

# MOPAR CYLINDER HEAD PORTING TEMPLATES

COMPILED 23 JANUARY 2016

## B/RB

- Pages 2-3: Instructions
- Page 4: Templates

## LA

- Pages 5-8: Instructions
- Page 9: Templates

## MAGNUM

- Page 10-12: Instructions
- Page 13-14: Templates

Page 15-17: Scale References

## Notes:

These templates are scans of the Mopar cylinder head porting templates. Ensure when printing that your print options are set to NOT shrink or scale the pages when printing. You need to print actual size. Failure to ensure correct print settings may result in template printouts that are not true in size to the originals. Reference photos to verify correct size printouts are attached for each template style.



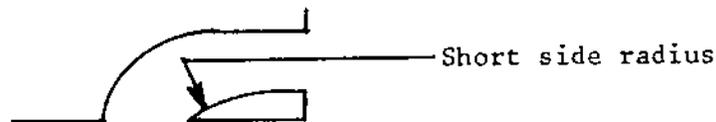
P.O. Box 1718 CIMS 423-13-06, Detroit, MI 48288

### INSTRUCTIONS FOR P4120437 TEMPLATES

The P4120352 "B" Engine Head needs very little porting work to make it flow a lot of air. The most gains over the dead stock port can be found by simply removing the rough production cutter ridges underneath the valves and at the manifold flanges. These templates will also work on standard B-RB heads.

Starting with a rough valve job ( $35^{\circ}$  top angle and  $45^{\circ}$  seat angle for both intake and exhaust), blend the bowl area into the  $45^{\circ}$  seat by removing only the minimum amount of material necessary to make a smooth wall. Then open-up the port at the manifold flange just enough to remove the "as cast" surface about  $\frac{1}{2}$ " into the port follow up with a first class valve job and you're all set. This is basically a Super Modified-type port. Further gains can be made by removing the "as cast" surface between the bowl and the manifold face with a sandpaper roll. Check your class rules before porting to be sure you stay legal. If you are going to use a bronze guide bushing, fit them BEFORE porting. For Bracket racing, if the templates are used, the valves (I & E) should be back cut.

The short side radius of both the intake and exhaust ports should be left unchanged except to remove the "as cast" surface.



Changing the shape of the short side radius can drastically alter the flow characteristics and is best left to experienced porters with a flow box.

### USING THE TEMPLATES

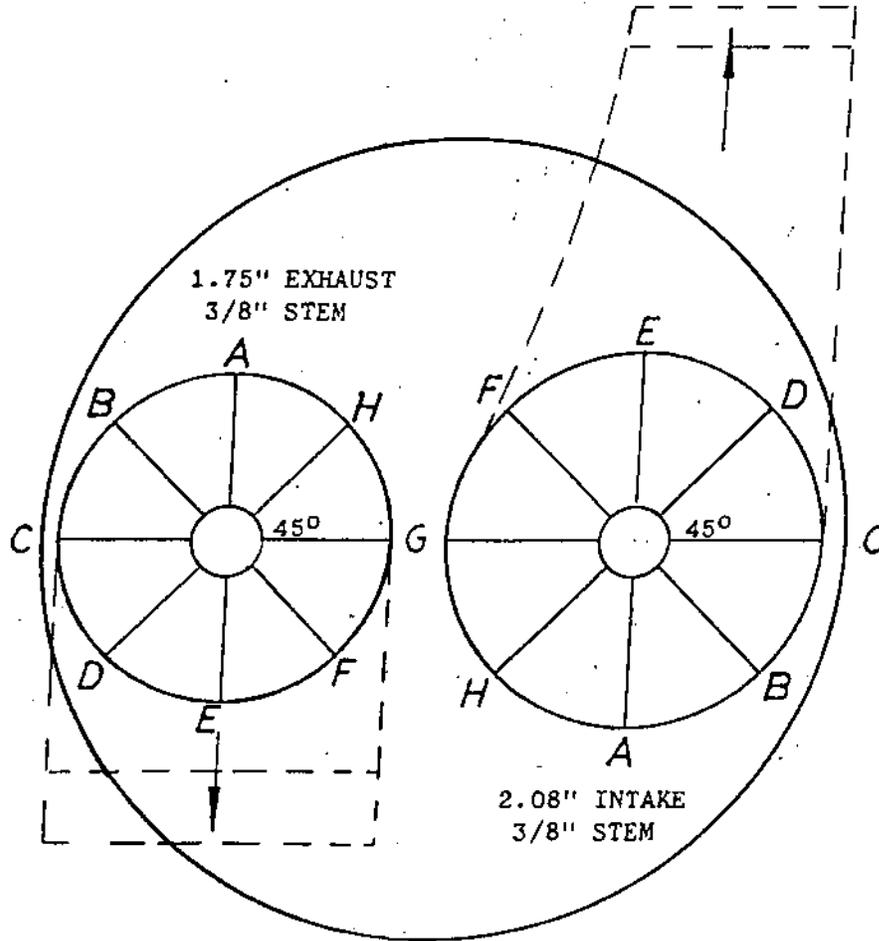
NOTE: These templates are made for use with 2.08" diameter,  $\frac{3}{8}$ " stem intake valves, and 1.75" diameter,  $\frac{3}{8}$ " stem exhaust valves.

After cutting out the templates following the OUTSIDE of the lines, fit the template stems to the valve guide by removing material from both sides of the template stem (to be sure the template remains centered).

