

## Turning a Manual Dobsonian into a push-to Dobsonian

### Background

At the time, I had owned this Dobsonian mounted Newtonian telescope for several years, having bought it 2nd hand. The previous owner had modified the scope by adding a 12" (300mm) "Lazy Susan" rotating bearing.

Most Dobsonians of this size rotate on smooth plastic pads or buttons, but the addition of the ball bearing equipped Lazy Susan drastically smooths the Azimuth rotation of the scope. Having recently tried a Dobsonian with just the pads I would make the lazy susan my VERY first modification.

Altitude rotation still depends on smooth plastic bearings. The previous owner also fitted four plastic legs to the base to raise it off the ground and to provide some degree of levelling ability, although the unmodified Dobs scope is very tolerant<sup>1</sup> of being slightly off level.

Although Dobsonians are renowned for their light gathering ability at low cost, their greatest failing is the lack of any form of go-to ability or even setting circles that can aid in the location of dimmer objects. Star hopping is the usual way of navigating a Dob and with a Telerad Finder fitted star hopping is perfectly feasible.

But what if I had some form of go-to adaption to my scope.....?

### Giving the Dobs a "push-to capability"

Push-to adaptations usually consist of some form of setting circle for the base/Azimuth setting and a level/protractor arrangement for the Alt setting.

For the Altitude setting I simply use a digital protractor (inclinometer) which has a built in magnet that allows it to cling to the scope like a limpet. This was by far the easiest step, and even on its own it is a worthwhile investment of around £25.

There are a number of ways that setting circles are fitted to Dobsonian bases. You can research them on the net as I did, but I feel my approach is the best as it allows for easy adjustment when aligning the scope.

1. This is the process of setting up the scope.
  - Place the base so that it is reasonably level and *with the setting circle zero mark roughly adjusted for north.*

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<sup>1</sup> To get the best out of a push-to dobs you will want to be able to level the base.

- Select a bright star and move the scope so that the star is visible in a low power eyepiece. Find the current Azimuth setting for the star - . I use SkEye app on my tablet for this.
- With some care so as not to move the scope in Azimuth, adjust the setting circle so that the cross hair is on correct reading for that star's **current alt az setting**.
- Check the field of view and setting circle setting to ensure star and reading are as they should be, and you are ready to "dial up" the coordinates of any object above the horizon

2. To find a star look up its settings in your app.

- Raise/lower the scope so the Alt reading is correct and lock the scope altitude in place.
- Swing the scope around until the Azimuth setting is correct.
- Look in the view finder and your target should be there.

Occasionally you may want to readjust the setting circle using a known object's current settings.

With a bit of practice you can find an object in seconds.

### **Fitting the Azimuth Setting Circle**

Rather than attach the printed paper circle to the base of my scope I decided to fit a plastic circle between the Lazy Susan bearing and the outside of the base. The setting circle "ring" is held in place by three plastic buttons. These are the same plastic buttons that the base would have originally rotated on, and which were left in place when the previous owner added to lazy Susan bearing.

The handle allows the ring to be rotated through approximately 100 degrees, greatly simplifying the alignment.

To make the ring I cut the circle using a router.

Step 1: decide the radius of the OUTER circle and fix a pivot (a 1.5mm drill in my case) that distance away from the edge of the router blade.

Step 2: drill a small hole in the centre of the plastic board. Switch on the router, place the board over the pivot and allow the router blade to cut into the board. Switch off and check your measurements.

Step3: Switch the router back on and slowly rotate the board so that the router cuts out a circle. Stop 50mm before completing the circle as this last bit will form the adjustment handle.

Repeat the process with the pivot set up closer to the router blade to cut the inner circle. I moved the pivot another 70mm closer to the blade so that my ring was 70mm wide. Cut the handle out, clean up the rough edges and fit to the base board of the Dobsonian mount. You may need to move the buttons slightly to get a good firm fit.

### **Printing the setting circles.**

Cloudynights.com and other websites have free to download setting circles. Take care when printing them that the size is just right or you can waste a lot of printer paper. My original attempt was as a mosaic on A4 paper which I glued together. Later I had them printed on a single large (A2) sheet.

Trim to fit and glue to the ring. Measure the distance from the central pivot to the setting circle markings.

In my case I measured out to the blue mark. This distance is where you will drill the viewport.

The next step was the hardest step of all as it required me to drill a 50mm diameter hole in the top part of the Dobsonian base. Drilling wasn't hard, but making that first cut was a big step as everything else until now was reversible.

My first attempt (see right) was in the wrong place and so I had to make another cut. The best place for the viewport is on the left side of the base. This is the west side when the OTA is pointing North, and the same side that you will stand when operating the scope. Glue a fine wire across the port to act as a crosshair.

And that is as far as you need to go.

