular pot sleeve and a single 1" shaft).



There are two kinds of sleeve assemblies. The standard sleeve allows quick and easy adjustments, but the spinner will not be a one-piece assembly.

Here is a comparison of the one and two piece designs. The one-piece design is on the top or left. Note how the retaining wire is held in place by a second washer.



Standard sleeve

Drill a hole near the edge of the 1.25" washer. It will be used to secure the sleeve to the panel, although it's really not necessary.

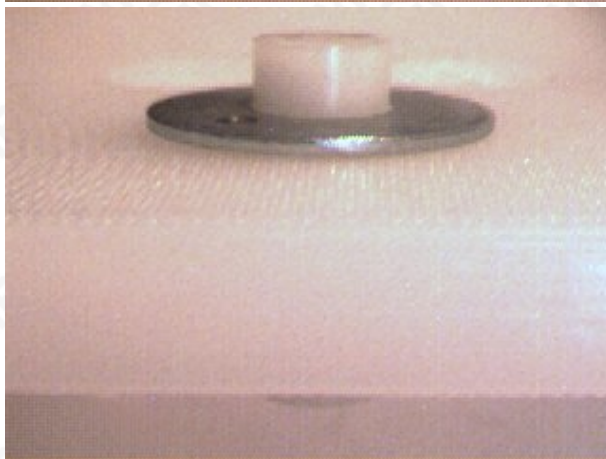
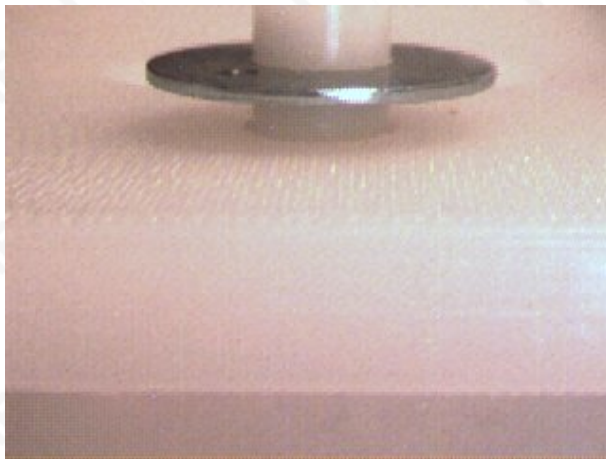
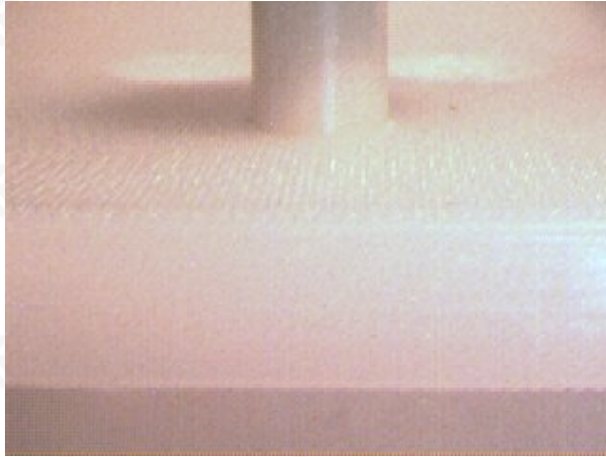
Glue the washer to the plastic sleeve.

The plastic collar is used to keep the knob off the panel. Without it, the knob would scrape the surface. Do not glue the plastic collar.