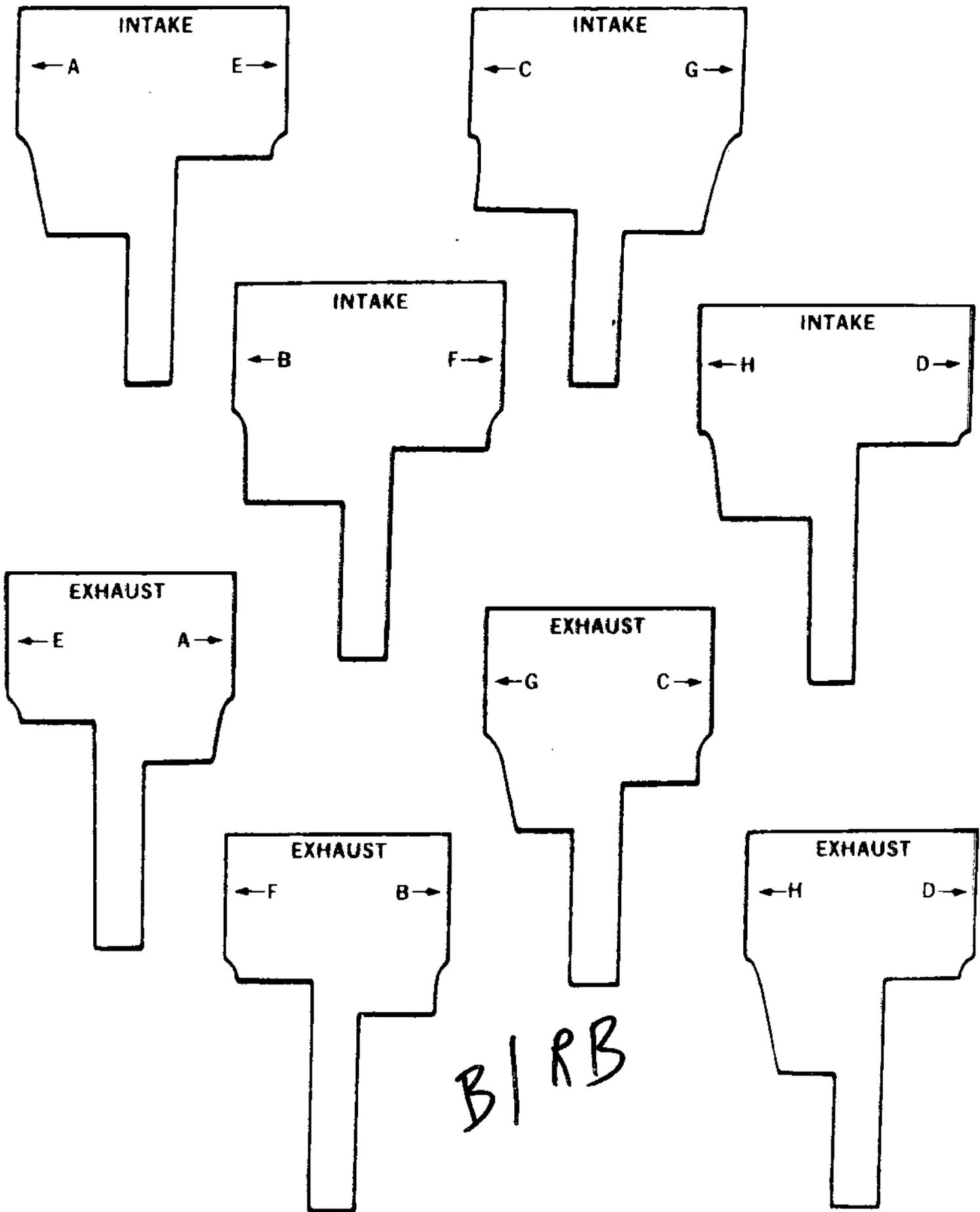
The templates are made to be fitted every  $45^{\circ}$ ; to help align them properly, mark off every  $45^{\circ}$  with a felt tip pen on the outside of the seats as shown on the sketch. Templates C-G lie along a line connecting the centers of the valve guides.

The templates fit the ported surfaces under the valve. Any surface below (not touching) the template are either "as cast" surfaces or are part of the short side radius.

After you have matched the port to the templates under valve, and if your rules allow, use a sandpaper roll to clean-up the "as cast" surfaces without changing the shape of the rest of the port.



BOTTOM VIEW OF CHAMBER  
3614476 CASTING  
TEMPLATE PLACEMENT  
B-RB ENGINE





PERFORMANCE

# INSTRUCTION SHEET

## for Porting Template Packages P4876412 for the cast iron 360 swirl-port cylinder heads

This porting template kit for the cast iron 360 or 340 swirl-port cylinder heads consists of 11 die-cut forms in a hard, semi-clear plastic. These templates can only be used on cast iron 360 swirl-port heads, P459269, P5249767, P5249574 or "308" and "576" castings; they will not work on any other cylinder head, cast iron or aluminum. This porting template package is based on stock 3/8" valve stems and the stock HP 340/360 valve sizes of 1.88" intake and 1.60" exhaust.

### Tools required to do this job (not included):

- Makita die grinder with variable speed control
- Carbide oval-shaped burr on a 6" shank made for cutting aluminum
- Spray or wax cutting lubricant FOR aluminum

Estimated time to complete the porting process for one pair of heads is 15 to 20 hours. The air flow gain for the porting could be as high as 15 percent over stock swirl-port with the same valve sizes with even bigger gains possible on the exhaust side. The next performance/cost plateau would be 2.08" intake valve.

The first step is to set the 360 swirl-port cylinder head on a flat, clean surface with the combustion chamber facing upward and the plug holes close to you. Now arrange the 11 die-cut forms in front of the cylinder head. Notice that each form has a letter printed on it and some arrows. Forms marked with the letters "A", "B", "C" and "D" are used on the intake side, with 6 intake forms total. Forms marked with the letters "E", "F", "G" and "H" are used on the exhaust side, with 5 exhaust forms total. You will notice that most of the templates are quite short because most of material that we are going to remove is in the bowl area. This kit does not enlarge the port window at the manifold flange. Since most of the performance gain is in the bowl and guide area, that is where we have concentrated our time.

The next step is to locate figure 1 of this instruction sheet, a view looking down on the combustion chamber. By the valve relationship, this chamber would be either the second cylinder or the last cylinder on the

head, counting from left to right. Notice that figure 1 has letters printed around each valve seat at 90 degree intervals. In figure 1, the smaller hole to the right is the exhaust seat and bowl area and is marked "EXH." The intake is to the left and marked "INT."

Figures 2, 3 and 4 are given for reference. Figure 2 is a cross-section through the valve guides cut parallel to the centerline of the crank and shows the shape of the 2 ports in the bowl area. The important thing is to note where the water is; 6 locations for water are shown in this view and are shaded with arrows pointing at them. Figure 3 shows the intake port and where water is located above and below the port. In this view there are 3 areas for water. Pay particular attention to the valve spring seat area in relationship to the top of the port. This area can get very thin if ANY amount of material is removed from the top of the port or the guide boss. Figure 4 shows the exhaust port and where water is located around the port; 3 areas for water are shown. These views are given so you will know where water is in the head, because when you port a cylinder head it is very, very important to be careful near the water jacket.

### General porting tips:

1. Read the complete instruction sheets BEFORE starting this project.
2. Remove the minimum amount of material possible to obtain the template shape.
3. The ports should be ground with a cutter to fit the templates and then finished off with a sandpaper roll.
4. The valve guides may be thinned but leave a minimum of .075" wall thickness around the guides.
5. If bronze-wall guides or inserts are to be fitted, they should be installed BEFORE porting. This means "Do the guide work first, then port!"

Continue on next page

6. On the variable speed grinder, use the fast speed to rough the port in and the slow speed for the smooth or final finish.
7. With this porting template kit, most of the material is removed from the valve guide boss and the bowl area.
8. In using templates on the "CAST" surface, such as the ports in the head, there may be instances when the cast surface does not touch the template. This may occur with templates A2, B, D2 and G2 on the roof, and is OK.
9. Take your time. You are NOT in a hurry!

Now let's begin our detailed analysis by looking at the intake side. Place the exhaust templates in another area for the time being. We have 6 intake templates left, marked A1, A2, B, C, D1 and D2. You will notice that figure 1 had A-B-C-D marked around the intake valve seat with a letter every 90 degrees.

1. In figure 1, the center of the valve seat is noted with a "+" or cross, and locates the center of the valve guide.
2. Notice that each template has a "stem." Arrange each template with the wide part at the bottom, so the stems all point upward.
3. Use the straight edge to precisely mark the valve seat each 90 degrees, with the valve guide as the center in each case.
4. With your magic marker, mark the letter as shown in figure 1 on the combustion chamber side of the valve seat on the head.
5. Notice that there are 2 types of arrows on each template - solid arrows and hollow arrows. Hollow arrows are used to locate the template and solid arrows are located in the areas where you will grind cylinder head material away to fit the template's shape.

6. Notice that there are 2 hollow arrows on each stem, one toward the top and one toward the bottom, on the same side of the stem. This indicates that this side of the stem should be pushed against the side

of the guide itself. This is the main locator. There are 2 other sets of hollow arrows located at the bottom of each template, the lowest set is also the farthest apart. This set of hollow arrows fits on the top of the machined valve seat and locates the template as far up into the port as it goes. The second set of arrows in this area lines up with the bottom of the valve seat (farthest away from the chamber). The valve seat is cut on a 45 degree angle. This second set of lower arrows is a check to help align the template.

