



Tripulse Motor



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The Minimag Tripulse Motor

Introduction

These notes accompany the drawings available for download on our website. They are intended to be used by purchasers of our SPC-1 Self Pulsing Coil.

You will be able to build a novel electric motor demonstrating the unique properties of the SPC-1

Principle of operation

Powered by a single AA size alkaline cell, SPC-1 senses the approach of a magnetic South pole. If the magnet is of sufficient strength and the rate of change of flux is high enough ie. magnet approaches fast enough, SPC-1 will switch on, drawing a pulse of current from the cell. The resulting magnetic flux increase in its core will further attract the approaching magnet imparting an impulse. Design of the coil and built-in circuitry ensure that the coil switches off again after a few milliseconds by which time the magnet has accelerated and is continuing on its course.

SPC-1 will work equally well with a North pole instead. In this case, a pulse occurs as the magnet recedes and is given a repulsive force instead.

Tools and equipment

Small lathe with 3 jaw chuck. A drill press or preferably a vertical mill. Slot drills 6mm and 8mm. Long series slot drill 9/16", 1/4" reamer, metric drills and marking out equipment. Soldering iron fitted with a fine bit and resin-cored solder. Loctite 601 or similar.

Make the body

With reference to the base drawing, square up your material and finishing the outside to size. Mark out and drill all the holes and cut the wiring slot and solder tag recesses. Use ordinary HSS or preferably carbide tools when machining Nylon 6. It is imperative all tools are extremely sharp otherwise rapid heating heating will occur and it will be impossible to obtain a good finish. If necessary use a water or compressed air to keep the job cool. The battery tunnel should be left to last. Pilot drill first then finish to size with a 9/16" end mill.

Make the bearing post

1. Clean up a length of aluminium rod to OD.
2. Through drill 4mm.
3. Drill and ream or use a D bit to produce the 1/4" bearing recesses.
4. Turn the 8mm spigot to a press fit in the baseblock.
5. Thoroughly clean then fit two 1/4" x 1/8" x 3/16" ball races. It is advisable to make a tool to push the bearings into place. The tool should bear only on the outer race. Bearings will likely be ruined if driven on their inner races. If the housing ended up a bit oversize, use a drop of Loctite to retain the bearings.
6. Press the bearing post into the baseblock ensuring it is perfectly square and fully home up to its shoulder.

Make the rotor hub

1. Turn the OD
2. Turn the 6mm spigot
3. Centre drill, drill 3.1mm and ream 1/8"
4. Part off to length.
5. Reverse in the chuck, correct the length if necessary and then turn the 4.5 x 0.5 spigot.

Make the rotor

1. Rotor is cut from a piece of 1.6mm double-sided copper-clad fibreglass PCB laminate (FR4). You can instead use aluminium, brass or other non-magnetic material.
2. Mark out and saw, file, mill or rout the profile.
3. Mill the three magnet pockets. Do not go right through and ensure all three are the same depth.
4. De-burr and if using copper-clad, give it a good clean.
5. Take the rotor hub and fit it into the rotor centre hole. Magnet pockets should have open sides facing away from the hub.
6. Using an M3 stainless steel screw, cup washer and nut retain the hub securely. Its wide end must sit flat on the underside of your rotor.
7. Flux the hub / rotor joint.
8. Wrap two turns of fine solder around the 12mm diameter of the hub so that it is in contact with the rotor.
9. Slowly heat the joint, preferably with a hot air gun, so that the solder runs. Allow to cool.
10. Fit the spindle with a drop of Loctite. End should be flush with the 6mm spigot of the rotor hub.
11. Using a drop of "Superglue" fit an 8x1 N52 neodymium magnet into each rotor pocket. We suggest South pole downwards toward the SPC, but this is not essential, however all three magnets must have the same orientation.
12. Check the assembly fits your bearings. If a bit tight, ease the spindle with fine emery. Aim for a light push fit.

Make the battery door

1. Turn from brass to a snug fit in the battery tunnel.
2. Drill the cross hole 1.7 x 5 deep. Tap M2
3. Chamfer the larger diameter and polish for appearance.

Assembly

With reference to the 3D exploded view:

1. Fit the SPC-1 using an M3x20 screw. Don't forget to put a solder tag under the screw head.
2. Fit an M3x20 screw with a solder tag from the top face of the baseblock so that it passes across the bottom end of the battery tunnel.
3. Trim the SPC-1 black lead and solder to the solder tag in 2. Bending the tag up slightly will avoid melting your baseblock.
4. Drop a conical spring down the battery tunnel wide end first. It needs to contact the screw in 2.
5. Drop in an AA alkaline cell, negative end first.
6. Fit the battery door and retain with an M2x6 screw and M2 solder tag.
7. Using a length of 22SWG tinned copper wire or solderable enamel wire, link the two solder tags, pressing the wire into its milled out channel.
8. Fit the rotor. Check for free running and an airgap of about 1mm between rotor and SPC-1

Starting and stopping

Give the rotor a gentle flick. It should rapidly accelerate and you'll see the SPC-1's LED transition from a flicker to a steady light as the speed increases. When the rotor is stalled the battery is effectively isolated therefore a separate ON/OFF switch is not required.

Bill of Materials

REF	Description	QTY	NOTES
1	Black Nylon 6 block 68 x 54 x 22	1	Engine base
2	Self-Pulsing Coil, SPC-1	1	Minimag part
3	Aluminium rod 12 dia x 40 long	1	Bearing post
4	Brass rod 18 dia x 20 (approx.)	1	Battery door and rotor hub
5	Double-sided PCB laminate 1.6mm FR4	1	Rotor
6	Stainless steel dowel 1/8" dia x 1 1/8" long	1	Spindle
7	Screw M3x20 SS CHD	2	SPC-1 and battery contact
8	Screw M2x6 PAN SS	2	Battery door
9	Solder tag M3	2	SPC-1 and battery
10	Solder tag M2	1	Battery door contact
11	Conical spring	1	Salvage from an old battery tray
12	Ball bearing 1/4" x 1/8" x 3/16"	2	Spindle
13	Neodymium magnet 8 x1 N52 grade	3	Rotor
13	Drawings	4	PDF
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Manual revisions