

# Getting started on the Pacifier V4

By Steve Huck

The Pacifier is a V4 engine that was originally conceived by the late Bob Shores. With the smaller Peewee V4 built, the “big brother” was going to be the Pacifier V4. The patterns used to produce the castings were made by Mr. Shores. When he passed away the patterns were given to Dirk Tollenaar in Mc Kinney Texas. A deal was struck and Dirk had castings produced from Bob's original patterns and he sent a couple sets to me. The castings were measured and the Pacifier was designed. We tried real hard to design the engine in the way we believe they would be if Bob had done them himself. The drawings were produced and the first engine built from those drawings. This document was written to show some of the first steps that were taken to build the first Pacifier V4. I don't claim that this is the best way to to get started. I just produced this document to show how it was done by myself. Feel free to change or deviate in any manner that suits your machining style.

To get started the oil pan will need to be prepared. Using a file or sander of some kind, clean off the flashing on the front and rear of the casting. The pan is then setup in the vise with a pair of parallels under the two side flanges. Snug the pan and give it a couple taps to be sure the pan is tight down on the parallels. When ready be careful not to over tighten the vise.



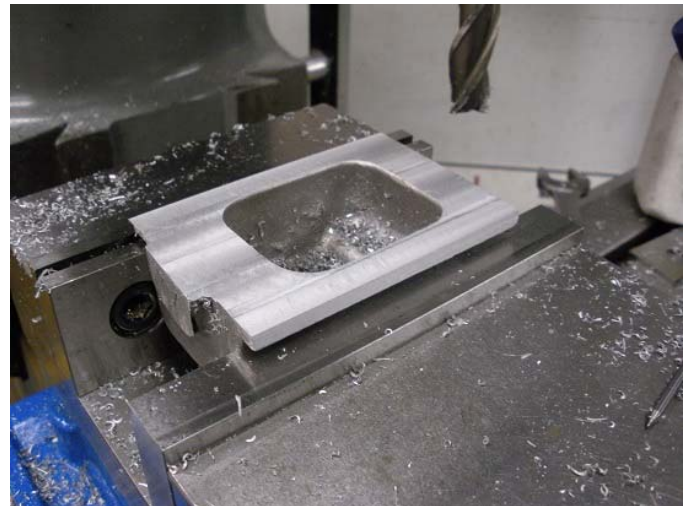
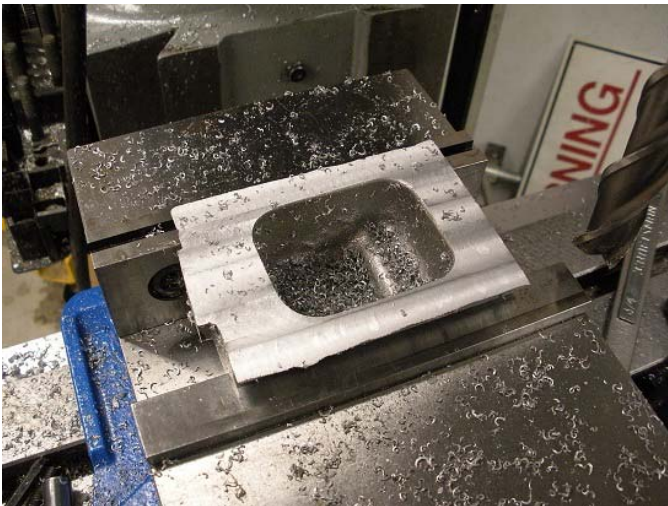
The edge finder was used to find the center of the casting both ways. Front and rear of the casting was used for center, left to right (X axis). The inside of the vise jaws were used to find center the other way (Y axis)



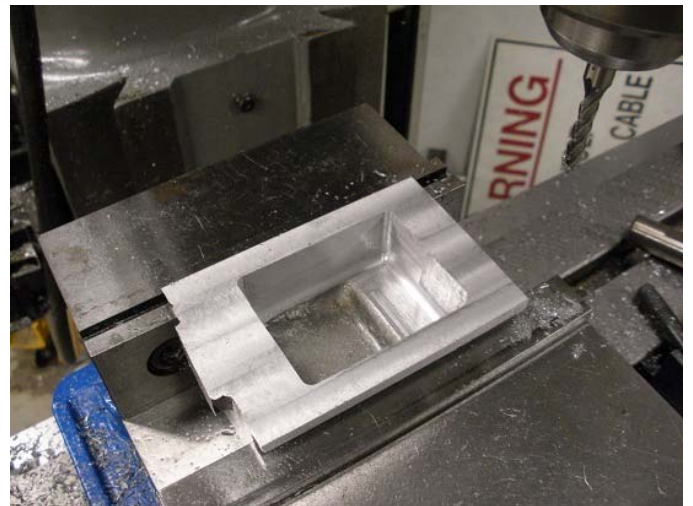
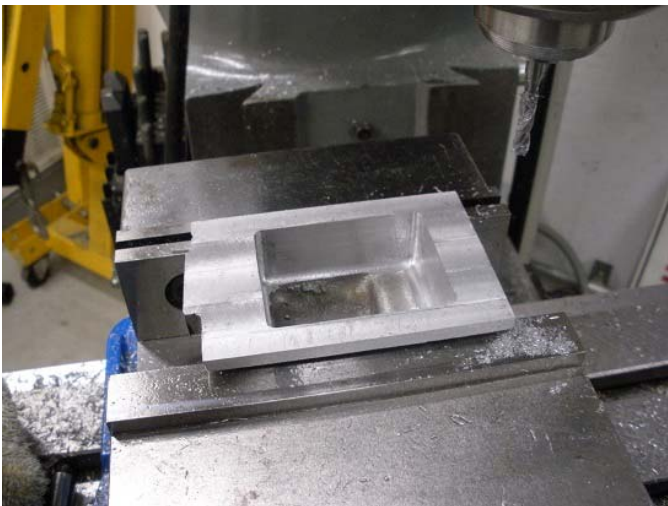
Tool Height was established by touching off the tool on the parallel and setting the DRO to  $-.200$  inches. The parallels were then removed to clear the way for machining.