7. There are 2 "A" template shapes - "A1" and "A2." A1 is for the floor of the port, commonly called the short-side radius. A2 is for the up-stream side of the guide. Reference figures 2 & 3 and note location of water. We must be more careful in these areas.
8. The "B" template is for the side of the port but it also narrows the guide on this side. Reference figure 2.
9. The "C" template is used on the roof of the port or long-side radius. This section between the seat and the guide is generally considered the "bowl" area. Reference figure 3.
10. There are 2 "D" templates. D1 is for the side of the port opposite to B. D2 does the guide and the roof of the port as it passes by the guide. Reference figure 2.
11. Once you have the 6 templates located and tested for fit, and have a general idea as to how much material to remove, you can now get the grinding tools and start porting. Always reference drawings for location of water and/or "air".
12. Once you have completed the general metal removal in A and B areas, you can blend them together. Once all 4 areas have been fit for the proper template, the areas between them can be blended smoothly.

Note: Aluminum heads must have valve guide inserts that are usually made of a bronze material. These "guides" are pressed into the valve guide boss itself from the top. The bottom of the boss is NOT a machined surface and may vary in height somewhat. Ordinarily this variation causes no problem. However, when using templates, locate the template on the valve seat, rather than the top

of the guide or insert. Similar conditions may exist in cast iron heads like the swirl-port 360. The valve guide insert (bronze) will generally stick-out past the guide boss in either aluminum or iron heads, some cylinder head services like to shorten the guide, either the as-cast boss or the bronze insert. We would not recommend shortening the as-cast boss. In either case, do NOT locate the template on the top of the guide.

Special note: The ports on the first and third cylinders of the head are mirror images of the chamber shown in figure 1; the exhaust valve to the left and the intake valve to the right. On these seats the letter line-up for the template forms is as follows: A is still toward the top and C is still toward the bottom. D is away from the exhaust valve so it is now to the right. B is next to the exhaust valve so it is now to the left.

We recommend that all the valve seats be marked with the proper letters before you start the actual grinding operation. Double check each cylinder (2nd & 4th) with figure 1. On the 1st and 3rd cylinders, flip figure 1 over and double check again.

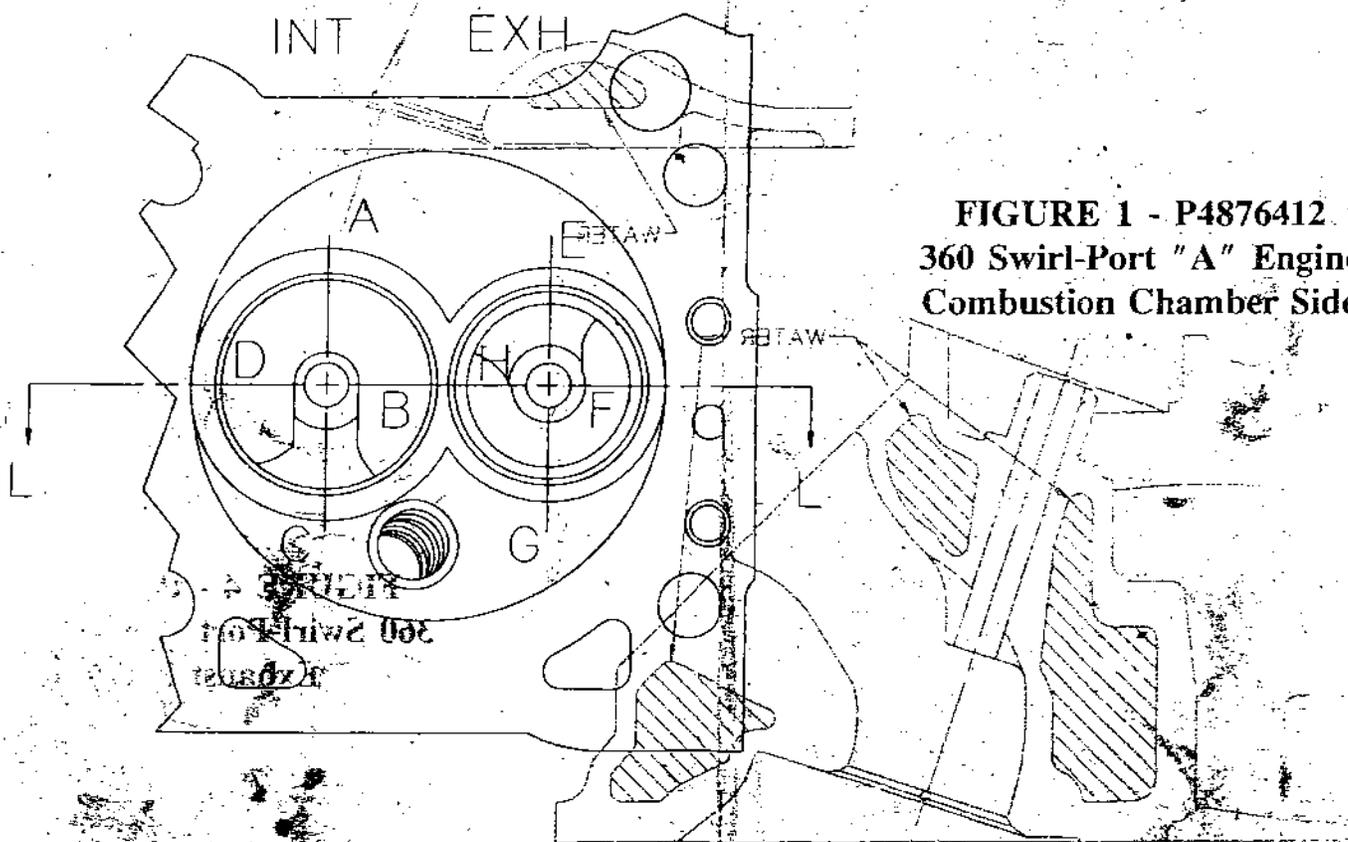
Once we have completed the intake side, place the intake templates in a safe place and bring out the exhaust templates. Follow the same procedure for the exhaust ports using templates E, F, G1, G2 and H. Refer to figure 4:

Some locations such as "A" and "G" have 2 templates because of the shape of the port. With the thick plastic that is used, it would have been almost impossible to get the template into these areas and do both the top and the bottom of the port. By splitting the top and bottom of this template into 2 parts, they should be much easier to use.

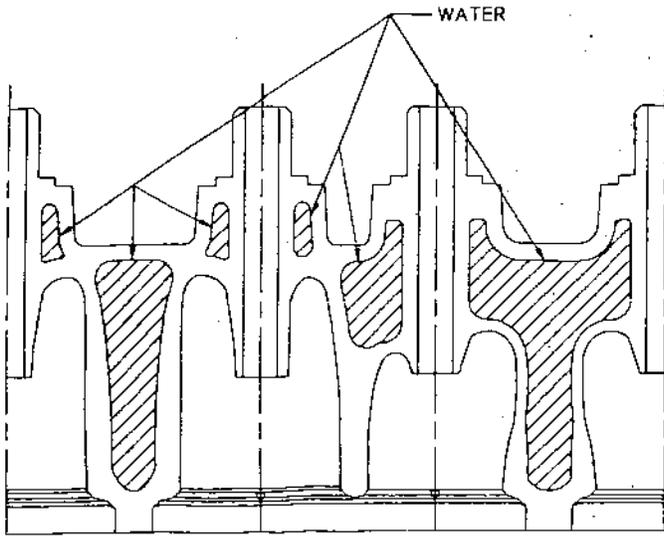
**Good Luck & Be Careful!**

Note: There are four figures that follow for reference.

