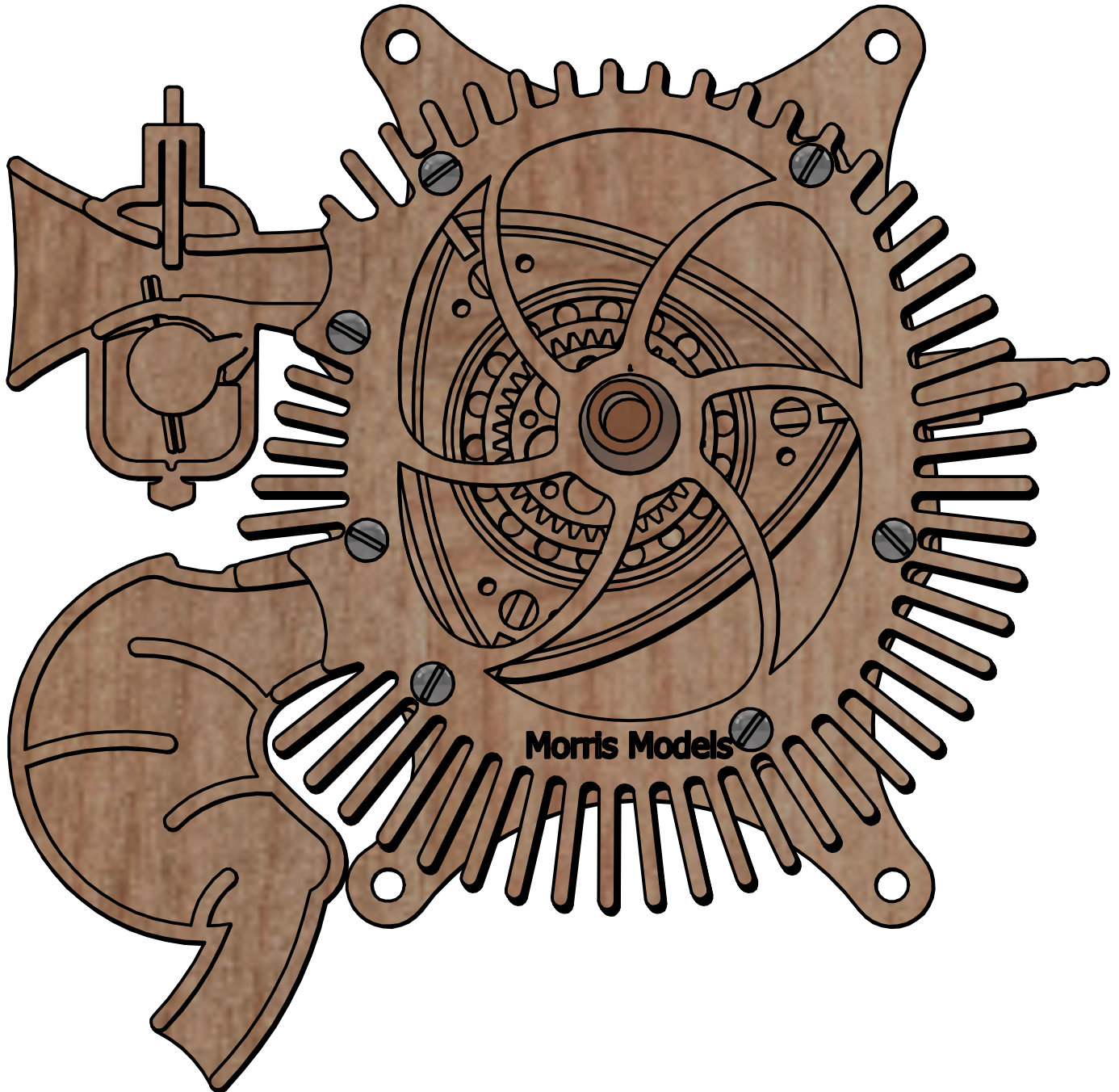


Morris Models Kinetic Cutaway - Technical Art that Moves™

Mini Aircooled Wankel



Build Manual

Instructions, manual, illustrations, and model outlines Copyright (C) Don Morris, 2024. All rights reserved. Printed in USA.

Before you Build

Most of this kit was cut out of Baltic birch plywood on a laser cutter. Plywood is a natural product, and every piece is different. Because of this, the laser cannot cut every piece perfectly. This means that in some places, there is smoke and scorching. In other places, the wood did not cut completely and there are splinters hanging on the edges. The more time you spend preparing your parts, the better your completed model will be.

You should begin by making sure that none of the parts are missing. Look over the rest of the manual, and find all the parts as they are mentioned. Check the parts to make sure that they are in good condition. Minor damage can be repaired with glue. Splinters should be removed using an X-acto type knife and sandpaper. Scorched marks can be lightly sanded off. If any parts are badly broken or are missing, you can get replacement parts from www.morrismodels.com.

The main shaft is cut from hardwood. It should be sanded for splinters and checked for fit. Make sure that the shaft can rotate freely in the cover and in the rear wall bores. Sand if necessary. It tends to get tighter fitting in the summer and looser in the winter due to changes in humidity. If you are building in the winter, make sure it is a little tighter than seems necessary.

