283 CI Engine Build for Harmonic Balancer, Water Pump, Generator Pulleys & Brackets

Rich Mozzetta

Link to CF thread

I built a parts buck to show a stock 1959 - 1961 to help clear up confusion about brackets and pulleys. I will also show methods to help align the generator to the pulley system, as this design was not ideal and allows much movement during assembly, and some critical areas that must be observed. There are many photos and measurements shown to help visualize assembly.

Any feedback, corrections or comments are always welcome.

It will take some time to edit and add comments and captions, as I'm doing it “on-the-fly”.

Rich

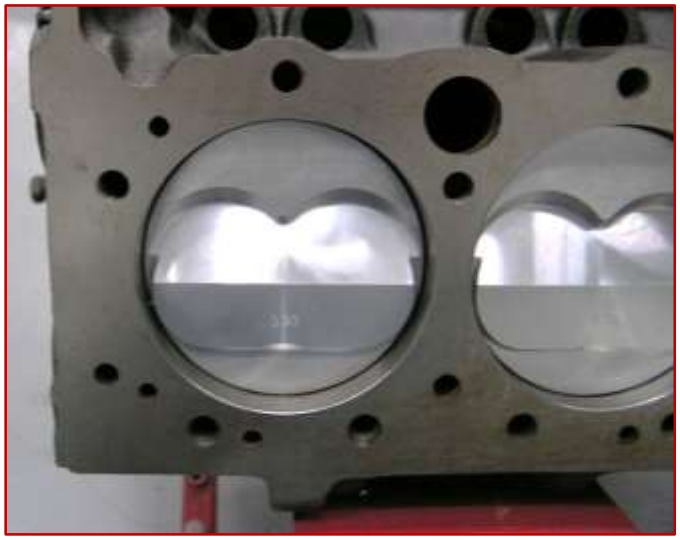
PDF file compiled by Dave Zuberer

The Parts Buck Engine. A 283 CI with stock build.

The Parts Buck Engine.
A 1961 283 CI with stock build.

This one is slated for Fuel Injection and has Domed Pistons, the Duntov Camshaft, and it will have solid lifters. It included a Cloyes adjustable Timing Gear set to allow the cam to be dialed in. It was balanced by the shop, meaning all connecting rods and pistons were weighed and altered for equal weight.

After returning from the machine shop...



Here it is after trial fitting the heads and other various pieces for the trial build exercise.

Here is the crankshaft snout. Note there is no harmonic balancer (HB) spacer installed. The spacer will be discussed later.

Here are the pieces to be installed; with the exception of the timing chain cover so it will be easier to photograph and measure the items in the assembly.

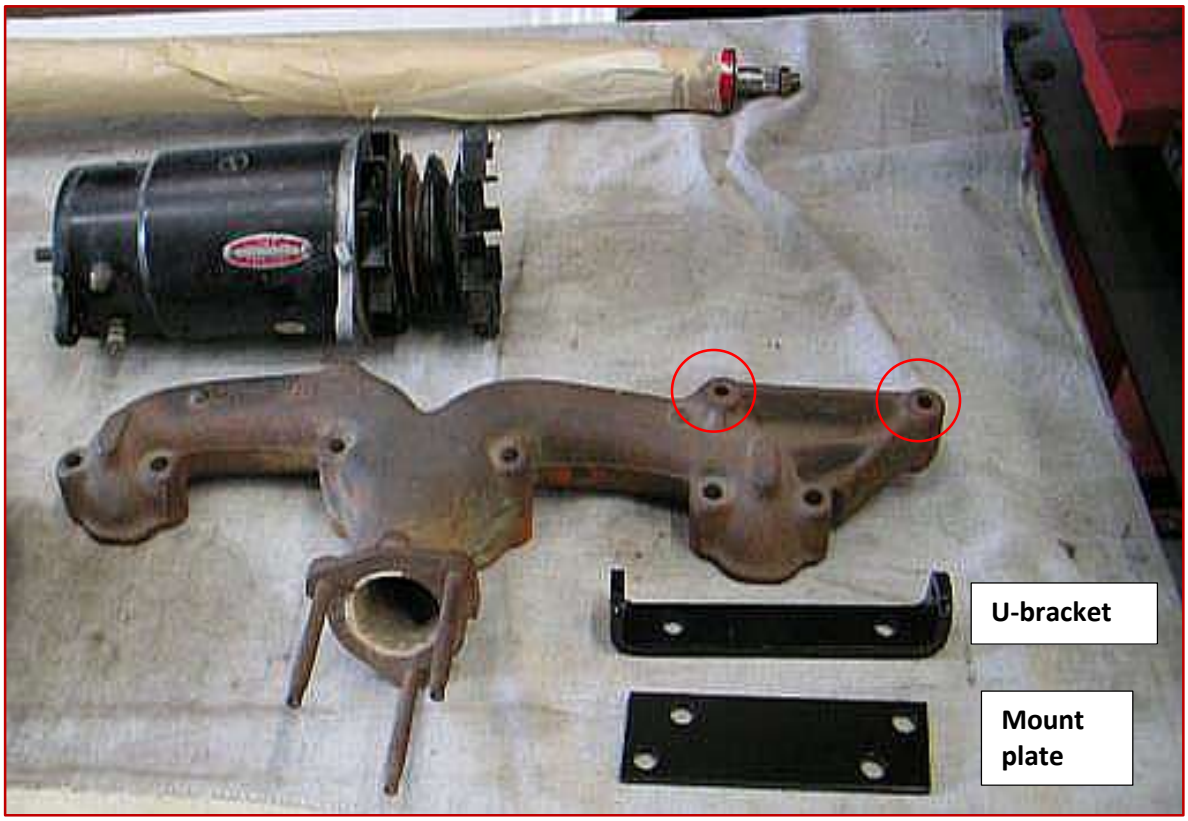
The small round washer with the keyway slot is the **spacer**. On the 1956 to 1962 Corvette, this must be installed to allow the balancer pulley to align with the stock Chevrolet Water Pump (WP). Because the front engine mount sits between the block and the pump, that same thickness must be matched at the balancer where it attaches to the crankshaft. This brings the HB pulley forward to match the WP.

One problem I had was that I did not have the stock '58-'61 generator U-Bracket, GM part# 3750548, used on 1958-1961 Non-FI engines. Its dimensions are 1 7/8" H x 6 5/8" OAL (overall length). This engine is destined to be reassembled as a 315HP Fuelie for the '61 I'm restoring. My U-Bracket is slightly longer with offset mount holes for the **1102268** generator which has different mount spacing of 7". For the parts-buck build I had to improvise. I used the longer U-Bracket designed for the 11022268 FI generator, not for the tach drive generator 1102043. I simply extended the rear of the generator case to the rear frame (Commutator End frame). I did this by adding spacer washers between the end frame and the rear of the generator case. This has no effect on pulley alignment as the front frame (Drive End frame) ends up in the same position as it normally would.

Also, the 1102043 generator I used in this buck was not the one pictured above. I had to use a Passenger car generator that I had on the shelf. This is only different in the distance of the armature shaft center to end frame mounting hole centers. It's 1/2" taller in its mounted position. The only effect this has on the buck is that the belt tension will yield a slightly shorter profile. Since this exercise is to show alignment methods and assembly practices, this also has minimal effect on the main objective of this document.