The top surface was machined down until the DRO read zero. Now the side flanges should be  $.200$  inches thick as per the drawing. The side of the flanges were milled so the pan is  $2.600$  inches wide.

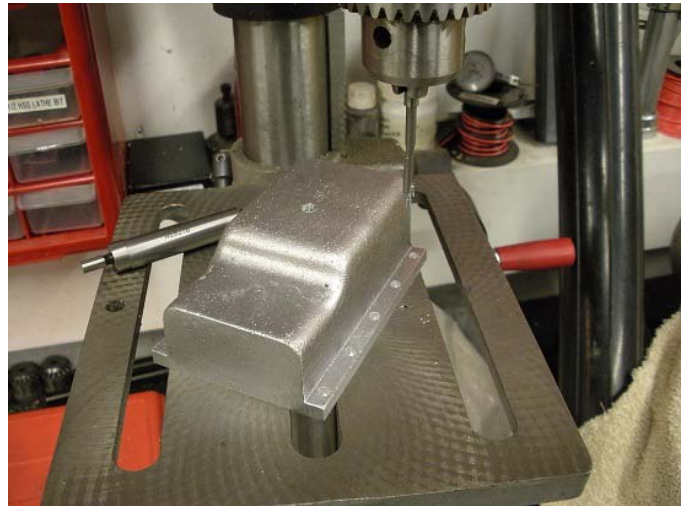


The crankshaft clearance pocket was then cleaned out using a  $.250$  ball nose mill around the edges. After the edges were done a  $.250$  end mill was used to finish the bottom surface.

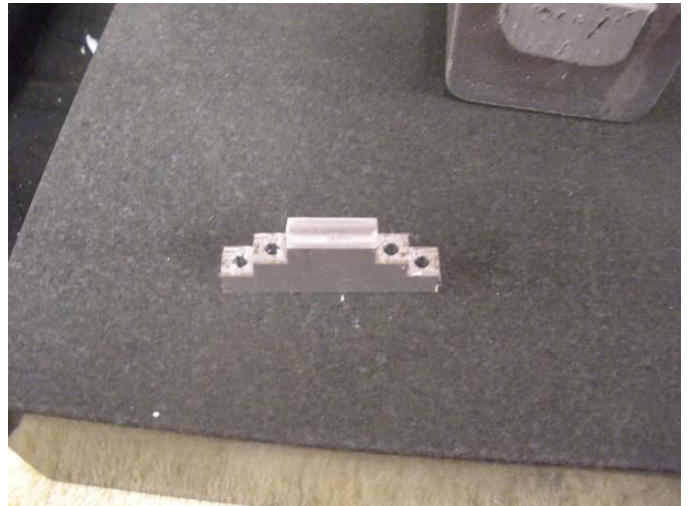




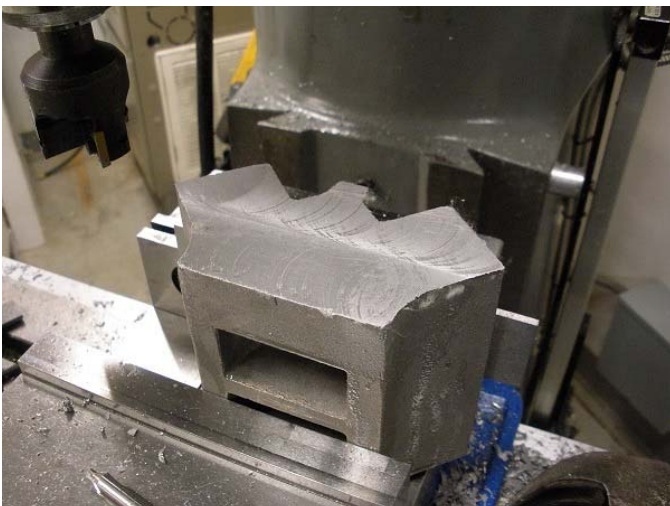
The mounting holes were then spot drilled and then drilled. It's not in the drawings but counter bore the mounting holes so that the screw heads are just recessed a small bit.



