

Fall 2008

2.0 MACHINING LAB

Objective

This lab is used to familiarize the student with the basic operational procedures of a vertical milling machine, drill press, and various bench tools. The student will utilize the following machining processes to achieve this goal: milling, drilling, tapping, counter sinking, counter boring, and reaming.

Resources

Part Print	Machinery's Handbook	Lab Handouts
AML Staff / TA's	Machining video tapes	

Safety

- Safety glasses at all times.
- Stay alert; pay attention to what you are doing.
- Make sure your set-up is safe. If you are unsure about an operation, ASK BEFORE YOU BEGIN!

Machine & Bench Tooling

17/64 Drill	#8-Counter Bore	Counter Sink	#7 Drill
1/4-20 Tap	3/8 Reamer	23/64 Drill	Center Punch
Center Drill	Deburring Tool	Edge Finder	File
Combination Square	Scriber	Tapping Block	Tap handle
Parallels	Collets	Tap Magic for Aluminum	
3/8 (2) Flute End Mill			

Measurement Devices

0"-1" Micrometer	6" Dial Calipers	Coordinate Measuring Machine
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Miscellaneous Supplies and Tooling

1/4-20 Flat Head Screw	8-32 Cap Screw	3/8 Dowel Pin	Layout Blue
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** Note: The above is a list of suggested tooling; actual tooling you use may be different. The list is supplied to you as a guideline; you are encouraged to think about what you are doing and substitute items when appropriate.*

Suggested Manufacturing Method

1. Study the part print. Think about how you will make it. Ask questions before you begin.
2. Mill stock to 4.000
3. Locate part zero datum in milling machine.
4. Mill .375 slot.
5. While in milling machine, drill & ream .375 hole on location.
6. Layout remainder of holes using a combination square and layout blue.
7. Punch hole locations with center punch.
8. Use drill press to center drill. Drill, counter bore, and counter sink appropriate holes.
DO NOT TAP IN THE DRILL PRESS!!!!
9. Tap appropriate hole.
10. Debur and break all sharp edges.

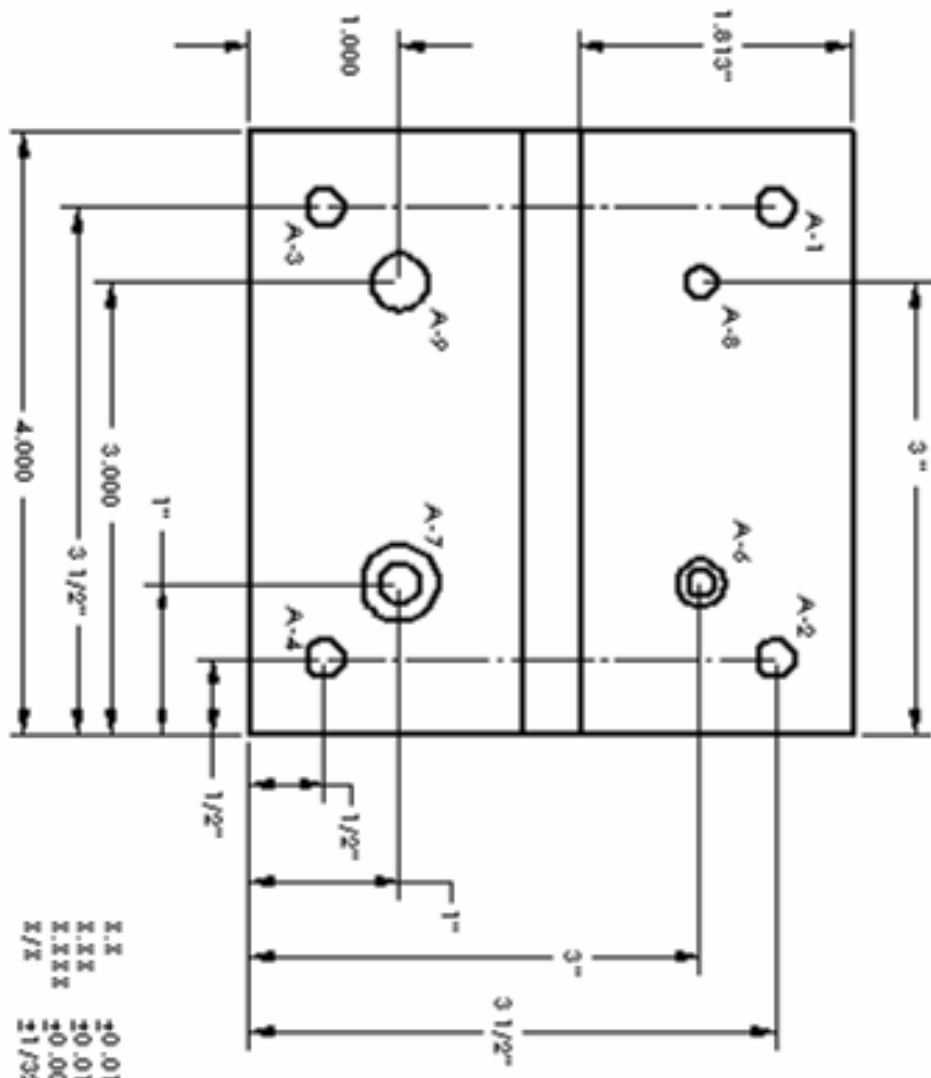
**Note: There are many ways to manufacture a desired part. This operations list has been provided to you as a guideline. As you work through this lab you may have to use alternative methods to manufacture your part. Think as you move through this lab and ask questions if you are not sure!*