This engine is designed to be assembled with any type of wood glue. I personally use Elmer's "Glue-All" glue. Do not use Elmer's "School Glue." It will not work. Whatever glue you use, use only enough glue to stick the parts together. Extra glue will squeeze out from between the parts and stick the engine together in places where it should not. Any glue that does squeeze out from between parts should be wiped up with a damp cloth while it is still wet. Many of the plywood parts have 1/8" holes. These holes are to help line up the layers. As you work, try to keep the glue away from these holes. When you put on a new layer, push short dowel pins into the layers to help line them up. These are called alignment pins. You should remove the alignment pins after the glue has had a few minutes to dry.

Many people ask if they can varnish, paint, or stain the engine. I do not recommend using paint or varnish, but oil-based finishes or stains are appropriate. Assemble the engine before using them. Another alternative is to use water-based markers. You can color each part before or after it is assembled. These parts absorb a lot of marker ink, so it will take quite a few markers to do the job.

Real engines use oil to keep them sliding smoothly. This wooden engine model would be ruined with oil. Some people use wax when assembling my wooden engine kits to help the parts slide smoothly. This step is optional. I have used candle wax and I have used colored crayons. Either of these will work fine. So does paraffin wax. I have also assembled quite a few of these engines without any wax. This also works. Just don't use wax on your engine before gluing the parts together, as this will interfere with the glue. It will also interfere with staining or painting the parts, so plan ahead.

This manual shows how to build the engine step by step. Sometimes it is hard to explain things in a manual, but easy to understand it on a video. We try to shoot videos for each engine as time allows. If a video for this engine is available, it will be posted on the web site www.morrismodels.com. Our videos show the same steps that are in the manual. Use a video if you prefer, or use the video to view any steps where you have trouble understanding the manual.

Do not be disturbed when you have parts left over at the end of the project. We include as many spare parts as we can reasonably include - particularly the small ones. Where there are extra parts, try to use the best ones. Any that did not cut cleanly can be saved in case the other ones are ruined.

If you have access to Facebook, you can also interact with us there. We have a group that is intended to share tips, tricks, and questions with other builders. This group is entitled "Laser Cut Model Engines and Art," and we would appreciate it if you check it out and post pictures of your completed builds. If you have a Facebook account, the QR code on the right should take you there. We would love to see pictures of your kit there, too.



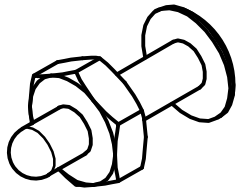
We hope you enjoy building this kit. If you do, you may want to consider building some of the other model kits. We have several more models available on the web site, including a larger water-cooled wankel kit. Since we had room, we included a rotor from the larger kit with your current kit.

New Parts:

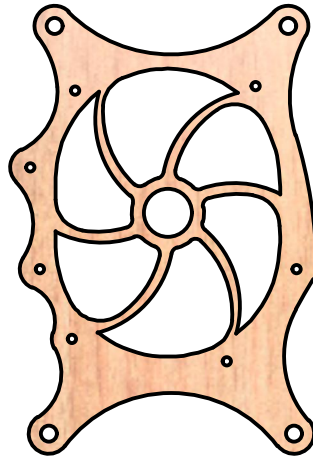
6-32 Nylon
Nuts x 7



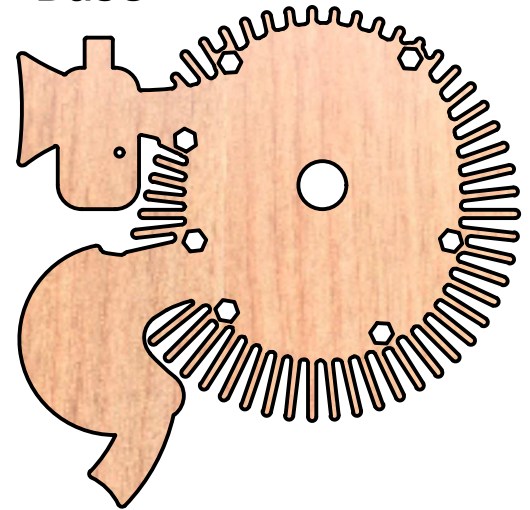
6-32 Nylon
Screws x 7



Mount

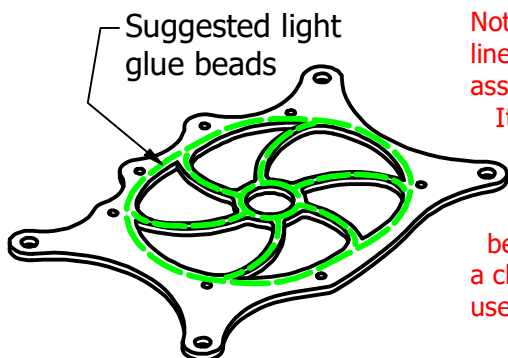


Base

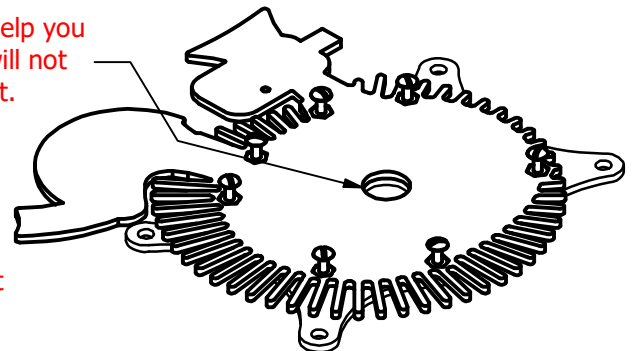


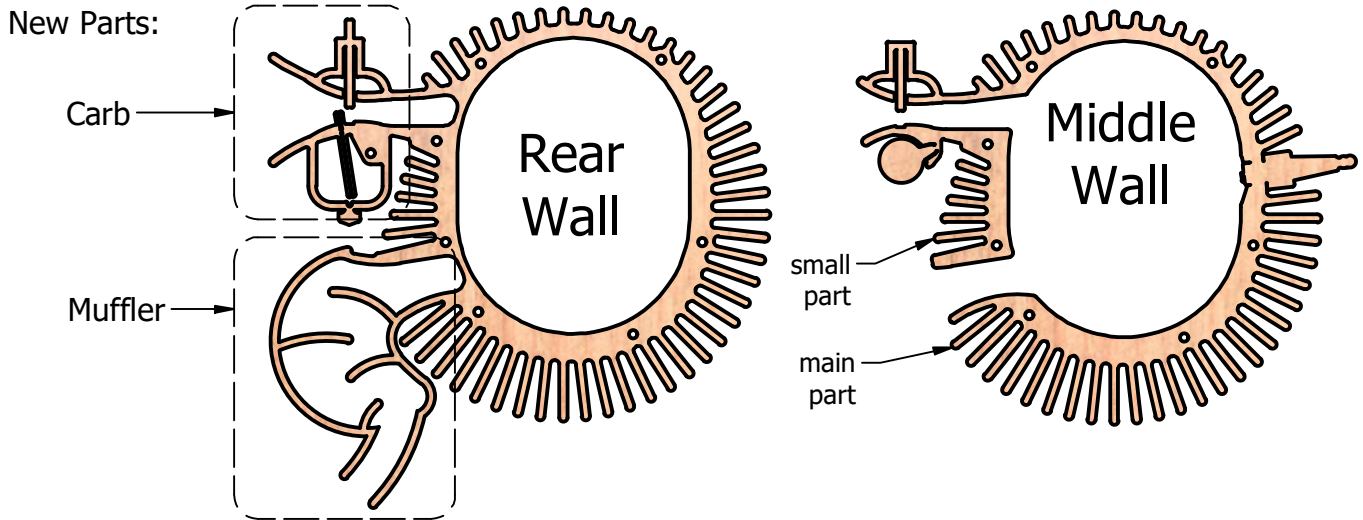
Thread each of the nuts partway onto the screws (shown enlarged and without threads). The threaded part of the screw should be about 1/8" (the same thickness as the plywood parts) past the end of the screw.

Locate the mount and base shown above. Deburr the edges and clean up any scorch marks. Set the mount down in front of you with the two holes on the left in the orientation shown. Then apply a thin bead of glue - again as shown. Place the base onto the mount so that all seven hexagons line up with the seven holes in the base. Press it down into the glue. Use the screw/nut combinations you built above to help line it up. Stick the nuts into the hexagons. The ends of the screws should fit into the holes below. Carefully remove the screws, but leave the nuts in place. It is safer to allow the glue to dry before moving on. However, as long as you do not allow the base to shift, it is OK.

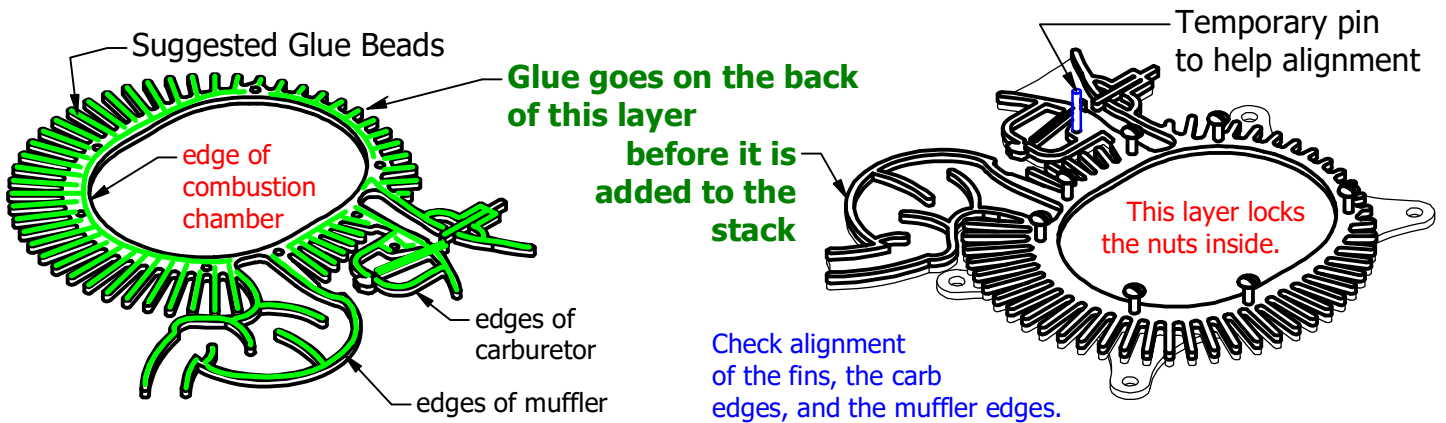


Note: The screws will help you line up the layers, but will not assure perfect alignment. It is important to line up these holes very precisely before the glue has a chance to dry. Do not use too much glue!