Finally the pan is rotated bottom up and surfaced so that the drain plug washer will seal. Take the absolute bare minimum needed to clean up around the drain hole. Next you will need to machine the center bearing support. Machine the part using .250 inch thick stock. Do not reduce the thickness of the support at this time.



Next the block will need to be laid out. The absolute bare minimum (.060ish) was cut off to clean up the rear of the block. The block was then clamped down to the table flat on the bottom and the peak of the cylinder banks were skim cut just enough to leave machine marks.

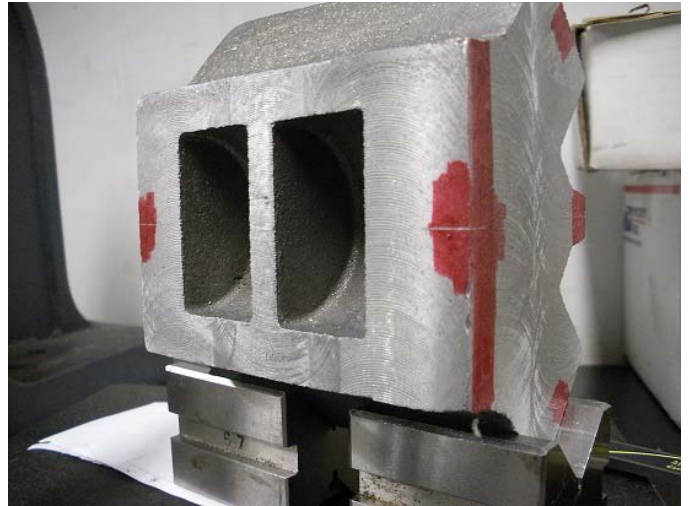
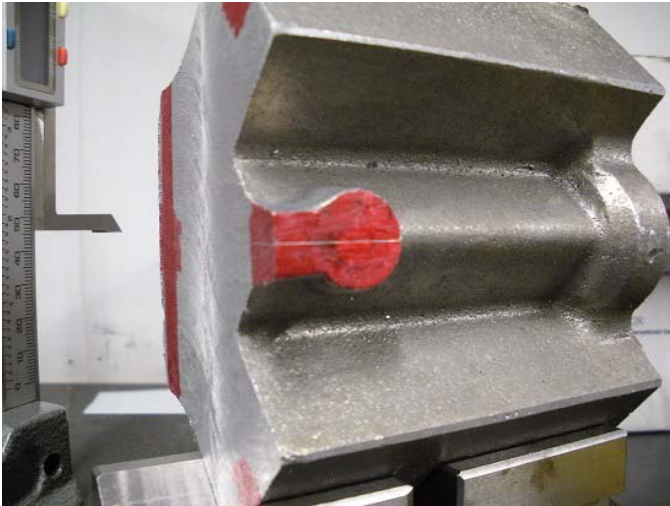




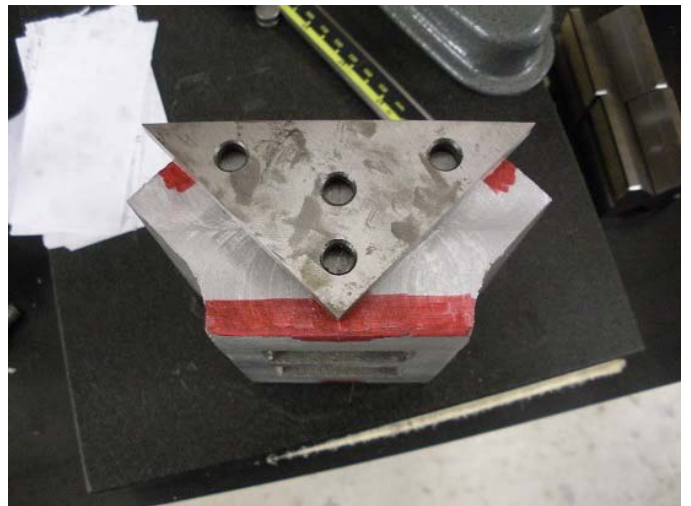
The block was then rotated bottom up and a bare minimum skim cut taken to clean up the bottom. The distributor boss was just cleaned up with a few strokes of a file.



The center of the distributor boss was found and transposed to the rear of the block. The center of the bottom of the block was also found and transposed to the rear of the block and the two points connected.