I've included an Addendum **(A)** at the end of the document showing the different generator U-Brackets used for various years and horsepower applications.

The photo below shows the exhaust manifold for the Right Side, GM part# cast 3750556. This is used on 1958 to 1961. It has 2 threaded 7/16 holes for the generator brackets. You can't see it here, but this one is for the FI application, as it is missing the machined holes for the carburetor choke fresh air tube. Other than that, it's the same manifold used on the non-FI engines.



This is the Water Pump Pulley (GM part# 3724816) used on all engines from Late 1958 (with hood support on the left), up to Early 1962. Early 1958 used a stepped pulley; part# 3827846. Late 1962 used 3770245, 7 1/8" diameter double groove pulley, if I recall correctly, for the SHP engines. The double groove is to accommodate an idler pulley drive belt.

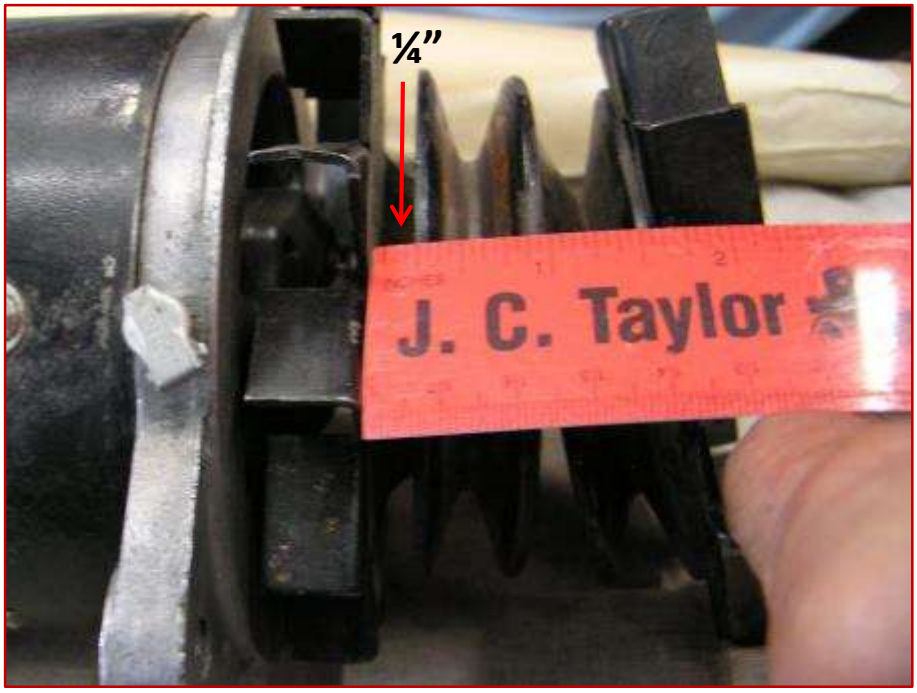
This is the stock Harmonic Balancer pulley; GM part# 3756328. This was used on all 1958 to 1962 engines, except the 1962 Special High Performance (SHP) Fuel Injection. That option requires the part# 3858533 double- groove pulley; 6 5/8' diameter. The double groove is to accommodate the idler pulley also to the above mentioned Water Pump pulley. Note that pulley was also used up to 1980 for various engine configurations.

The exhaust manifold for the Right Side is 3750556. This is used on 1958 to 1961. It has 2 threaded 7/16 holes for the generator bracket.

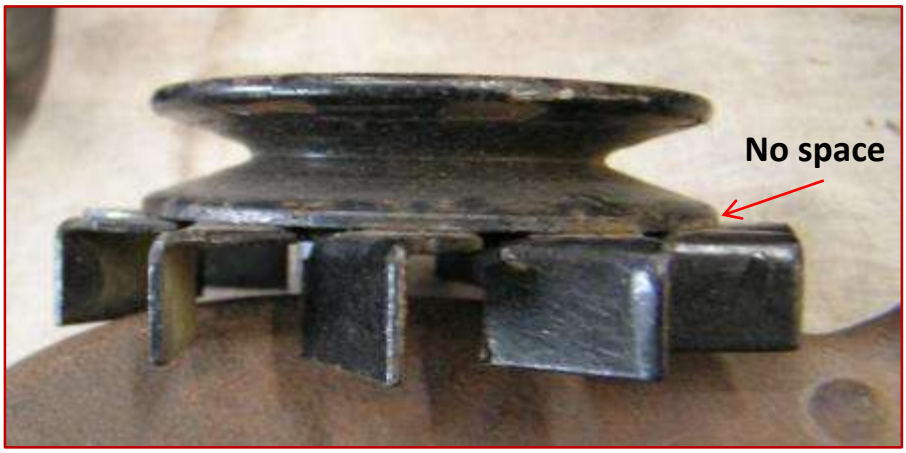
A close up of the casting number 3750556 RH. This will be more visible when cleaned and painted for the actual engine build.

The generator is a stock issue 1102043 NON-FI unit. This was used from 1956 to 1961, but has variations of attaching parts and pulley usage based on year.

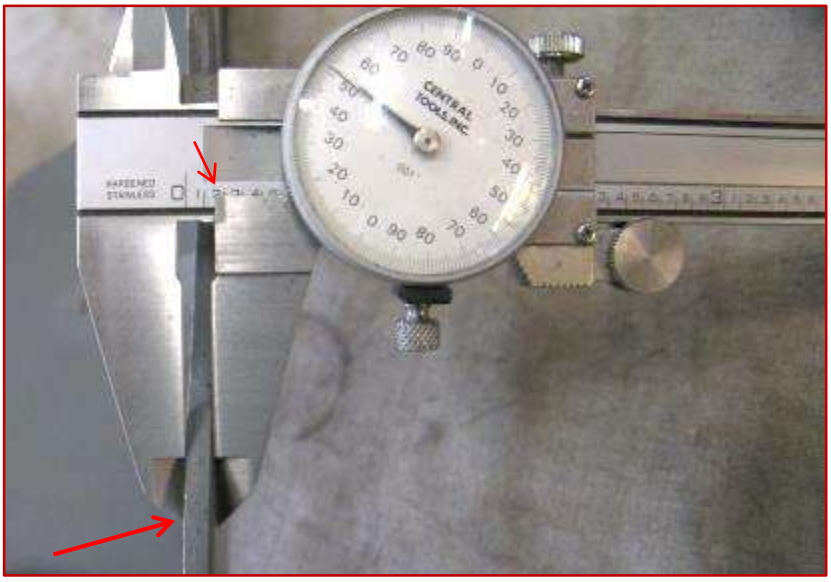
The 1958 - 1962 generators used a special 3 5/8" pulley which has a 1/4" offset/space between the fan and backside of the pulley dish.