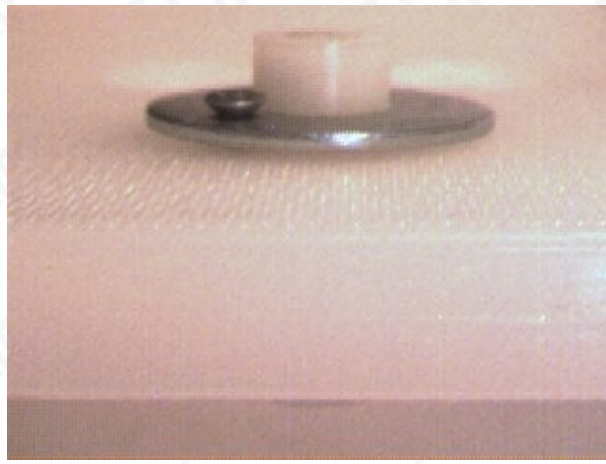
Standard sleeve

Slide the plastic sleeve assembly into the 1/2" hole you just drilled. It should be a snug fit. If it is not, take the sleeve out and apply a little glue to the exterior of the sleeve before reinserting.



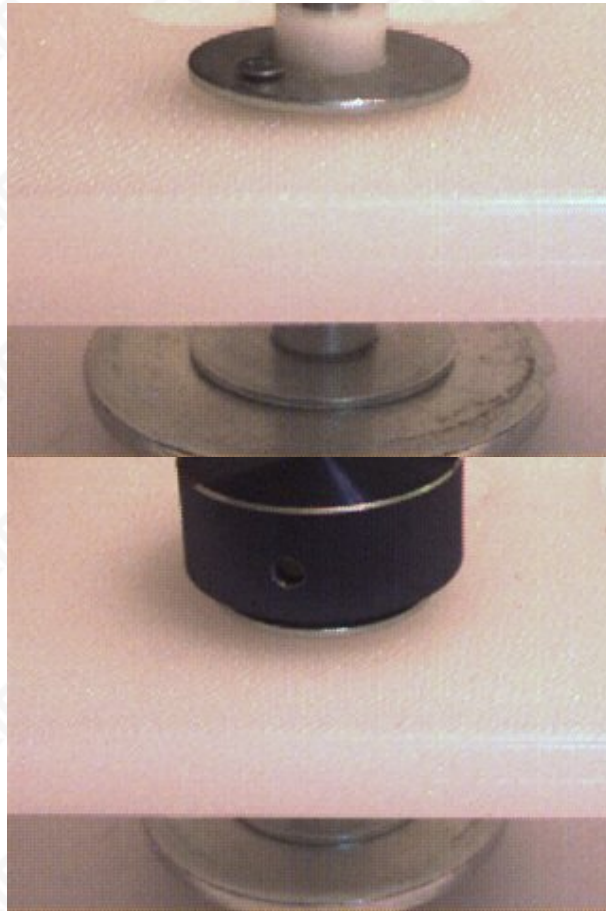
Standard sleeve

Secure the sleeve assembly with the screw. If you drilled a perfect 1/2" hole, this step is not necessary because the spinner won't wobble.



Standard sleeve

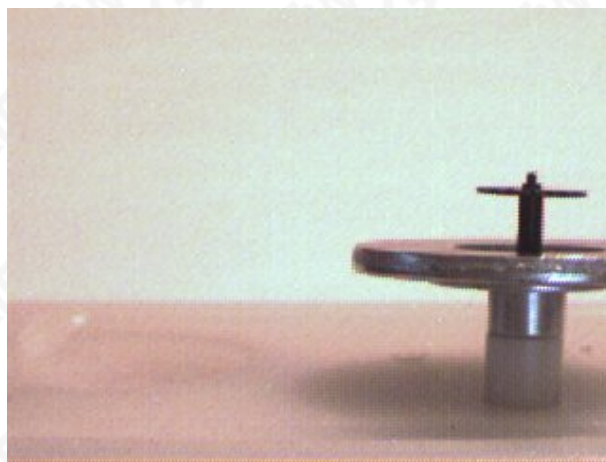
Insert the shaft/flywheel assembly into the sleeve. Re-attach the knob. Check to see that the spinner turns freely. If it does not, loosen the knob and pull it up a little to give some space between the ends of the plastic sleeve. Re-tighten the set screw.



