

# YAMEB

Personal Project Blog of Daniel J. Gonzalez, PhD Candidate at MIT [Yet Another Mechanical Engineering Blog]

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02 July 2013

## Replacing a Brushless Etek/Mars/Motenergy Motor's Hall Sensors



Meet the brushless Etek/Mars/Motenergy motor (EMMM? EM^3? EM3?). This one has dead hall sensors. How do I know?



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### About Me

Oh. That's how. I also ran 10V to the the red line, tied the black line to GND and scoped the three other colored leads. Nada. I'm going to need those up-and-running if I'm going to be using the sensors-required Sevcon controller.

I decided to call up **Motenergy**, the current makers of EtekMarsMotenergy Motors, and I have to say their customer service is absolutely top-notch. John Fiorenza, President of Motenergy and I believe one of the original designers of the Briggs and Stratton Etek motor, picked up the phone himself and seemed genuinely interested in my project.

He offered to send me the replacement sensor board free of charge, but while I was in contact with Motenergy I purchased a replacement fan and fan cover for the back of the motor.

It's also on the phone with John where I found out officially my model motor is one of only about 200 manufactured for a special order (someone at MITERS must have picked it up wholesale) and that it is, in fact, more powerful than an ME0907. Sweet.

Now the issue is getting to the sensors. They are deep inside the motor, attached to the inside face of the back plate, past damn powerful magnets, and a shaft well press-fit into a bearing. And that's after you get past the fire-breathing dragon and beachhead, then perform an animal sacrifice. Taking the motor casing apart is like trying to pull apart two ultra-magnetic plates: very difficult.



I got to work making a makeshift mount out of leftover aluminum. My plan is to put the motor in the mill and do...something with it. But I can't just clamp onto the tangential points of the cylindrical motor. The flat edges on this aluminum plate (which is mounted on the dedicated motor mount points anyway) will work perfectly.



Man, I haven't machined anything in a while...



**Daniel J. Gonzalez**

I am a PhD Candidate in Mechanical Engineering MIT working in the d'Arb Laboratory. This is a por of my various class, rese and personal projects.

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Well, 3 out of the 4 holes ended up lining up. That's what I get for eyeballing it.



I mounted the motor on the mill on top of high parallels to allow the output shaft the room it needed.



Using a length of steel cable, I tied figure-eight loop (not a smart idea with steel cable you want to reuse, but hey it was free and lying around) to one end and snaked the other end under this hole in the motor, over the head of the mill, under the opposite hole in the motor, then back over the mill. After that I pulled the standing end through the loop, tensioned it, and hitched it a couple times for a full hold.



Then it was time to lower the Z axis. I slowly lowered it until...



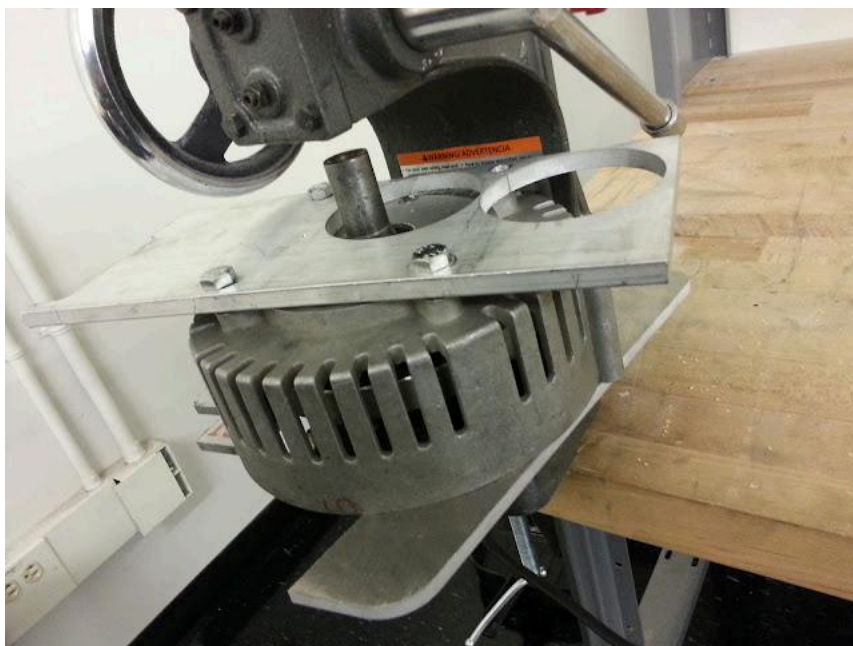
With a SHUNK, the stator and back half of the motor came free!



