

[= 1200 RPM Center = 600-1000 RPM

Mount Intermediate – Manufacturing Procedure


O = 4486

Edge finder = 1000 RPM

- 1) Cut a piece of .38" X 1.25" 6061-T6 aluminum alloy rectangular bar to a length of 3.13" on bandsaw. (9:48)

Tools used: Combination square

Milling Machine Operations:

Conventional →  feed table 'towards' rotation
Climbing →  feed table 'away' rotation

WATCH THE VIDEO!



<https://youtu.be/FjtUpLtgjsw>

Install mill vise on table and ensure it is properly aligned to the table travel. Clamp part in vise on parallels with 1.25" stock dimension between jaws and about .5" stick-out on left side of jaws.

#2,3

- 2) Side mill one end to clean. (11:27)

Tools used: 6" rule, 1/2" HSS end mill, digital readout

Remove part, rotate 180° and reclamp as before.

- 3) Side mill other end to 3.01" overall length. Use *conventional*, rather than climb, milling technique for roughing cuts. (12:27)

Tools used: 1/2" HSS end mill, dial caliper, digital readout

Remove part from vise.

Layout Operations:

- 4) Scribe lines for outer contour. *Granite surface plate is for layout and measurement only! It is not for storage or benchwork and must be kept clean!* (14:08)

Apply Dykem layout fluid to 1.25" X 3.01" top surface of part on workbench. Use height gauge with scribe and angle plate on top of surface plate to scribe lines for outer contour 1.50" from left side of part and .438" from both sides of 1.25" dimension. Also, scribe crosshair for location of 1/4-20 UNC 2B threaded hole at 2.81" from left side of part and on center of 1.25" dimension. Lightly punch location of 1/4-20 UNC 2B threaded hole using 60° prick punch on workbench. Set dividers to 3/16". Set one point in the small punch mark and the other on the part surface. Swivel the dividers to scribe a 3/8" circle.

Tools used: Dykem layout fluid, height gauge with scribe, angle plate, 60° prick punch, 6" ruler, dividers, surface plate

Milling Machine Operations:

Reclamp part in mill vise so that .38" X 1.25" surface is facing up, .38" dimension is between jaws, part is oriented so scribed lines are against moveable jaw and part is in center of vise. Select shortest parallels available.

- 5) Find center of part in X and Y axes. (22:06)

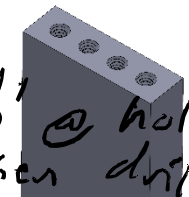
Tools used: Edgefinder, drill chuck, digital readout

- 6) Spot four holes for #6-32 UNC 2B threads. (24:25)

Tools used: #3 HSS center drill, drill chuck, WD-40 lubricant, digital readout

- 7) Drill four .0107" holes .40" deep for #6-32 UNC 2B threads. (25:05)

Tools used: #36 HSS drill, drill chuck, WD-40 lubricant, digital readout



Steps 8+9 can also go here for "1st day" full depth

spray w/ surface cleaner only halfway ish

Clean other side, then measure, then set x-axis to that val

Then measure again

#6

0.438" x 2 is for the protrusion

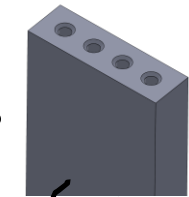
0.4375" = $\frac{1.25 - 3/8}{2}$

Also mark @ 1.5" for base of protrusion

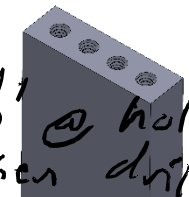
#7

The scribe cuts the Dykem paint to make lines

#8



#9



Set Z axis for consistency for 0.138" threads → Countersink a smidge larger +0.015" - 0.030"

480

8) Countersink four holes for #6-32 UNC 2B threads. (26:54)
Tools used: 1/2" X 90° HSS countersink, drill chuck, WD-40 lubricant, digital readout

9) Tap four holes for #6-32 UNC 2B threads minimum .3" deep. Be very careful not to overtorque the delicate tap and break it! (28:26) ~9.6 turns
Tools used: #6-32 HSS plug tap, tap wrench, spring-loaded tap guide, drill chuck, WD-40 lubricant, digital readout

6 Taller Parallels
Remove part. Reclamp part in mill vise on parallels so that 1.25" X 3.01" surface (with scribed lines) is facing up, 1.25" dimension is between jaws, part is oriented so scribed lines are on right side and part is in center of vise.