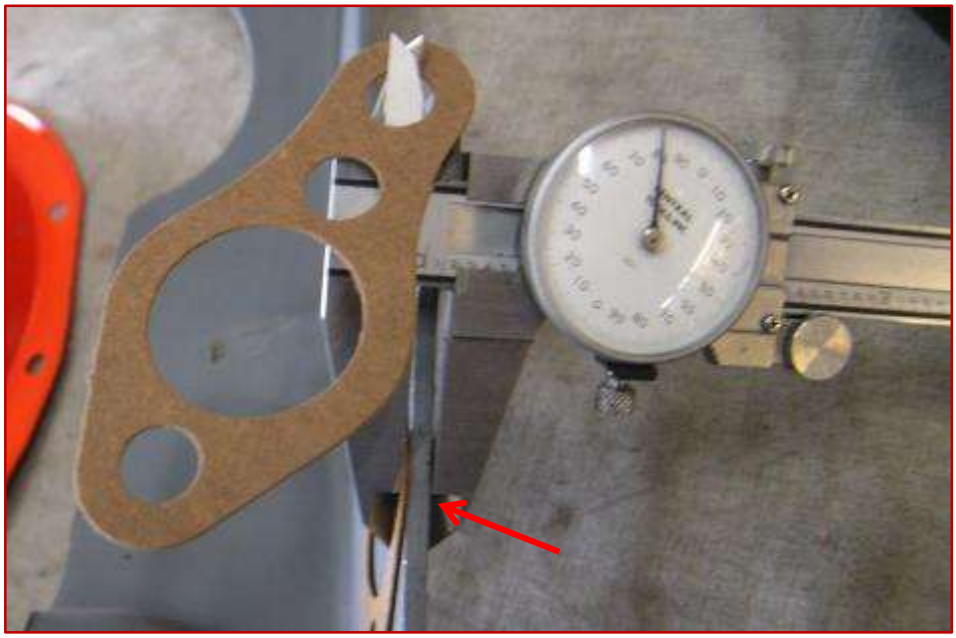
1956 - 1957 also used a 3 5/8" pulley, but it had no offset/space.



This photo shows the thickness of the engine-mount bracket.....approx. 0.150".



This shows the thickness of the engine bracket.....approx. 0.180" **including one additional water pump gasket**.



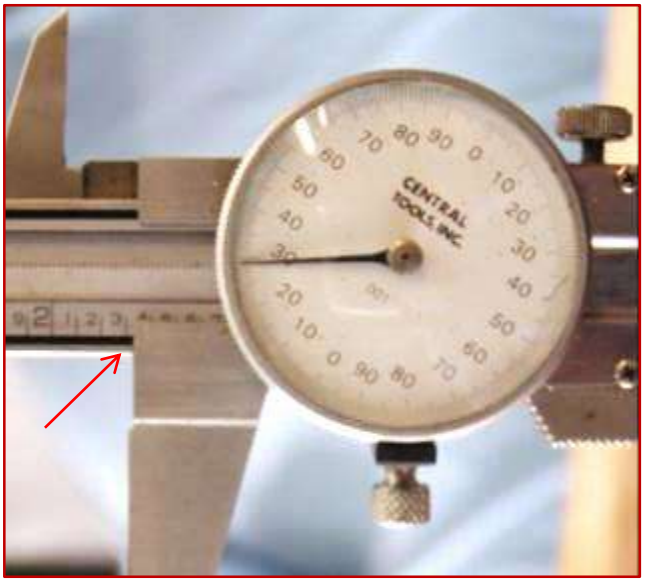
This is the Water Pump Pulley Reinforcement; GM part# 3720616. Pictured is a reproduction.

This shows the thickness of the Harmonic Balancer **Spacer**.....approx. 0.150"

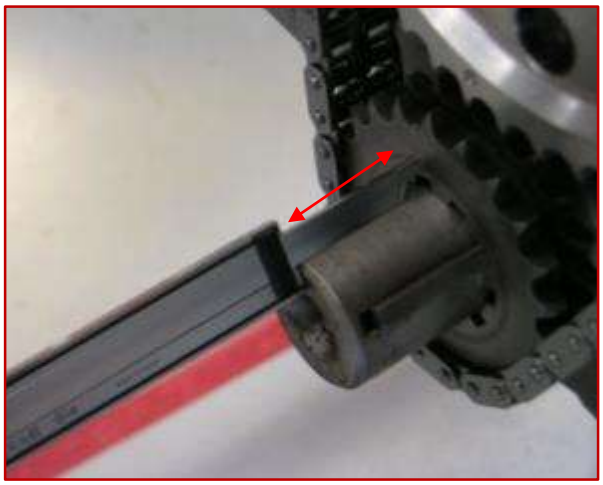
The WP pulley reinforcement is approx. 0.042" thick at its mount surface.

The photo below shows the height of the Harmonic Balancer; approx. 2 1/16" to the face of the outer ring.

The inner sleeve of the balancer snout measures approx. 2.330".

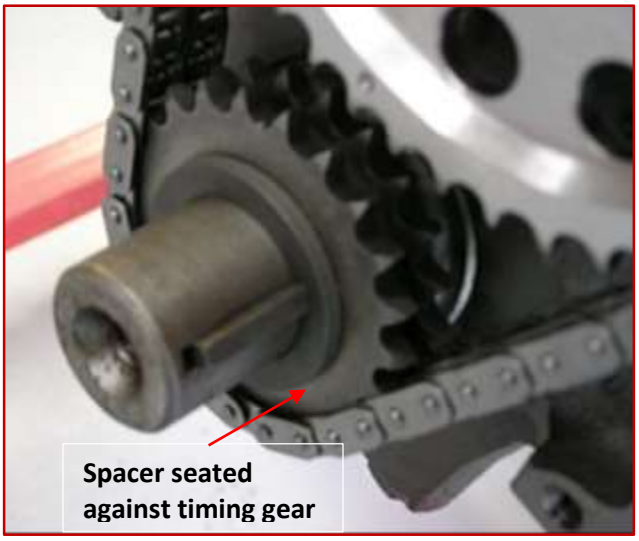


Here is the crankshaft before installation of the HB Spacer.