Note: These templates will not work on other heads. The W2 templates are P5249598. The W5 aluminum head templates are P5249599. The cast iron 1992-98 Magnum head templates are P4876413.

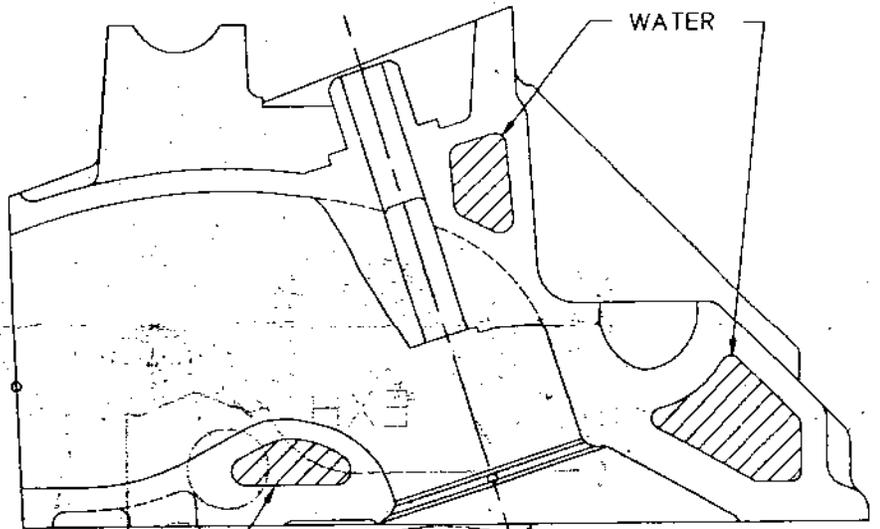


**FIGURE 1 - P4876412  
360 Swirl-Port "A" Engine  
Combustion Chamber Side**

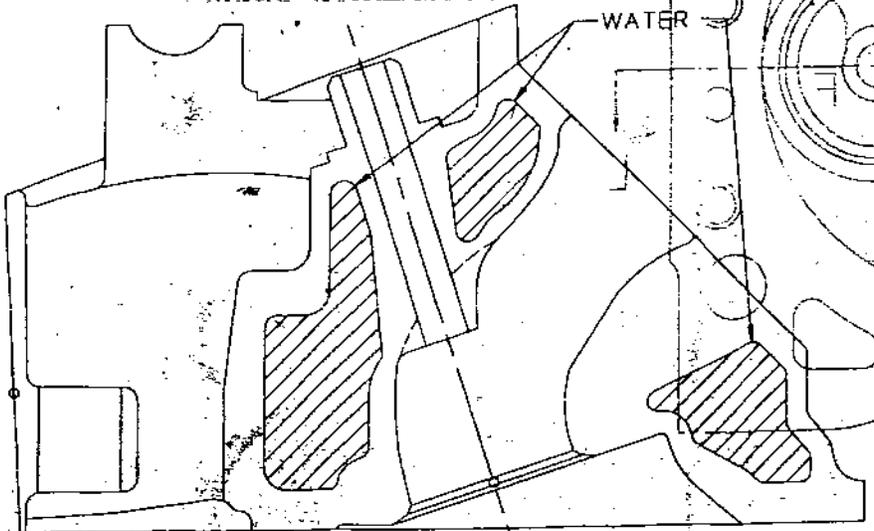


**FIGURE 2 - P4876412**  
**360 Swirl-Port "A" Engine**  
 (section T-T from figure 1)

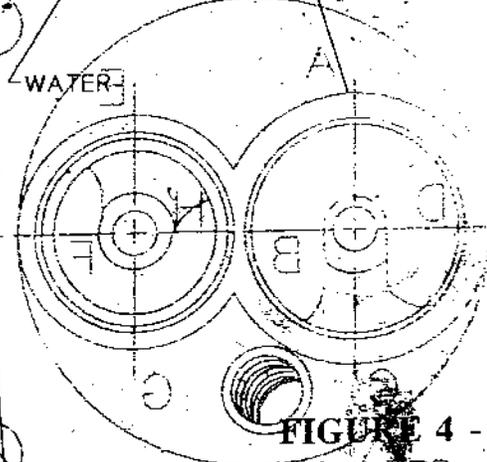
**FIGURE 3 - P4876412**  
**360 Swirl-Port "A" Engine**  
**Intake Port**