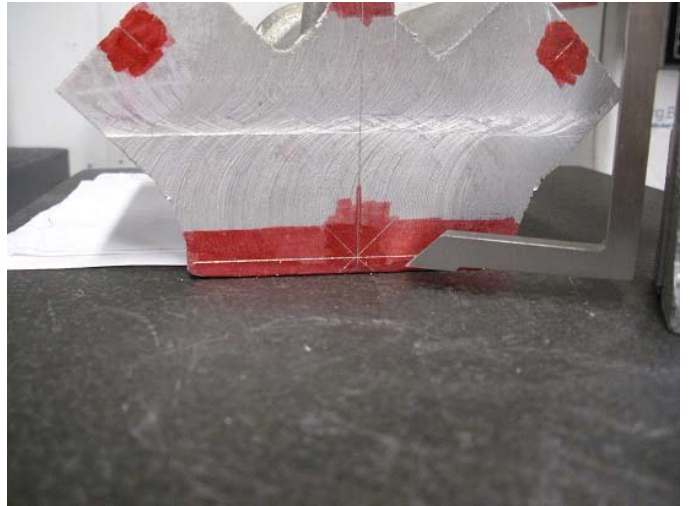


Then the centers of the two cylinder banks were located and marked. The square was adjusted so both bank centers were aligned and the point of the square on the center mark. The point where the square and center mark intersect was marked out.

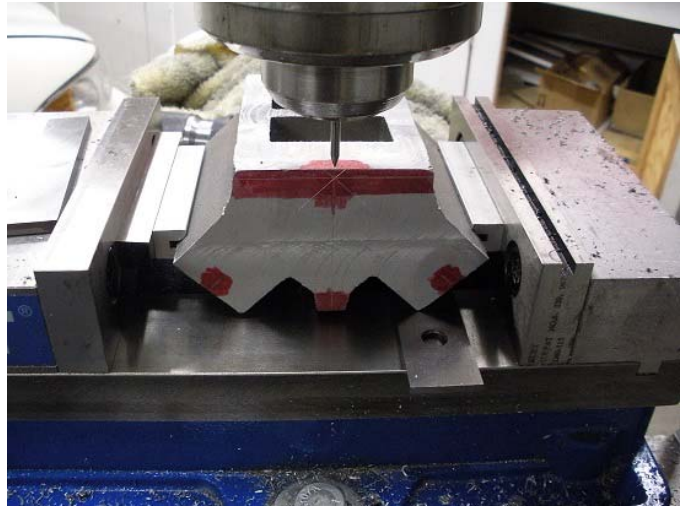
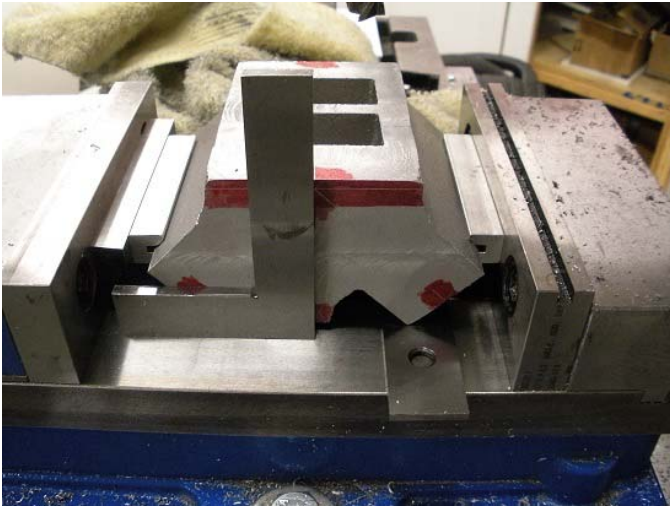




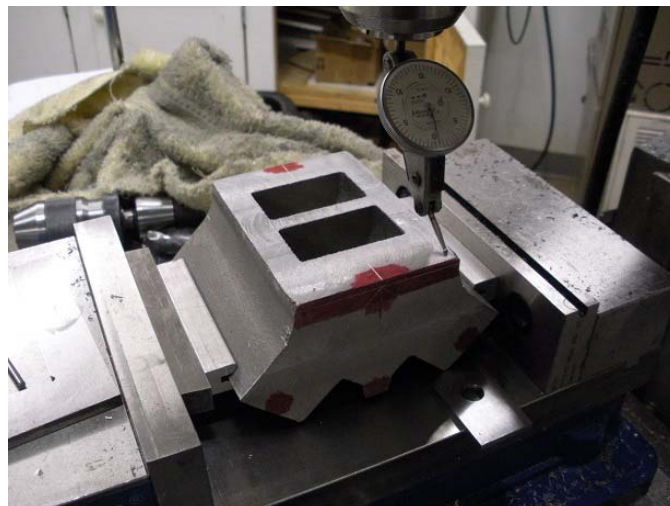
Verify that the center mark is perfectly vertical. I used a few strips of paper to shim one side up. Scribe a horizontal line right where the center and cylinder bank lines all come together.



Setup block so center line is perfectly vertical. Verify the block is aligned from front to back using the center marks on bottom of the block.

