

Upgrading the EQ3-2 Equatorial Tripod.

By Phil Jaworek

The EQ3-2 Equatorial Mount is standard equipment for a number of commercial telescopes at the current time, it is manufactured by Synta of China under a number of different brand names.

The mount itself is more than capable of handling most of the small to medium sized scopes on the market today but its Achilles Heel is the aluminium adjustable tripod it is supplied with as standard.

The tripod's failing is its lack of torsional rigidity around the head. This is primarily due to the use of hollow section leg struts with plastic lugs where the legs are fitted to the mount, (fig 1). This results in pronounced wobble at the eyepiece after even the most minor of adjustments to the telescope position or even focus. Another problem is the poor damping of even the slightest knock on the tripod.



Fig 1

There are many quick fixes around for these tripods. A search on the Internet reveals several methods from filling the legs full of sand to drilling through the accessory tray and fitting a centre bolt to the spreader bars. Some of these improve the rigidity of the scope a little but non really cure all the problems.

The upgrade I have carried out is relatively cheap and is within the capabilities of most people with a bit of DIY knowledge and skills and is guaranteed to reduce tripod wobble and vibration to an acceptable level.

The upgrade replaces the tripod legs with wooden legs made from Ash, (renowned for its vibration damping), but retains the tripod head, spreader bar and accessory tray. The tripod described is for use with a refractor but if you have a Newtonian Reflector the tripod height will need to be reduced in height to suit the most comfortable viewing position.

Tools: -

Electric Drill

Wood drill bits, various

Countersink bit or large general purpose drill bit

Plane, not essential but can be used to taper the leg struts to make them more esthetically pleasing

Wood Saw Tenon or cross cut

Surform

Workmate or Wood Vice

Hack saw

Fine metal file

Materials: -

Wood = Knot free American Ash.

Sizes as follows for refractor mounted on tripod: -

7 off 32x25x1500mm

1 off 32x32x1500mm

1 off M12 Plated screwed rod, 1 metre length. from B&Q

6 off M12 Plated nuts, from B&Q

12 off 12mm Plated repair washers, from B&Q

1 off M8 Plated screwed rod, from B&Q

6 off M8 Plated wing nuts, from B&Q

6 off 8mm Plated repair washers, from B&Q

1 off small tin of gloss exterior varnish

Wood Glue

Wood Screws, 42 off 5mm x 40mm

24 off 3mm x 35mm (ish)

I used plated countersunk cross head screws in the following sizes but brass screws could be used to make the tripod look smarter if required.

Sand Paper, various grades down to fine for the final finish.

Total cost will be about £60 ish

Notes!

1. Ash nowadays is very hard to source, I eventually tracked down a joiners shop who stocked it and would cut and plane it to size. The sizes shown cost about £40 but if you are willing to cut and plane it yourself it can be cheaper.
2. It is important that the wood is free of knots. Knotty wood will severely reduce the rigidity of the legs particularly if used in the leg struts.
3. The length of the leg struts will depend upon how high you want the tripod to be. I chose 1.5 m which gave me a tripod height of 1.4m ideal for my use with a refractor, a bit of basic trigonometry will help to determine the best height for you. This is a perfect height for me as I am 6'1" tall but people of shorter stature would do better to reduce these lengths. If in doubt measure the total extended length of the original tripod legs and use this measurement. Important! If you have a Newtonian the legs must be made considerably shorter than those shown.

Construction

The construction is very basic using screws and glue, no fancy joinery is required.

- 1. Cut all pieces to length as per the cutting drawing fig 2 below.

