# Liney Machine

| RV-1 | UPDATE 11-14-07 |
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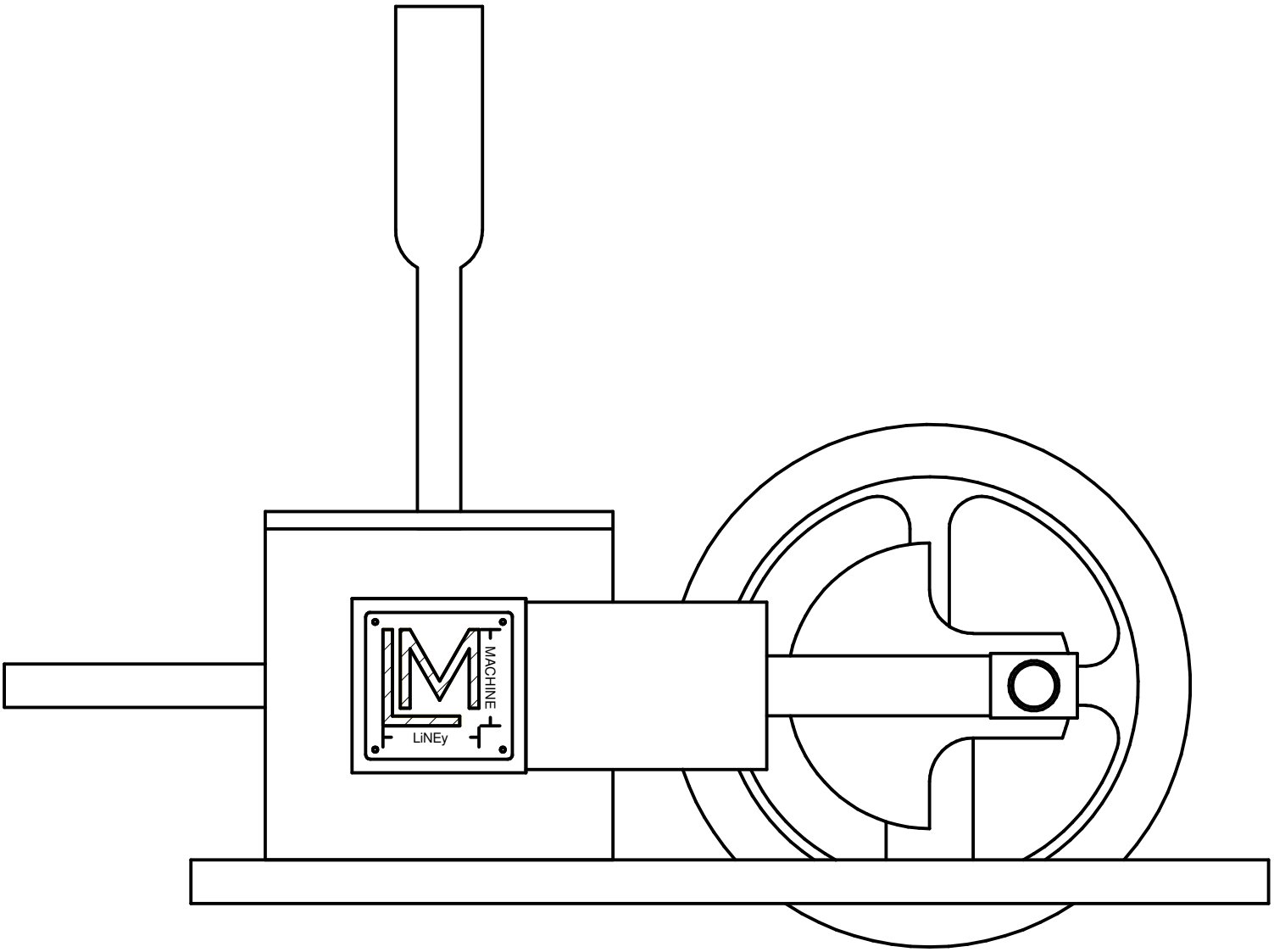


# RV-1 KIT CONTENTS

| LENGTH | MATERIAL | USE |
|---|---|---|
| 2.5" | 3.0 X .125" ALUM. PLATE | BASE |
| 3" | .625" ALUMINUM ROUND | VALVE, SPACERS |
| .75" | 1.5" ALUMINUM ROUND | FLYWHEEL |
| 2" | .125" BRASS TUBE | INTAKE |
| 2" | .250" BRASS ROUND | STACK |
| 1" | .875" BRASS ROUND | CRANKS |
| 2" | .250" BRASS SQUARE | BEARINGS |
| 3" | .500 BRASS SQUARE | CYLINDERS |
| 1.25" | 1" BRASS SQUARE | VALVE BLOCK |
| 3" | .1875" STAINLESS SQUARE | PISTONS |
| 3" | .125" DRILL ROD | AXEL, PINS |

**FASTENERS**

2-56 SCREWS

| | | |
|---|---|---|
| .25" | PHILLIPS HEAD | (8) |
| .25" | SOCKET HEAD | (3) |
| .1875" | SOCKET HEAD | (3) |

M3 WASHERS (4)

# NOTES

- All material in these documents is copyrighted. Please do not make copies without permission.
- The thickness of the base material included in the RV1 kit is 1/8". The flywheel extends ¼" below the top surface of the base plate. When using less that ¼" thick base material, whatever mount you choose will need to have a space milled out for the flywheel, or the base plate will need to be mounted on spacers to raise it at least 1/8".
- No drawing is included for the intake pipe as this should be made to match the pressure source of your choice. A piece of .125 OD brass tube is included in the kit and the valve block dimentions allow for this to be press fit into it.
- The following fasteners are needed to complete the engine. These are included in the kit.
- 2-56 x ¼" machine screws: 6 flat head, 2 socket head
- 2-56 x 3/16" machine screws: 2 socket head (used as set screws to secure the cylinders to the valve)
- 2 washers with 1/8" ID and a thickness between .020 and .025. The smaller the outside diameter, the better. M3 size are perfect.

- The 2-56 screws included with the kit, for attaching parts to the base plate, are a flat head type. Although not shown in the drawings, the bottom side of the base plate holes should be countersunk to allow a flat mounting surface.