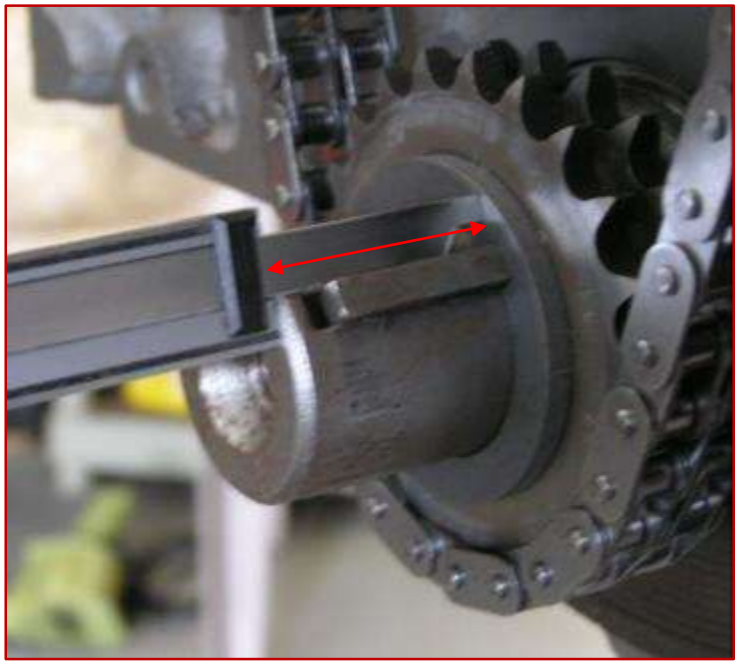


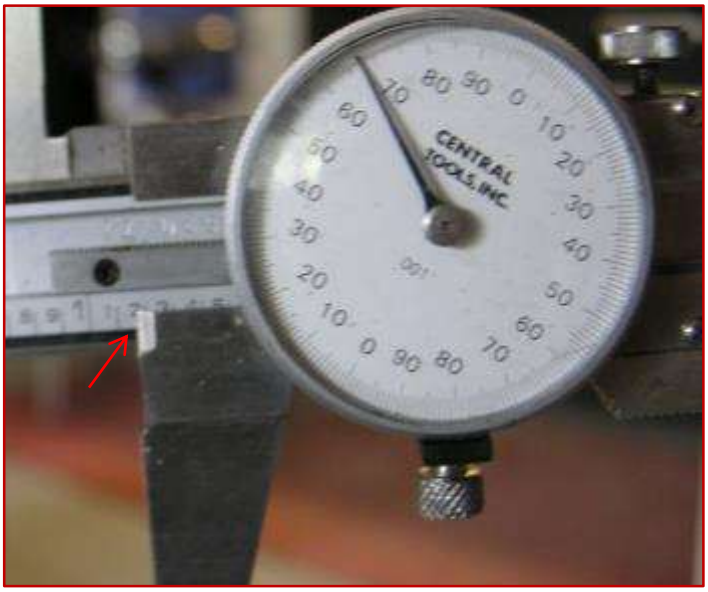
It measures approx. 1.330" from the face of the crankshaft timing gear to the front edge of the crank snout.

Here I am installing the HB spacer. This must be installed before the balancer is installed.



Here I measure the snout for reference after installing the spacer.

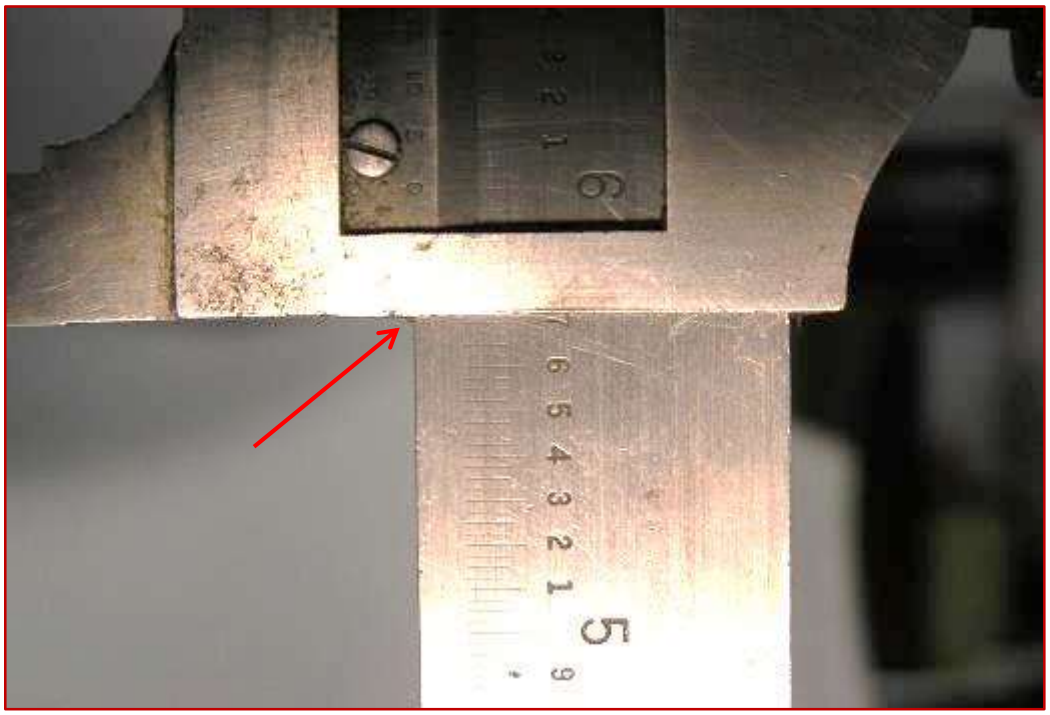




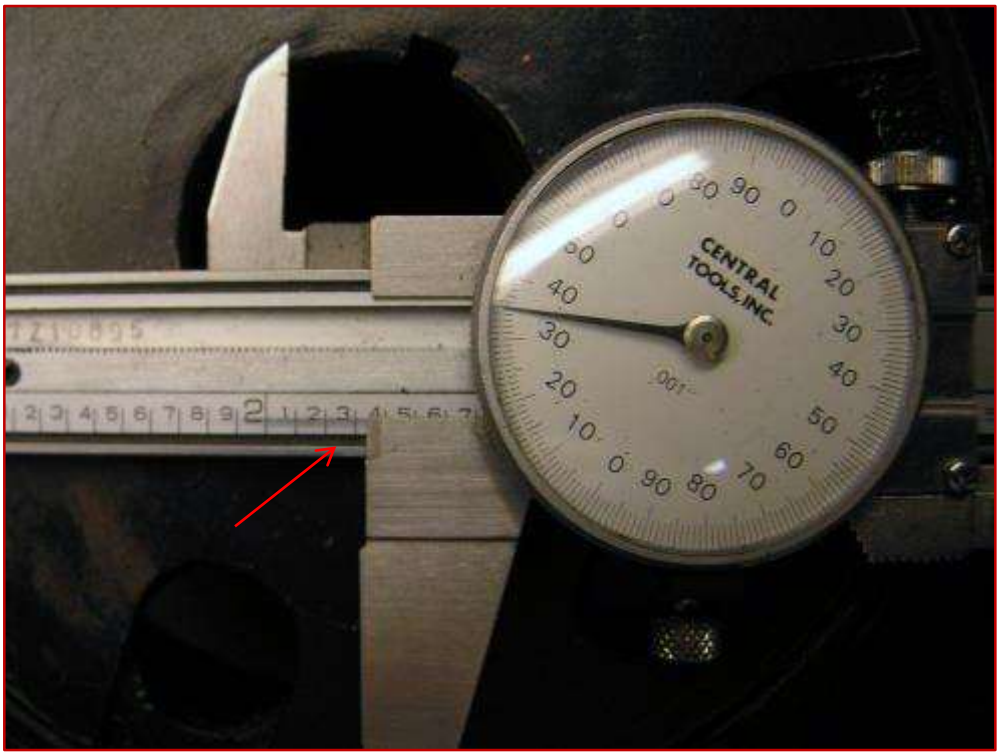
2.335"(HB Height) - (1.330"(Snout) + 0.150" (HB Spacer Thickness)) = 1.155" (I'm off a few thousandths in the numbers, hardly a factor)

When installed, the measurement from HB spacer to snout face is now approx. 1.165". You can use our found measurements before and after HB installation to verify if a HB spacer is installed in an unknown engine assembly. This is particularly important, as you don't want TWO HB spacers installed, and find out later when things don't fit, or worse, the HB gets launched at high RPMs in the future.