Standard sleeve

Turn the panel over.

Let this be a lesson to everyone: when drilling the 1/2" hole, use a drill press or an alignment tool. If you use a hand drill, hold the \$#@! thing straight.

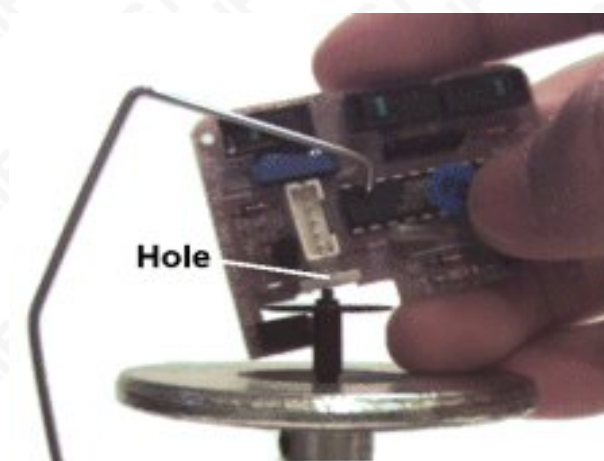
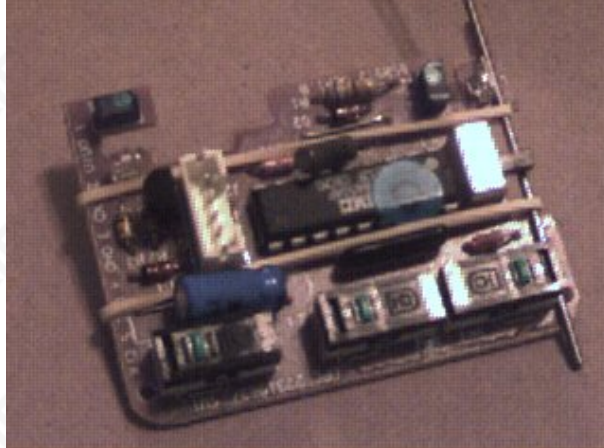
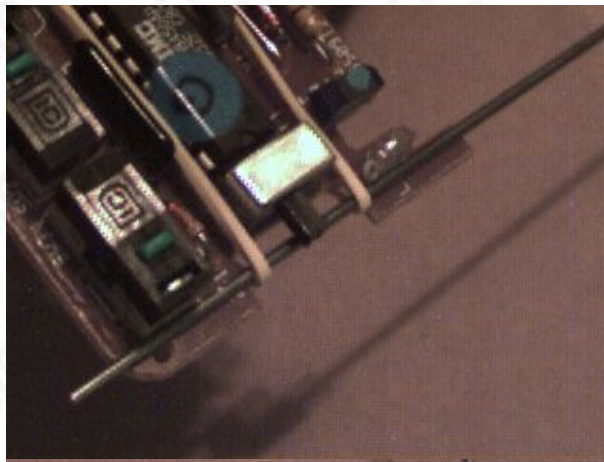


Standard sleeve

Straighten out a wire coat hanger and cut about 4" off.

Take some #10 rubber bands and secure the wire as shown.

Now the circuit board has a few rubber bands and a wire strapped to it. Originally, the wire was pre-glued to the circuit board, but different panel thicknesses prevented the parts from lining up. You must glue the wire on when you are finished (Superglue or Elmer's will do), although the rubber bands will hold for a long, long time before they slip out of alignment. So if you're just too excited to try it out, and can't wait for glue to dry, go ahead and play with it when you're finished.