I can see why these suckers were giving me trouble: they're HUGE.



I removed the retaining ring from the remaining shaft, but it still would not budge out of the bearing. Time to bring in the big guns...



I began to push it out with a small arbor press when...



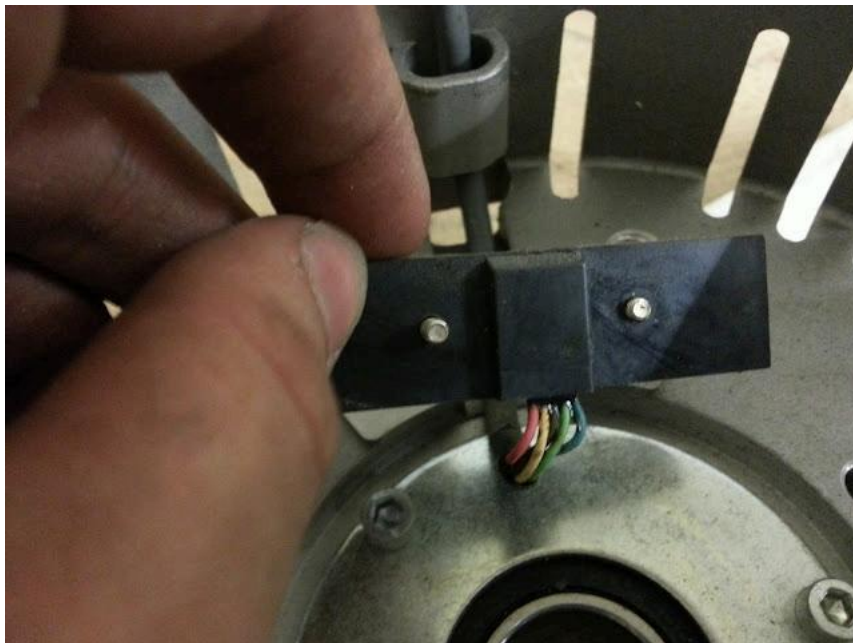
The rotating steel bottom of the arbor press flew up and into the motor -\_- . It took Nancy and I 10 minutes of prying with a hammer and tapping with screwdrivers before we could get it out.



And so I found parts of Chibikart's old steering assembly and used them as sort of "magnet condoms", due to their aluminum-non-magnetic-ness. After much pushing down with the arbor press, the shaft came out with a CRACK.



Ooh, the inside of the EtekMarsMotenergy Motor! And there's the sensorboard for the taking!

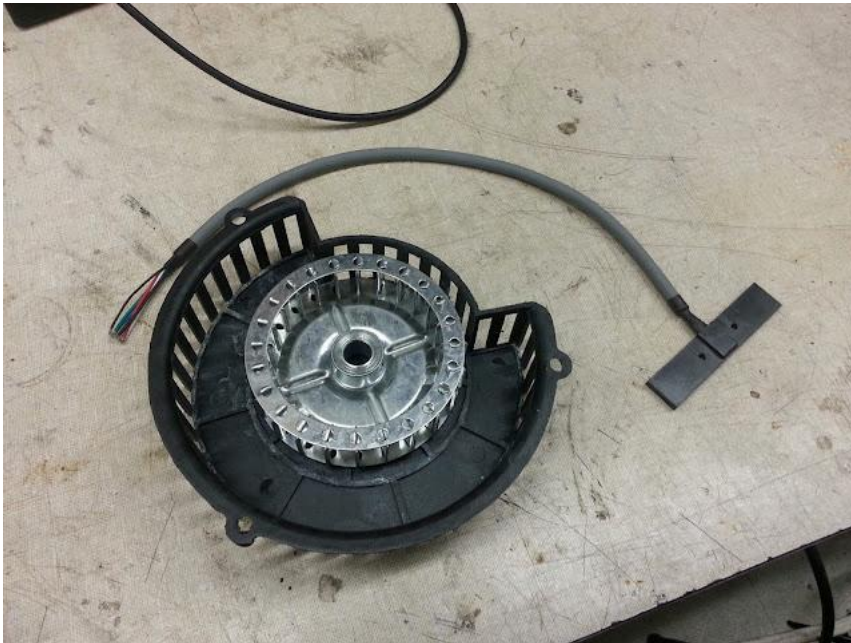


I wasn't expecting it to be all plastic. Then again, I imagine that's to ensure it is weatherproof. Unlike Cruscooter...