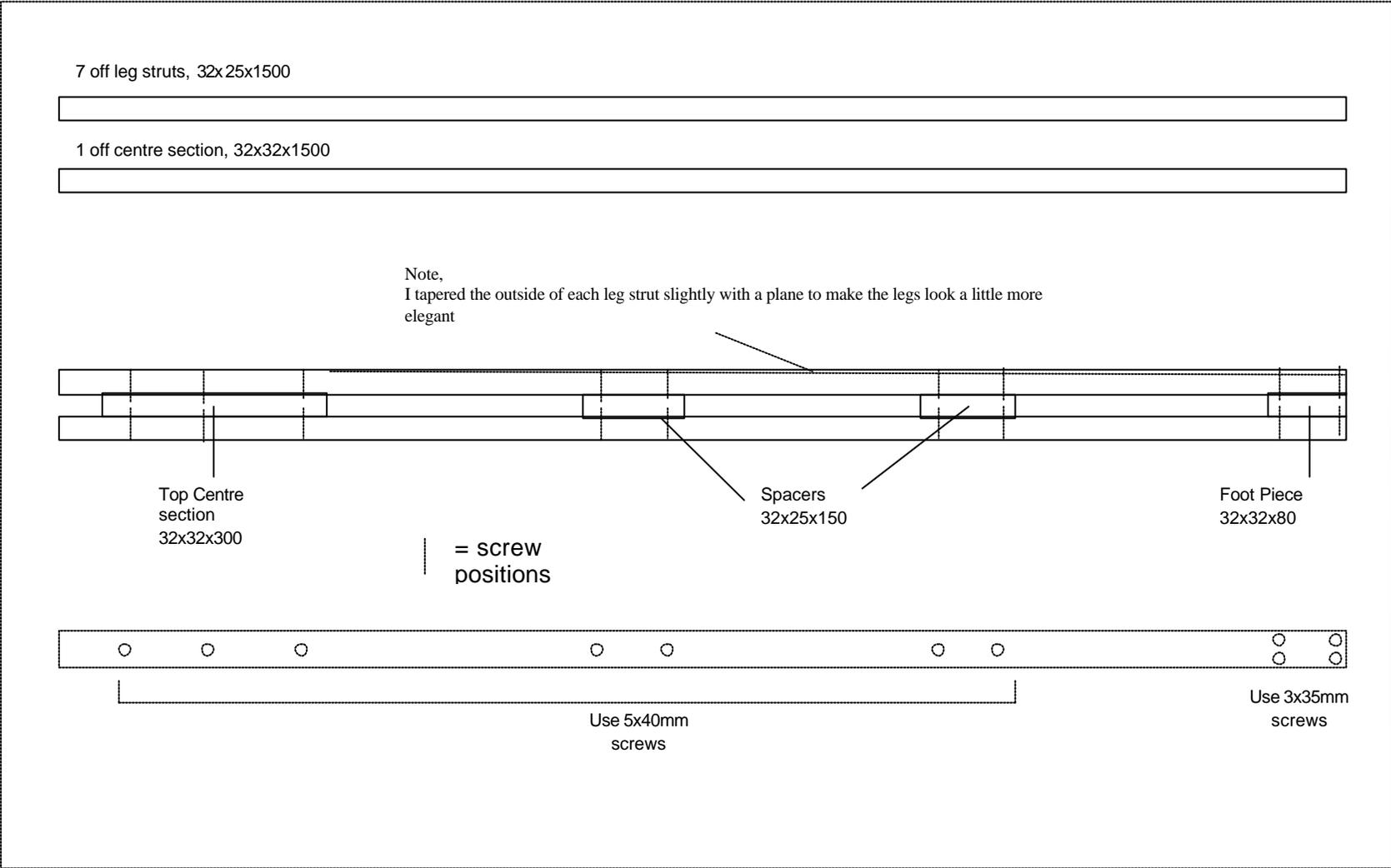


Fig 2

2. Drill the 3 "foot pieces", with a 12mm dia hole as shown in fig 3 along the long axis. I used a pedestal drill and vice but a portable drill can be used provided the drill is held perpendicular to the wood and the wood is held firmly in a vice or workmate.

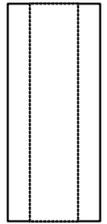


Fig 3

3. Mark and drill the tops of the leg struts with an 8mm drill. It is more accurate at this stage to put 2 struts together in the vice and drill straight through both, these struts can then be paired to make up a leg.

4. Mark the tops of the leg struts to make a neat round end as shown in fig 4 then shape them using the surform, fig 5, again it is better to place the paired leg struts together in the vice to get an even shape on both legs.

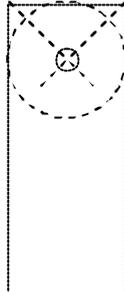


Fig 4



Fig 5

5. Mark up the three pairs of leg struts for drilling as fig 6 and drill. Countersink the outside face of the leg strut holes.

6. Assemble the legs using glue and screws to fix the centre blocks and foot pieces, I found it easier to fit the centre blocks on one leg strut first and then align the other strut before fixing. Placing an 8mm drill through each of the leg strut top holes assists alignment here, fig 6. Ensure the drill is perpendicular to the struts and central before fixing. This will ensure accurate fitting of the assembled leg to the tripod head. The top centre block should be positioned at a distance from the top of the leg struts to give adequate clearance from the tripod head, see fig 5.

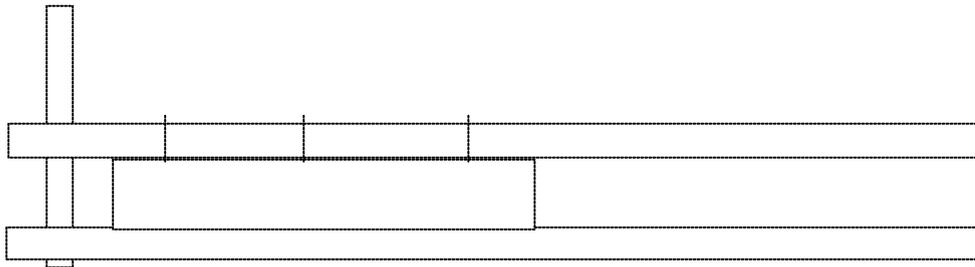


Fig 6

7. Cut 3 off 6 to 8 inch lengths of 12mm screwed rod and tidy up the sawn ends with the metal file so the nuts will start easily on the threads.