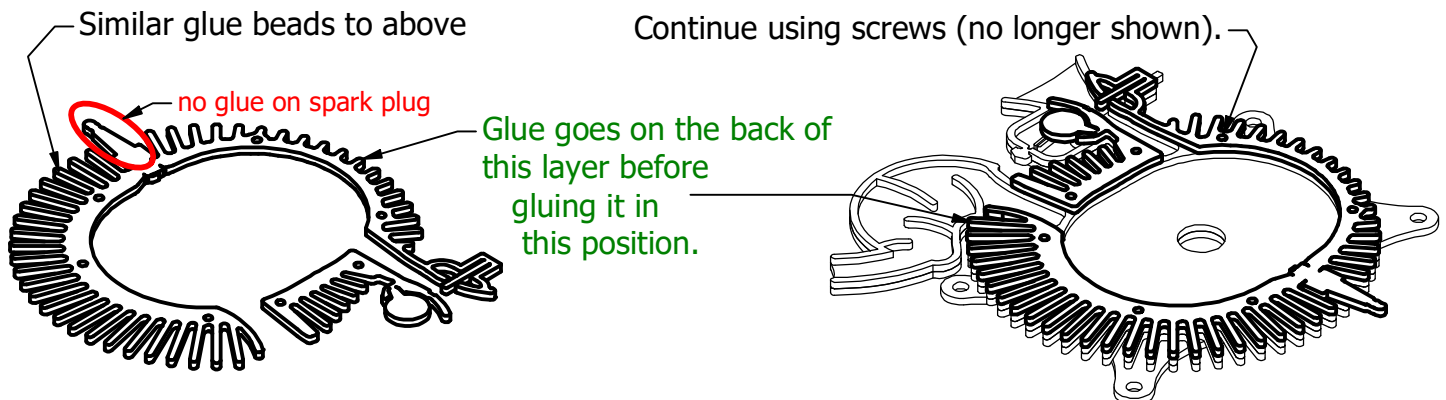




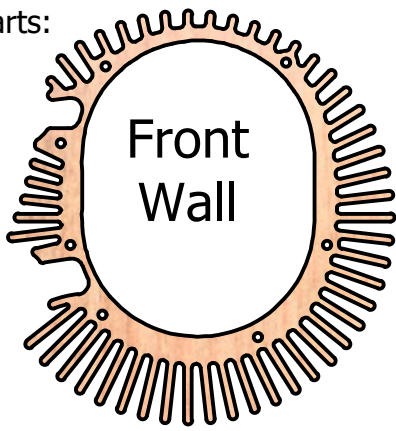
Set the rear wall layer in front of you as shown. Note that this is upside down. Spread a thin bead of glue over all of the areas of the rear wall layer - including all the fins and all the fine details of the carburetor. Don't get any glue too close to the inside edges of the combustion chamber. Carefully turn the rear wall layer back right side up and glue it down over growing housing you are building. Press it down firmly, and clean up any squeeze-out. Re-use the screws to make sure that everything is lined up properly. Only screw them partway in. Remove them before continuing.



Continue with the middle wall layer. Place it as shown, and apply a similar layer of glue to the last step, covering all of both the small and large part. Invert the glued parts, and add them to your assembly, again using the screws to help you line things up. Before the glue dries, check to make sure the edges of the combustion chamber are lined up perfectly, and there is no glue squeeze-out on them. If there is glue, clean it up while it is still wet.



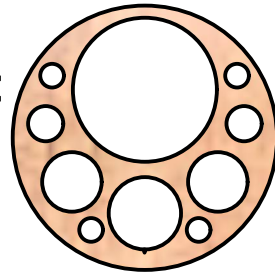
New Parts:



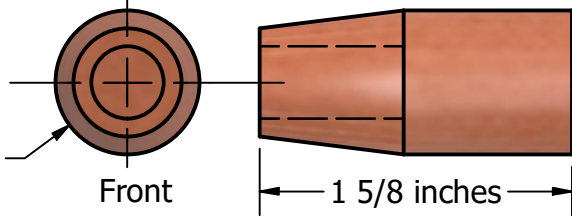
Front Wall

Note: Wall shown at 1/2 size. Other parts shown full sized.

Eccentric x 2



Shaft

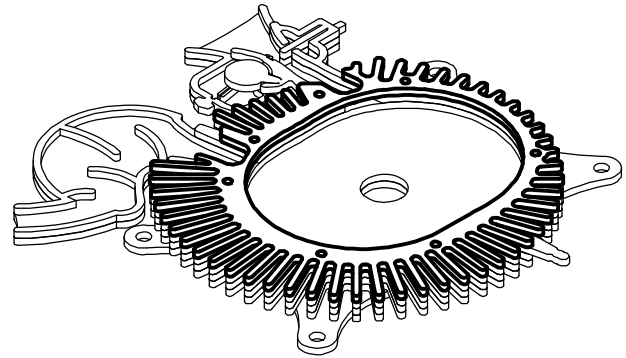
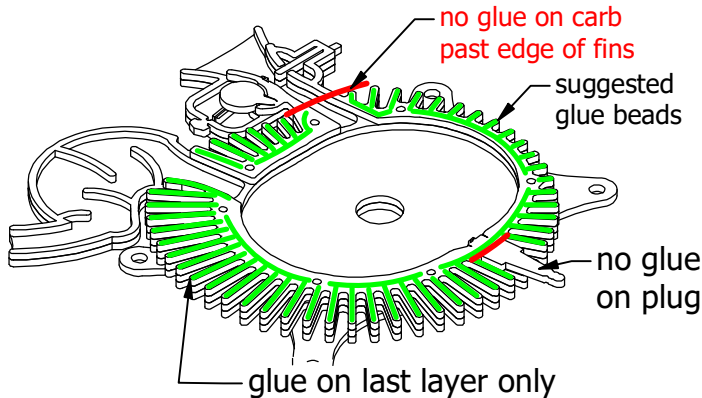


