

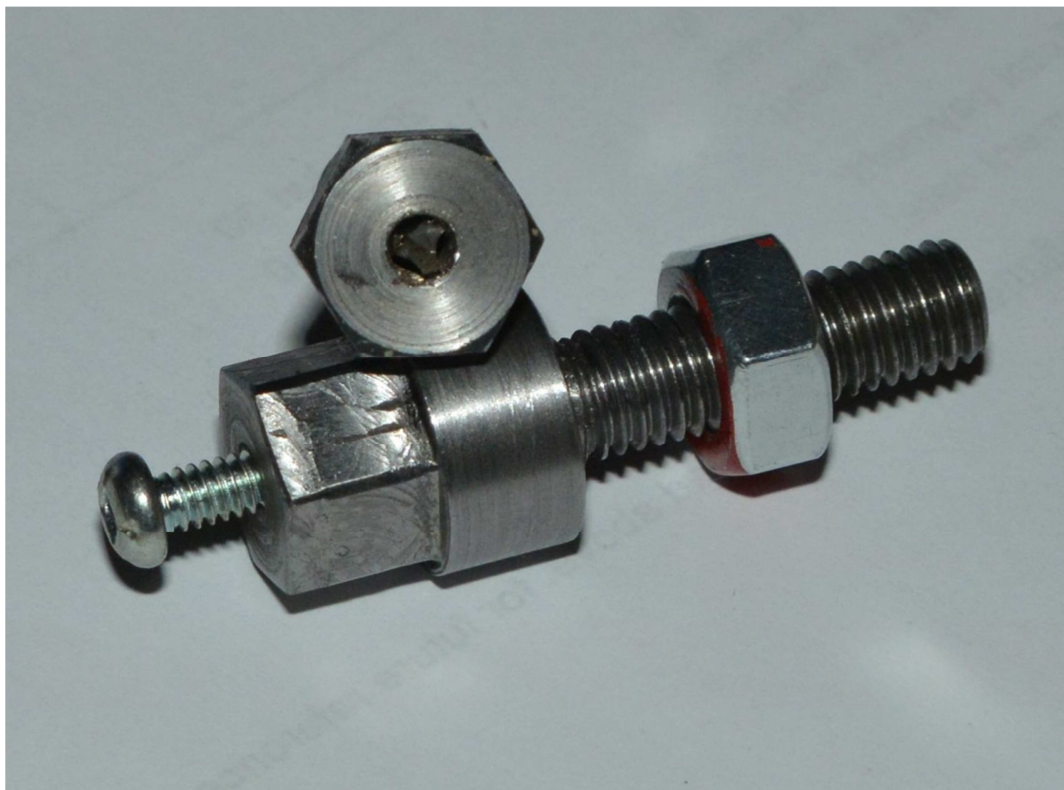
# Custom Bolts

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To mount the slotted sensors on my mill for sensing the motion of the toothed wheel I needed some sort of solid support for the bracket that held the sensors. The inner part of the casting was way too rough so I thought maybe I could use longer bolts with spacers. However, I didn't have the bolts and initially using a 3D printed bracket wouldn't hand the torque.

One suggestion from the LinuxCNC group was to drill and tap the bolt heads for a smaller screw and then use a spacer. Seemed like a good idea so I removed one, chucked it in the South Bend Heavy 10L and drilled the tap hole size for 10-24. Then promptly broke the tap in the hole. I think the bolt was a bit harder than I expected.