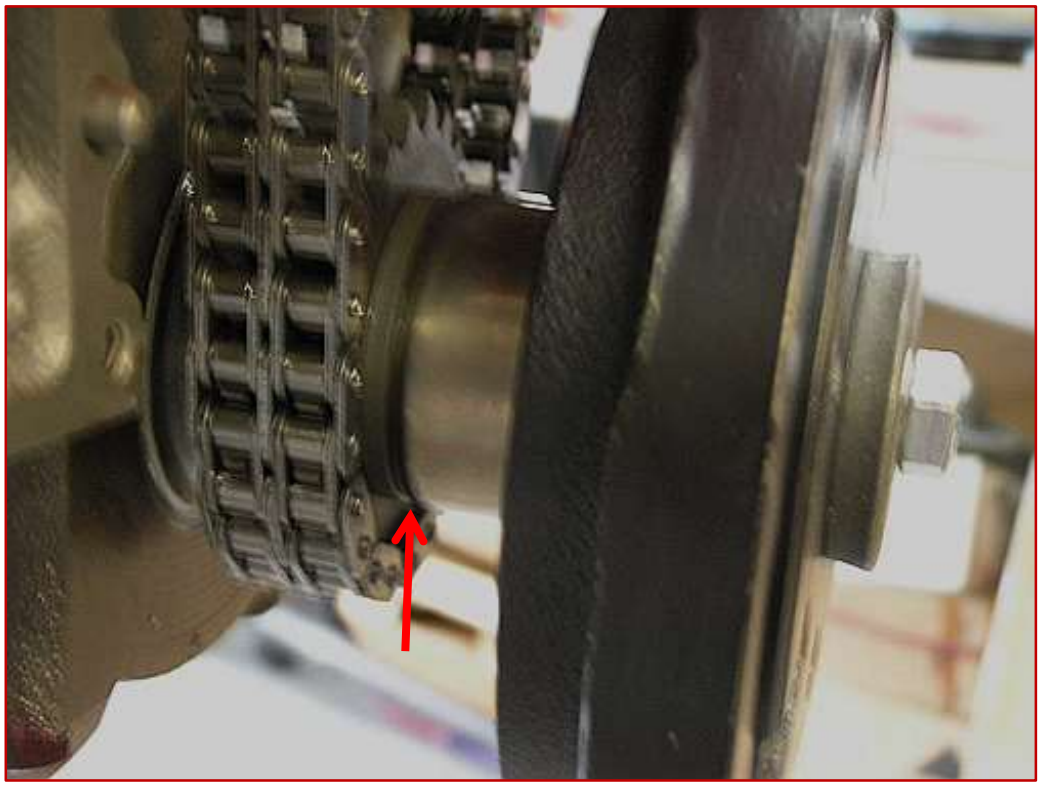
Some water pump considerations:
A standard Chevrolet water pump measures approx. 5.700" from the mount flanges to the top surface of the pulley hub. This is often a factor when buying a rebuilt pump, or one that someone has modified. Don't rely on "out-of-the-box" correctness. Measure it to be sure.



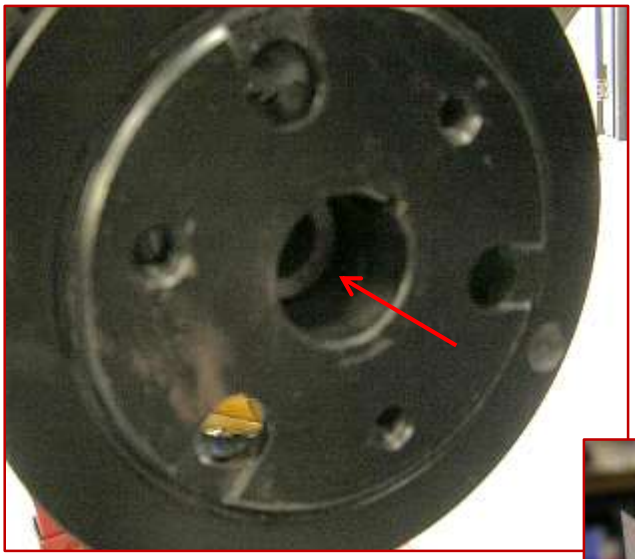
Measured again, the depth of the HB from the end of the mount hub to the front edge of the pulley hub is 2.335".

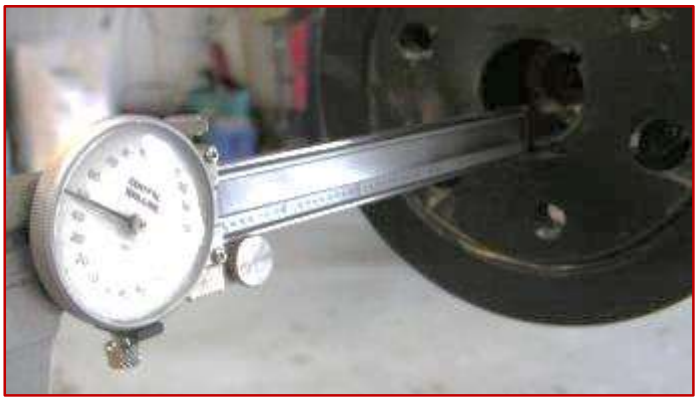


Here you can see the installed HB against the spacer. It was drawn in tightly.



Here is the end of the crankshaft through the hole in the HB. It measures 1.150" from crank snout face to edge of HB.