3/4 inch diameter

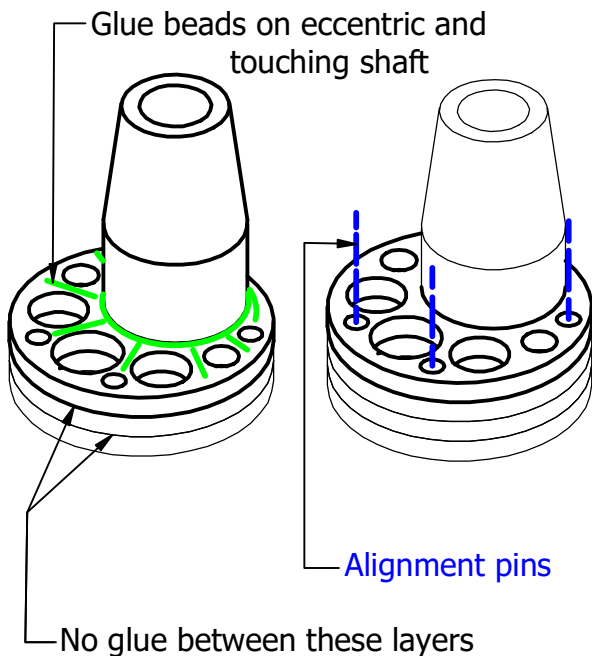
Front

1 5/8 inches

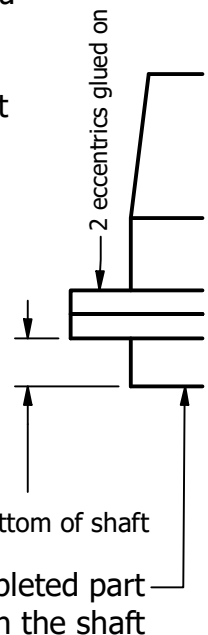
This time, the glue will go on the front of the assembly before adding the next layer. Spread a thin bead of glue over the top of the middle layer as shown. Then glue the top layer down over the top, using the screws as needed. Again, keep the edges of the combustion lined up perfectly. Clean up any glue squeeze-out and remove the screws before the glue dries.



The housing is now complete. Check the alignment of the bore and the combustion chamber edges. Trim off any excess glue that may have squeezed out here and you may have missed. Allow the glue to dry thoroughly before final assembly.



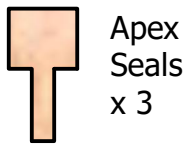
The eccentric shaft is next. There should be 4 eccentrics in your kit. You only need 2 as parts, but the other 2 help line up shaft. Set three of these parts over the top of the shaft without glue. Add glue to the top layer as shown. Make sure that the glue is on both the eccentric and the shaft. Add the last eccentric, and make sure it aligns perfectly. There is room for up to four 1/8 inch alignment pins to help. Make sure you remove the pins before the glue dries. Remove the bottom 2 layers as well.



A 2 layer space on bottom of shaft

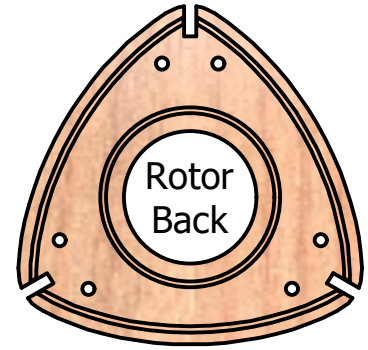
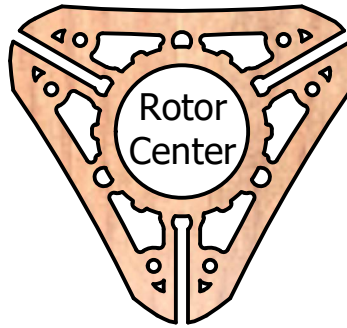
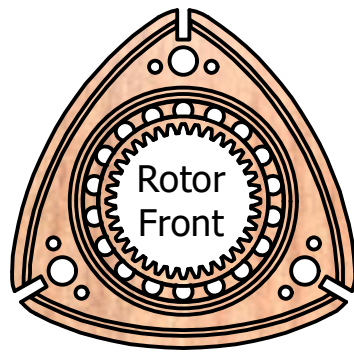
Side view of completed part with 2 eccentrics on the shaft

New Parts:

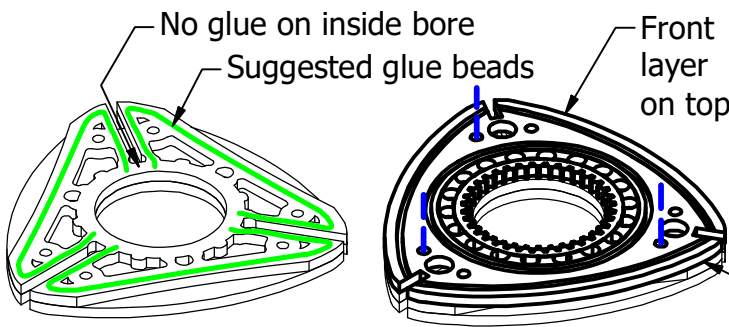
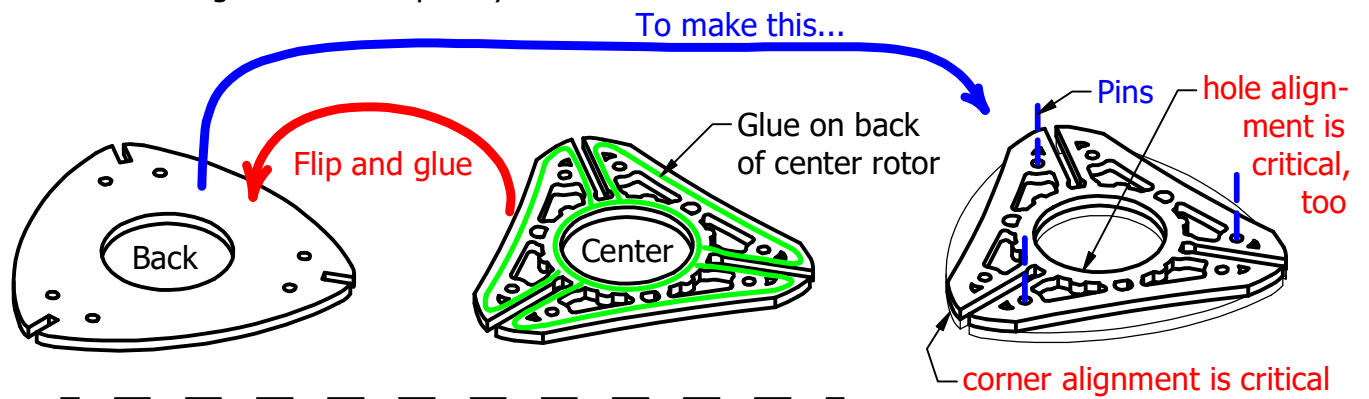


Apex Seals
x 3

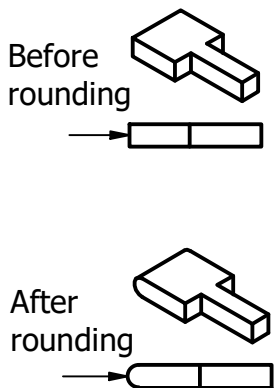
Apex seals shown full sized. Rotor parts shown 1/2 scale.



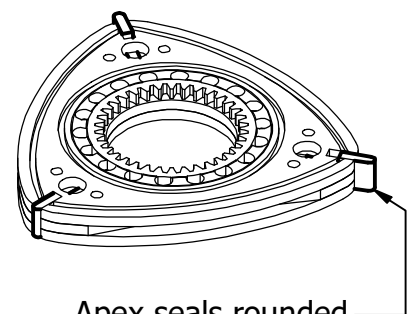
Assemble the rotor, beginning with the back. Set the back out with the engraved seals facing down. Put glue on the center rotor as shown. Turn it over and glue it down on top of the back layer. Use 1/8" alignment pins to help keep it lined up correctly. Clean up any glue that squeezes out. Remove the pins before the glue dries completely.



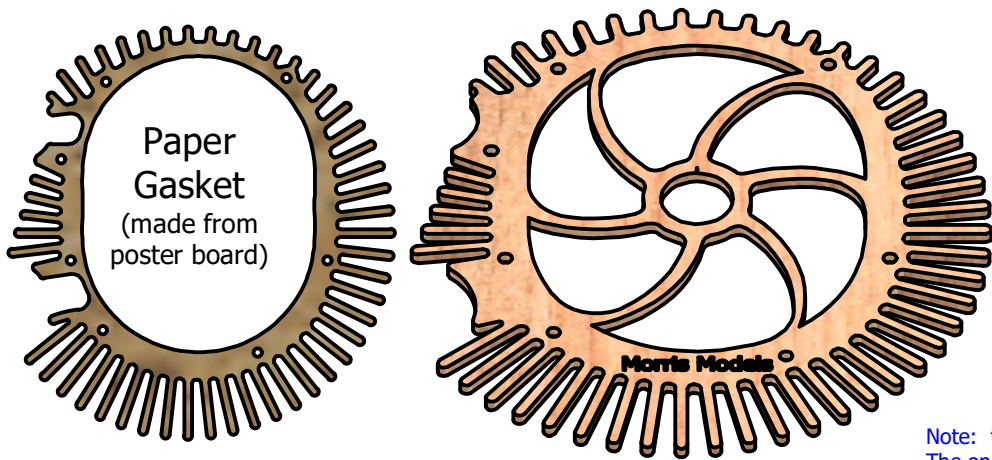
Continue with the rotor by spreading glue on the center layer as shown. Avoid the center bore. Add the front rotor layer with the details facing up. Make sure there is no glue squeeze-out. Use alignment pins to help you line it up. Remove the pins...