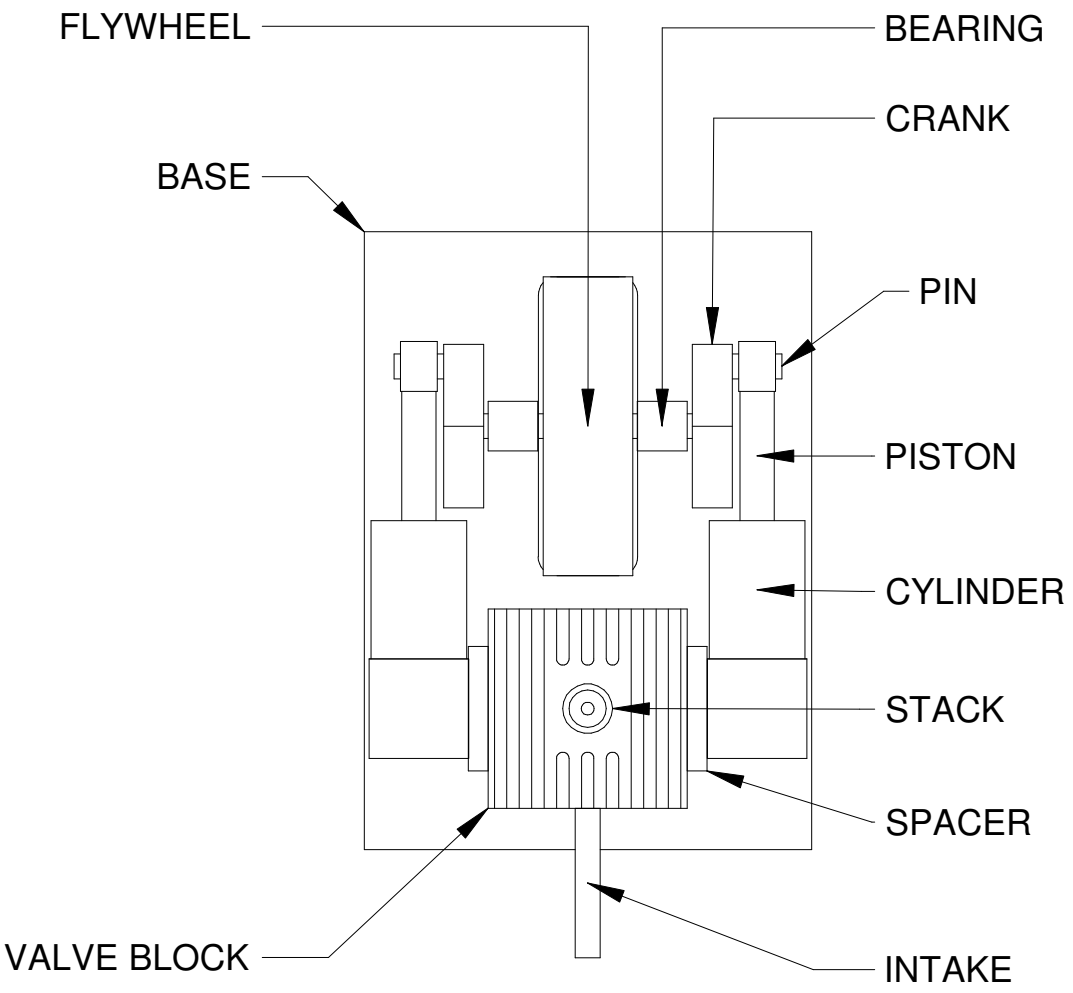
- With the exception of the stainless pistons and the steel pins and axle, all material in the kit as well as our production engines is 360 brass and 6061 aluminum. This was chosen because it is easy to machine with decent corrosion properties. The supplied material for each part is indicated in the drawing of that part. If you are supplying your own material, steal, if kept oiled or given a protective finish, will provide better wear resistance. A heavier flywheel will also allow the engine to idle lower.

- A great reflective finish on your parts can be produced by buffing them with tripoli polishing compound and a muslin polishing wheel.

- If you are looking for a less involved project, there are several steps that can be left out of this engine with little or no ill effect.
    - The cooling fins on top of the valve block are for aesthetic purposes and can be left off. You may also want to substitute another design or pattern more to your personal taste.
    - The cranks can be left round. The engine will not be as balanced, but the effect is not significant.
    - The flywheel can be left solid. This would actually be beneficial, though in our opinion, not as aesthetically pleasing.
    - The stack can be omitted or a simple 1/8" OD tube used instead. It is and area open to a lot of creativity.

We are always glad to answer questions and take/make suggestions. Please refer to www.LineyMachine.com for our contact information.

# PARTS

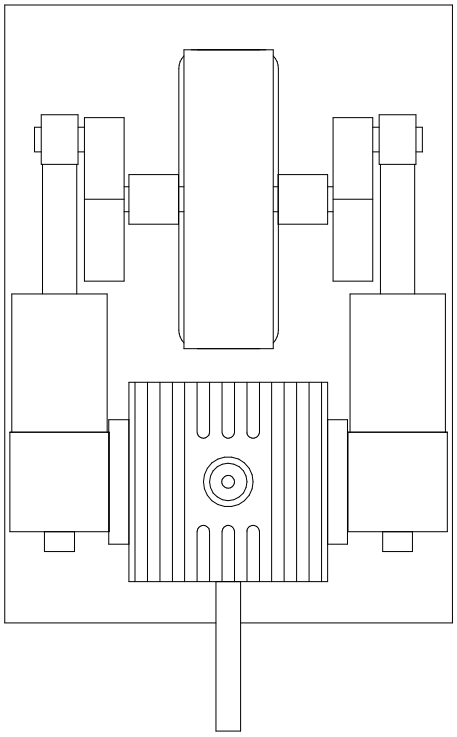

FLYWHEEL
BEARING
CRANK
BASE
PIN
PISTON
CYLINDER
STACK
SPACER
VALVE BLOCK
INTAKE

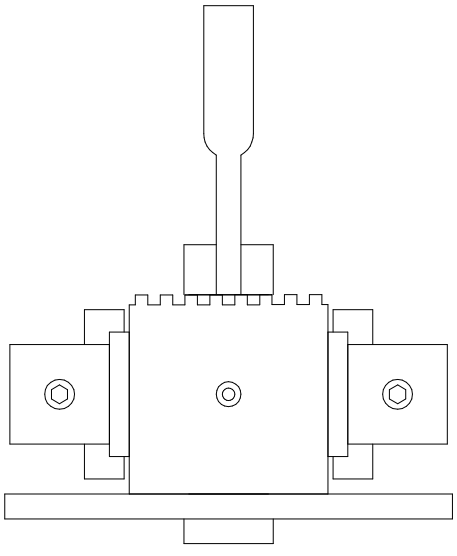
# ASSEMBLY

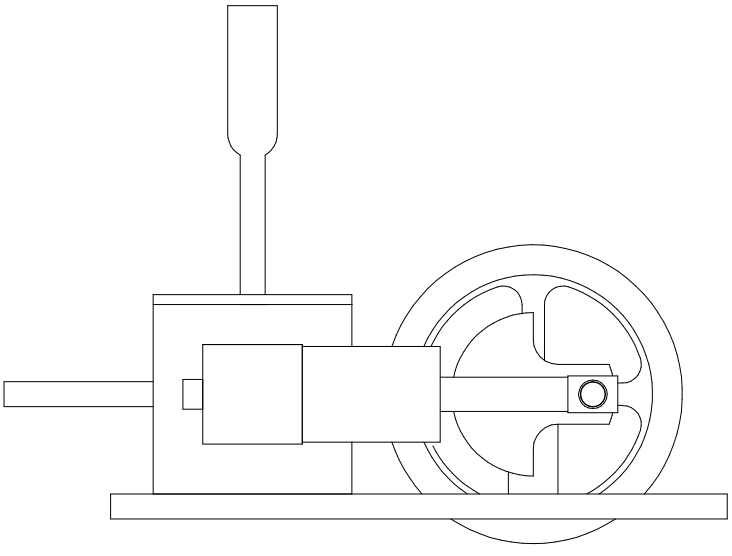
Note: Do not install the stack or the intake until the valve holes have been drilled (step 11).

1. Do any finishing work before assembling.
2. Remove any burrs, and wash all your parts to remove any chips, and work in a clean area.
3. Press the axle through the flywheel. By using the Z axis on a milling machine to do the press, you can ensure that the axle stays square with the flywheel. It will also make it easy to ensure that it is pressed through exactly half way.
4. The pins need to be pressed through the outer holes of the cranks. They should be pressed flush with one face of the crank.
5. Fasten the valve block to the base with four 2-56 machine screws. The intake hole should face away from the flywheel.
6. Slide a bearing onto the axle on each side of the flywheel. The smaller diameter side of the bearings should be away from the flywheel. Attach the bearings to the base so they are not quite tight.
7. Alignment is crucial to keep the engine from binding. Insert the valve into the valve block. As you tighten the bearings down to the base, measure the distance from the axle to the valve. It should be as close as possible to 1.224" on both sides. Holding the bearings from twisting with a ¼" wrench as you tighten them will help.
8. Slide a small washer and a crank onto each side of the axle. Rotate the cranks so that the pins are perfectly aligned and tighten the set-screws. A parallel set is useful for aligning the cranks.
9. Slide a spacer onto one end of the valve. Slide a cylinder on the same end, push the cylinder firmly against the spacer, align the cylinder bore with the valve hole, and fix it all in place with a screw in the back of the cylinder. Be careful not to over tighten it.
10. Fit the piston into the cylinder with the smaller diameter side of the cross bore away from the flywheel. As you slide the valve into the valve block, align the cross bore in the piston with the crank pin. Put the spacer, cylinder, and piston in place on the other side of the engine and rotate the flywheel a couple times to allow the cylinders to align, then tighten the cylinder set-screw. Remember that, if you have not drilled the valve holes, the engine will not spin freely yet, because there is no way for the cylinder pressure to equalize.
11. There are two options for drilling the #54 holes in the valve. You can drill them when you make the part using a dividing head or any method you choose. However, we recommend not drilling them until this point in the assembly. This will assure perfect valve alignment. Set up your assembled engine in your mill/drill and rotate the cranks to the top most position (farthest possition from the base plate). While holding the cranks in place, drill down through the exhaust hole in the valve block and into the valve with a #54 bit. Now, rotate the cranks to the bottom most position and do the same thing through the intake hole. The setup can be tricky but the alignment results are great. Once the valve holes are drilled, always keep one of the cylinders attached to the valve to maintain the alignment.
12. Remove one cylinder and remove the valve. Carefully clean out any chips and reassemble.
13. Press in the intake and the stack and oil all points of friction.