1000

10) Find left side of part in X axis and center of part in Y axis. Apply vise stop on left side of part as reference for future setups. (30:33) (w/ allen wrench)
Tools used: Edgefinder, drill chuck, digital readout, vise stop

600-1000

11) Spot hole at 2.81" from left side of part. (33:36)
Tools used: #3 HSS center drill, drill chuck, WD-40 lubricant, digital readout

2388 RPM

12) Drill ø.201" hole for 1/4-20 UNC 2B threads. (34:08)
Tools used: #7 HSS drill, drill chuck, WD-40 lubricant, digital readout

480

13) Countersink hole for 1/4-20 UNC 2B threads. (34:13)
Tools used: 1/2" X 90° HSS countersink, drill chuck, WD-40 lubricant, digital readout → to ~ø0.280" (@ 0.290")

Tap

14) Tap for 1/4-20 UNC 2B threads. (34:27)
Tools used: 1/4-20 HSS plug tap, tap wrench, spring-loaded tap guide, drill chuck, WD-40 lubricant, digital readout → through hole

600-1000

15) Spot hole at 2.38" from left side of part. (34:38)
Tools used: #3 HSS center drill, drill chuck, WD-40 lubricant, digital readout

2553 RPM

16) Drill ø.188" hole at 2.38". (34:55) → through hole
Tools used: 3/16" HSS drill, drill chuck, WD-40 lubricant, digital readout

1250

17) Counterbore ø.32" X .13" deep. (35:01)
Tools used: 5/16" HSS end mill, R8 collet, WD-40 lubricant, digital readout

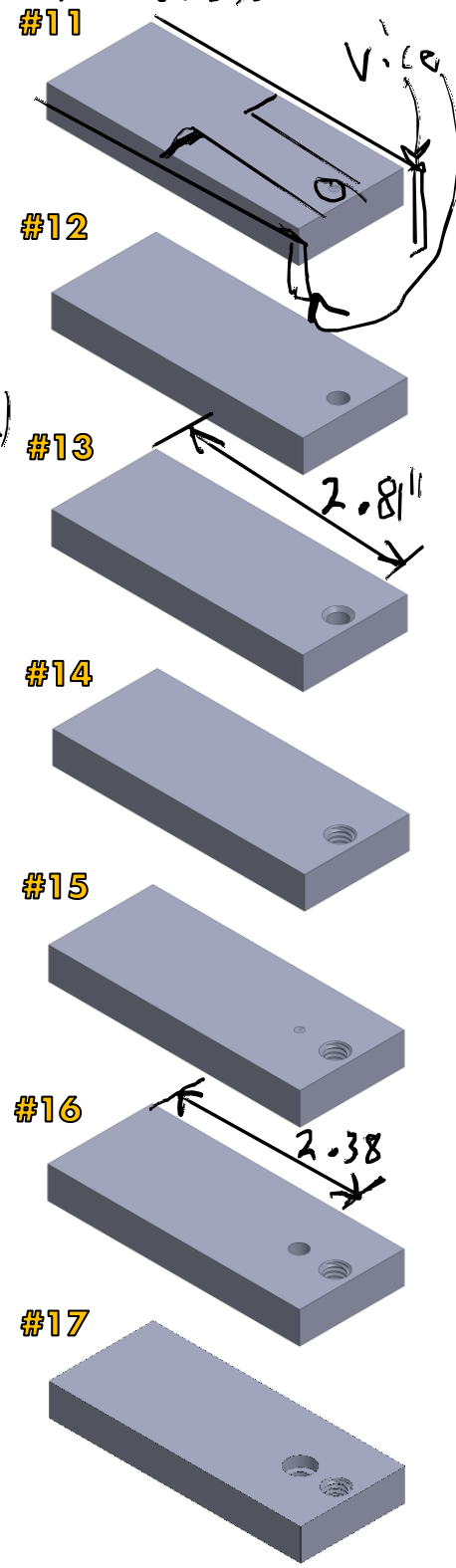
0-out Z-axis to get depth of 0.130" accurately
3/8" collet