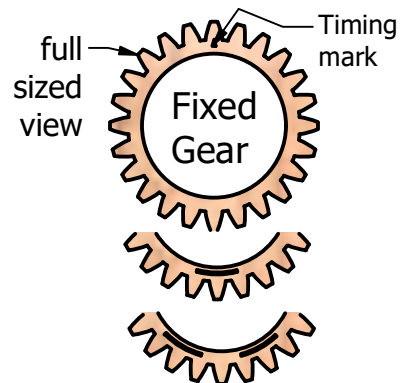
Optional - Apex Seals: The apex seals are critical on a real running wankel engine. Round the outside edge of the apex seals as shown on the left. Insert them into the three corners as shown on the right. (Note - there is room for a tiny spring in the seal socket if desired. These are not included.)



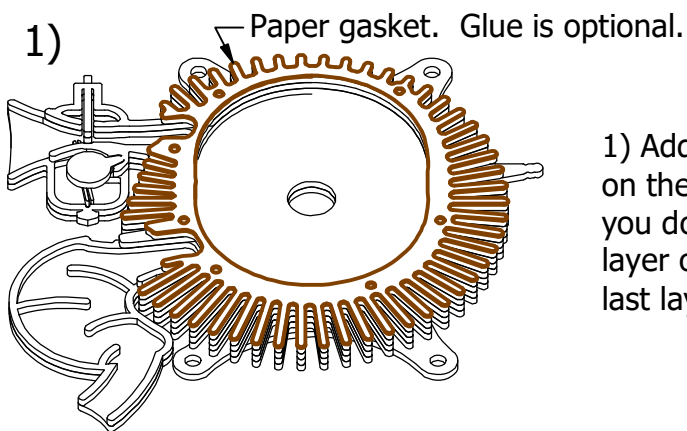
Apex seals rounded and inserted in rotor (all three corners).



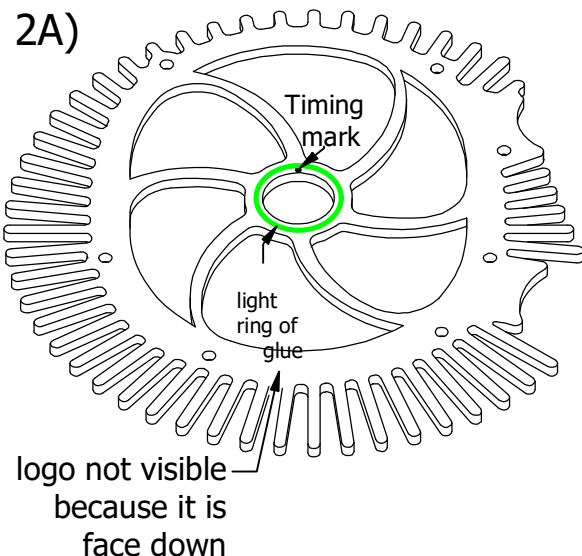
Front - note engraved logo



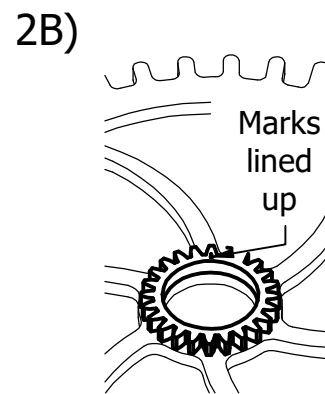
Note: there are three different gears in the kit. The one with no dashes is "standard" sized. The one with a single dash is 0.001 oversized. The one with two dashes is 0.002 oversized. Use the one without dashes first. If the rotor fit is too sloppy, pull/sand it off, and use one of the blue oversized options.



1) Add the gasket to the top of the assembly as shown on the left. I like to glue it on, but this is optional. If you do want to glue it on, spread the glue on the top layer of the engine and then fit it just like you fitted the last layer.



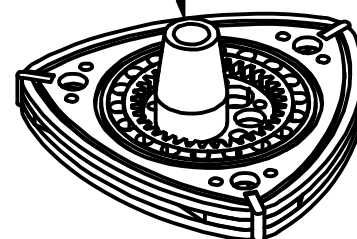
Lay out the front layer with the engraved logo facing down (2A). Locate the timing mark as shown. Add a light ring of glue around the center bore. Glue the gear in place, taking care to line up the timing marks as shown in 2B, and the edges of the hole. Clean up any glue that squeezes out.