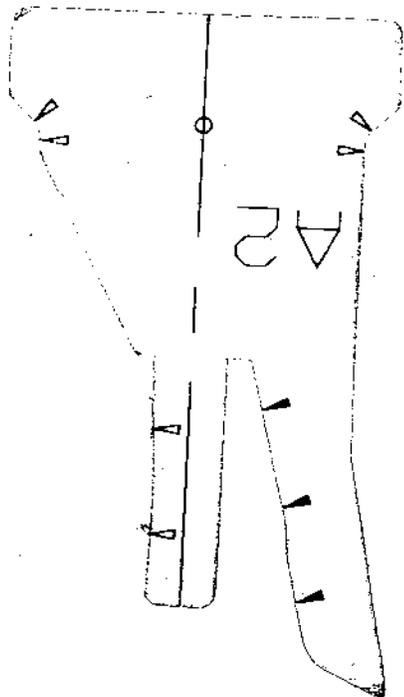
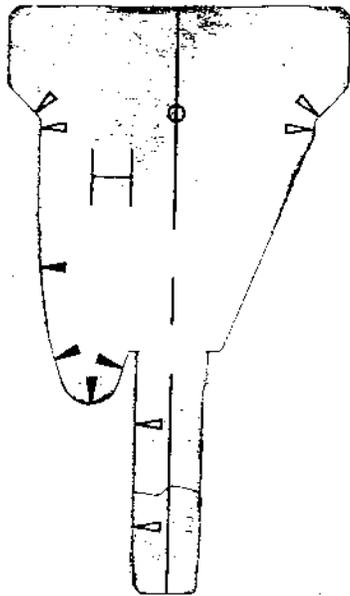
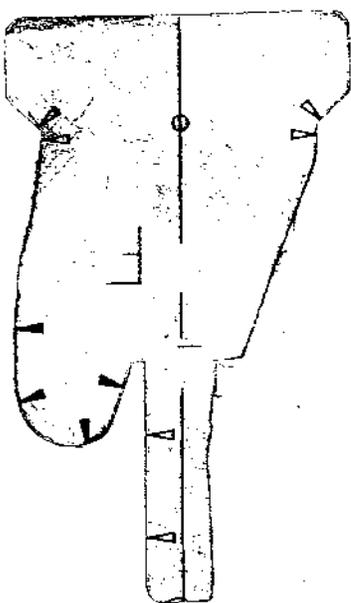
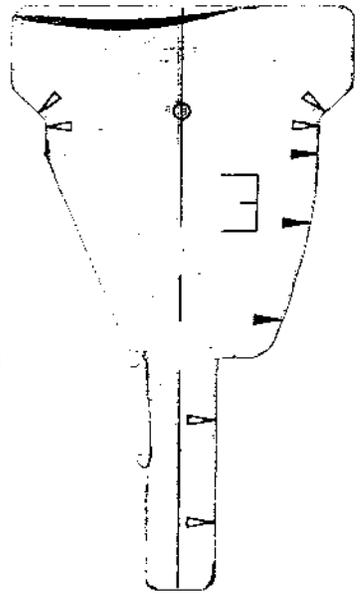
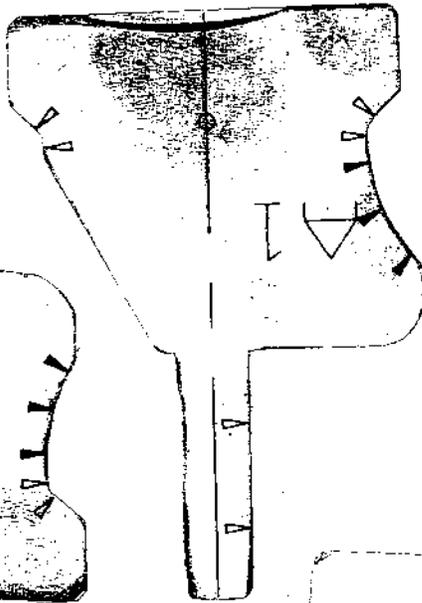
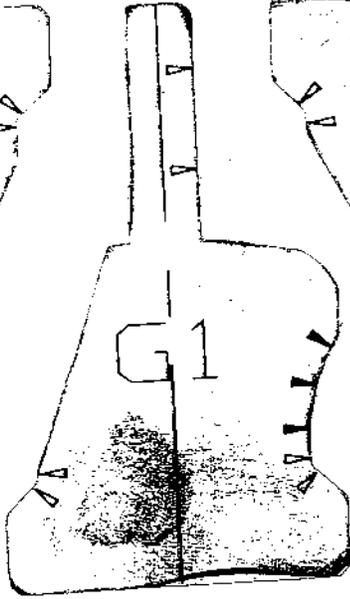
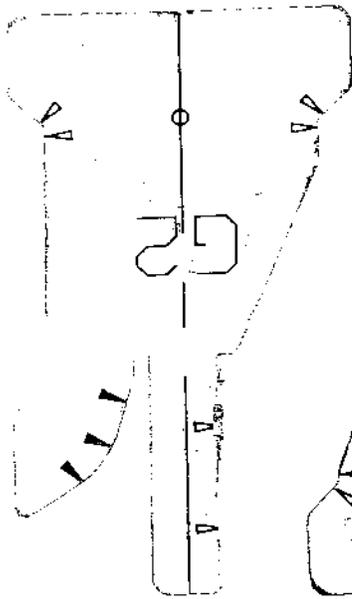
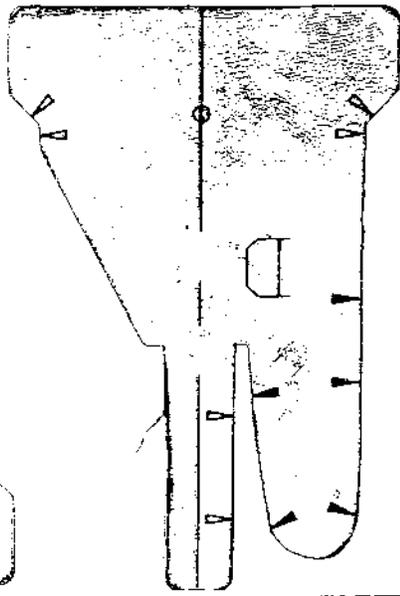
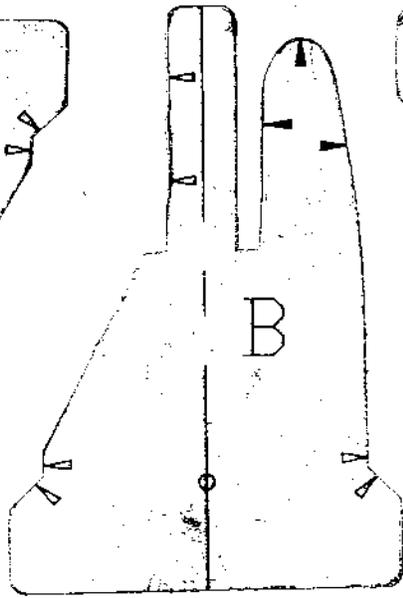
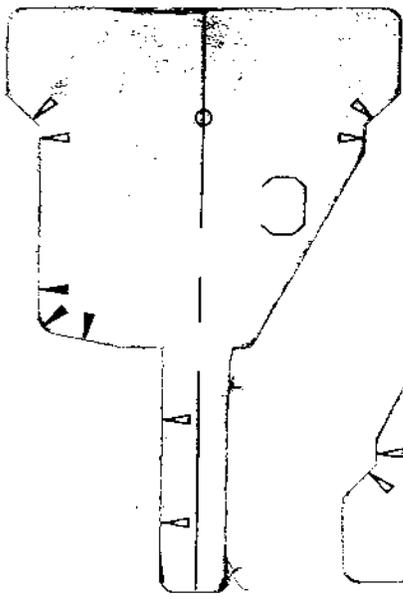


