

String potentiometers are fast becoming the mainstay for those wanting to obtain accurate outputs when a lever is moved, such as the: ailerons, elevators, rudder, flaps, speedbrake, or thrust levers in the throttle quadrant. This is because the slightest movement of a the string is registered by the potentiometer.

While commercial made string potentiometers can be purchased, they are not inexpensive, and if used will deliver an order of accuracy that isn't necessary for the assigned tasks.

I am not using a commercial string potentiometers. Rather, a standard Bourne 3500-3501 rotary potentiometer has been adapted to use a string.

You will need the following items:

- (i) Bourne rotary potentiometer;
- (ii) Plastic housing box;
- (iii) 6 screws (to secure box lid and to fasten spool);
- (iv) 1 nut and washer (to secure potentiometer to box)
- (v) 1 retractable spring-loaded spool and stainless steel string;
- (vi) A cylindrical piece if moulded ABS plastic (or wood); and,
- (vii) 1 small dog leash type clip or other fastening device (not pictured).

It's best to use a CNC machine to fabricate the correctly shaped box, however, any box can be used. Boxes can be purchased from electronic shops that are used as a housing for interface cards. These are suitable.

It's difficult to document exactly how the process is done, but by carefully studying the pictures, you should be able to replicate the process.

### **Fabrication**

1. Make a small hole in the side of the box for the string. Ensure the hole enables the string to have some lateral movement. You may need to attach some type of protection to the inside or outside of the hole so that the string doesn't rub the plastic. I have used a soft piece of plastic for this task (Figure 1). Equally suitable is piece of cork (wine bottle)
2. Drill a hole in the top of the box to enable the shaft from the potentiometer to be inserted. Secure the shaft with a nut and washer (Figure 2). The main body of the potentiometer will be outside the box.
3. Glue a piece of solid ABS plastic (or wood) to the lid of the box. Make a small drill hole that enables a screw to be attached. This screw is used to help secure the retractable spool (Figure 2, 4 & 6).
4. You must fabricate, from a piece of ABS plastic or similar, a cylindrical attachment that is glued to the retractable spring-loaded spool. This piece if plastic must a hole drilled that is the same circumference as the shard of the potentiometer (Figure 3).
5. The retractable spring-loaded spool is glued to the bottom of the box in direct line with the shaft of the potentiometer. The shaft must align with the hole in the spool (Figure 1).
6. Drill a small hole into the side of the shaft of the potentiometer and the retractable spool. The hole should be large enough to enable a small screw to secure the

retractable spring-loaded spool to the shaft. This is done to stop the spool from freely spooling. When it's secured, the string when pulled in or out will turn the shaft of the potentiometer (Figure 2, 3 & 6).

7. When everything is complete, the string should move the shaft of the potentiometer as it is pulled out of the retractable spring-loaded spool. To secure the spring to the control device, a small clip can be used which is attached to the end of the string. I have used a small dog leash style clip, but any clip will work.

### **Photographs**

The fabrication as seen in the photographs in Figures 1-6 looks quite rough. This is because the example photographed was a prototype. If you are careful, work methodically, and have an eye for detail, then there is no reason why the end product will not look semi-professional.

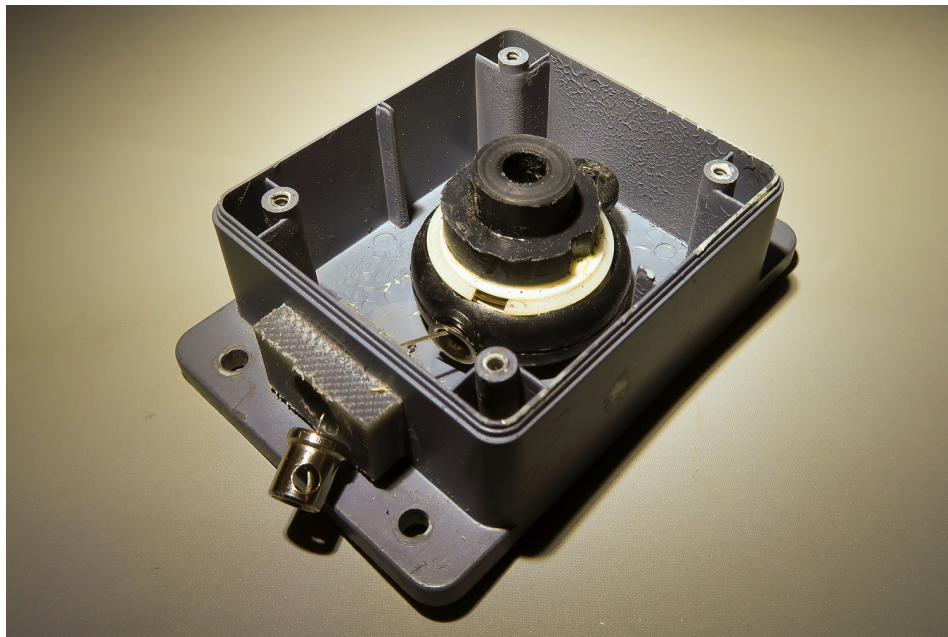
### **Final Call**

Fabricating a string potentiometer is not difficult, however, it can be a little finicky, especially when connecting the rotary string to the end of the potentiometer. The accuracy of the string potentiometer is more or less similar to that of a commercial string potentiometer, and is more than sufficient when calibrating the various flight controls and levers.