Curious, and knowing I would get a new one in a few days, I took it apart. There were the three hall sensors in some kind of SMT package.



Out with the old and in with the new! Here is the new sensor board, fan, and fan cover I ordered.



And it fits like a glove, as expected. Time to repeat the above process in reverse order!



I have to press the shaft and magnet housing back through the back bearing. This time I needed a larger arbor press, so I headed to the FSAE/Solar Car shop.



I re-tied the back plate to the mill and prepared for reassembly.



Before I could reassembly the whole thing, I needed to get the sensor leads back through to the rear end of the motor. This part was tricky, as the hole was teeny and there was a large wound stator in my way. I passed a small piece of twine down through the hole and tied a friction knot to the cable assembly.



I then pulled it up though, eventually needing to remove the rubber gasket to fit the thick cable assembly up.

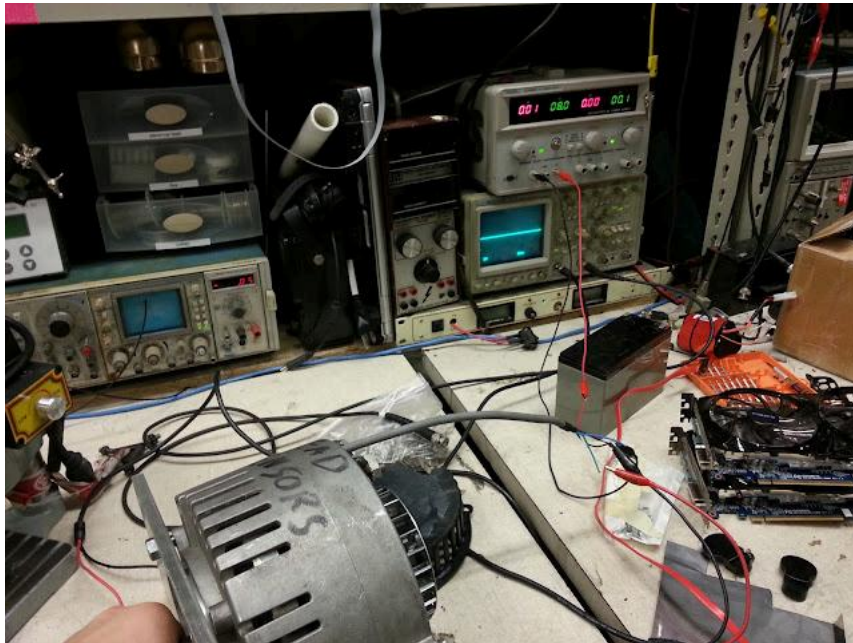


I then raised the motor up to the rear cover, taking care to ensure they were properly aligned for when the force of the magnet took over.