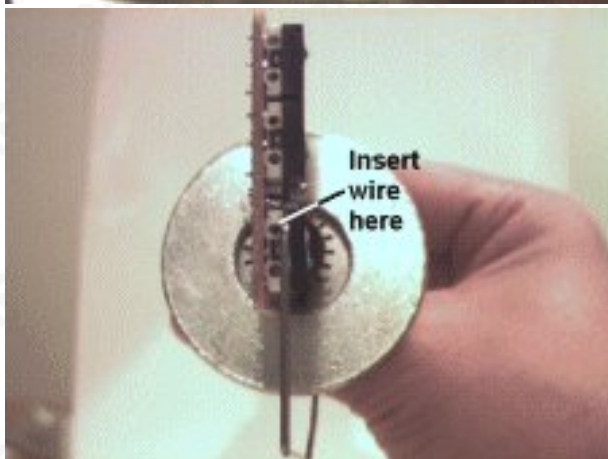
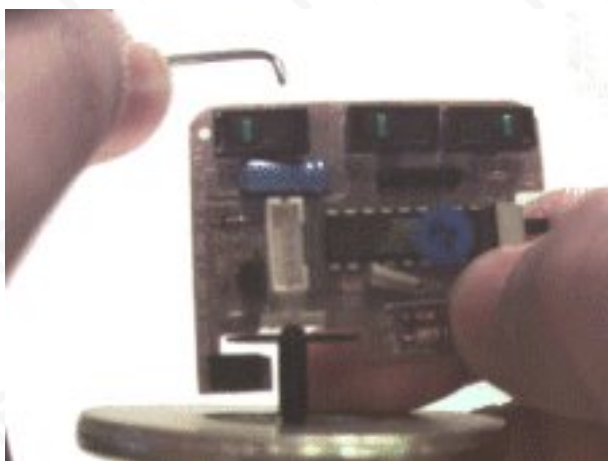
If you pick a flywheel washer that is very large, the

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wire will have to go around it.

The method shown wraps the retaining wire until it reaches the top of the nearest mouse microswitch. The microswitch has holes conveniently placed directly over the center of the hub of the optical wagon wheel.

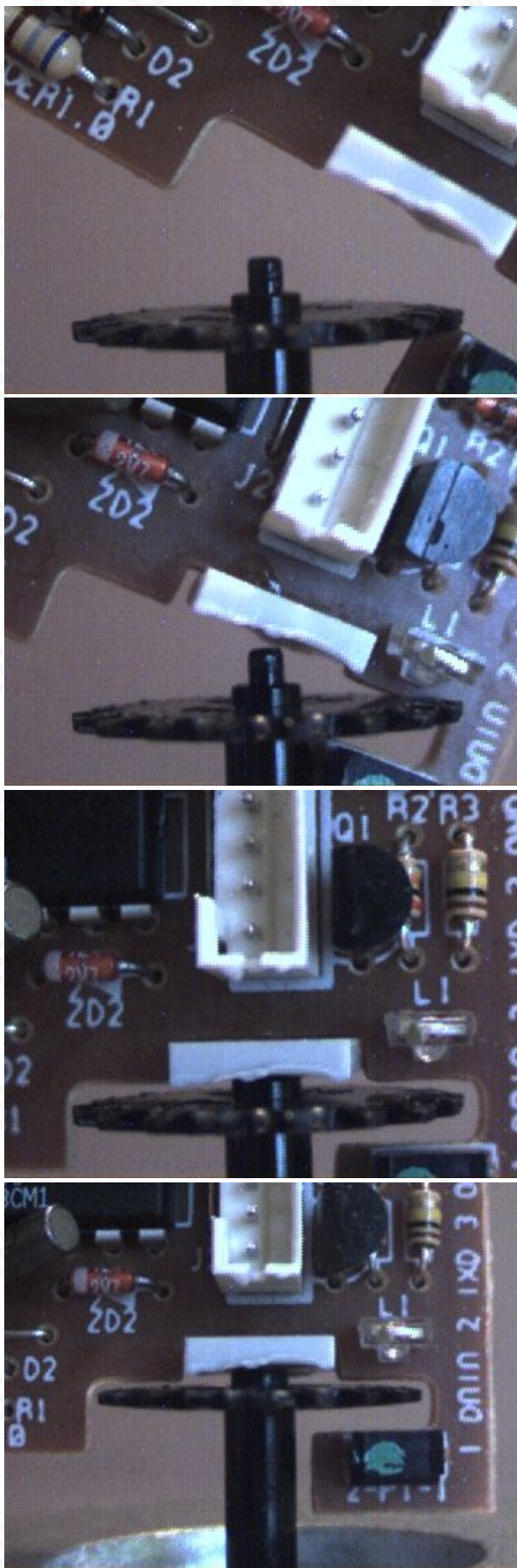
It balances perfectly if you insert the wire into the second hole.



