might change

feed rate | rough → 0.008"–0.011"

Focuser - Manufacturing Procedure

0.007" IPR | finishing → 0.003"–0.005"

WATCH THE VIDEO!

https://youtu.be/eZjWJOx0pGw

1) **Cut a piece of 1-8 low carbon steel threaded rod to a length of 2.63" on the bandsaw.** *(6:56)*
   Tools used: Combination square

Turning Cut ← Z axis

Facing Cut ↑ X-axis

Lathe Operations:

0.01–0.02"

Mount stock in a 1" collet in a 5C collet chuck on the lathe with 1" stick-out.

2) **Face one side to clean.** *(8:15)* angled touch front
   Tools used: 6" rule, HSS turning tool, digital readout, coolant

Flip part around and remount with 1" stick-out.

3) **Face opposite side to clean.** *(10:09)* touch front
   Tools used: 6" rule, HSS turning tool, digital readout, coolant

set Z DRO to this

2.630"

Remove part, measure length with dial caliper, remount with 1" stick-out.

4) **Face to 2.5" overall length.** *(10:35)* face from 0.05" finish cut
   Tools used: 6" rule, HSS turning tool, digital readout, dial caliper, coolant

5) **Turn ⌀.83" to .39" from end.** *(11:23)* Turn finish to 0.825"ϕ (b/c knurls)
   Tools used: HSS turning tool, digital readout, 0-1" micrometer, coolant

6) **Cut ⌀.80" X .07" wide groove at .32" from end of part.** *(13:32)*
   - **Visually align point of chamfering tool to end of part, zero digital readout, position tool .32" from end of part, feed tool in X axis until it lightly touches off on ⌀.83" turned surface, set digital readout to actual measured value of turned surface, plunge to just under ⌀.80", move tool to .39" from end of part with carriage handwheel, retract tool, measure and recut if necessary.**

   Tools used: HSS chamfering tool, digital readout, dial caliper, heavy cutting oil

0

final → 0.794"?

7) **Cut .02" X 45° external chamfer.** *(17:24)*
   Tools used: HSS chamfering tool, digital readout, heavy cutting oil

8) **Form fine diamond knurls.** *(17:43)*
   - **Adjust knurling rollers square to part surface, move along Z axis to position knurling rollers over surface to be knurled, align pivot of knurling tool to center of rotation of spindle, feed tool in X axis to position knurling rollers over center of rotation of spindle, hand-tighten clamp nut to touch off knurling rollers on part surface, tighten carriage lock, apply oil, tighten clamp nut one wrench flat (1/6th turn), turn on spindle (slow speed) and then turn off after a few revolutions. Repeat, adjusting clamp nut in increments of one-half to one flat at a time, until knurls are fully formed. Apply oil frequently to flush away swarf. Loosen clamp nut and carriage lock, retract tool.**

   Tools used: Clamp-style knurling tool with fine diamond rollers, adjustable wrench, heavy cutting oil

193 RPM

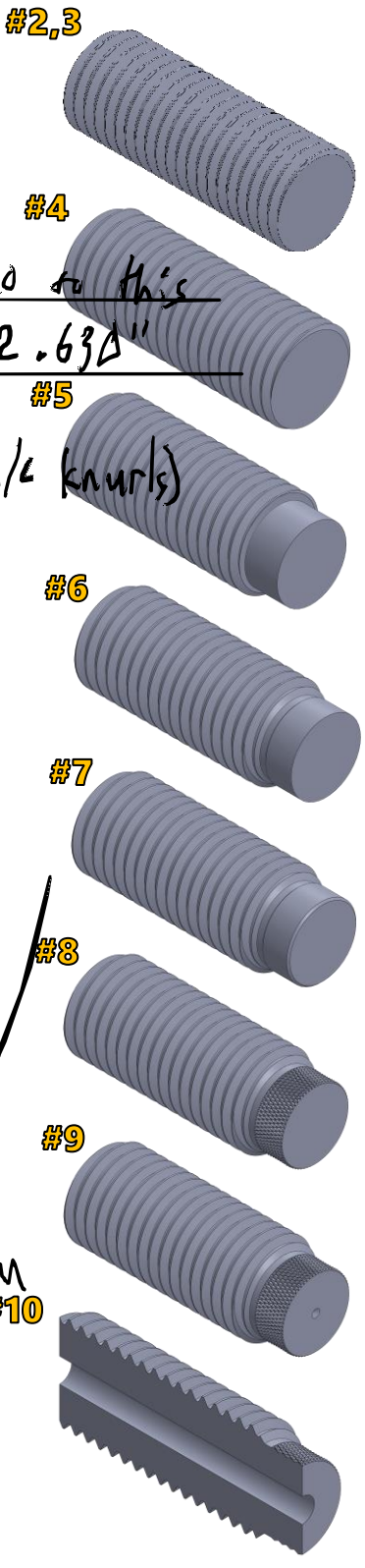
9) **Spot hole for 5/8-18 UNF 2B threads.** *(22:54)* 600–1000 RPM
   Tools used: #4 HSS center drill, drill chuck, coolant