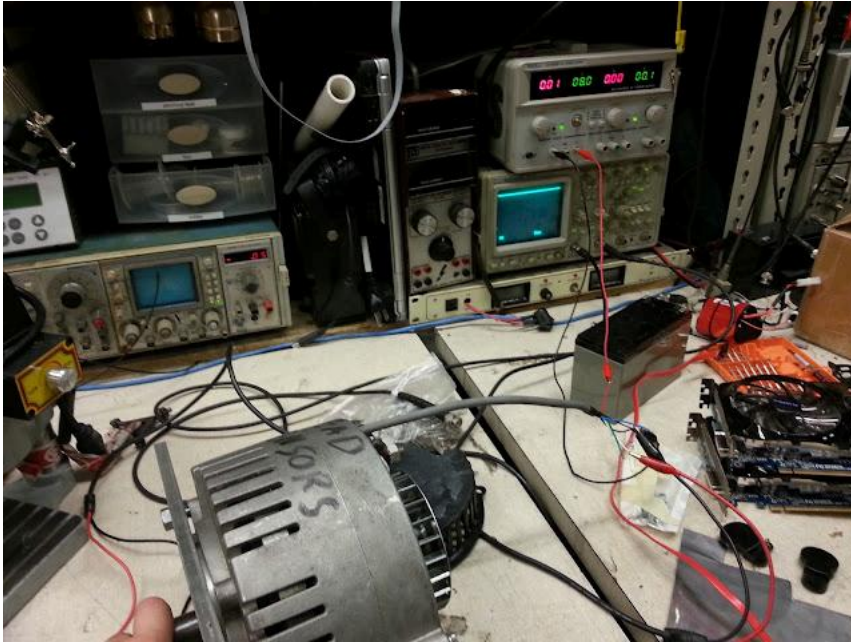


CRACK!

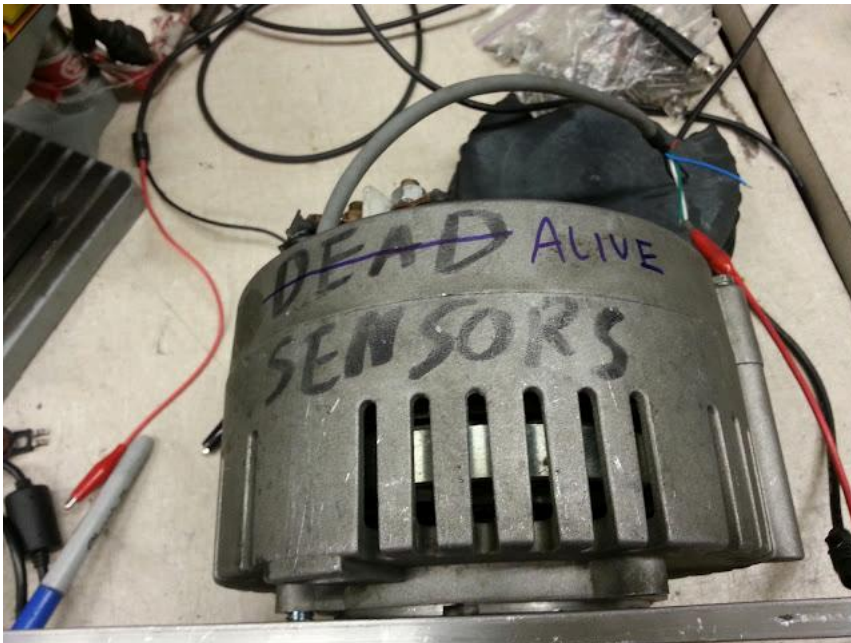
The magnets grabbed it hard when it was close enough. Right on target.



Time to test the new sensors...



YAY! All three channels worked properly. One last thing to do...



Sweet. See you next post!

at 9:22 PM

Labels: EtekChopper, EVs

### 6 comments:



rondoc September 16, 2013 at 3:23 PM

very well done!! I thought that these motors were biaxial..may be the new ones? Be nice to see how the factory do all of this!

Reply



Unknown July 30, 2014 at 9:28 AM

Thanks for the article, it is very instructive. I found this website if you would like to read further information: <http://www.directindustry.com/industrial-manufacturer/brushless-motor-61102.html>

Reply

Old man tucker January 30, 2017 at 4:08 AM



Hi Great article! where can I get a replacement hall sensor from?

Reply

Anonymous April 13, 2017 at 2:29AM

Hello! I have problem with MARS ME0907 and KELLY Controller KBL. Controller output voltage is 5V. At first, I connect it to hall sensor. But motor was not run. I find and look at drawing of me0907 then I see hall sensor of ME0907 is 12V! I connected it again. And it run. I use the motor few time. Today I powered motor, but controller indicator saw me messege "xxxx xx". It means break connect of hall sensor, or it damage. I can help and I need your comment to Nich\_27@mail.ru, thank you.

Reply

Replies



Unknown August 15, 2018 at 3:59 PM

plz check the hall sensor connection because the phase B and C had cross connetion  
dm me on my instagram for more help  
CUSTOM\_EV

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Reply

Escorts London Agencies November 15, 2018 at 3:13AM

This article is fascinating.

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