FINAL ASSEMBLY

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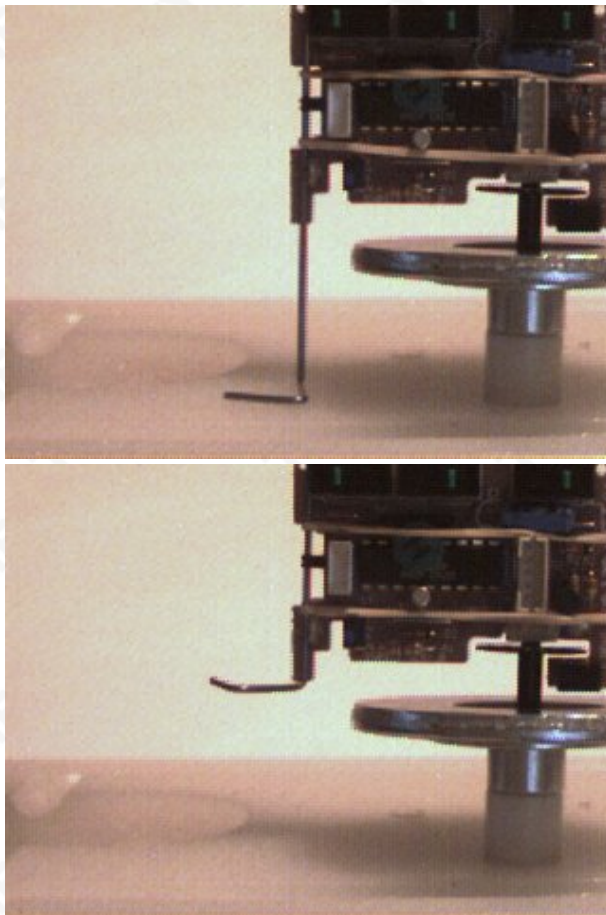
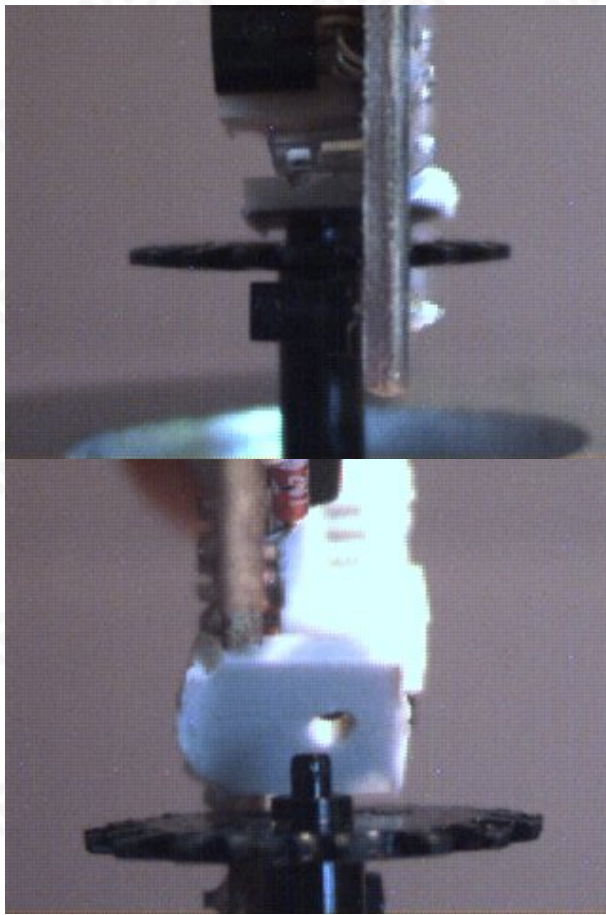