Evaluation

(Use additional paper as needed)

1. What was your measured reading for the .375 slot's location and depth? How did you measure it?
2. What was your measured location for the .375 reamed hole? How did you measure it?
3. What was the overall machined length of your part? Was it within tolerance? If not, why?

4. Name (1) handbook used as a reference for machining.
5. List the procedure for drilling and tapping for a 1/4-20 thread.
6. How did you determine and control the depth for the counter bore for the 8-32 Cap Screw?
7. If the .375 slot had a tolerance of $\pm.003$, how would you have machined it?
8. What function does a center drill play in the drilling process?
9. What is the general formula for calculating RPMs on a machine tool?
10. List 4 reasons why you may not be able to run a machined tool at the calculated speeds & feeds.



- Hole Specifications:
- A-1 A-2 A-3 A-4 = Clearance Hole for 1/4"-20 Bolt
 - A-5 = Drill & Countersink for #8-32 Allen Head Cap Screw
 - A-6 = Drill & Countersink for 1/4"-20 Flat Head Screw
 - A-7 = Drill & Tap for 1/4"-20 Bolt
 - A-8 = Drill & Ream to 0.375"

X.X	±0.015
X.XX	±0.010
X.XXX	±0.005
X/X	±1/32

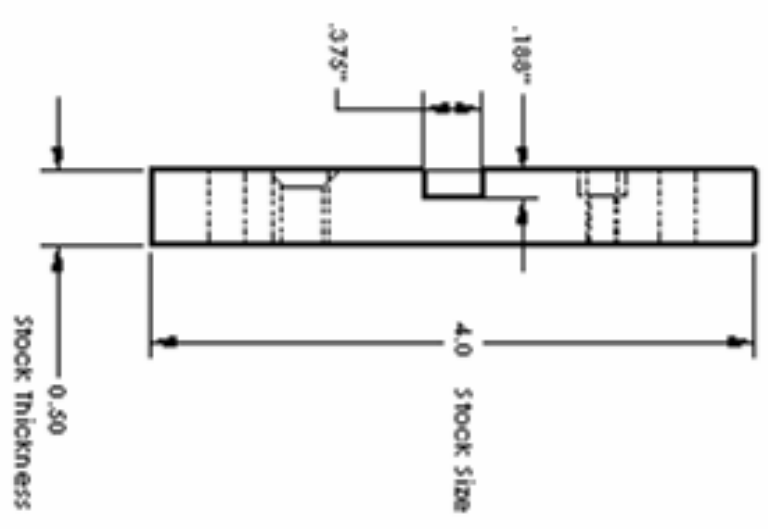
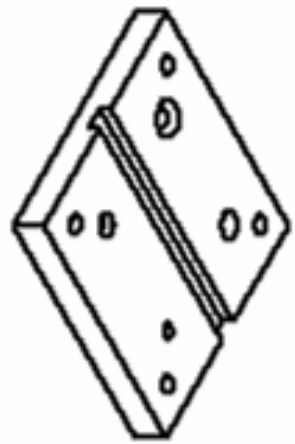


Figure 9.1: Milled Part Specifications