- For further information: [String potentiometers: Are They Worthwhile.](#)

<http://www.flaps2approach.com/journal/2018/7/15/string-potentiometers-are-they-worthwhile.html>

**Figures 1 - 6**



**Figure 1:** The base of the plastic box. Note the hole to enable the string to leave the box. Also the protective sleeve to stop the string rubbing the edge of the box. The spool is glued to the base of the box. The shaft of the potentiometer slides into the hole at the top of the spool when the lid is secured.



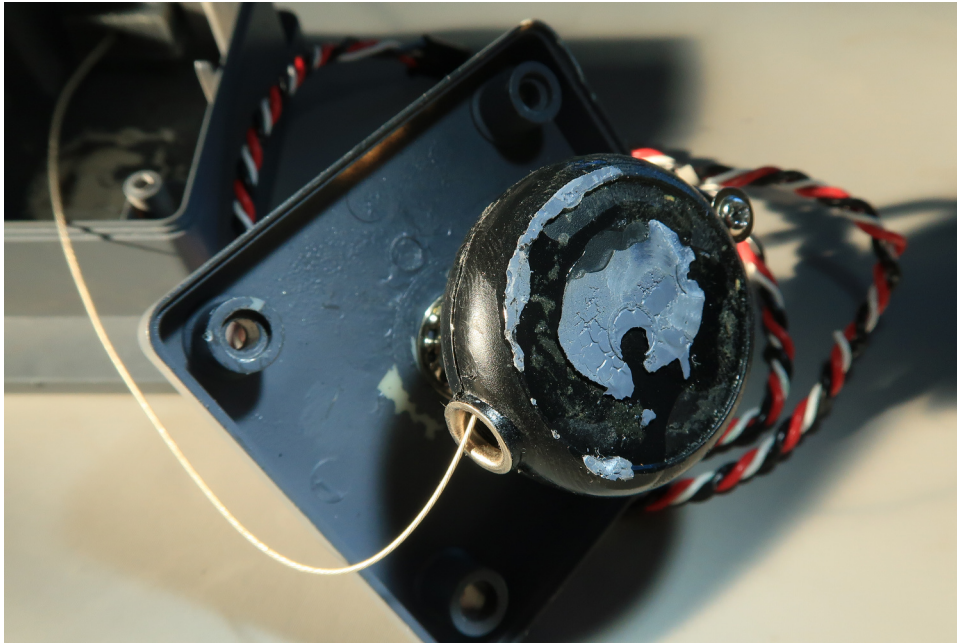
**Figure 2:** The inside lid of the box with the shaft of the potentiometer secured by a nut a washer. Note the hole that has been carefully drilled into the shaft. This hole aligns with the hole drilled in the side of spool (Figure 3). A screw secures them together to stop the spool from free spooling. The piece of ABS plastic with a small drill hole is also seen .



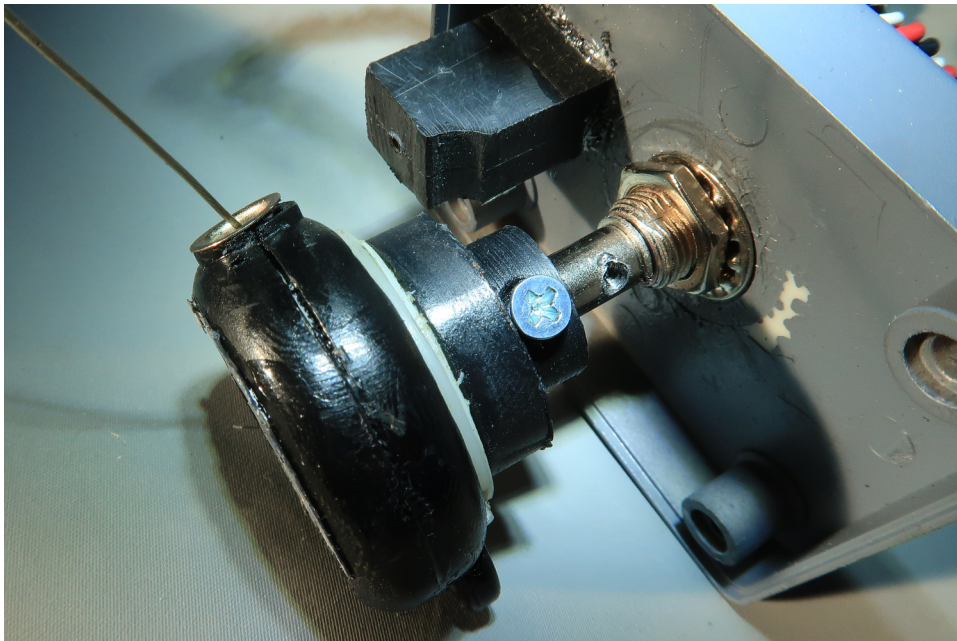
**Figure 3:** The retractable spring-loaded spool removed from the base of box. Note the screw which is used to secure the spool to the shaft of the potentiometer. Also note that the two-tiered ,black-coloured cylindrical attachment (with the screw). This has been fabricated from ABS plastic and glued to the spool (circled in red).



**Figure 4:** The lid of the box showing the retractable spool secured to the shaft of the potentiometer. The discolouration on the base of the spool is old glue (*from when I dismantled the unit to take photographs*). Note the screw attached to the piece of ABS plastic. This screw helps to secure the spool.



**Figure 5:** Another view showing the base of the spool. The spool is attached to the shaft of the potentiometer which has been inserted through the lid of the box. The red, white and black cabling come from the base of the potentiometer. The discolouration on the base of the spool is old glue (*from when I dismantled the unit to take photographs*).



**Figure 6:** Another view showing the screw that attaches the spool to the shaft of the potentiometer. In the image, the spool has yet to be pushed on the shaft. The screw hole in the small piece of ABS plastic can also be seen.