Standard sleeve

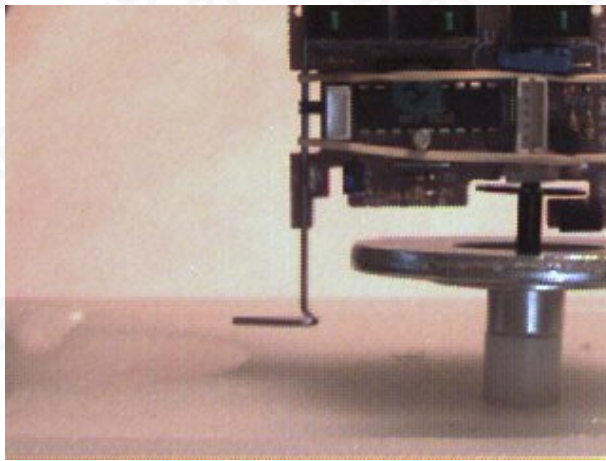
Align the circuit board on the optical wagon wheel. Make sure the circuit board is perfectly vertical and all the spokes clear the edge.

Turn the knob a little to check the clearance of the spokes. The spokes must not touch the circuit board!



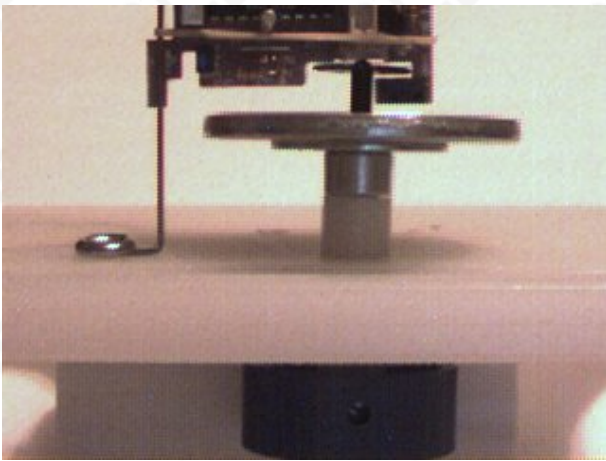
Standard sleeve

Slide the wire up and down the edge of the circuit board until the bottom of the wire touches the base panel.



Standard sleeve

Secure the retaining wire with the wood screw and washer.