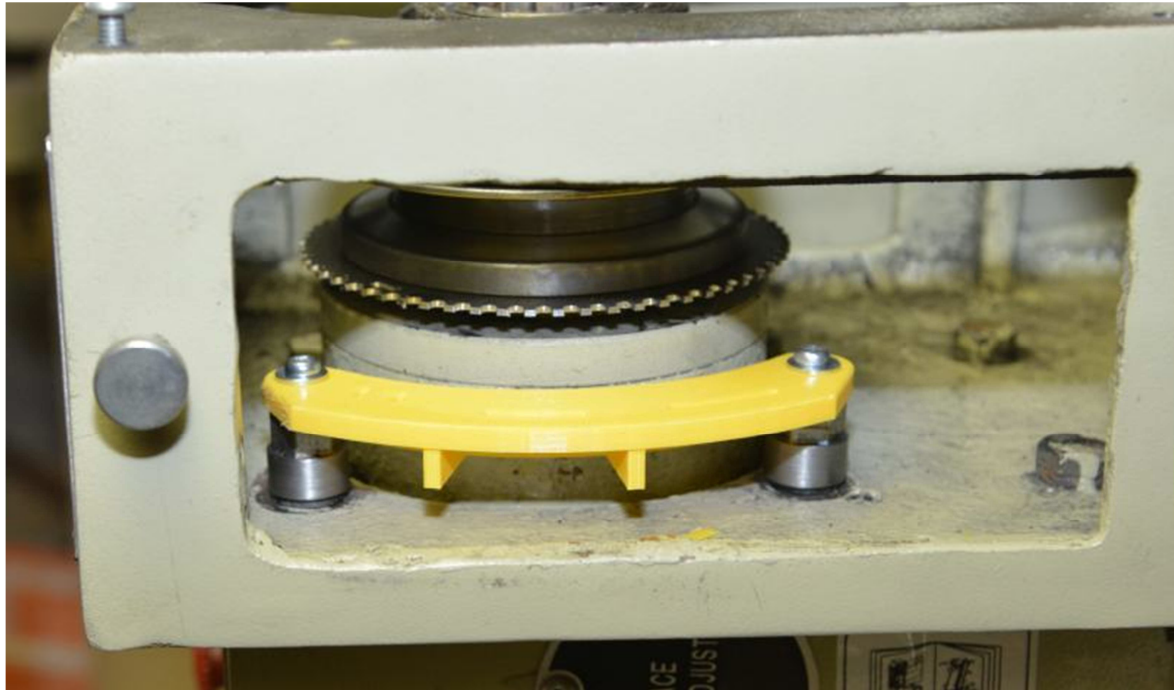
After a step back and rethink and I grabbed a couple of scrap pieces of round stock and made my own. Here you can see the broken tap in the old bolt.



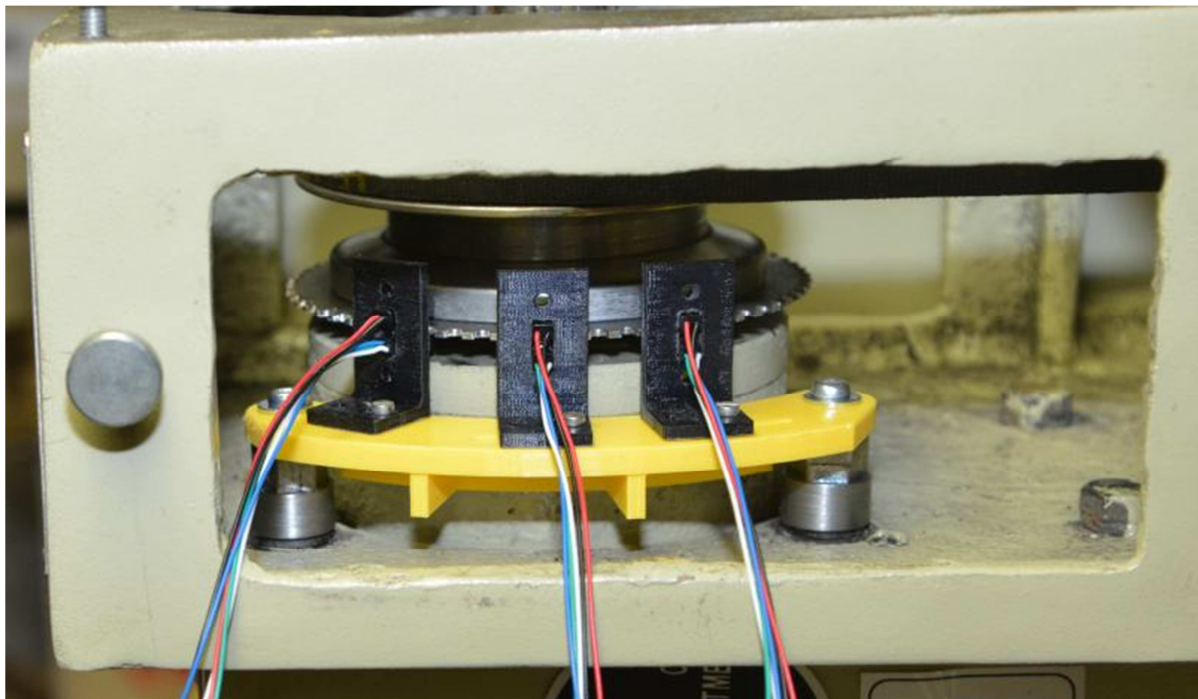
The new bolt also included the spacer and a long enough hex head so I could shave it down for adjusting total height if needed. Metric thread on 1942 series lathe using my ELS. A 5C Collet chucked in a spin index on the mill to cut the flats. Now with the bolts in place I had a level surface for mounting the sensor bracket.



Eventually I will cast and machine one from metal. However, it turns out the holes that mount the housing onto the mill head aren't concentric with the mill spindle. So the first try at brackets didn't fit without some major filing on plastic printed slots and new sensor holders.



The 3D printed body has extra structural bits to stiffen the bracket. The screws hold it firmly in place.