**FIGURE 4 - P4876412**  
**360 Swirl-Port "A" Engine**  
**Exhaust Port**

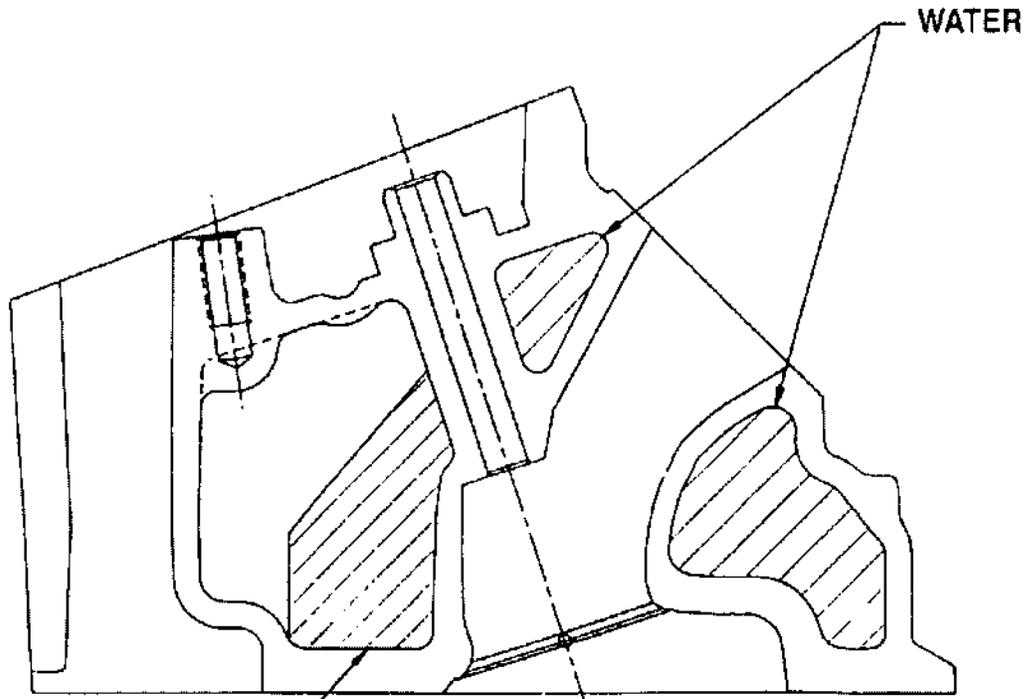


**FIGURE 4 - P4876412**  
**360 Swirl-Port "A" Engine**  
**Exhaust Port**

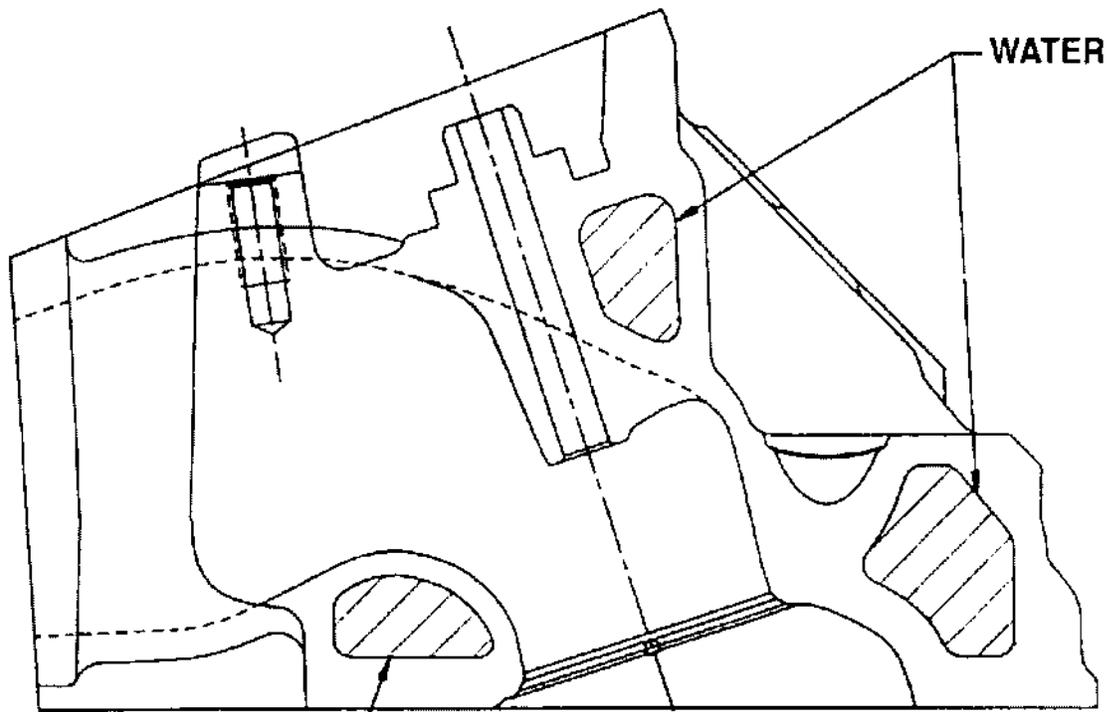




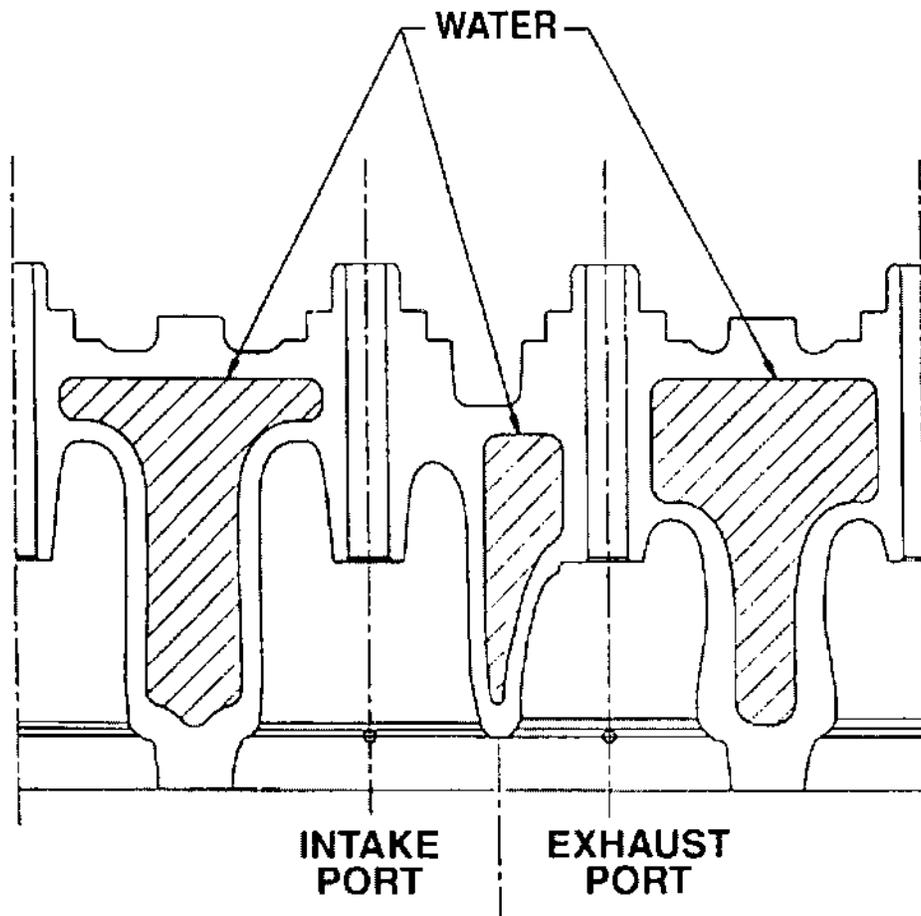




WATER

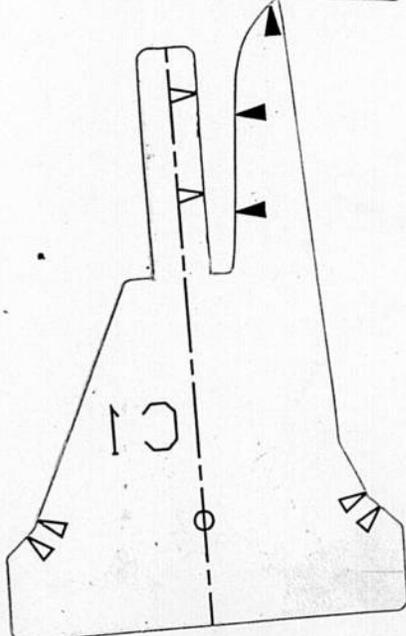
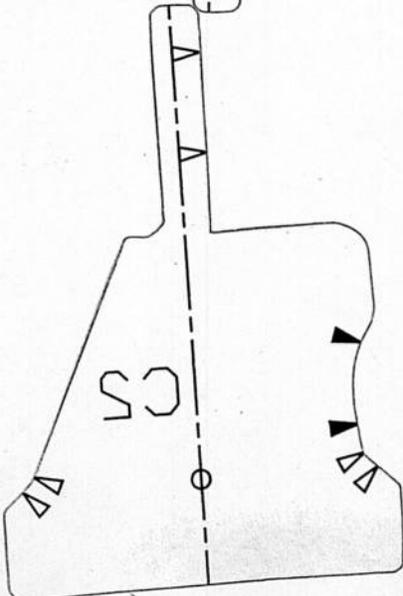
