

## Assigned Parts Outlines

This document outlines the sequence to manufacture the assigned parts (wheel hub and shaft clamp bracket) using the equipment in the laboratory. TAs will guide you through the process and explain why the parts are made in this manner. These outlines are provided so you can review what is done during each session. *Your knowledge of the nomenclature and processes listed on these outlines will be important when working on your own to manufacture parts for your group's final design; this knowledge will also be evaluated on the final exam, so make sure you understand how these parts are manufactured and ask questions about anything that doesn't make sense.*

### SHAFT CLAMP BRACKET (i.e. milling machine part):

1. Cut a piece of ½" x 2" aluminum rectangular bar stock roughly 4-1/8" long in the bandsaw
2. Face ½" x 4" sides using 1" endmill
3. Face 2" x 4" sides using 1" endmill
4. Cut 4" length to size using 1" endmill
5. Cut ¼" x 2" x 2" slot in part using 1" endmill
6. Locate surface/hole datums using edge finder
7. Accurately begin drilling all nine holes using center drill
8. Drill four tapped holes thru using 0.157" tap drill
9. Drill remaining five holes using 0.196" clearance drill
10. Drill shaft mounting hole 1/64" under 5/16" (~0.297") in preparation to use reamer
11. Use 0.3135" reamer to finish shaft mounting hole for precision fit on 0.3125" motor shaft
12. Countersink the four #10 clearance holes
13. Tap the four threaded holes using spring loaded tap guide, tap handle and 10-24 UNC tap
14. Flip part on its side; use the edge finder to locate the surface datums
15. Drill the 10-24 set screw hole using a center drill and 0.157" tap drill
16. Thread the set screw hole using tap guide, tap handle and 10-24 UNC tap

### WHEEL HUB (i.e. lathe part):

1. Cut a piece of 2" diameter aluminum round bar stock roughly 3-1/2" long in the bandsaw
2. Clamp part in lathe (at least 1" in chuck jaws and 0.5" clearance) and face end of workpiece
3. Turn OD (outside diameter) along length of part so it's round
4. Turn shoulder on end of workpiece
5. Turn front two chamfers on workpiece
6. Cut off workpiece on the bandsaw (about 1/8" over final length)
7. Load part back into the lathe chuck and face 2" OD of hub to final length
8. Start drilling center hole thru workpiece using center drill
9. Drill center hole thru using 1/4" drill
10. Drill center hole 1/64" under 5/16" (~0.297") in preparation to use reamer
11. Use 0.3135" reamer to finish shaft mounting hole for precision fit on 0.3125" motor shaft

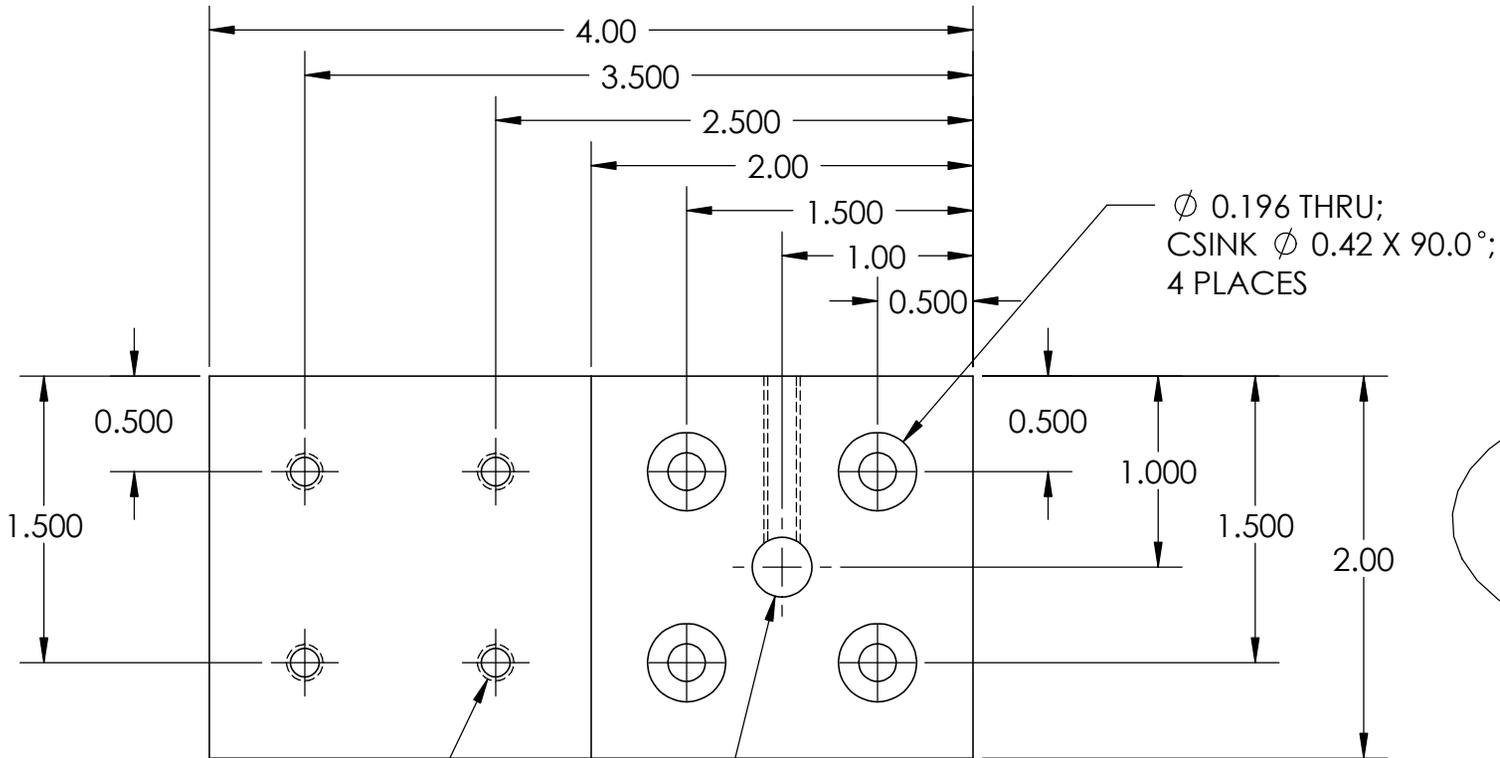
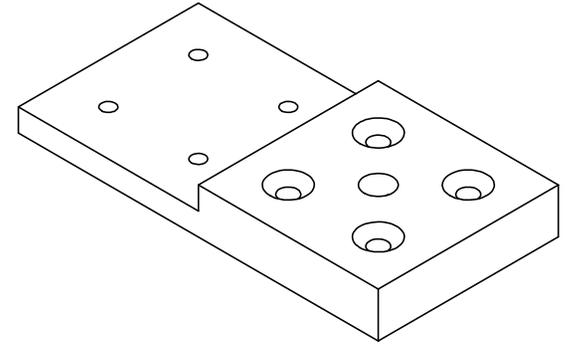
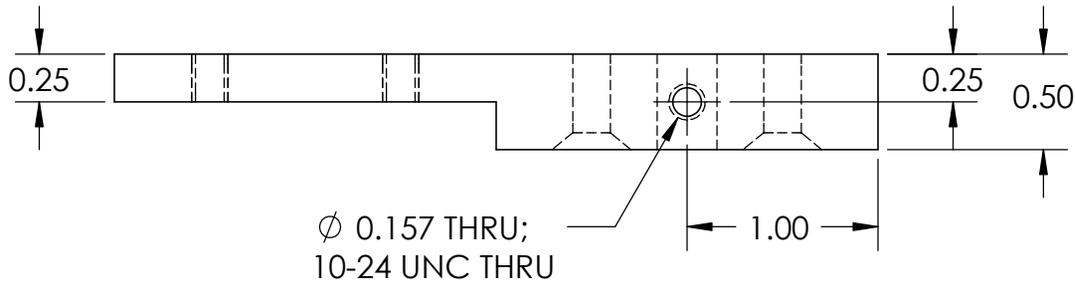
( >> outline is continued on next page >> )