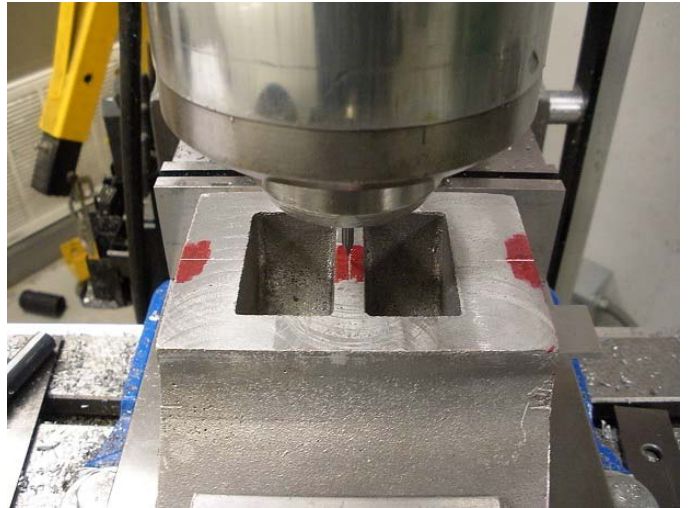
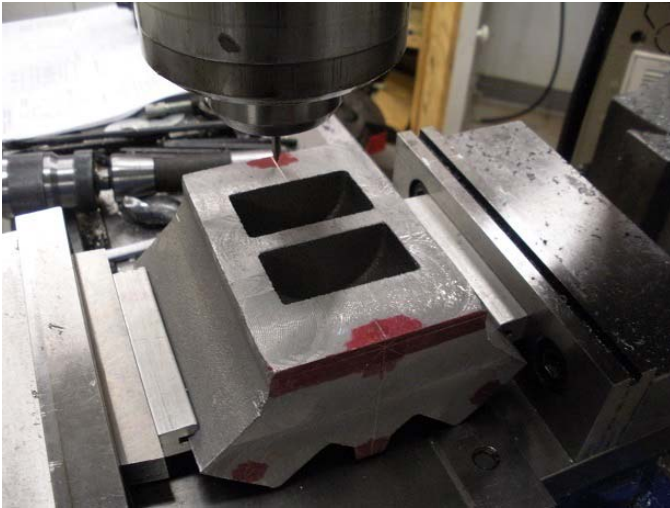


Just as a double check, indicate the block from front to back to verify that it is horizontal. With the tip of the cylinder being cut, it should be real close.

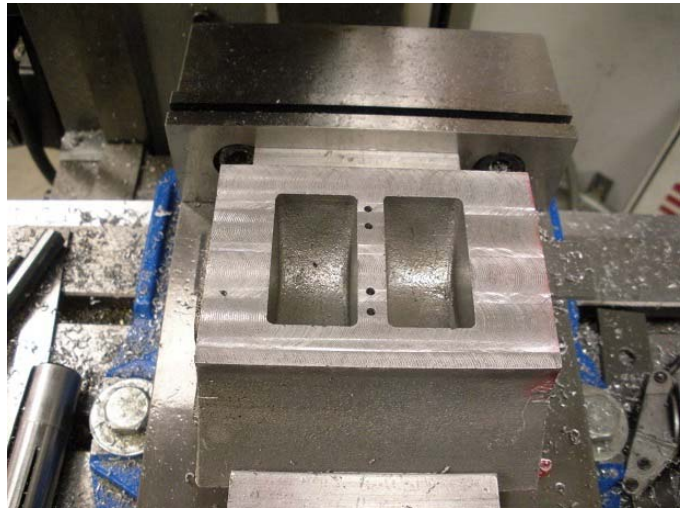
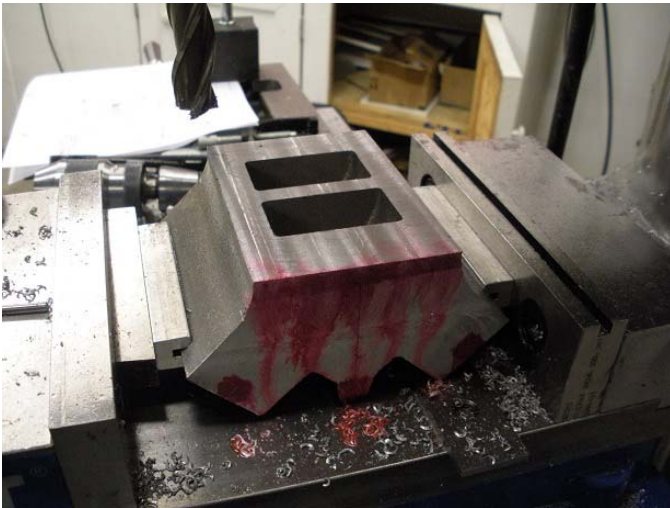