10) **Pilot drill for 5/8-18 UNF 2B threads all the way through part.** *(30:19*)* 960 RPM
    Tools used: 1/4" HSS twist drill, drill chuck, coolant

11) **Drill for 5/8-18 UNF 2B threads through part.** *(23:10)* 415 RPM
    Tools used: 37/64" HSS twist drill, morse taper adapter, coolant

Tap

12) **Tap 5/8-18 UNF 2B threads through part.** *(24:27)*
    Tools used: 5/8-18 UNF HSS plug tap, tap handle, spring-loaded tap guide, drill chuck, heavy cutting oil



HSS turning → 400 RPM

Chamfer 0 → 193 RPM

13) **Bore ø.694" to .56" from end.** *(25:27)* 2882 RPM
Tools used: 3/8" boring bar with CCMT 2(1.5)1 carbide insert, digital readout, 0-1" micrometer, telescoping gage (size A), coolant

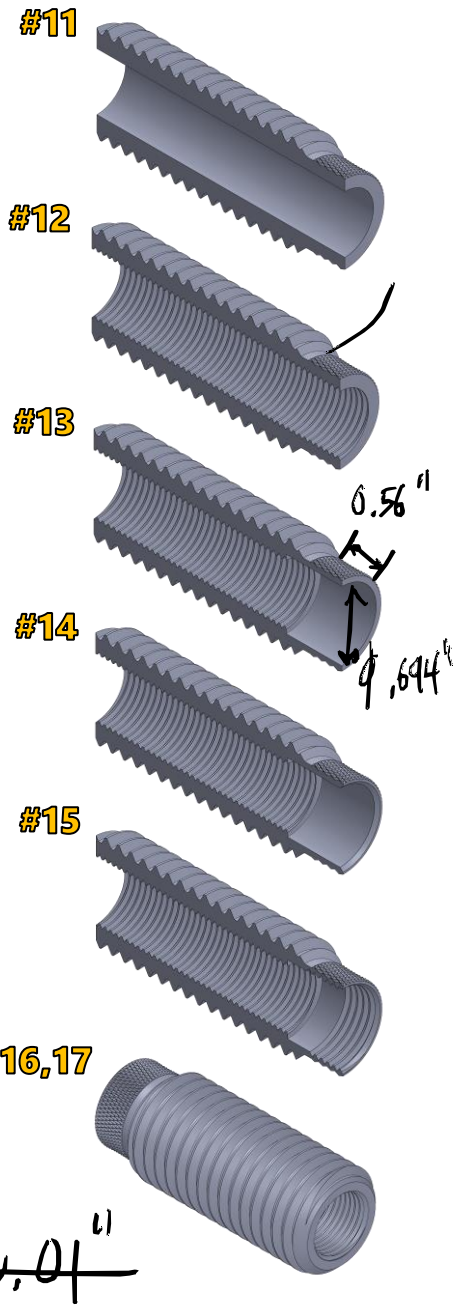
14) **Cut .04" X 45° internal chamfer.** *(28:18)*
Tools used: HSS chamfering tool, digital readout, heavy cutting oil

15) **Tap 3/4-16 UNF 2B threads .3" deep.** *(28:39)* 4.8 rotations?
Tools used: 3/4-16 UNF HSS plug tap, tap handle, spring-loaded tap guide, drill chuck, heavy cutting oil