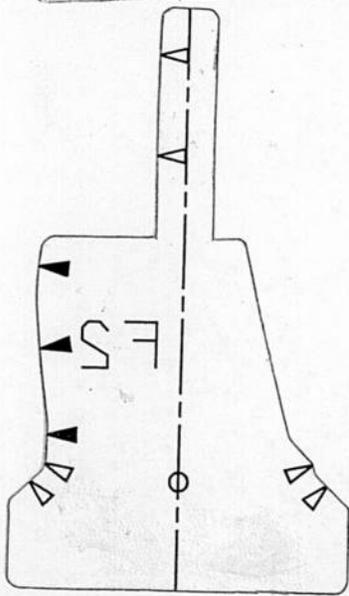
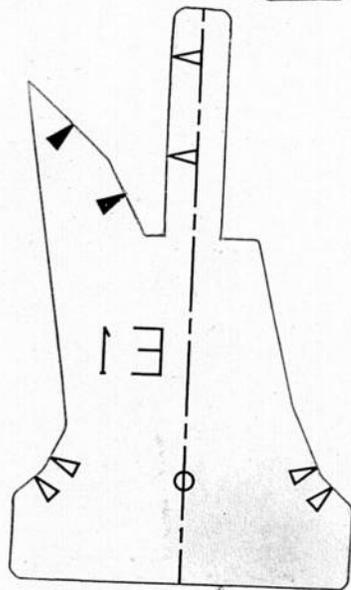
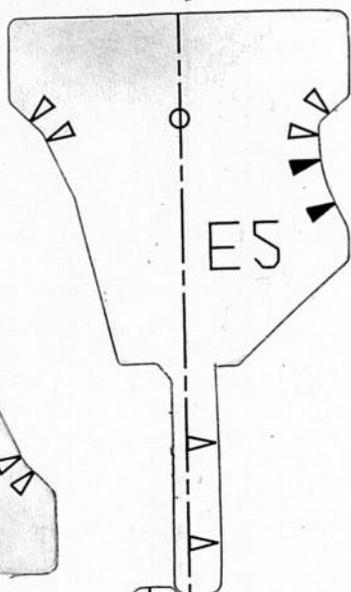
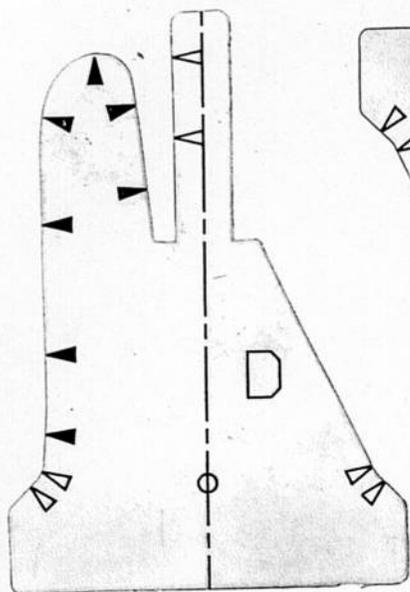
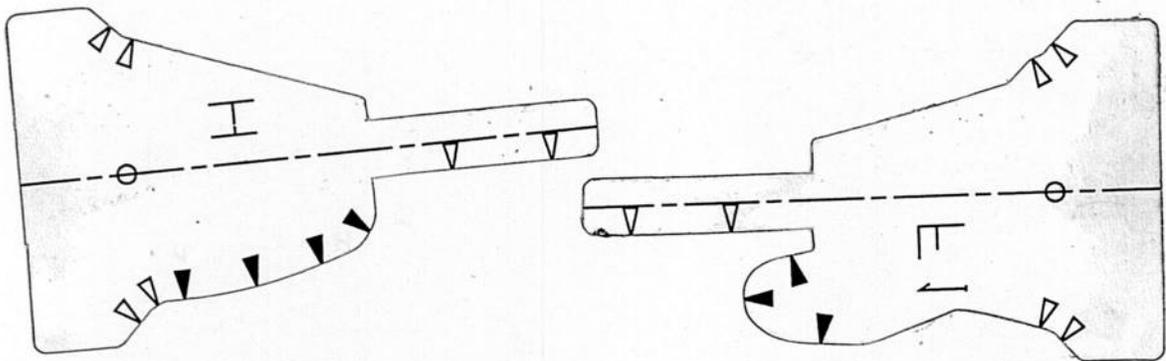


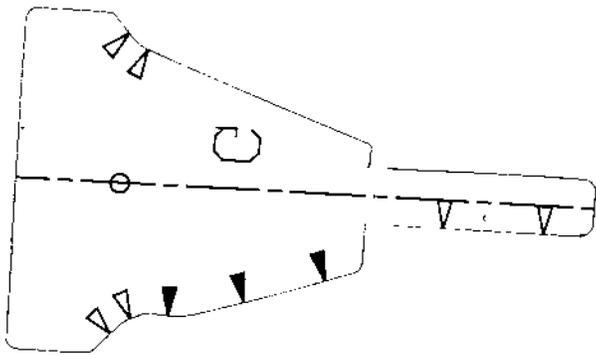
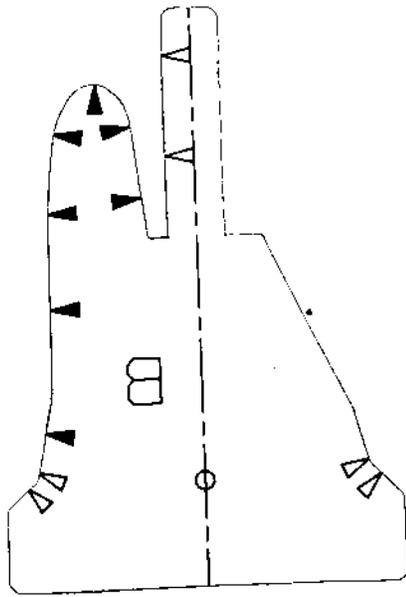
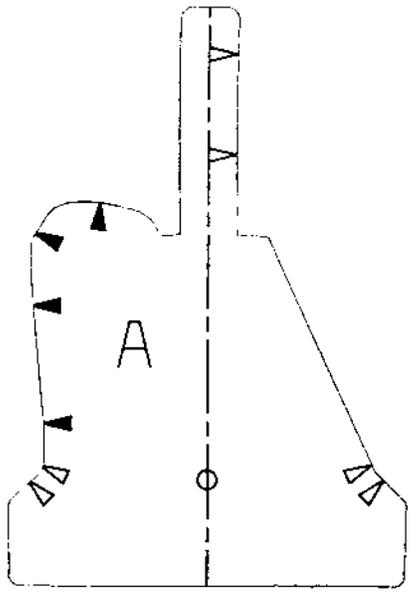
WATER