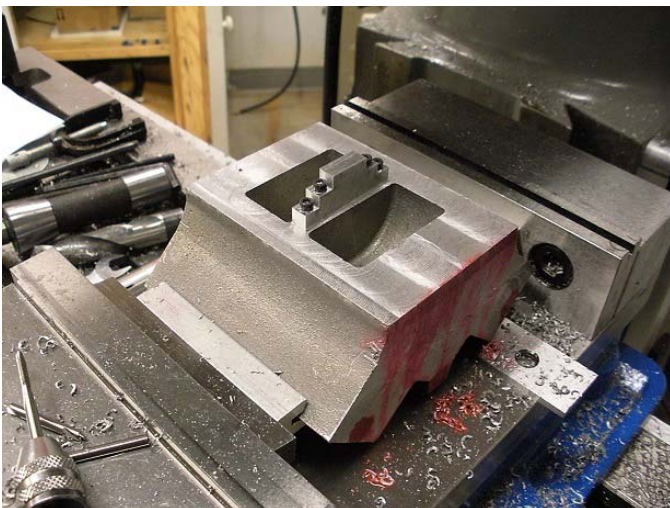
Pick up the center line with a pointed tool to find block center (Y0.000). Find center of the middle web of the block. Move .025 inches toward the front of the block. Use this point as the zero point (X0.000)



Machine the bottom surface down to the horizontal line. Drill and tap the holes to mount the main bushing support.

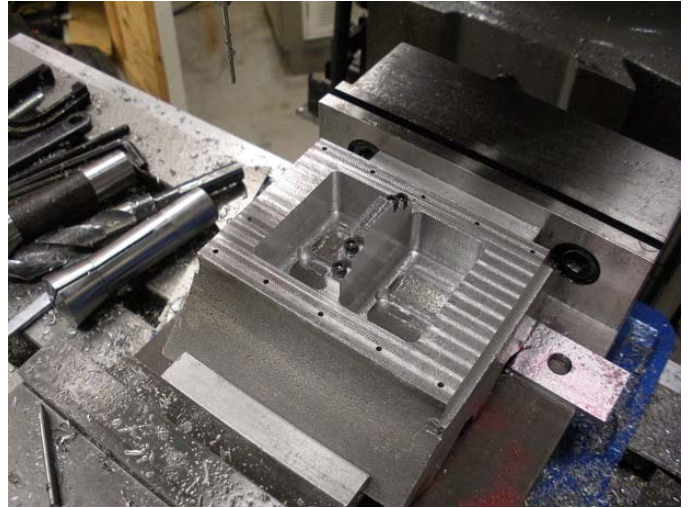
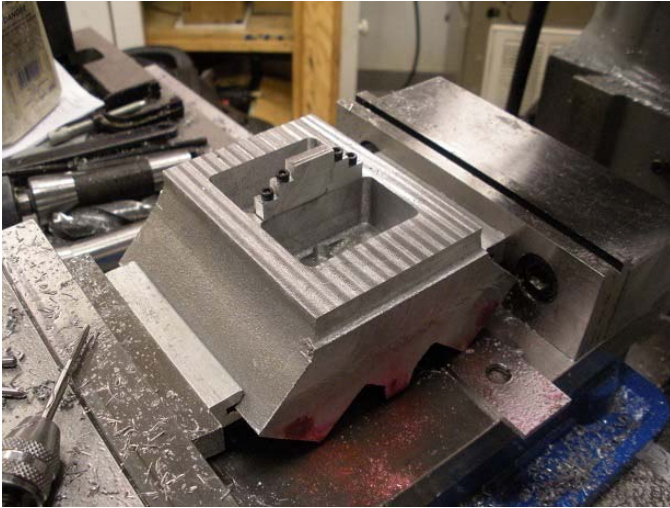


Install center bushing support without disturbing your setup. Machine the pockets and slots in the bottom of the pockets with support in place.





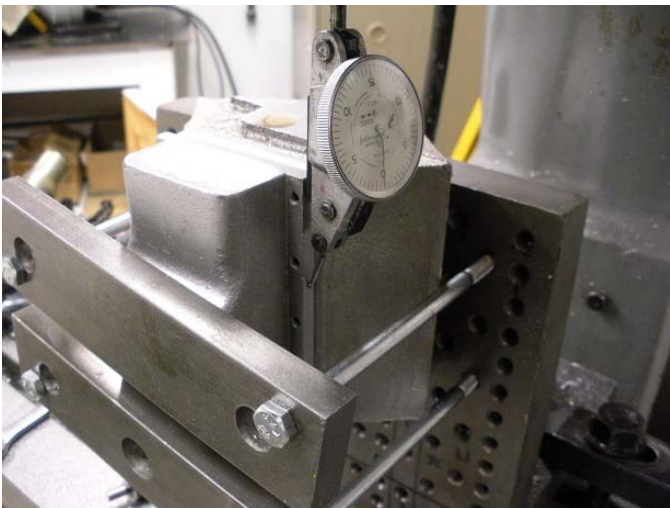
Machine the front and back of the block to size, 3/8 deep, leaving .005 inches for future machining. Drill and tap the holes to mount the oil pan.