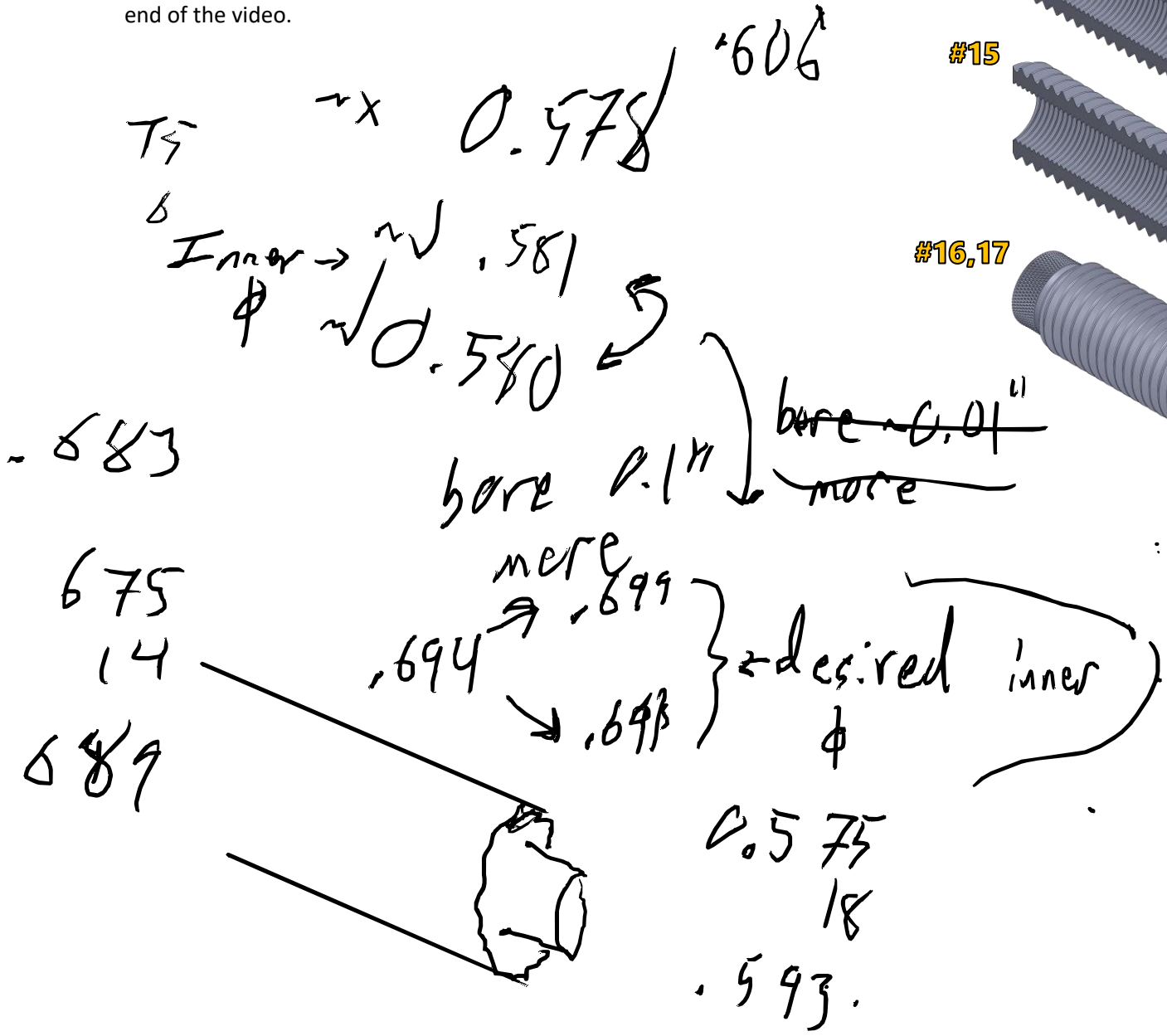
Flip part around and remount with 1" stick-out.

16) **Cut .04" X 45° internal chamfer.** *(29:42)*
Tools used: HSS chamfering tool, digital readout, heavy cutting oil

17) **Cut .10" X 45° external chamfer.** *(29:53)*
Tools used: HSS chamfering tool, digital readout, heavy cutting oil



*Pilot drill step was added to the manufacturing procedure after recording demonstration, but is discussed in a supplement at the end of the video.



6 1. Ajust knurling rollers square to part surface
2. Move along z axis to position knurling rollers over surface to be knurled
3. Align pivot of knurling tool to center of rotation of spindle
4. Feed tool in x axis to position knurling rollers over center of rotation of spindle.
5. Hand-tighten clamp nut to touch off knurling rollers on part surface.
6. Tighten Carriage Lock

HSS Turning/Chamfer Tool, 3/8" indexable boring bar, CCMT 2(1.5)1 carbide insert,

Clamp-Style Knurling Tool
fine diamond rollers,

#4 HSS center drill,
37/64" HSS twist drill,
1/4" HSS twist drill,
5/8"-18 tap,
3/4"-16 tap,

Center Drill #4

Pilot Drill 1/4" (Blackish)

Drill 37/64"