# ASSEMBLED VIEW

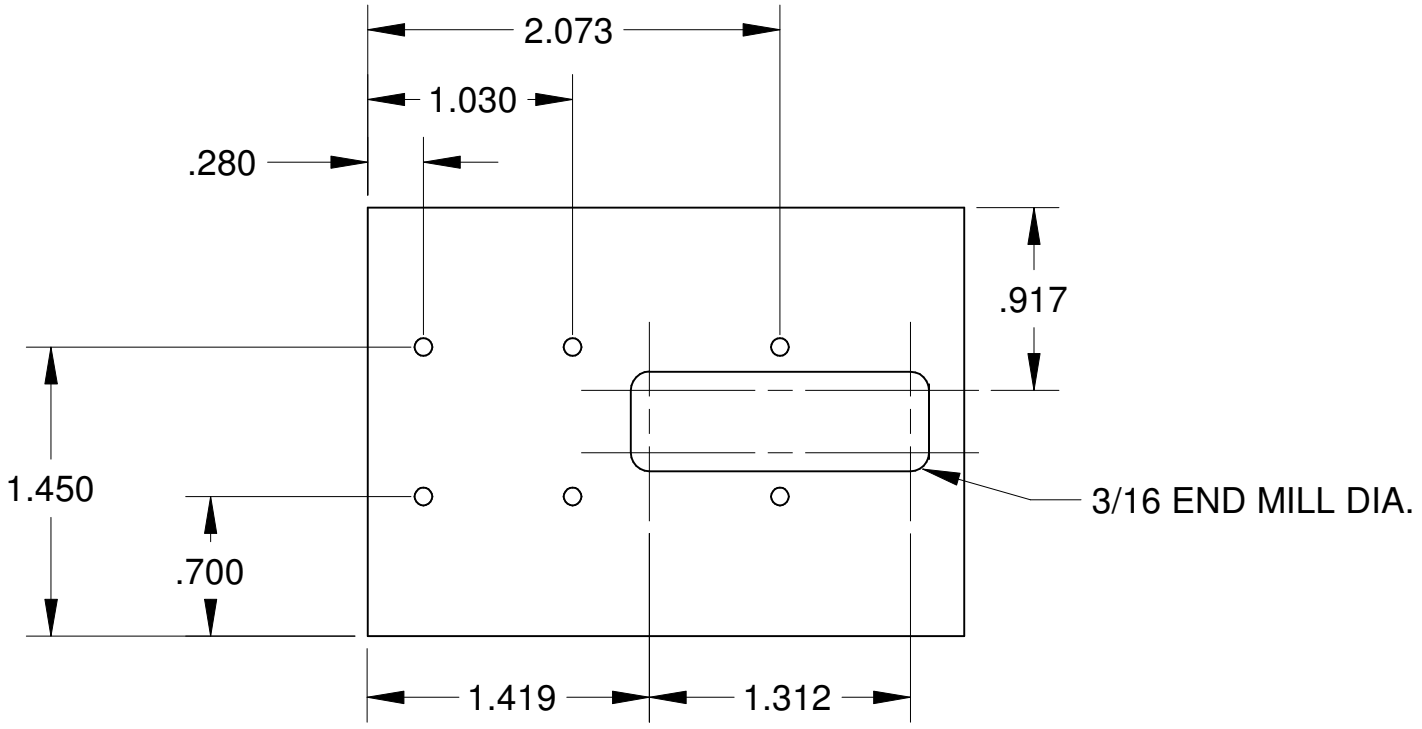


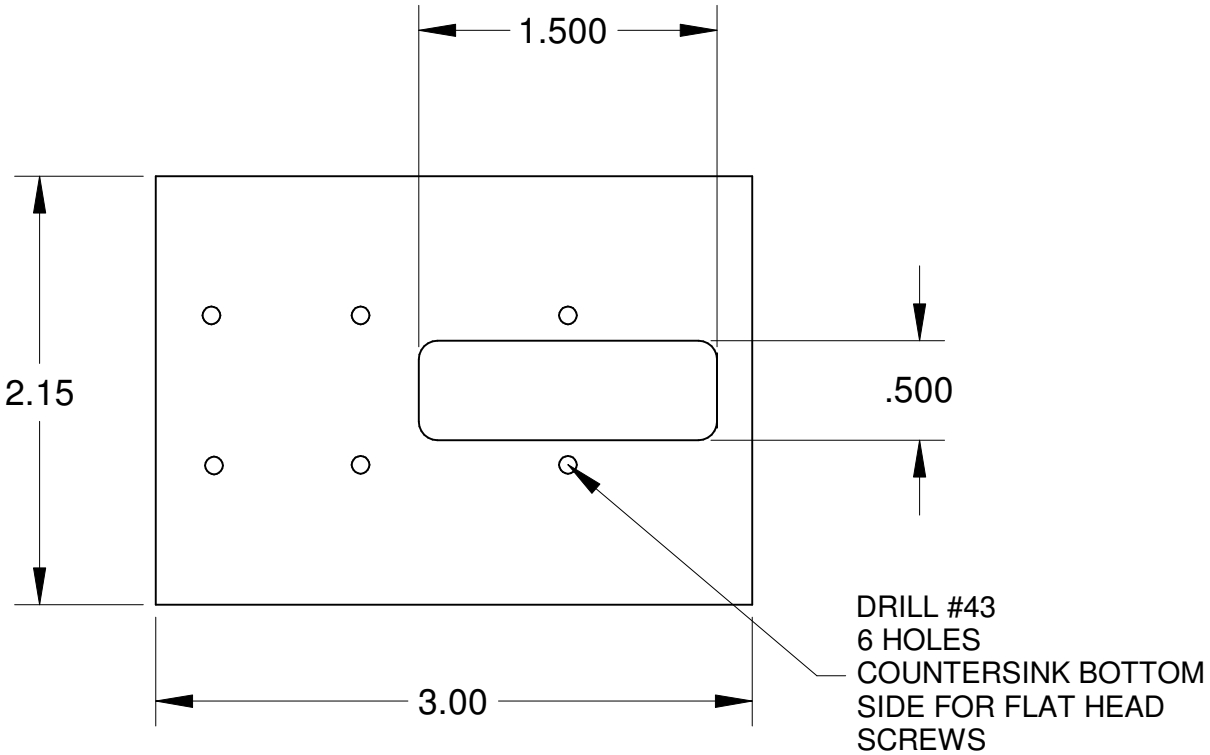




# BASE PLATE (PART #1)

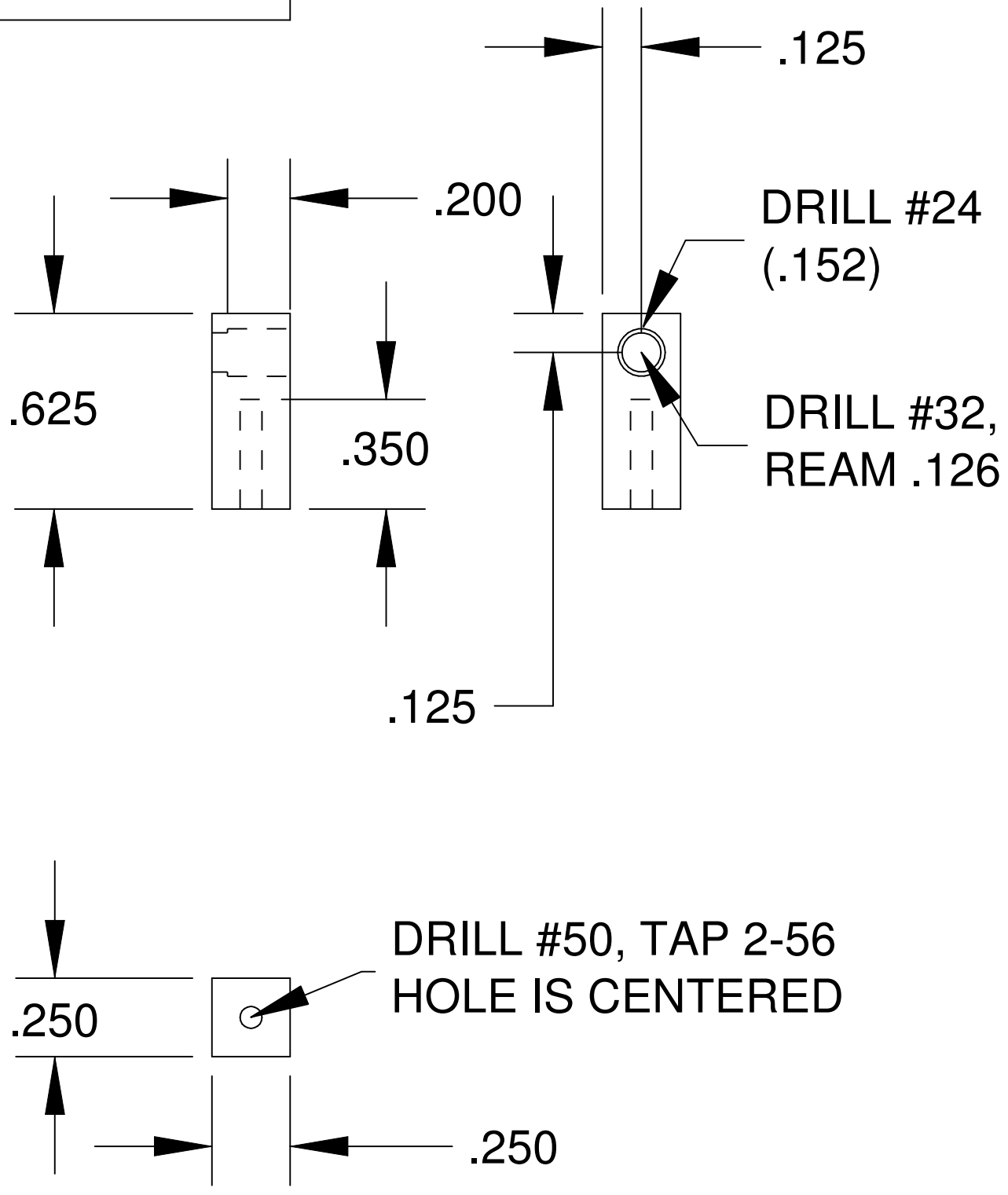
## 6061 ALUMINUM



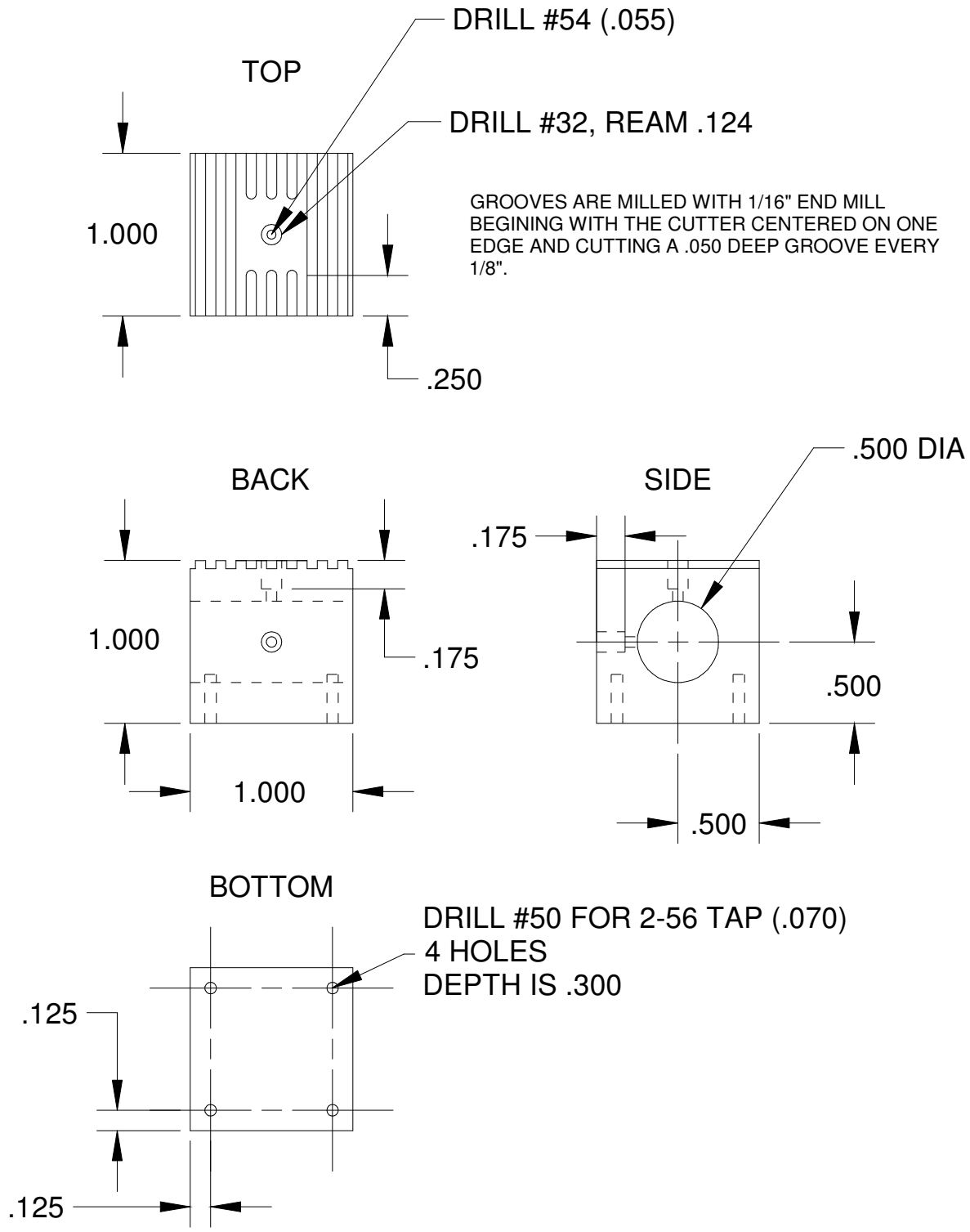
# BEARINGS (PART #2)