## WHEEL HUB (continued):

12. Drill and tap the 3 holes on face of hub using the manual milling machine
    - a. load part into vise face up using a v-block to clamp it
    - b. locate part datums using edge finder
    - c. use the DRO to find hole locations and drill with center drill and 0.157" tap drill
    - d. use spring loaded tap guide, tap handle and 10-24 UNC tap to thread holes in hub face
  13. Clamp part on its side; use conical edge finder to locate the surface datums; drill the set screw holes (center drill and 0.157" tap drill)
  14. Thread the set screw holes using a tap guide, tap handle, and 10-24 UNC tap
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## When finished with the parts you should understand the following:

1. **Lathe nomenclature and operation.** Understand how to identify and use the axes of motion, headstock, spindle, chuck, carriage, cross slide, toolpost, tailstock, DRO and machine controls.
2. **Milling machine nomenclature and operation.** Understand how to identify and use the axes of motion, quill, spindle, knee, saddle, table, vise, DRO and machine controls.
3. **Tool nomenclature.** Understand the purpose and use of collets, edge finders, endmills, center drills, (normal) drills, tap drills, clearance drills, tap handles, tap guides, taps, reamers, countersinks and parallels.
4. **Process nomenclature.** Understand the industry standard acronyms for process parameters: radial and axial DOC (depth of cut), ID (inside diameter) and OD (outside diameter).
5. **Roughing vs. finish passes.** Understand why they are used and what each is concerned with (i.e. time, feature size and/or surface finish).
6. **Nominal part size/stock material size vs. part geometry size and tolerance.** Understand that failure to consider how these two concepts relate can result in significant increase in part cost.
7. **Tolerance table.** Understand its primary purpose and be proficient with its use.
8. **Tap chart.** Understand its purpose and be proficient with its use for standard and metric threads in weak (softer) and strong (harder) materials alike.
9. **Dial calipers.** Be proficient in their use to measure part features. Understand the three types of measurements they can make (i.e. external, internal and depth measurements).
10. **Part deburring.** Understand why this is important for manufacturing and for safety, as well as how to do it using files and rotary deburring tools.



**NOTES:**

1. QTY: 1
2. ALL DIMS IN INCHES
3. MATL: ALUMINUM
4. FINISH ALL SURFACES
5. BREAK ALL EDGES

$\phi$  0.157 THRU;  
10-24 UNC THRU;  
4 PLACES

$\phi$  0.3125<sup>+0.002</sup>/<sub>+0.001</sub> THRU

TOLERANCE UNLESS NOTED				TITLE:		
OPERATION	PLACES IN DIMENSION			<b>SHAFT CLAMP BRACKET</b>		
	0.0	0.00	0.000			
MACHINING	$\pm 0.050$	$\pm 0.020$	$\pm 0.005$	DRAWN	M. BRADDOCK	
CUT OFF (SAW, BURN, SHEAR)	$\pm 0.1$	$\pm 0.060$		DESIGNED	J. KOCH	
WELDING	$\pm 0.1$	$\pm 0.060$		SIZE	DWG. NO.	REV
ANGULAR DIMS	$\pm 10$	$\pm 5$	$\pm 1$	<b>A</b>	<b>EML2322L-010</b>	<b>A</b>
				SCALE: 1:1	SHEET 1 OF 1	

