Install absolute encoder in PST2051 Rotator

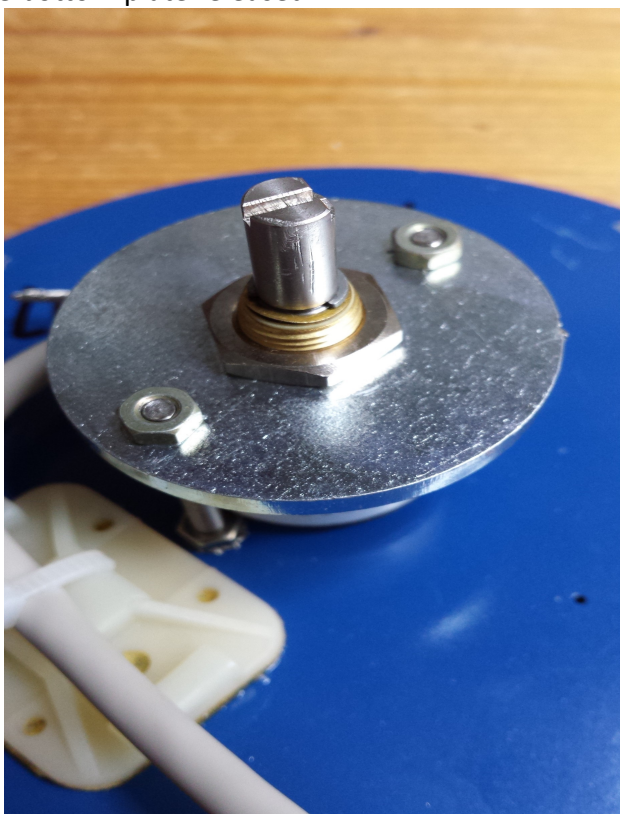
Harke Smits, PA0HRK

Introduction

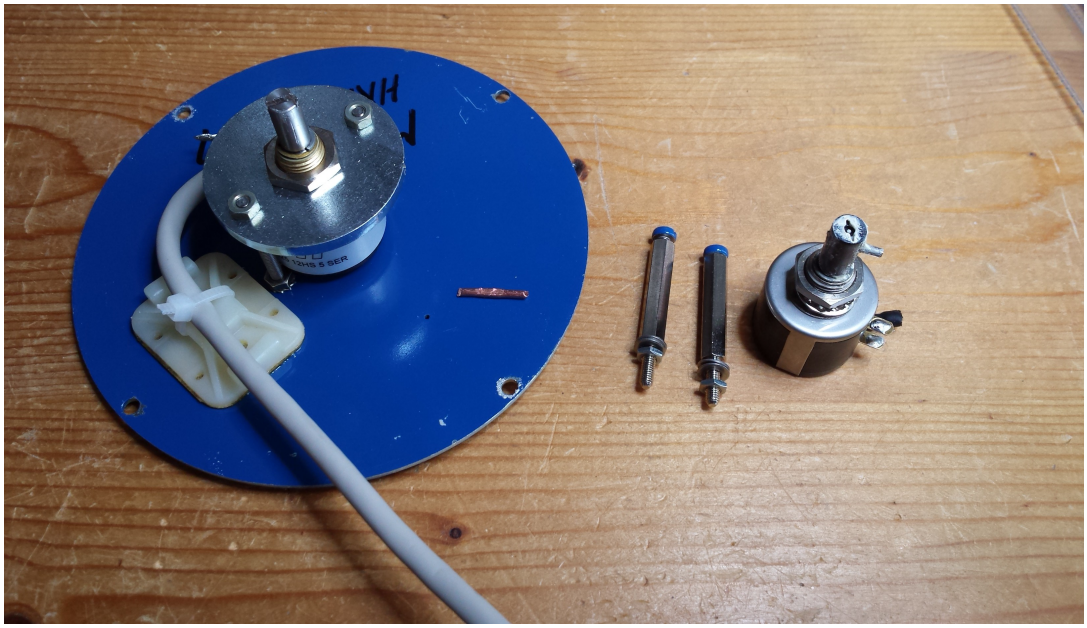
My current azimuth rotator (Yeasu KR1000 with external coupled MAB25 position encoder) introduced too much slack so I switched to a rotator based on a worm-gear. I found out that ProSisTel (http://www.prosistel.net/home-e/) delivers the rotator units separately, so you do not need to buy the control unit as well. As I had already a controller (my own design: http://parac.eu/projectpaohrk-1.htm) I just needed the motor section. It is important to realise that the motor section does not have any limit switches. Apparently this is realised in software in the PST control box.
This PST rotator, and I believe all of the PST series, contain a multi-turn pot-meter as position indicator (the display on the PST controller shows 1 degree of resolution) and that was considered insufficient to meet my accuracy requirements (a tenth of degree on display and maybe twice in control). Moreover, my controller can perfectly handle absolute encoders like the MAB 25 (or similar like HH12). So I decided to replace the pot-meter with a MAB25, as described here.

The replacement procedure

In fact the replacement procedure is not very complicated. So this is more to show you with a couple of pictures how I did it. Turn the rotor upside down and remove the 4 self-tapping screws around the edge of the bottom plate. Back into normal position the bottom plate just falls in your hand.... The left picture shows the situation with the bottom plate released.



The pot-meter is not fixed to the central shaft and is suspended by means of a simple construction: two stand-offs and a circular plate. Inevitably there is some small play between the pot's shaft and the main shaft. It looks like the only issue is to provide the MAB25 sensor with a small pin perpendicular to its shaft. Surprise: the MAB25 already has a slit, probably to accommodate a screw driver (right picture above). It looks like just replacing the pot by the sensor and inserting a small lever. Well.... almost.
Remove the pot-meter and the mounting hardware. Then you try to install the MAB25, alas: the diameter of the sensor is larger than that of the pot! You need to replace the stand-offs with 3mm bolts of the correct length. Then it fits, just! You need three nuts per bolt: one to fix the bolt on the bottom plate, one to hold the circular plate at the right distance and one to fix it all. In fact the idea is that all dimensions are to be kept much the same as before. The picture below shows the new sensor mounted and the removed hardware.



Now for the guiding pin. I cut some 15 mm copper wire (diameter 1.5 mm), salvaged from installation wire. With a small hammer, or if you are very strong with tweezers, squeeze the central part so as to fit the slit in the sensor. Try not to engage force on the sensor, just on its shaft. So do not hammer the pin in! If it fits snugly then apply a tiny drop of glue. Picture left.
Remove the old wiring and install a multi-lead cable to accommodate the new sensor. Assemble the unit and there you are.

The final situation is depicted here:

Conclusion and operational experience

The modification did not take much time and works well. That is: on the bench with my own controller. I have yet to test this in the field but I do not see any major difficulties. I suspect that this mod works the same for most if not all of the rotators of the PST line.
Update: Testing with my own controller gives good results. As both the azimuth (PST) and elevation (satellite actuator) motor are to be driven by the same voltage I adopted for 16-17 V dc. The controller deploys Pulse Width modulation and the PST is never run at more than 80%, the actuator can be run at 100%. I have a controlling resolution of about 0.1 degree. In control mode during tracking the PST runs only at 10% and the actuator at about 50%.
I need to modify the software of my own controller to implement limits. But I did not cut or remove the original cabling as I might use them in the future to accommodate hardware limit switches, that I consider in any case more reliable. Just two switches, two diodes and some mechanical lever to operate the switches is all you need. Pretty standard, I guess. The rest of the wiring is made in the multipole connector.

I hope this works out for you as well and in case of sharing experiences or questions: you are welcome to mail me at: pa0hrk@gmail.com.