Bolt the oil pan to the block. Rotate the block so the front is up. Indicate along the front of the block to assure the block is vertical. Indicate along the top of the oil pan to assure alignment along the X axis.

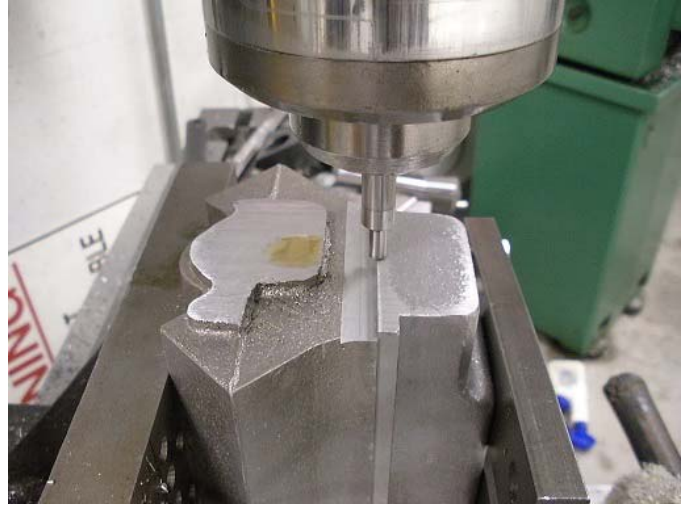


Indicate down the oil pan rail to double check vertical alignment. Using the edge finder, locate the top of the oil pan. The split between the pan and block center of crankshaft bore.

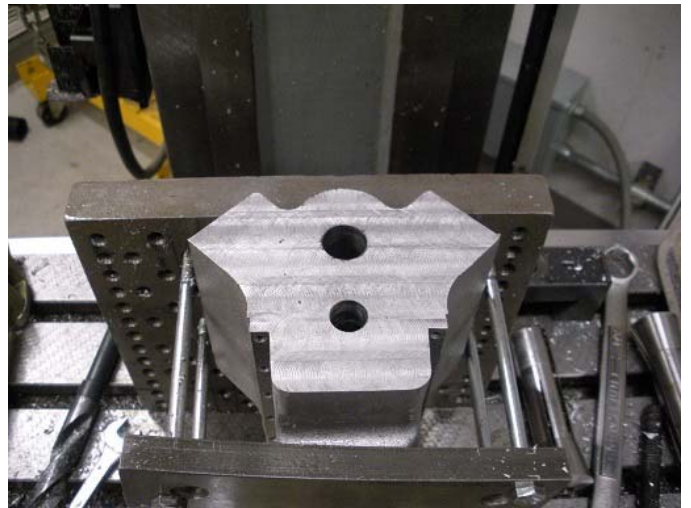
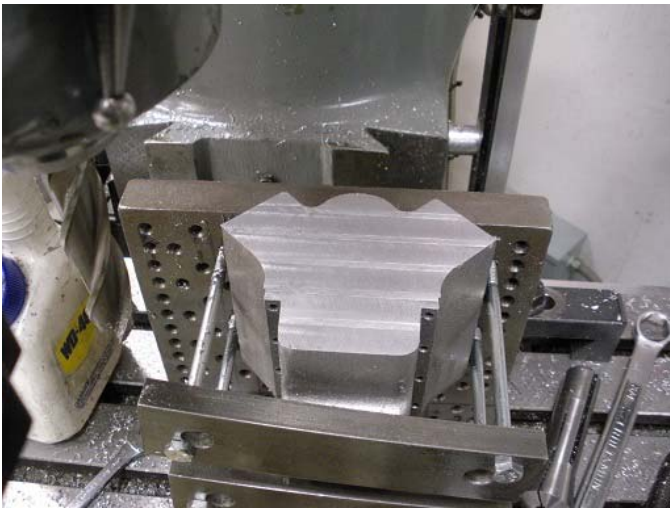




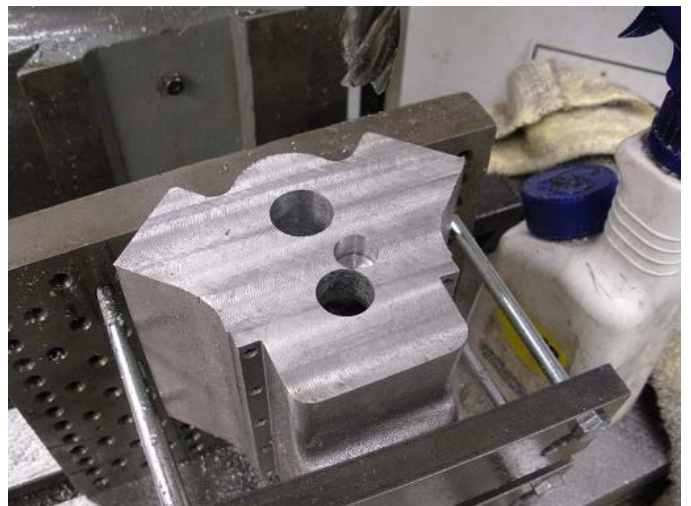
Use the edge finder on the oil pan flanges to find the center of the pan along the X axis. Double check by moving to zero X and Y axis and make sure the edge finder appears to be center of the pan and centered on the split.