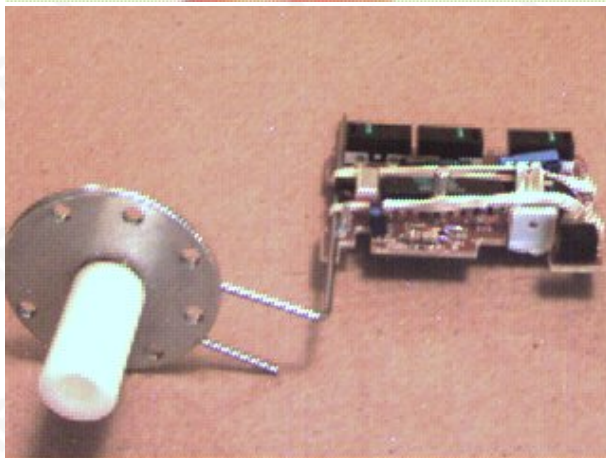


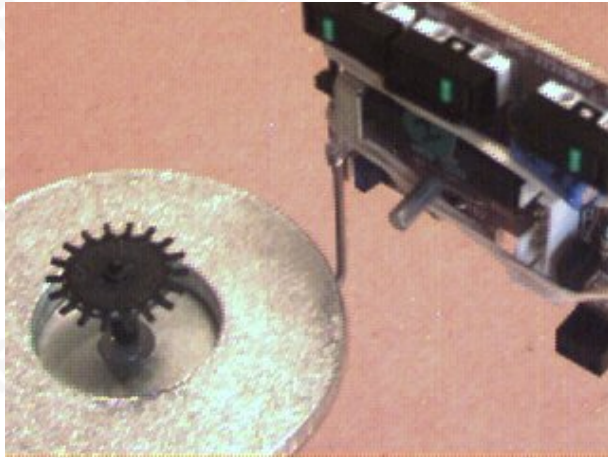
One-piece sleeve

The one piece assembly is very similar to the Standard Sleeve except it uses a second washer to hold the retaining wire.

The entire part is held by the brass sleeve. Sorry, an ordinary pot housing won't work here.

The one-piece sleeve is held from the bottom, so several mounting holes must be drilled into the washer.





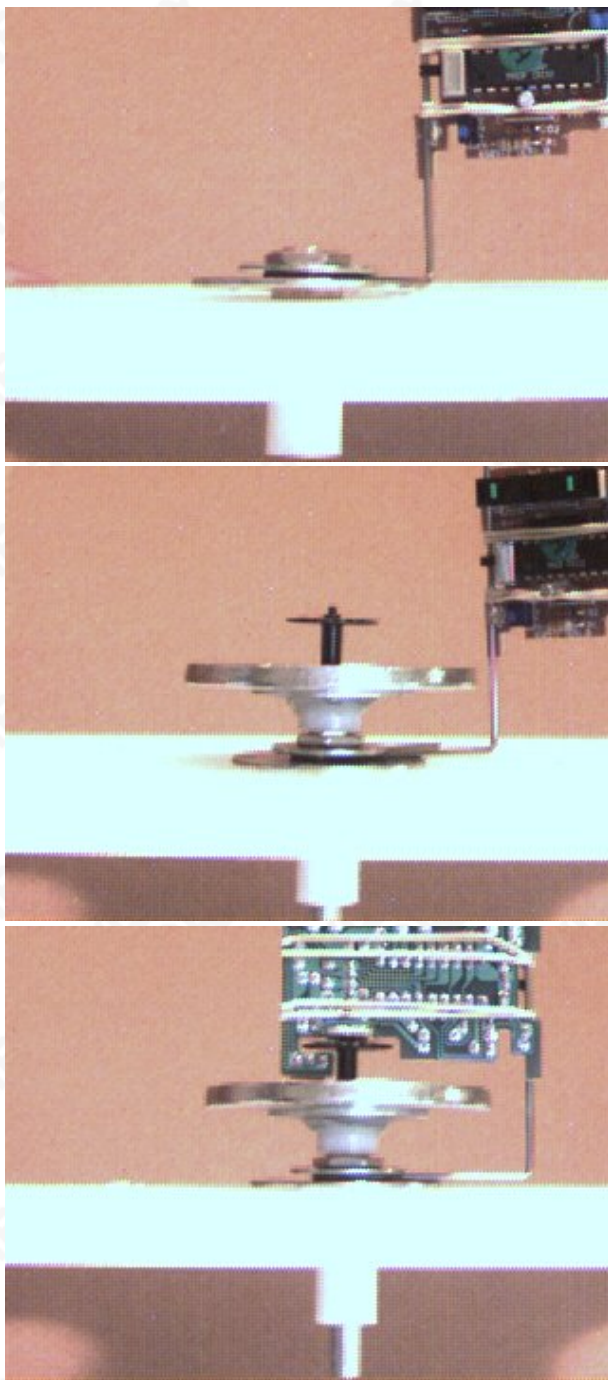
One-piece sleeve

Because the circuit board swings horizontally in this kind of assembly, you can't mount the PCB to the optical wagon wheel by tilting it at an angle.