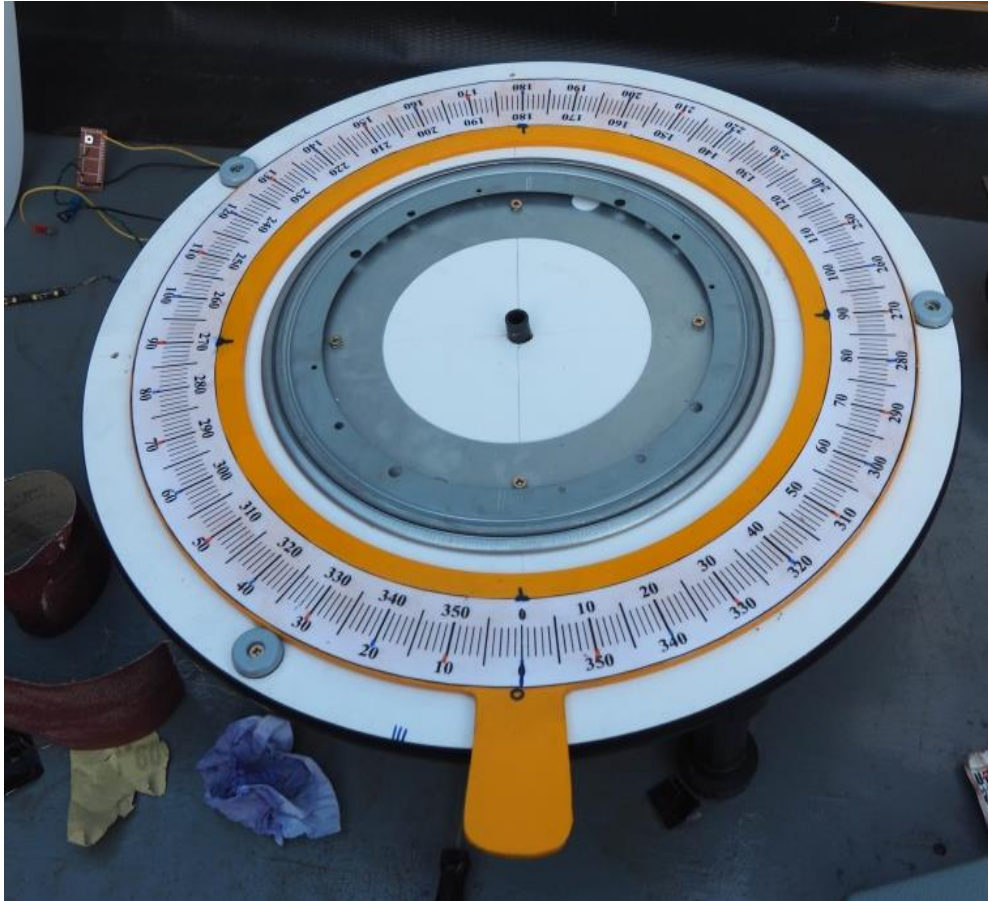
Total cost was under £50, and as I already had most of the bits in place it actually cost less than £10.

### **Other "improvements"**

1. Fit a low power magnifying glass lens over the azimuth scale hole to enlarge the scale. Use a marker pen to mark in the crosshair line.
2. Fit a red led so the scale can be read in the dark. Same can be done for the inclinometer
3. Build a levelling table to raise a small dob higher up for ease of viewing and to improve accuracy of the push-to.
4. Fit a bracket for your tablet device

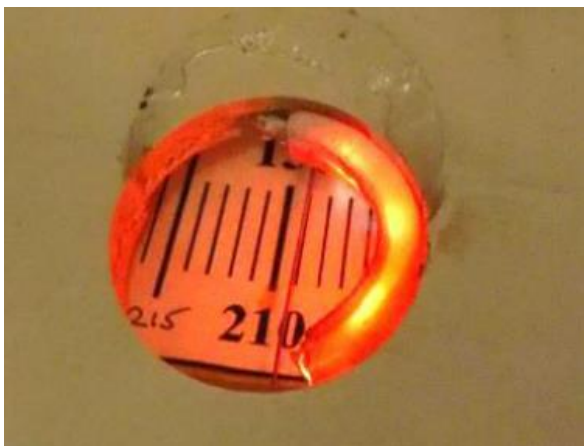
## Photos

Completed setting circle mounted on the yellow setting ring and fixed to the Dobsonian base so that it can rotate/be adjusted by the handle.



Some setting circles are fixed in place and a pointer is moved. My approach is harder to implement but much more satisfying to use.

See also: lazy susan in the centre is thicker than the yellow setting ring. The three buttons have a slight v profile which keeps the yellow ring locked down onto the base.



The view of the Azimuth scale is clear and easy to read with an added LED light.

A levelling base is useful thing to have.



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