## 360 BRASS



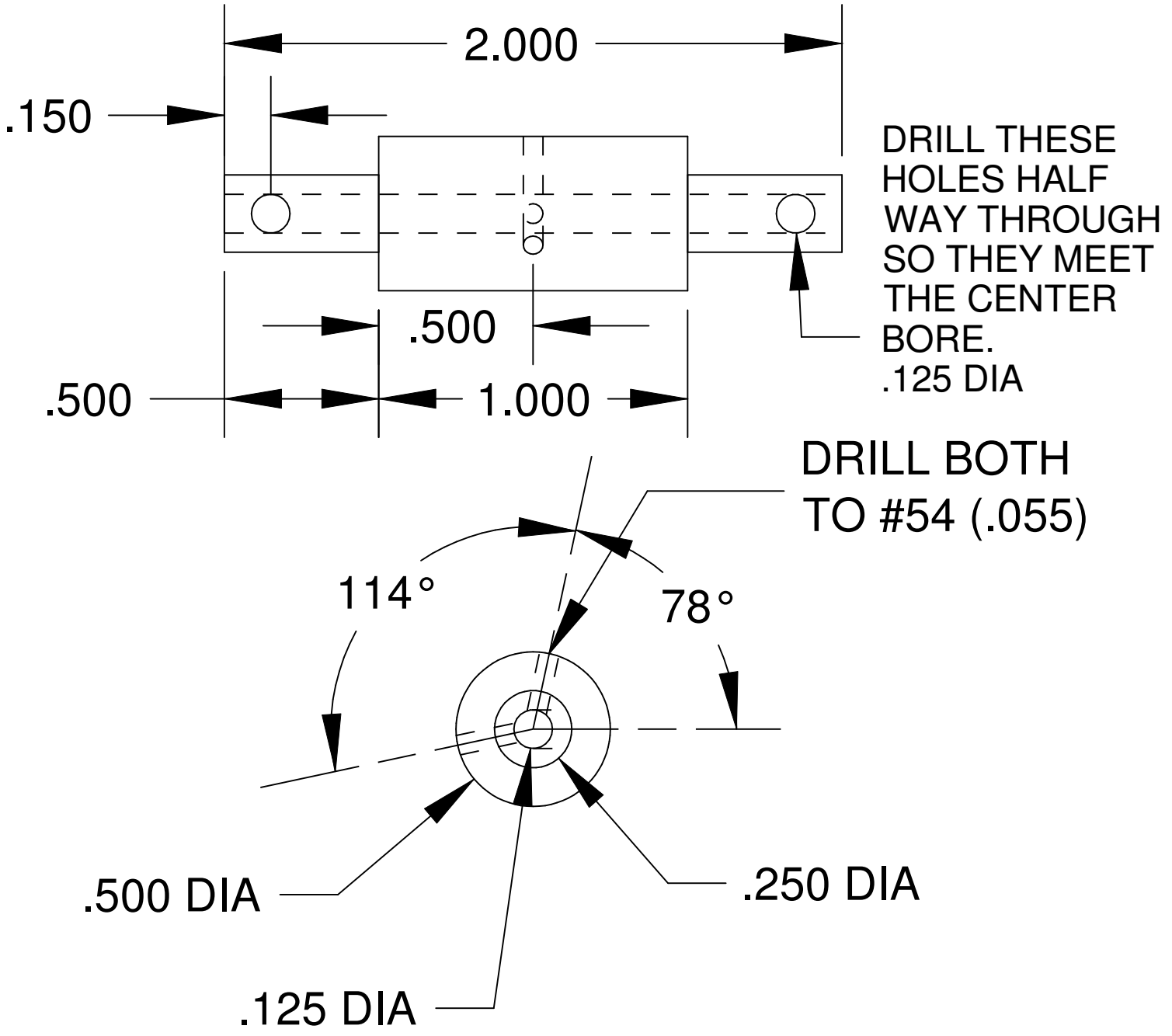
# VALVE BLOCK (PART #3)

## 360 BRASS



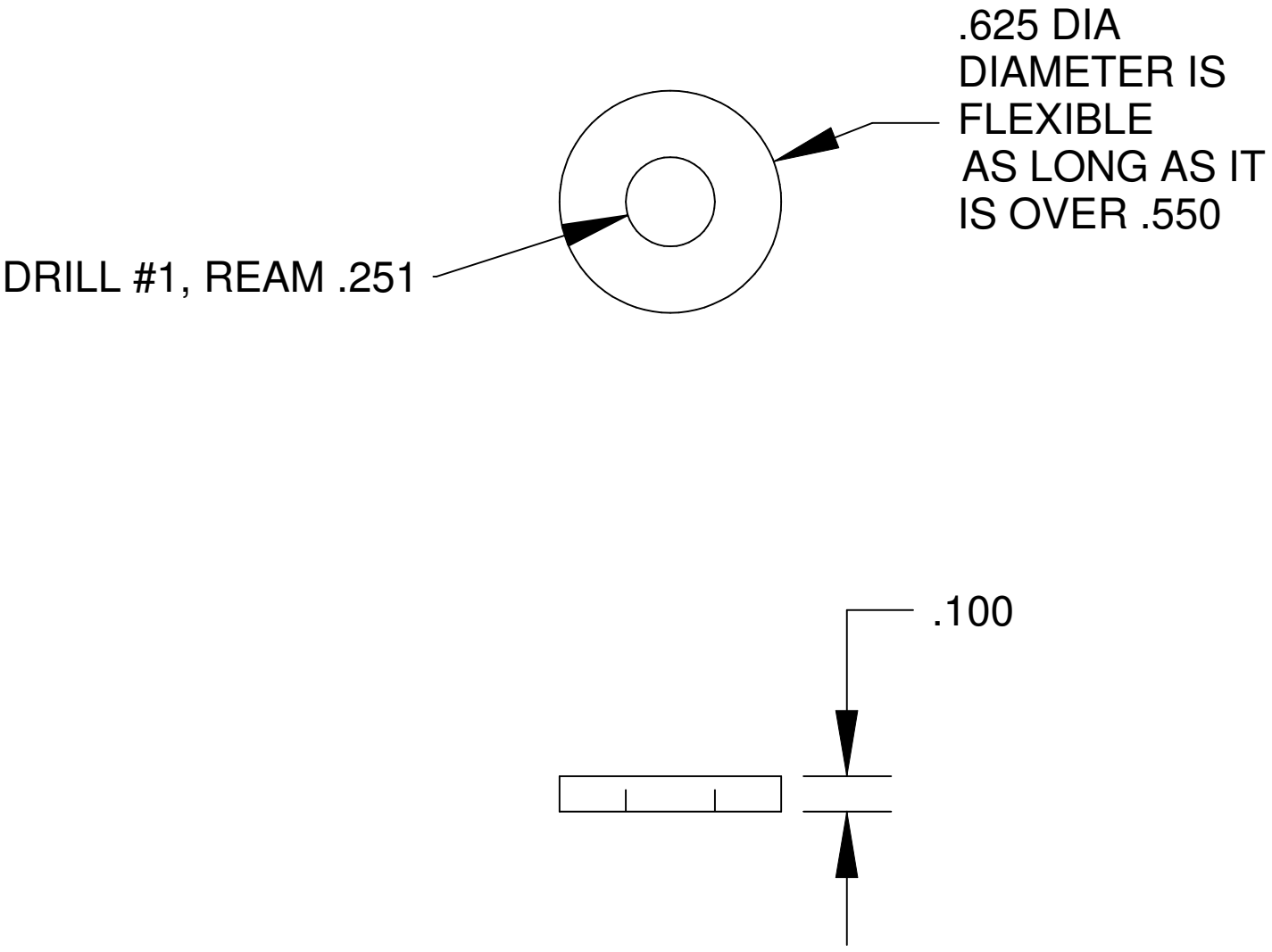
# VALVE (PART #4)