Then remove collet, reinstall drill chuck

-422, -141, -141, -422

0.138" ← threads
0.165" my sink

Don't forget about wood sides



600-1000

2553

654 RPM

320

Reinstall drill chuck

1000

600-1000

0

3200

1667

Tap

18) Spot hole at .750" from left side of part. (35:39)

Tools used: #3 HSS center drill, drill chuck, WD-40 lubricant, digital readout

19) Pilot drill hole. Exact pilot drill size is not critical. (36:29) Speed for hole from 3/16" drill

Tools used: 3/16" HSS drill, drill chuck, WD-40 lubricant, digital readout

20) Pre-drill for ø.750" hole. (37:42) → Thru hole

Tools used: 47/64" HSS drill, #2-morse-taper-to-R8-taper adapter, WD-40 lubricant, digital readout

21) Ream ø.750" hole at .750" from left side of part. (38:53)

Tools used: 3/4" HSS reamer, #2-morse-taper-to-R8-taper adapter, WD-40 lubricant, digital readout

Use a drift to install

Remove part and reclamp in vise so that .38" X 3.01" surface is facing up with about .63" stick-out above top of jaws, .38" dimension is between jaws, part is oriented so scribed lines are against moveable jaw and left side of part is against vise stop.

Deburr

22) Find center of part in Y axis. (40:06)

Tools used: Edgefinder, drill chuck, digital readout

23) Spot hole at 1.270" from left side of part. (41:14)

Tools used: #3 HSS center drill, drill chuck, WD-40 lubricant, digital readout

24) Drill ø.107" hole .81" deep. (41:17) → Small hole, 0-out Z axis, drill to 0.810"

Tools used: #36 HSS drill, drill chuck, WD-40 lubricant, digital readout

25) Drill ø.150" hole .4" deep. (41:51) → Small hole, 0-out Z axis, drill to 0.400"

Tools used: #25 HSS drill, drill chuck, WD-40 lubricant, digital readout

26) Counterbore ø.24" X .14" deep. (42:31)

Tools used: HSS counterbore for #6 screw, drill chuck, WD-40 lubricant, digital readout

27) Tap for #6-32 UNC 2B threads minimum .7" deep. (43:53)

Tools used: #6-32 HSS plug tap, tap wrench, spring-loaded tap guide, drill chuck, WD-40 lubricant, digital readout

Remove part from vise.

Step 31 Saw → $\frac{4 \times 700}{1.5} = 533 \text{ RPM}$

Step 21 Reamer → $\frac{4 \times 60}{0.750} = 320 \text{ RPM}$

Step 26 counterbore → $\frac{4 \times 100}{0.24} = 1,667 \text{ RPM}$

Step 17 counter bore → $\frac{4 \times 100}{0.32} = 1,250 \text{ RPM}$

Counter sink → $\frac{4 \times 60}{0.5} = 480 \text{ RPM}$

Step 25 → $\frac{4 \times 120}{0.150} = 3200 \text{ RPM}$

$\sim X = 17.92 \text{ turns} \leftarrow \frac{32 \text{ turns}}{1"} = \frac{X \text{ turns}}{\sim 0.56"} \leftarrow$

#18

#19

#20

#21

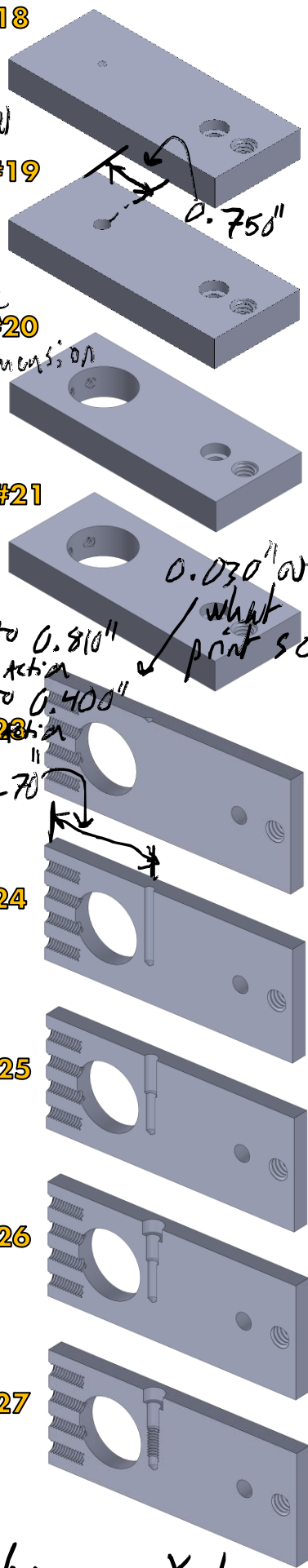
#23

#24

#25

#26

#27



0.030" over what print says

smallest dimension

[= 1200 RPM

Vertical Bandsaw Operations:

28) Remove excess material on contour of part using scribed lines as a guide. Set rail on bandsaw for straight cuts and use pusher blocks for safety. (44:33)

Milling Machine Operations:

Reinstall the $\frac{1}{2}$ " collet + $\frac{1}{2}$ " mill
Reclamp part in mill vise against stop as before with scribed lines against moveable jaw.

29) Mill first step surface .438" from top of part and 1.5" from left side of part. (48:12)
Tools used: $\frac{1}{2}$ " HSS end mill, dial caliper, digital readout

Remove part, flip 180° so part is oriented with scribed lines against **fixed** jaw and reclamp in vise against stop.

30) Mill second step surface .438" from top of part and 1.5" from left side of part. (50:11)
Tools used: $\frac{1}{2}$ " HSS end mill, dial caliper, digital readout

Remove part, flip 180° so part is oriented with scribed lines against **moveable** jaw once again and reclamp in vise against stop.

533 31) Cut .063" wide slot to split $\phi .750$ " hole. (50:57) $\frac{1}{2}$ " collet
Tools used: $\phi 1.5$ " X $\frac{1}{16}$ " wide HSS slitting saw, dial caliper, digital readout

Touch "bottom" precisely with 0.002" shim,
Belt Sander Operations: of protrusion w/ saw

32) Sand .19" radius on right side of part using scribed circle as a guide. (52:37)

Layout lines face up

Remove material from corners

Pre Collect $\frac{1}{2}$ " collet, $\frac{1}{2}$ " end mill,
 $\phi 1.5$ " X $\frac{1}{16}$ " wide slitting saw

29) + 30)

Touch part w/ mill, O-out Z axis
Touch + O-out X axis @ $\frac{1}{2}$ down hand saw
Clean up cut 0.01"

Measure "top width" set X-axis
to that value

Mill protrusion @ depth of 0.438"
along X-axis until close to 1.5"
width

Mill remaining excess until 1.5" is reached

Use acetylene to remove layout fluid

#28

1.5"

0.438"

#29

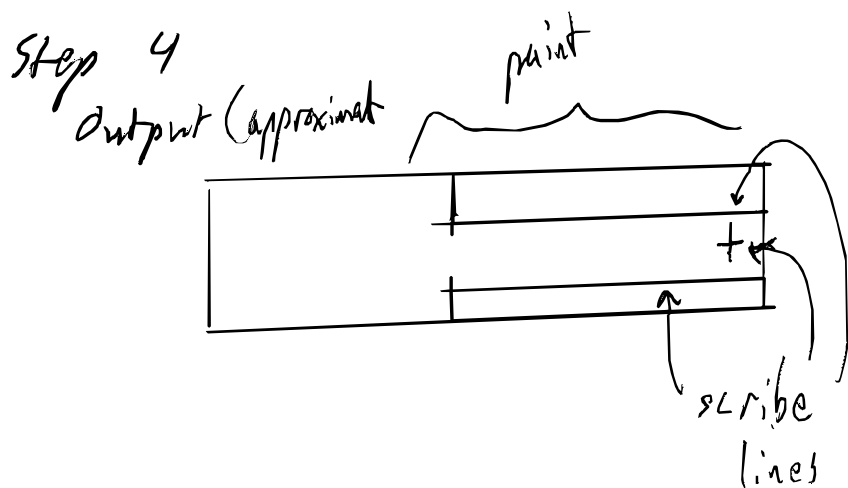
#30

#31

#32

O-out 2 axes,
Feed through part,
avoid collisions

Use the buffer
polisher + scotch
bright surface
conditioning
wheel



$\frac{1}{2}$ " HSS End Mill

1.528