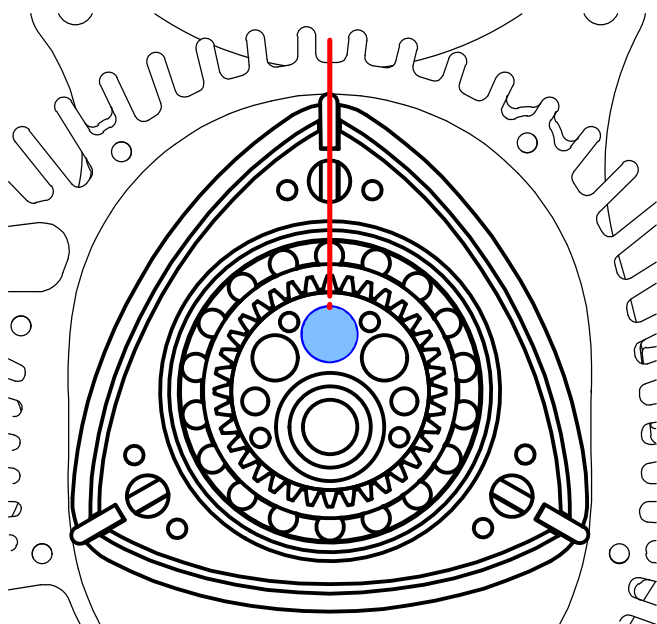
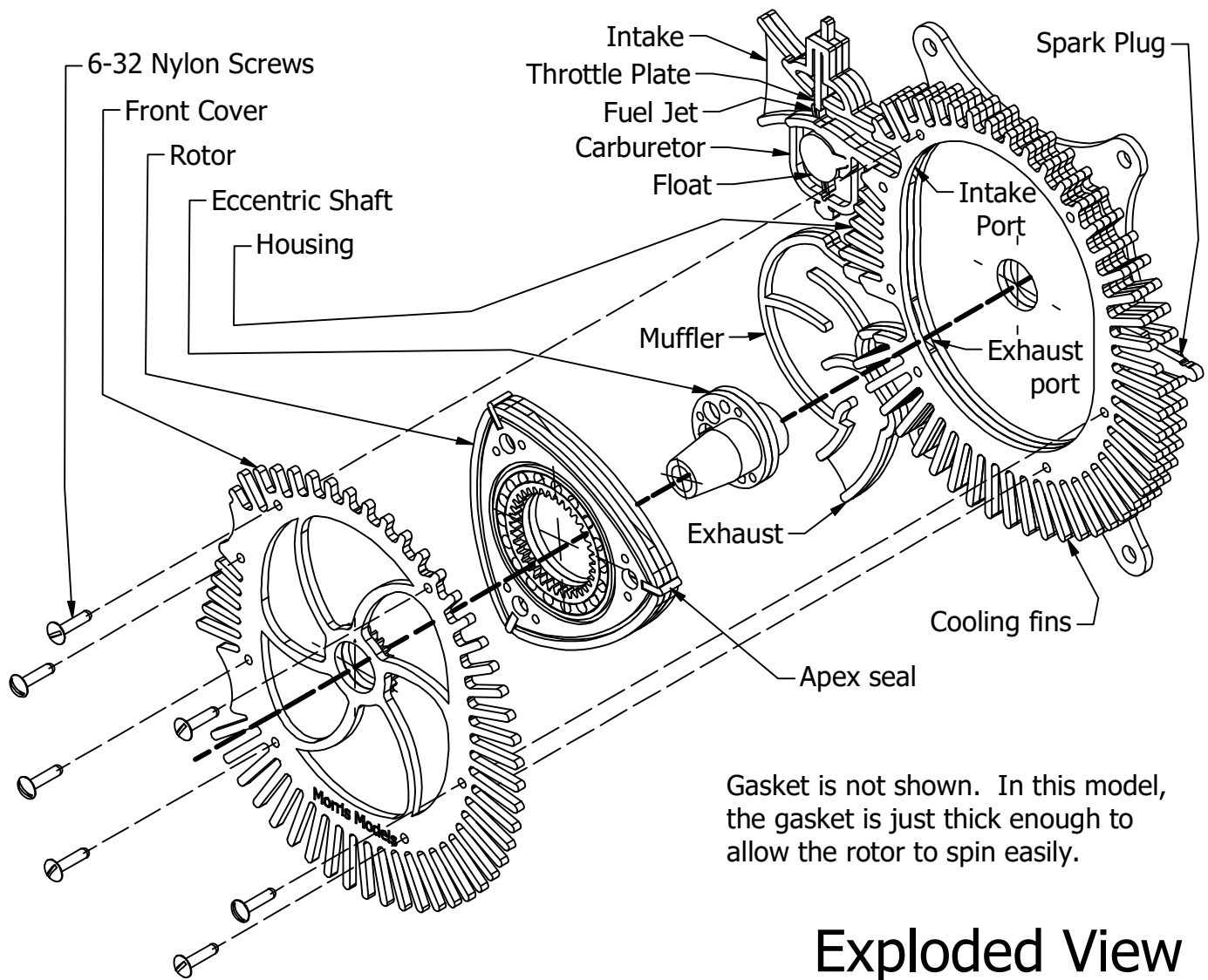


Let the glue dry completely before assembling engine.

Shaft should be able to stay still while you spin the rotor

Check to see if the eccentric shaft will fit into the rotor. It should pivot without a lot of resistance. If it is tight, gently sand the inside bore of the rotor and outside surface of the eccentric. You may also optionally wax the outside edges of the eccentric where they fit in the bore of the rotor. A brown crayon is excellent for this.





Set the eccentric shaft in the socket in the center of the housing. Notice the blue circle shown in the diagram on the left. There is a tiny timing mark on it that is shown in red. Line up this mark with the center of the housing - shown with a red line in the drawing. Place the rotor into the housing over the top of the eccentric shaft. Align any apex seal with the red line in the diagram. Carefully fit the front cover in place, making sure to mesh the gear teeth on the front cover with the teeth on the rotor. If the rotor will not sit straight with the teeth meshed, remove the gear from the front cover, and glue a different one on - taking care to line it up correctly. Gently screw the cover down with the screws. Your model is complete.