Magnum

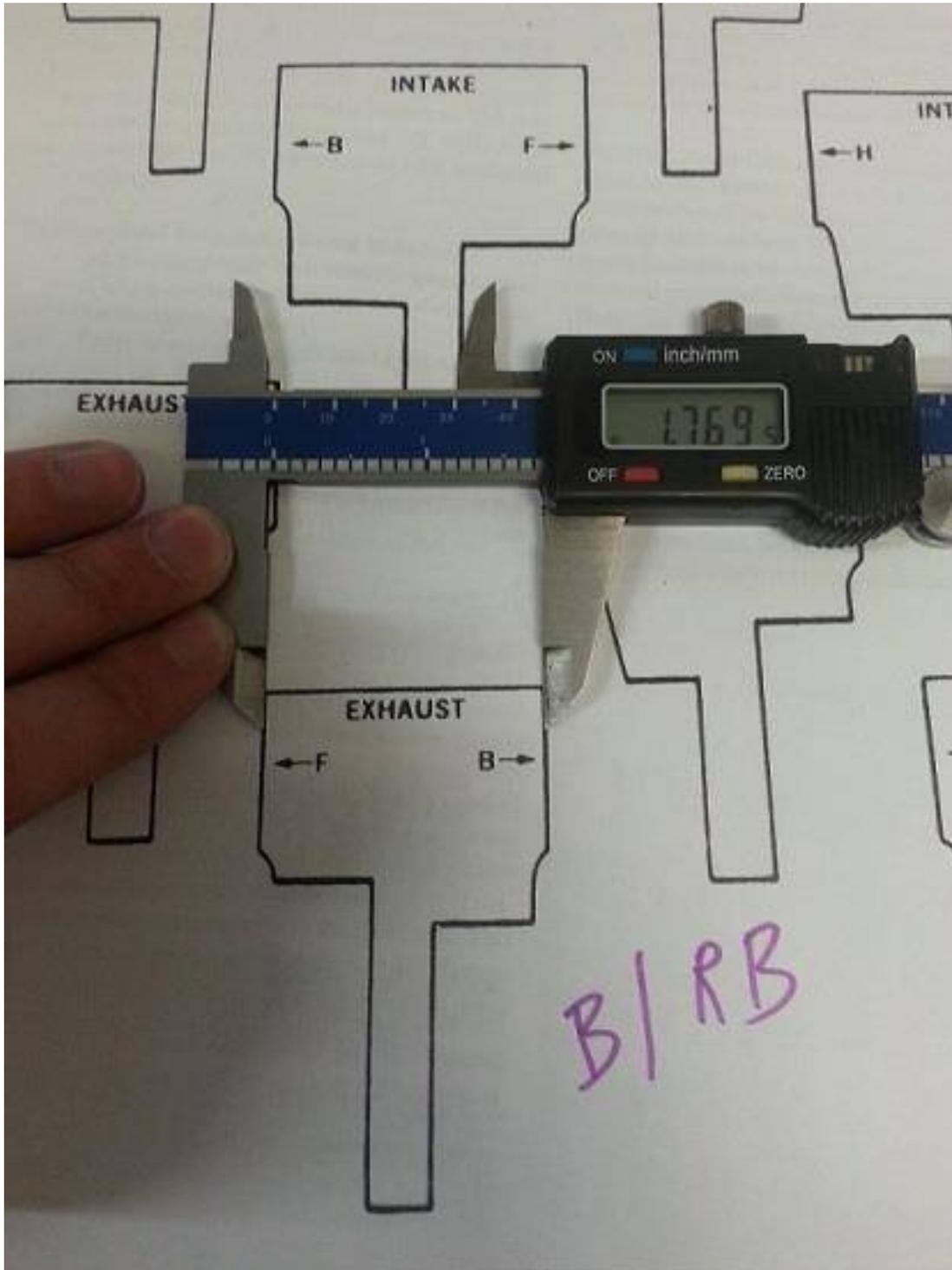
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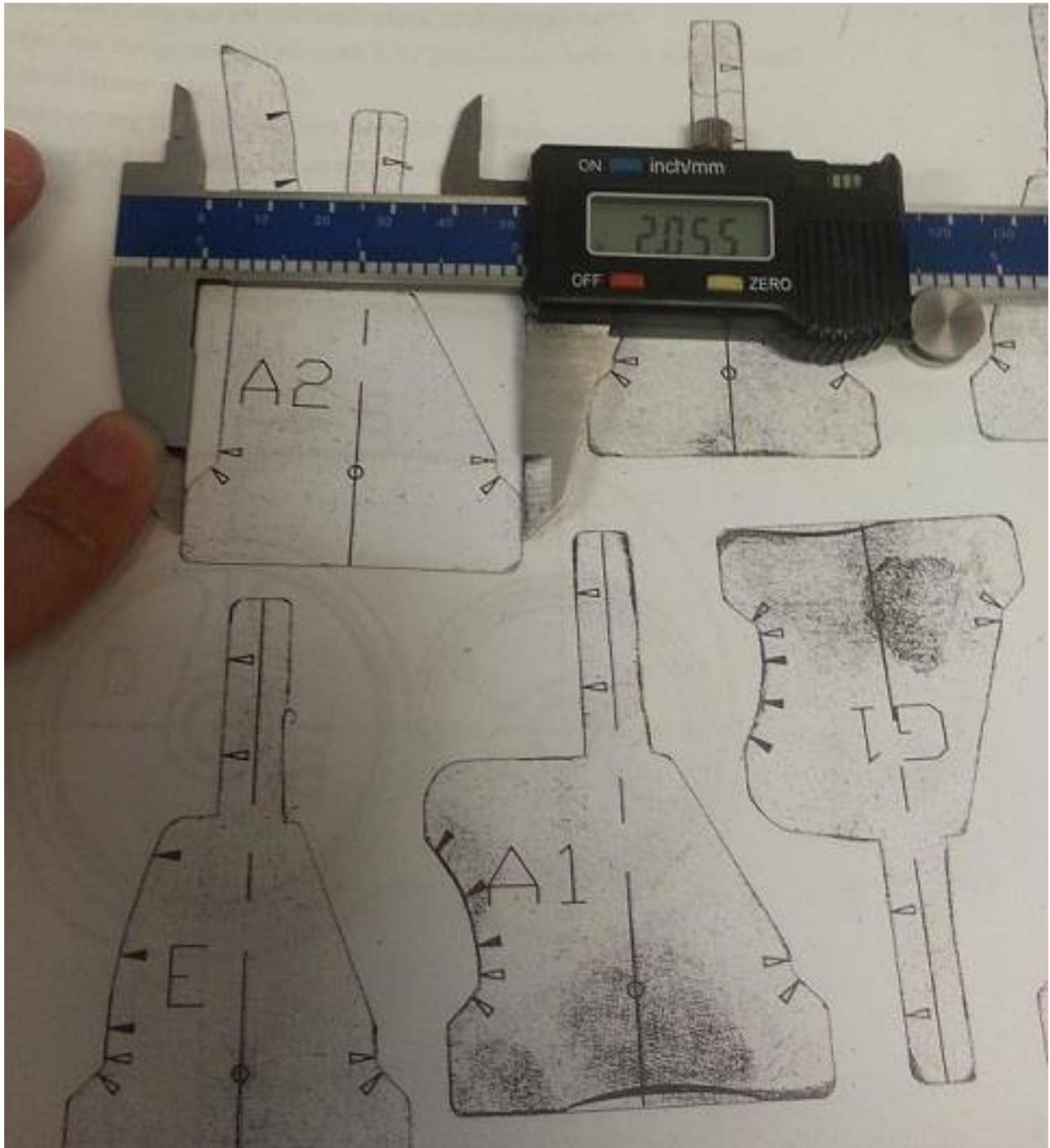


*mechanism*

# B/RB SCALE REFERENCE



# LA SCALE REFERENCE



# MAGNUM SCALE REFERENCE