Machine the front down .005 past the machined surface at the bottom of the block. Drill the crankshaft hole to 1/2 inch and drill the camshaft hole to 5/8 inch



Finish boring the crankshaft and camshaft holes to size. Use a 1/2 inch end mill that can center cut to start the pocket for the idler gear.





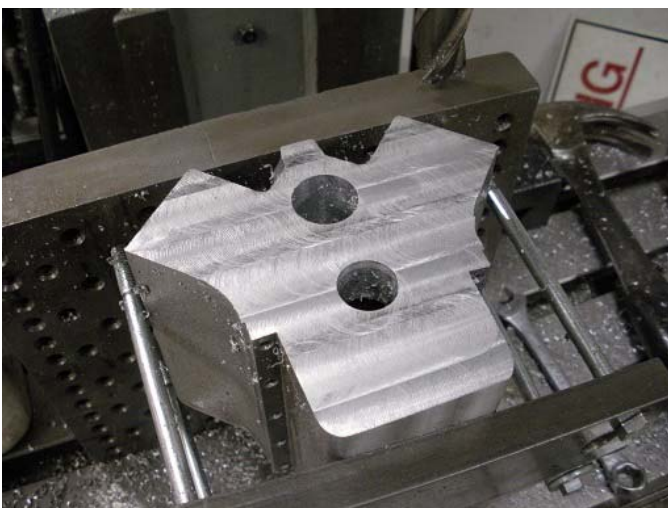
Use the boring bar to finish off the gear pockets. Drill all the holes for the mounting of the timing cover, water pump, and idler gear. Be careful that the three holes up each side of the timing cover are not in a straight line.



Rotate the block so the rear is facing up. If all has gone well the camshaft bore should be centered on the center line on the rear of the block. Again indicate across the machined surface to align vertically. Indicate along the top surface of the oil pan to align along its axis.



Machine the rear surface down .005 past the machined surface at the bottom of the block. Indicate the crankshaft hole to find its center.





Drill the water passages into the cylinder banks. Drill the holes for mounting the bell housing adapter plate



Insert a piece of 5/8 inch drill rod into the crankshaft hole. Laying the rod across the top of my vise gave horizontal alignment. Find the center of the cylinder bank and make a mark 5/16 inch on each side of center. Butt a square into the rod in the crank hole on both sides and align with 5/16 marks to assure vertical alignment. After aligning, use the pointer to pick up center of cylinder bank.



Indicate the bar at the front and back of the block to assure alignment along it's axis. Touch your cutter off the top of the rod. Set Z axis to .3125 inches.





Machine top of cylinder bank to height leaving .005 inches for future machining. Use the edge finder to locate the front of the block.



Drill the cylinder holes to  $\frac{3}{4}$  inches. Finish boring and counter boring the cylinder holes.



Cut the water jackets into the block. Drill holes to mount the head. Drill the hole for the camshaft setscrew.





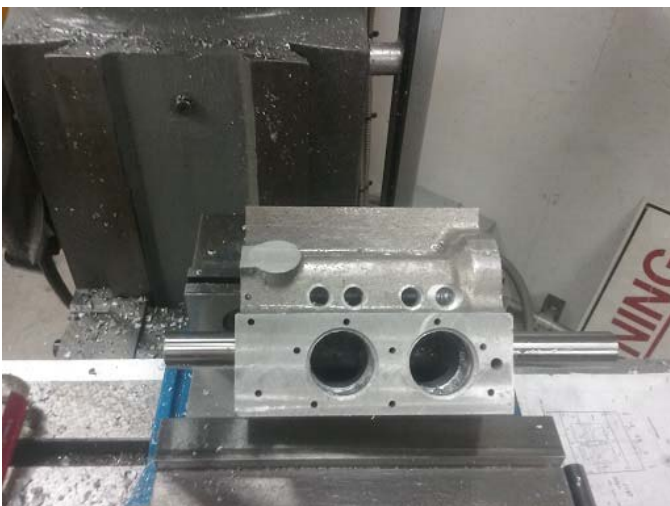
Spot the lifter bores with a 3/8 inch end mill then drill the holes for the bushings. Finally, drill the cooling passage hole.



Rotate the block to the other bank and repeat the process.



Machine the distributor boss to the correct height. Insert a 3/4 inch piece of stock or tool bit into the camshaft hole and use it to locate center of the hole. This is also center of the distributor hole.





Spot drill the distributor and crankcase vent. Drill the hole for the crank case vent. Drill the hole for the distributor. Be sure to be centered on the camshaft for proper gear mesh.



Finally drill the hole that locks down the distributor. That's all for the block and oil pan. If you haven't already, tap all the holes that require threads.