| 6061 ALUMINUM | NOTE: READ ASSEMBLY INSTRUCTIONS #11 BEFORE DRILLING #54 HOLES! |
|---|---|



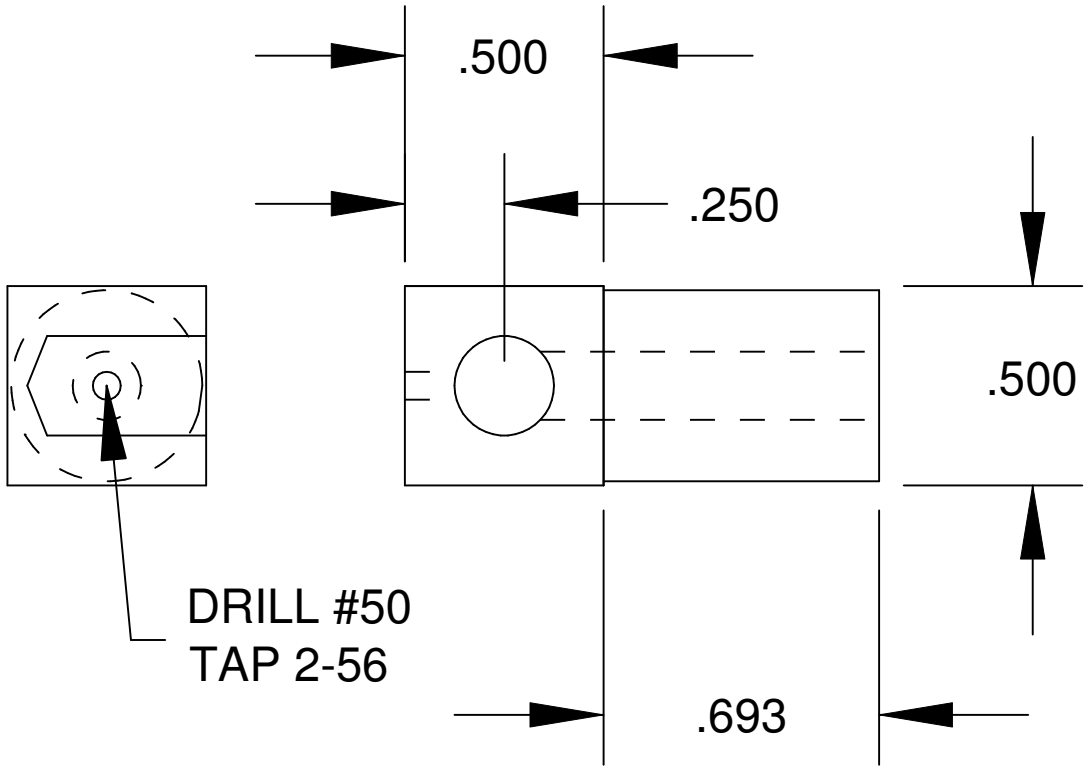
# SPACERS (PART #5)