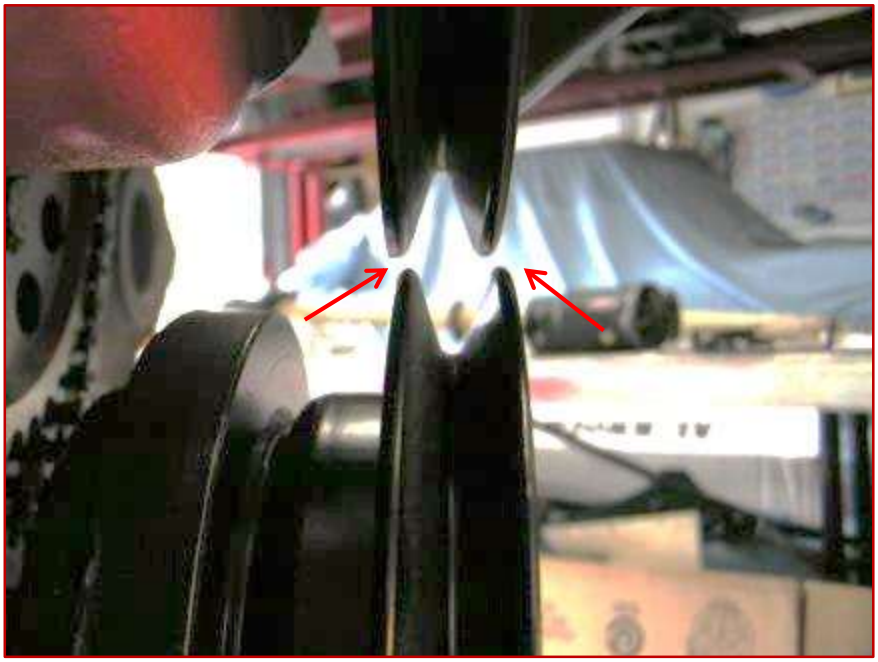


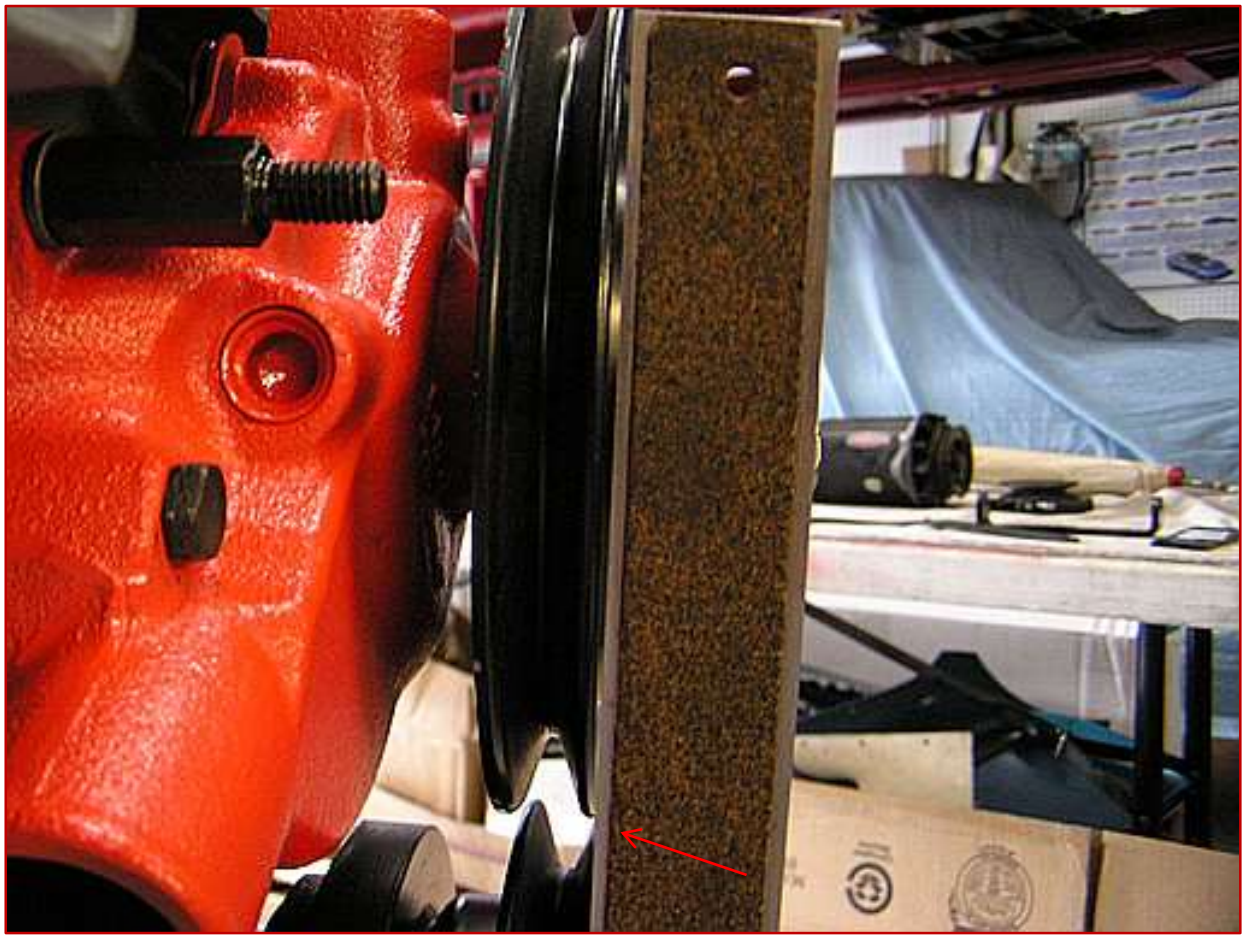


Here I've mounted the Water Pump using a gasket on each side of the engine brace. Note the 3/8" special stud (arrow) for the generator brace. I've also mounted the pulley to the HB.

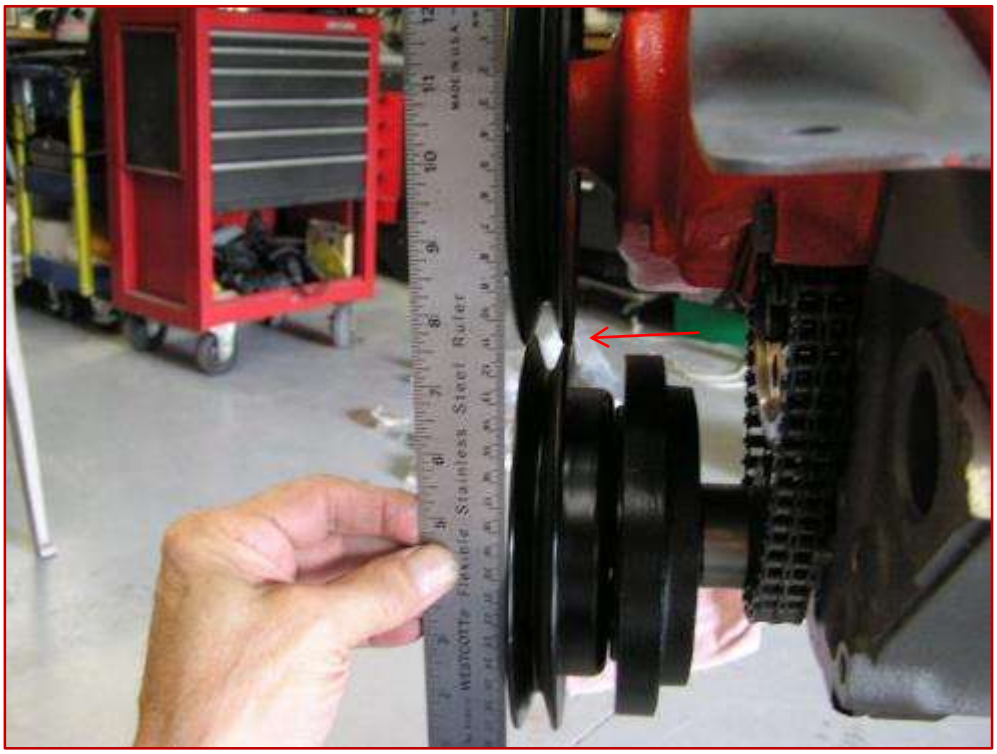
Here is the WP reinforcement mounted on the WP hub before the WP pulley is installed. This item should always be used as pulley condition and life will be extended.

As you can see below, there is a mismatch of the HB pulley to the WP pulley. It's off by about 1/8". Why is this? Variations in pulleys, water pumps and their hubs, and varying gasket thickness can play a role in these tolerances. But there are ways to correct these anomalies.





Here I have added one additional WP pulley reinforcement to help get better pulley alignment. This may not have been done at original build, as it's costly for many cars, but in your case it may make your build easier and produce a better finished product.