8. On each leg "foot piece" push a length of the 12mm screwed rod through the 12mm central hole, this may be tight, if so use a round file to open out the hole slightly, do not open out the hole too much as this will cause the rod to be slack in the hole and make the foot unstable.
9. Fit a 12mm washer and nut to each end of the screwed rod either side of the "foot piece" on each leg, fig 7. If you feel like doing a bit more filing, you can sharpen the very end of the rod to a near point to make a proper foot spike. Do not make the spike too sharp as this will make the foot unstable.

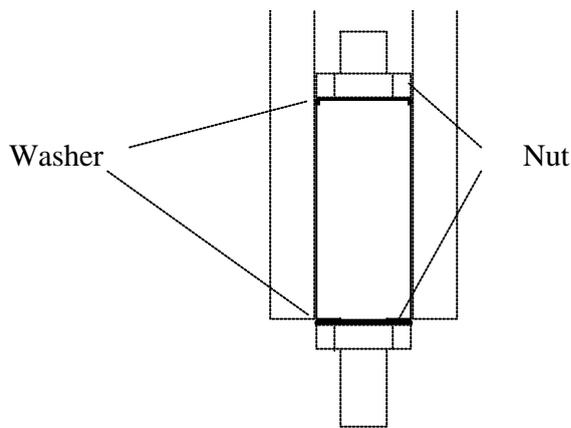


Fig 7

10. Test fit the first leg to the tripod head. This should be a tight fit, if it is too tight due to planing tolerance on the end centre block width, carefully sand or file the insides of both leg struts evenly and squarely, stop regularly to check the fit, stop as soon as you can just fit the leg on the head with a bit of force. Repeat for all three legs.
11. Cut three off 4" lengths of 8mm screwed rod and file the cut ends neatly so the nuts will start easily on the threads.
12. Fit all three legs to the head and push through one 8mm rod on each leg, fit an 8mm washer and wing nut either side of the leg and tighten, see fig 5. Stand your creation up on the floor and admire your handiwork.
13. Open all three legs evenly until the tripod is in what will be its normal position, try to get the legs at a similar angle to how the original tripod stood.
14. On the old tripod remove the plastic spreader bar from the tripod legs. Each end is fitted to the tripod leg with 4 off self tapping screws, remove these and lift off the complete spreader bar.

15. Now position the opened spreader bar in between the new tripod legs and move it up until all three ends of the spreader bar each touch a leg. Ensure the spreader bar is horizontal and mark one leg where the end touches the leg. Measure this mark from the end of the leg and mark the other two legs.
16. Dismantle the tripod again. Remove the fixing brackets from the spreader bar ends, this is just a long screwed rod and is easily removed by unscrewing, the brackets are a two part assembly.
17. Fix the spreader bar brackets to each leg at the marks made earlier and reassemble the tripod to the head.
18. Fit the spreader bar to the legs using the screwed rods removed in step 16 and voila, there you have it one super rigid tripod, fig 8.
19. Take the accessory tray and screw in the winged screws from the top of the tray so the threaded ends poke out from the bottom of the tray. Now just drop the tray into the holes on the spreader bar. Very convenient this mod, it saves fiddling with the screws when setting up in the dark.
20. As a finishing touch sand down the legs and give them two or three coats of varnish to make them look smart.



Fig 8

Notes on using the Tripod.

You will have noticed that the tripod is limited in its height adjustment and cannot cater for major terrain differences. Small differences in leg height can be adjusted using the foot spikes by screwing in or out the screwed rods and tightening the nuts. I never bother adjusting these anymore I use the EQ3 Mount adjusters to polar align the RA axis.

One more tip for those with motor drives, purchase some self adhesive Velcro tape, (from any haberdashery or needlework store), cut three 3" lengths and stick one piece of the looped side to the top centre piece of each leg. Stick one piece of the hook Velcro to the back of your hand controller and hey presto you never have to fumble in the dark again for the controller. Just stick the controller to the nearest leg to you.

One last thing; enjoy your new creation. If made properly this tripod will be very rigid and will transform the performance and looks of the scope and mount.



Important!

The instructions given in this guide are general only and are from the authors experience of building this tripod. They are not exhaustive in there content and are to be used as guide as to how to effect the upgrade of the tripod. The author cannot be held responsible for any differences in dimensions, sizes etc. from mount to mount and cannot be held responsible for any damage to equipment, tools or persons during the course of carrying out this upgrade.