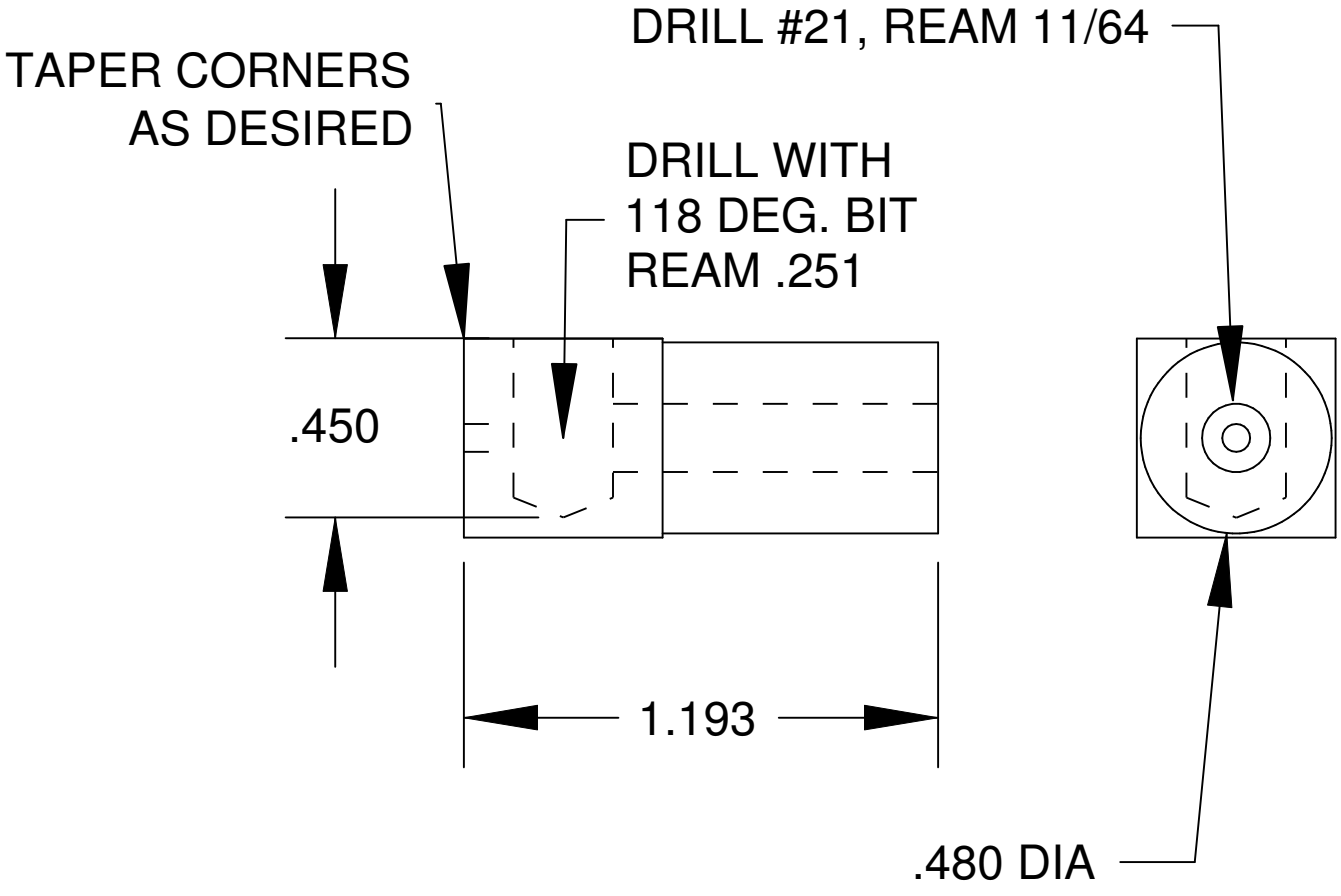
## 6061 ALUMINUM



# CYLINDERS (PART #6)

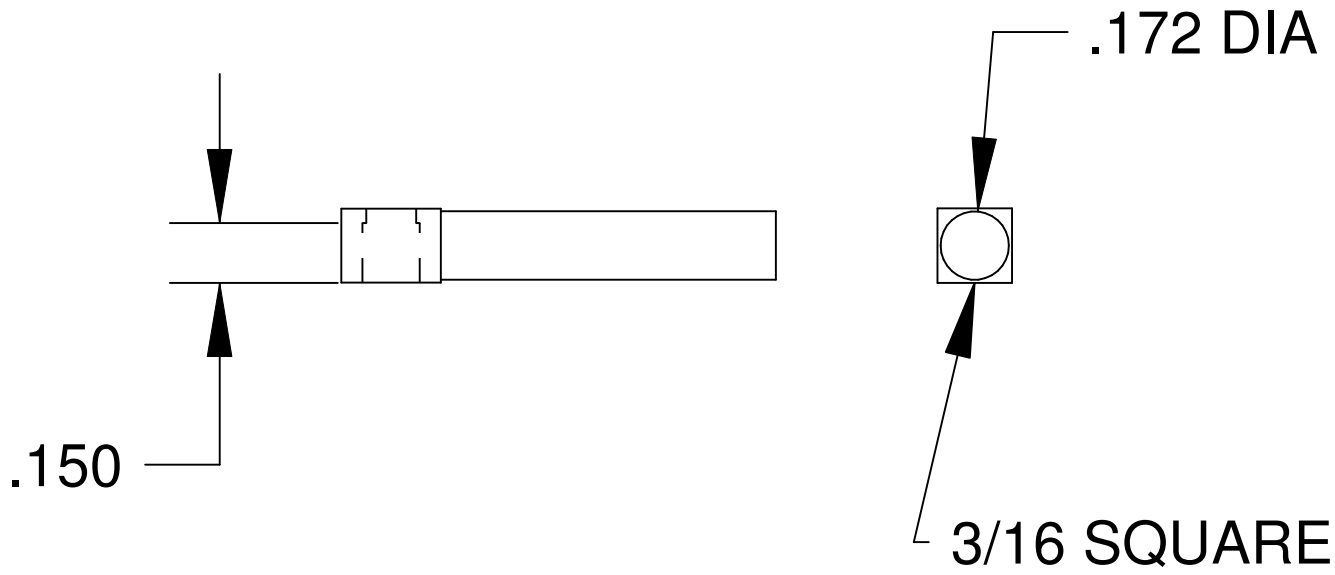
## 360 BRASS

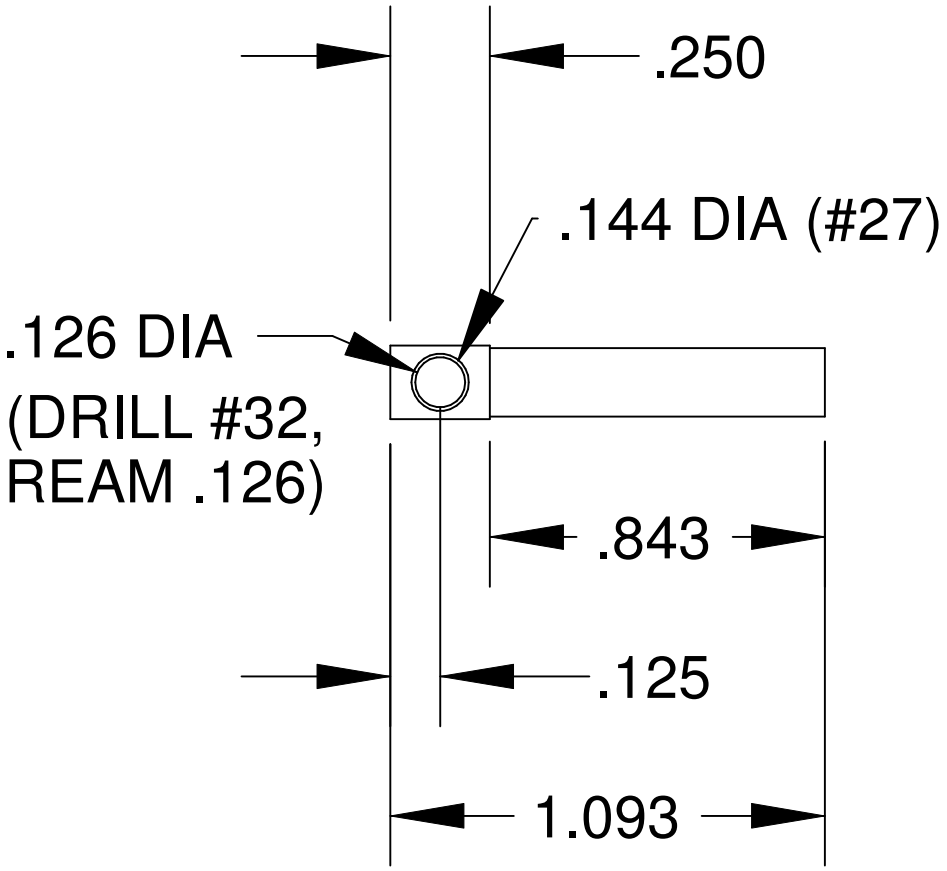


# PISTON (PART #7)

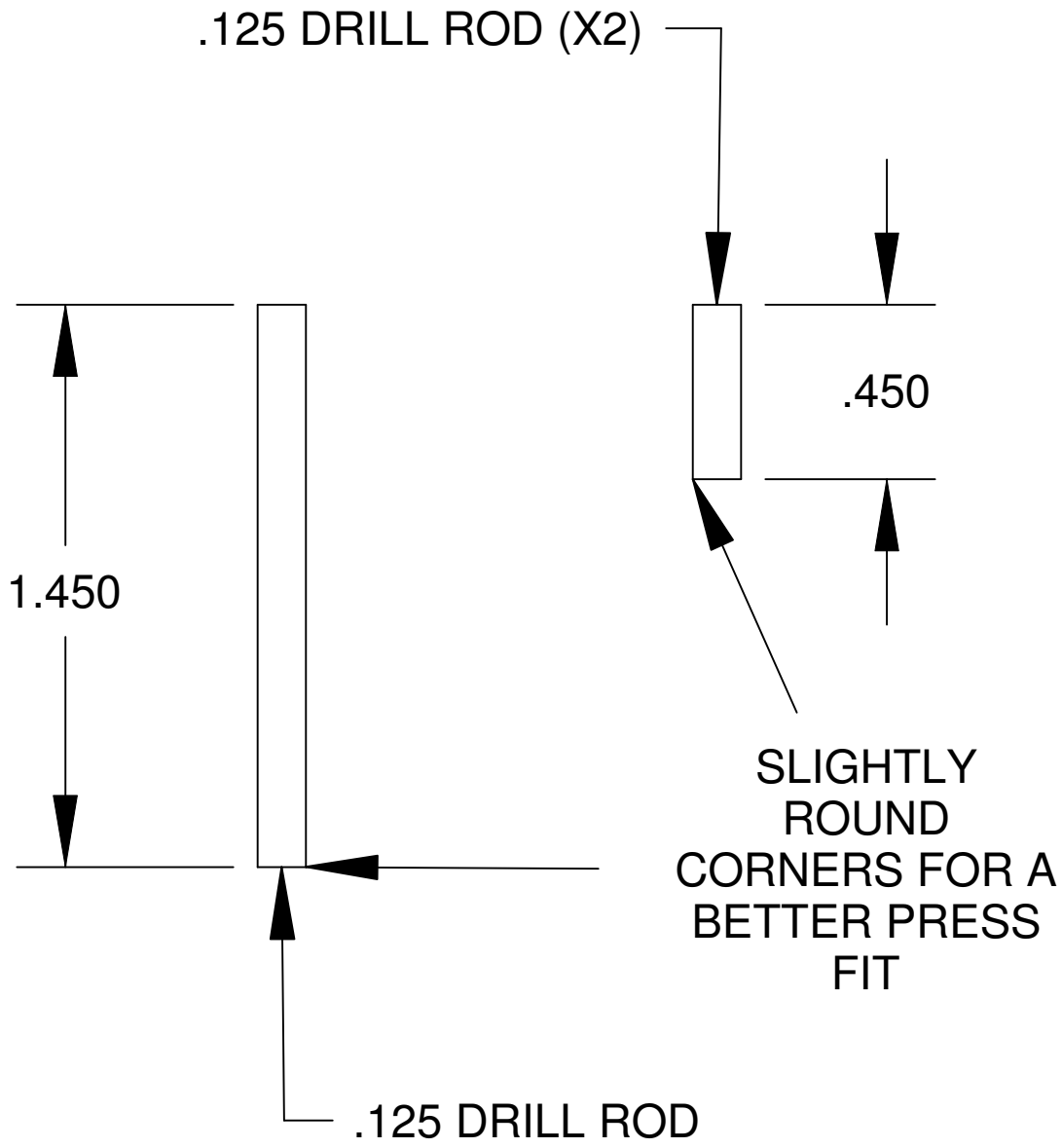
316 STAINLESS



