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The DRO which came with the PM1440E-LB has glass scales, the 'X' scale is mounted to the right side of the cross-slide and soaks up 3" of tail stock travel. This is not too big of a deal when drilling or tapping, but can make things a little tight (too tight) when using a live center (and having the quill hanging out an extra three inches to reach over the DRO reader loses a lot of rigidity), i would really like to gain that travel back. Two solutions came to mind, use a MT3 to MT3 extension (which i have from time to time, but really do not like it) or make a new quill which is longer, which is what i decided to do.



Made from 12" long x 2.75 Dia piece of 4140 pre-harden and heat treated (27-32ish rock-well).

Finish size will be:

- 1.2602 x 7" long (which slides in the tail stock housing)
- 2.625 x 4" long (which the MT3 taper will be in)
- 5/8 drill through hole (clearance for the "draw screw")
- .75 x .937 deep bored hole in the end of the 1.260 for the "draw-screw's" sleeve
- MT3 Taper on the 2.625 end

Took some pictures along the way, but missed some operations.

Here's the route i took:

Chuck up the stock and used a steady rest, faced (just to clean it up) then center drilled, flipped the piece and did the same on the other end.

Popped in a pre-cut dead center (just a piece of stock with a 60deg cut in it) and skimmed the 60deg to true it up, put the stock between centers along with a 3" lathe dog and spun it around 450 rpm, then upped it to 750 rpm - *NO-GO* for ether speed, the lathe dog caused way to much un-balanced weight. I wanted to turn it between centers because i figured it would be a lot easier to make sure there was no taper on the portion of the quill which would slide on the tail stock housing.

Got rid of the dead center and chuck the stock and moved in the tail stock, roughed the smaller OD to around 1.5 (will finish at 1.2602) x 7" long. For the most part spun it around 1250 rpm (slowed it down for the pic to give me more time so i did not have to pay attention to the machine (stuff happens pretty quick at 1250 rpm)), feeding around .005 taking off .05 a pass and was getting nice chips... was also using coolant. When it came time for the finish passes it was feeding around .002 and taking off .005 a pass... the last pass ended up to be around .002 and it was a little too light, wish it could have been .005.



Now that the smaller OD can fit in the spindle tube (2" spindle tube), i flipped the stock around, finished the larger OD to 2.625 and drilled an 8" deep 5/8 hole.



Flipped the stock around again, tossed on the steady rest and finished the 5/8 drill (4" deep to join the other side).





While the steady rest was in place, finished the screws sleeve bore, .75 x .937 deep. After that put a slight chamfer on the ID, brought the tail stock back in and finished the OD (1.2602) which sits in the tail-stock housing. Removed piece, transferred the hole pattern for the sleeve, drilled and tapped that and got ready for reaming the MT3.

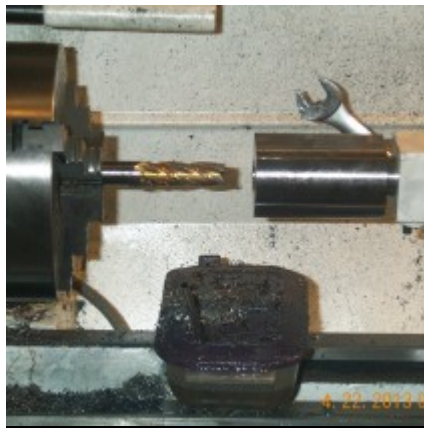
Milled the flat on the top (probably gonna mount a cheap-o 6" digital caliper on top) along with a .22 x 4.5" long groove in the bottom of the section which slide in the tail-stock housing for the "bottom guide screw" to move in.

Before reaming i roughed the bore to .73ish, put the quill in the tail-stock, locked it in place and put a 5/8 boring bar in the lathes chuck and ran the quill into it about .100 deep and it cut a .79ish bore which i used to help guide the reamer. Using a lathe dog with the spindle spinning at 70ish started to ream the whole with a MT3-Roughing reamer. Locking the tail-stock to the bed and snugging the quill lock i started to spin the hand-wheel roughly 1/4 inch in, retracted quill, moved tail-stock in, locked everything and moved in another 1/4...





After getting half-way done with the roughing reamer i decided to pop a 3/4 end-mill in the chuck and go a little deeper with it... when i roughed it before i must have not gone deep enough, was getting really tough with the roughing reamer.





Finished with the reaming, both roughing and finish reamer... the bores finished sucked (and still does) - rough and you can see and feel "chip groove"... took quill out of tail stock and tossed it in the chuck and started with emery paper, 220, 320... 320 lapping compound,,, 400, 500 and then scotch-brite... did not do too much for the groove but did really smooth out the rest. Live centers and drill chucks fit in it really nice. Turned down the end because during a test fit i could see the face of the quick-change tool post might cause havoc down the line, turned it down to the same dia as the live center i currently have. Can always take it apart and turn more off it if need be.



Now time to mess with the "draw screw". Since the quill is now 4" longer retracting the quill will no longer pop out the tool. Originally i was gonna make a whole new screw, but got lazy and wanted to finish this up so i decided to weld an 7/16 rod to the end of the current screw. Chuck up the current screw, faced, turned the OD (so the weld had a place to sit) and also "bored" out a little ID step to make aligning the extended rod easier. Then mirrored that to the 7/16 rod.

Sorry the photos suck.. have a problem taking clear images of small things...





Now welding the two together... Note: i am NO welder by any means... i can stick two pieces of metal together and it should hold, but its not too pretty. Took a piece of 3/4 angle iron and clamped it in the vice (two legs up) and used that as a jig. Measured the two ODs of the parts, split the difference and "shimmed" two side of the 7/16 rod... needed 1/16 and found two small two flute taps which fit the bill. Clamped the screw to the angle iron, tapped the rod in to place, shimmed and clamped the rod and tacked it with the MIG (dont have a TIG welder or i would have used that). If you look to the right you will see the taps sticking up under the little clamps.

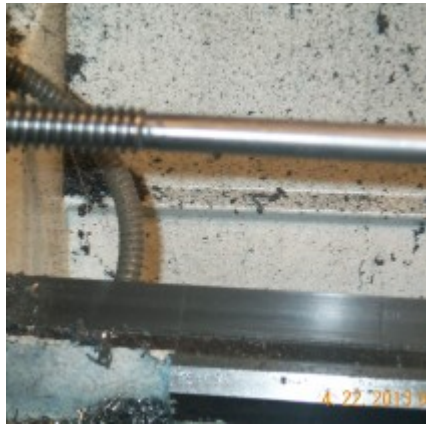






Tossed it in the lathe after and cleaned every thing up. Did not put an indicator on it, buy looks like there is about .02 run out at the every end, not gonna sweat that, not important for its function.





Reassembled everything... found out the 7/16 rod was a little long, cut it down and ended up with a total length of 10 (or 11) and a half inches from end to end.





The most important part, the OD which sits in the tail-stocks housing is "egged" (or oval) about .0007-.001. Not sure what happen there, only thing which saved me is the biggest part is 1.2602ish so it does fit snug, there might have to be times when i will have to snug the quill lock and keep any slop under control... i think it has something to do with the current quill being extend all the way out, but had no choice in this (hence the reason for the extended quill). If i ever get (or rig up a grinder) i will remake this and use the grinder to finish the tight OD. Used the tail-stock to make sure there was no taper, over the 7" there is only one to two tenths (small side is farthest in the tail-stock) which i can live with... For now, it seems like it will be better then the original but only time will tell...

Things to do next time...

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