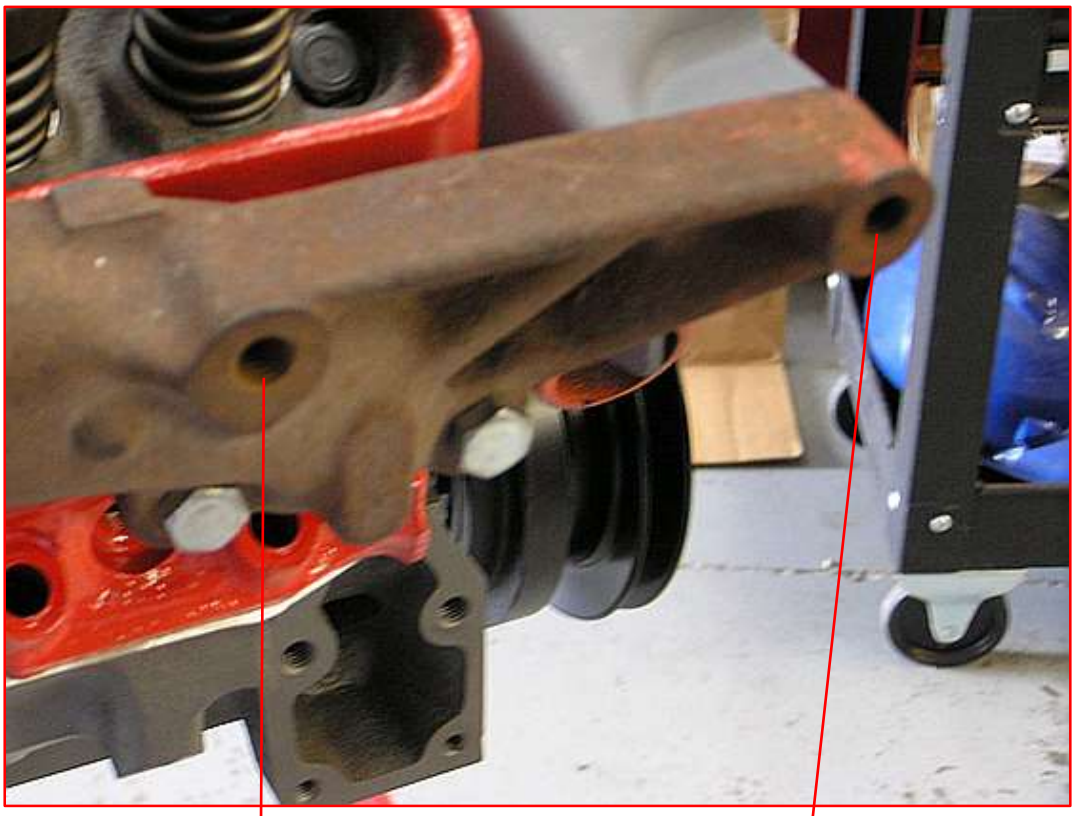


Now it's closer.

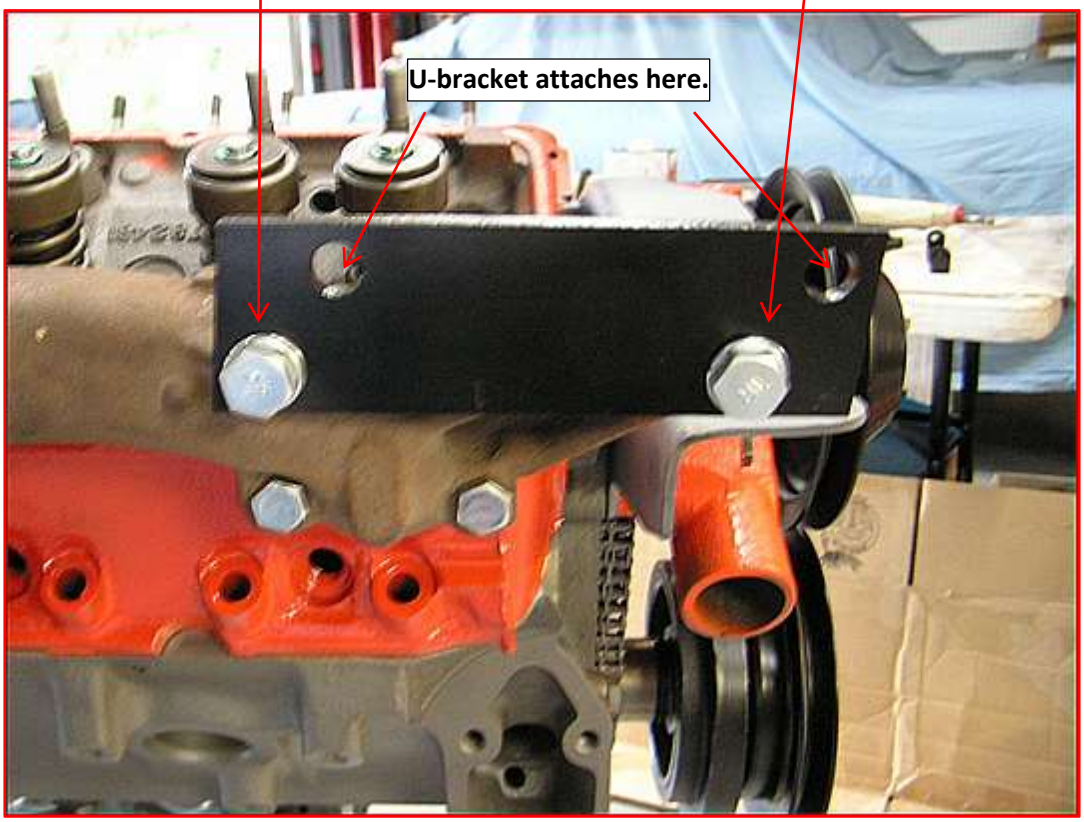
Another alternative to alignment is more involved. The Water Pump Hub can be adjusted to match, or can be adjusted to correct rebuild shop errors when it was installed. In this case, the hub could be "Pulled" forward using a 3-jaw puller to make up the difference. Do this very slowly and carefully, as you do not want to pull it too far out. **Proceed in small steps and measure carefully between steps.**

If the hub needs to go rearward, the pump MUST be removed from the engine and partially dismantled. After the WP rear cover is removed, a press will be needed to push the hub downward the required amount. A small diameter socket is held against the rear of the shaft where the impeller sits, to ensure that the impeller location is not altered on the shaft.