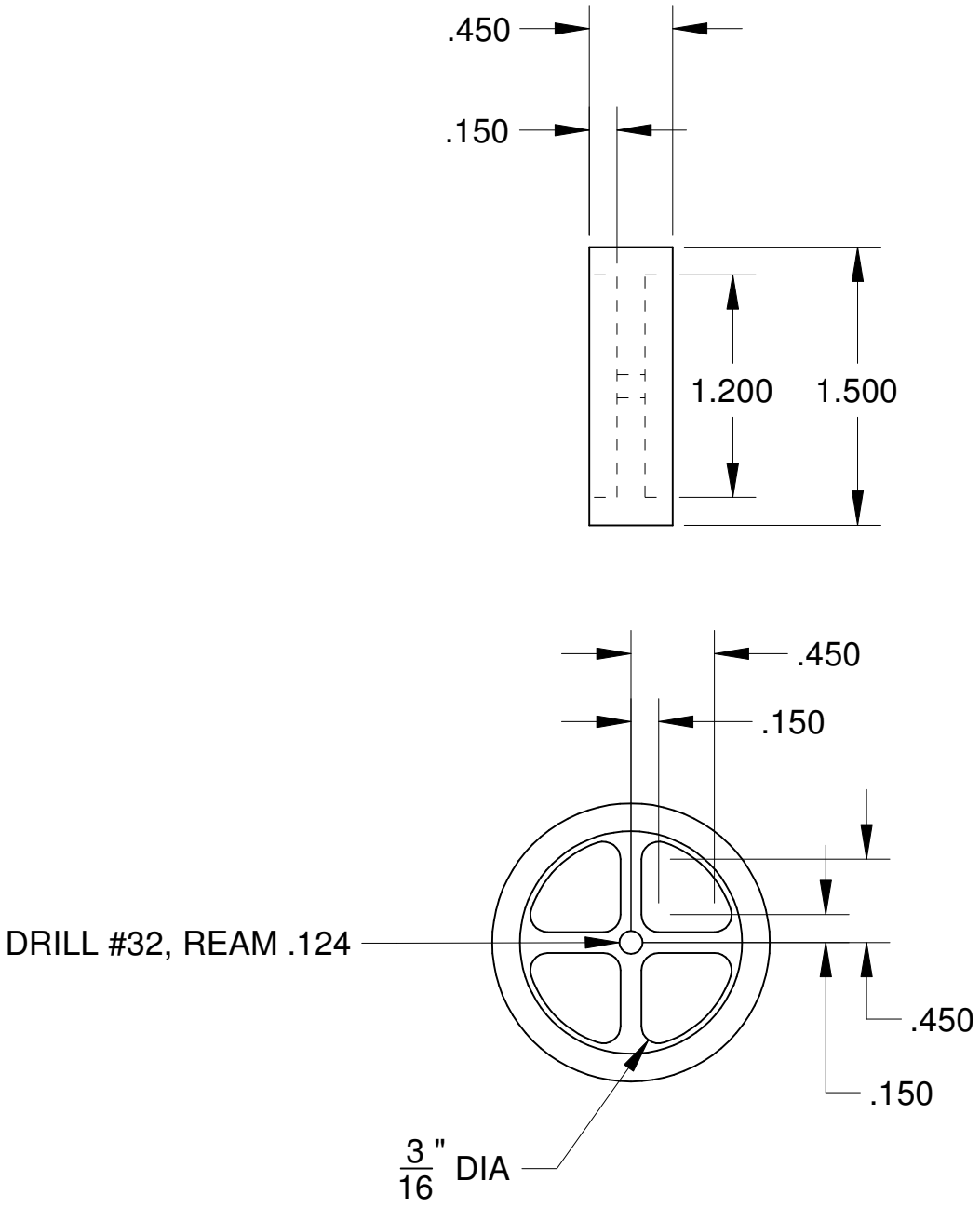
# PINS / AXLE (PART #8)

## O-1 DRILL ROD



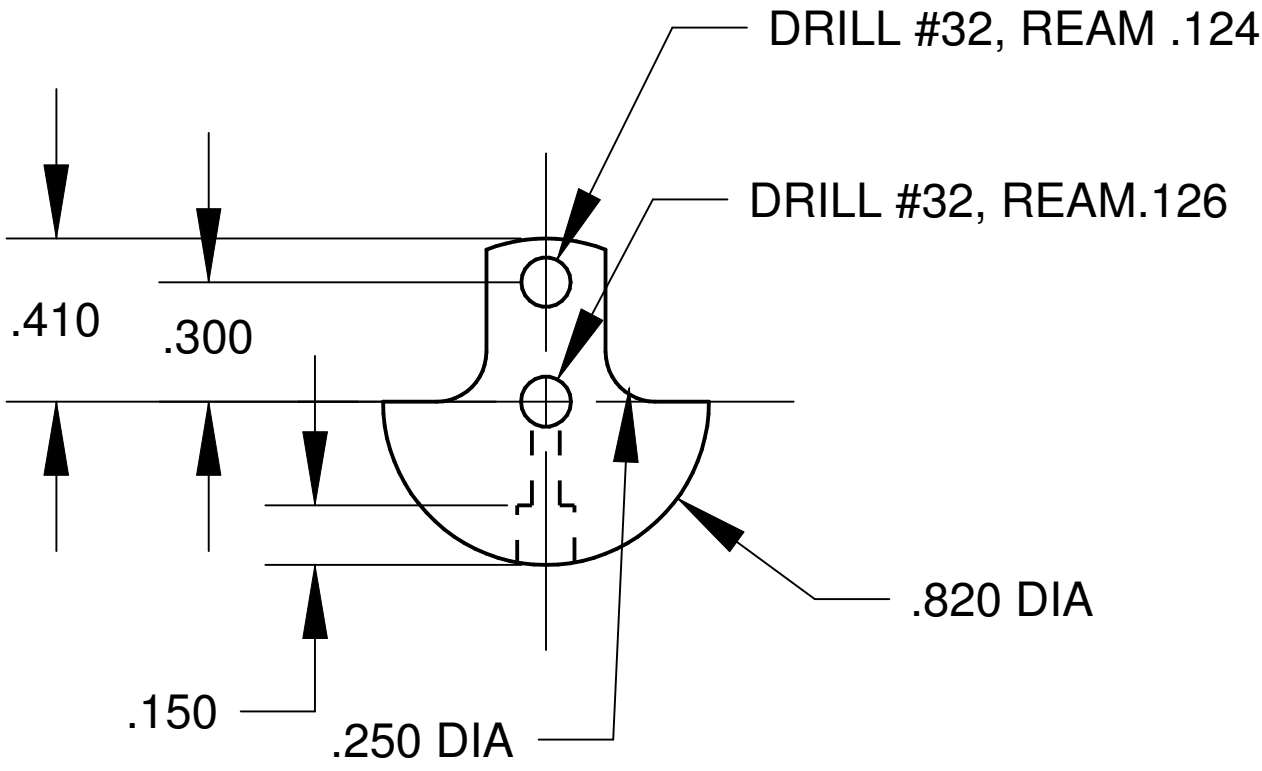
# FLY WHEEL (PART #9)

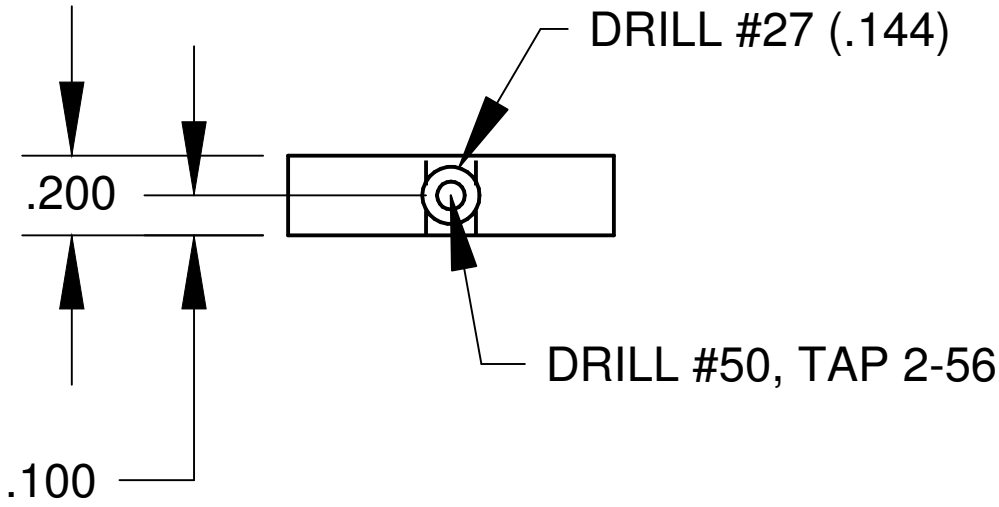
## 6061 ALUMINUM



# CRANKS (PART #10)

## 360 BRASS



# STACK (PART #11)

## 360 BRASS