A trial fit of the sensors showed the sensor holders weren't going to work because the mount was offset from the centerline. These black ones will also eventually



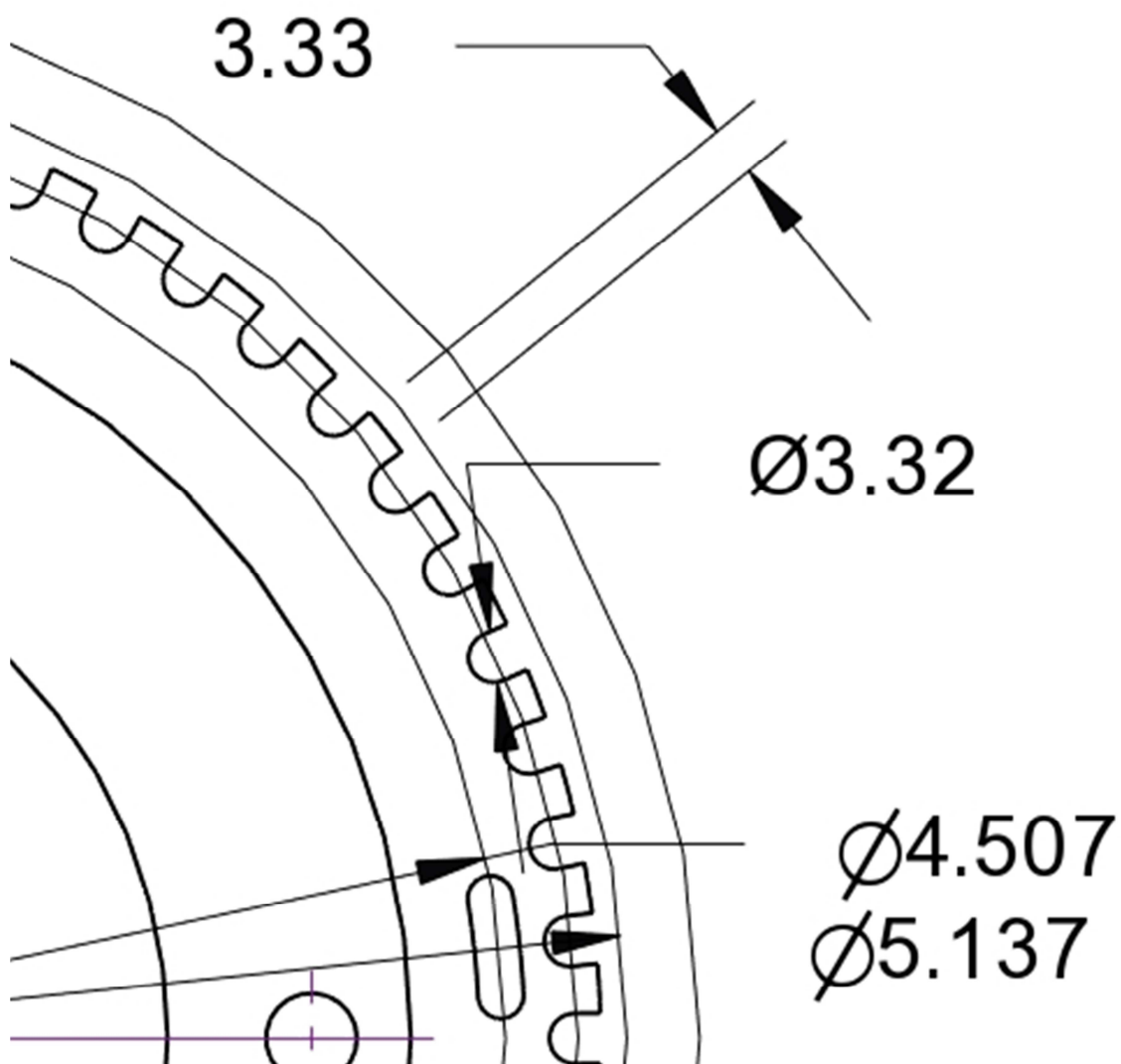
be metal. The next version of the brackets, done in yellow this time, had stiffer braces and were designed to slide better for adjustment.



Yes it could have been done with long COTS bolts and simple spacers or even a stack of washers but I might also have broken another tap in a commercial bolt. Instead I have a nice custom mount. The interface board has a spot for a



differential driver but the BoB I'm using is single ended so for now it's not used. I used a scope to adjust the position of the second AB sensor to get the wave form symmetrical. It's not quite 50% because way back when I made the slotted disk I cut the slots with a 4mm end mill when the G-Code expected a 3mm end mill. That resulted in the slots being wider than the teeth.



Clearly a 4mm mill doesn't fit into a 3.33mm slot and the initial disk was too thick for the sensors so I again used the lathe to turn down the disk after cutting slots.



Even so, the waveform did end up being good enough for later power tapping.