The circuit board is mounted to the optical wagon wheel

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by simply swinging it over and snapping the hub into the hole of the plastic tab.



One-piece sleeve

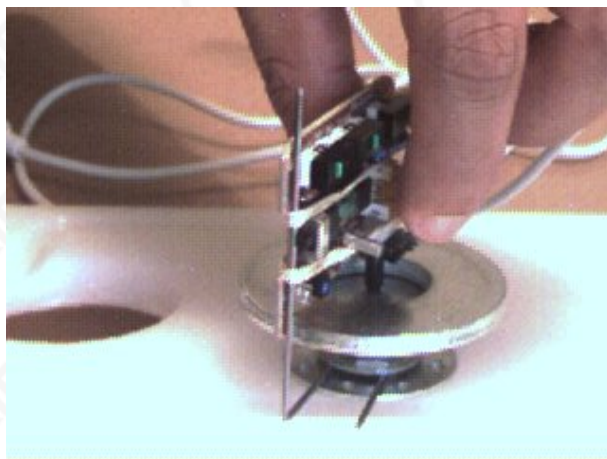
Flip the panel over and secure the knob on the other side. Make sure it spins freely. When mounted, the knob will not touch the surface.



ELECTRICAL

ELECTRICAL

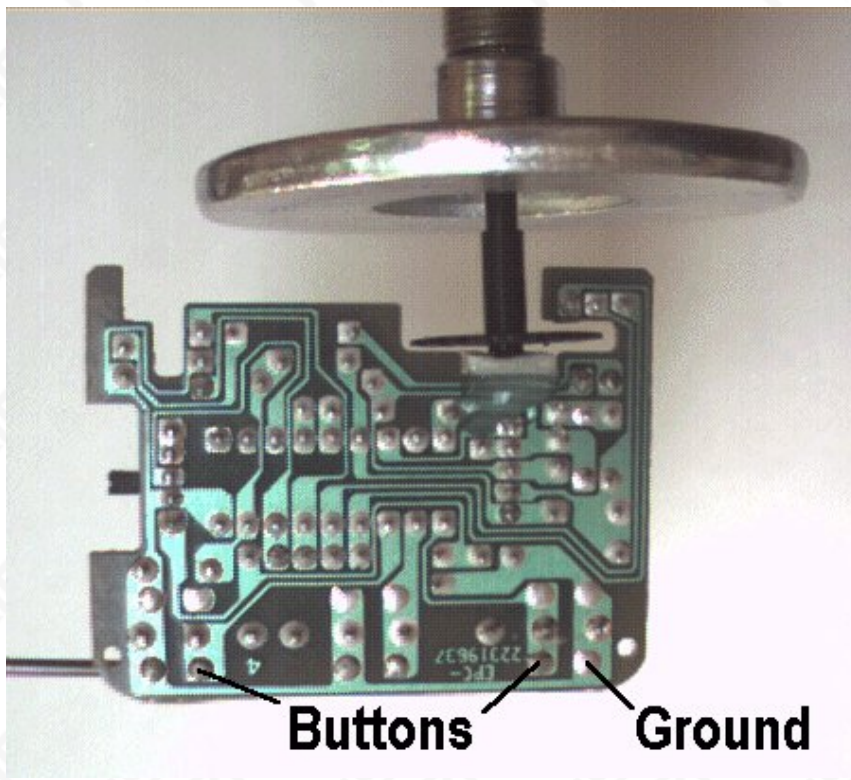
Move the rubber bands away from the socket and plug the serial connector in. Brace the back of the circuit board with your finger so you don't bend the wire.



To connect the fire buttons to real pushbuttons, there are unsoldered points for your convenience.

At this point, 99.9% of the work is complete. If you got this far, you can actually start using your spinner.

Don't forget to glue the wire to the PCB.



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