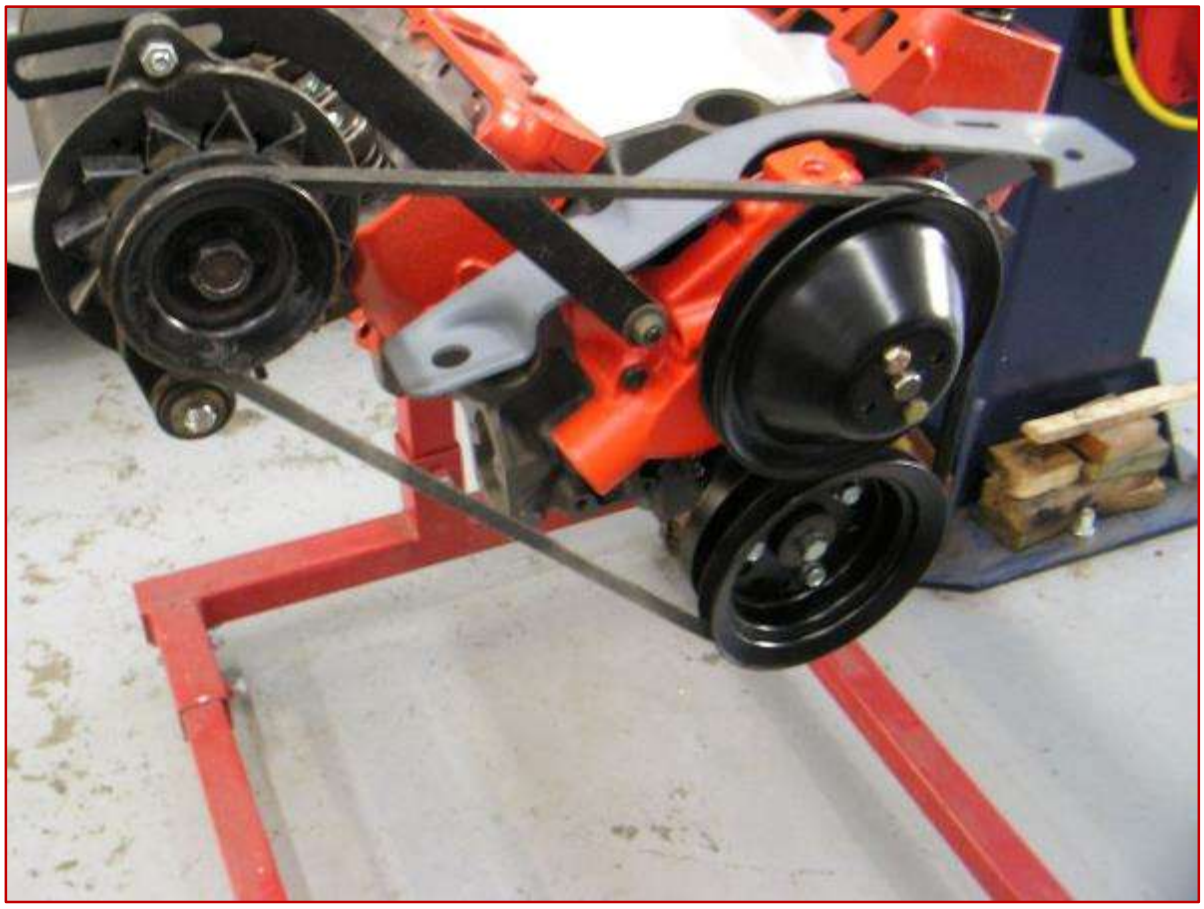
Here is the exhaust manifold boss to attach the generator brackets. Make sure the threads are clean by using a thread restoration die. It has a bottoming end to allow you to get very deep into the threads.



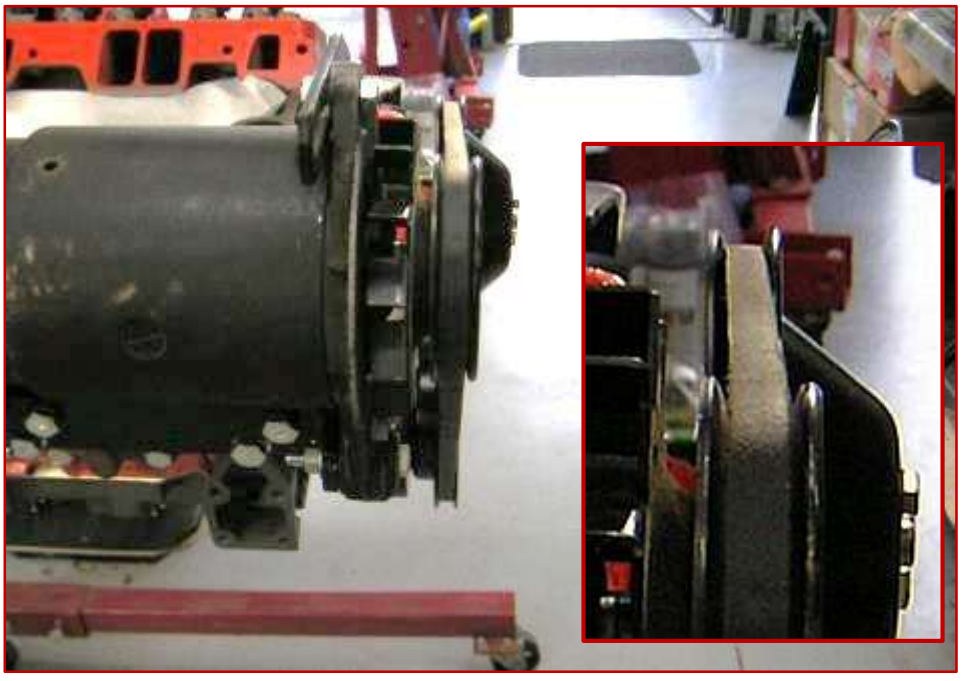
Here the main offset bracket is installed directly to the manifold.

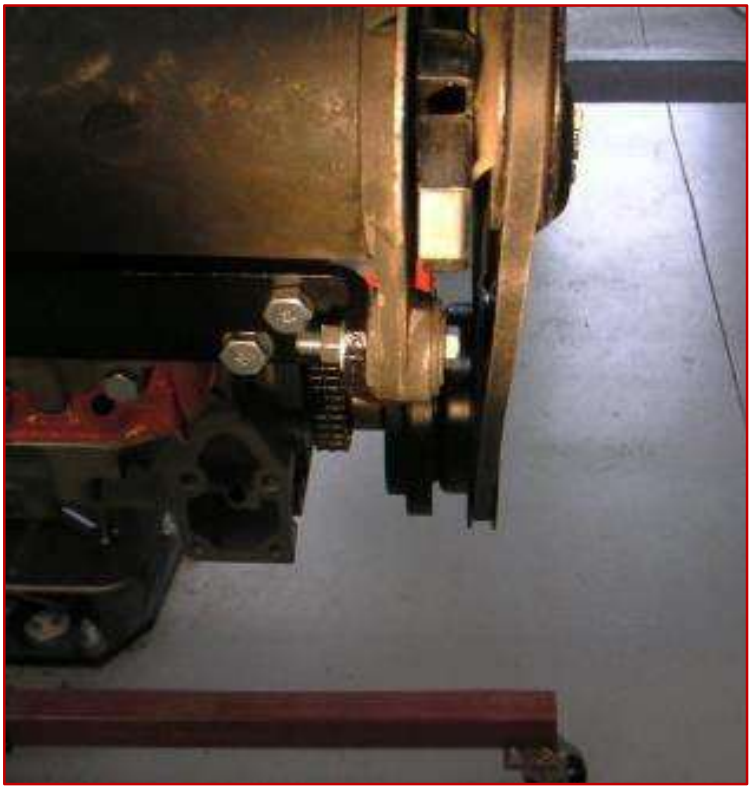


This is where you must make unconventional "adjustments" to the brackets and generator to achieve optimum alignment.



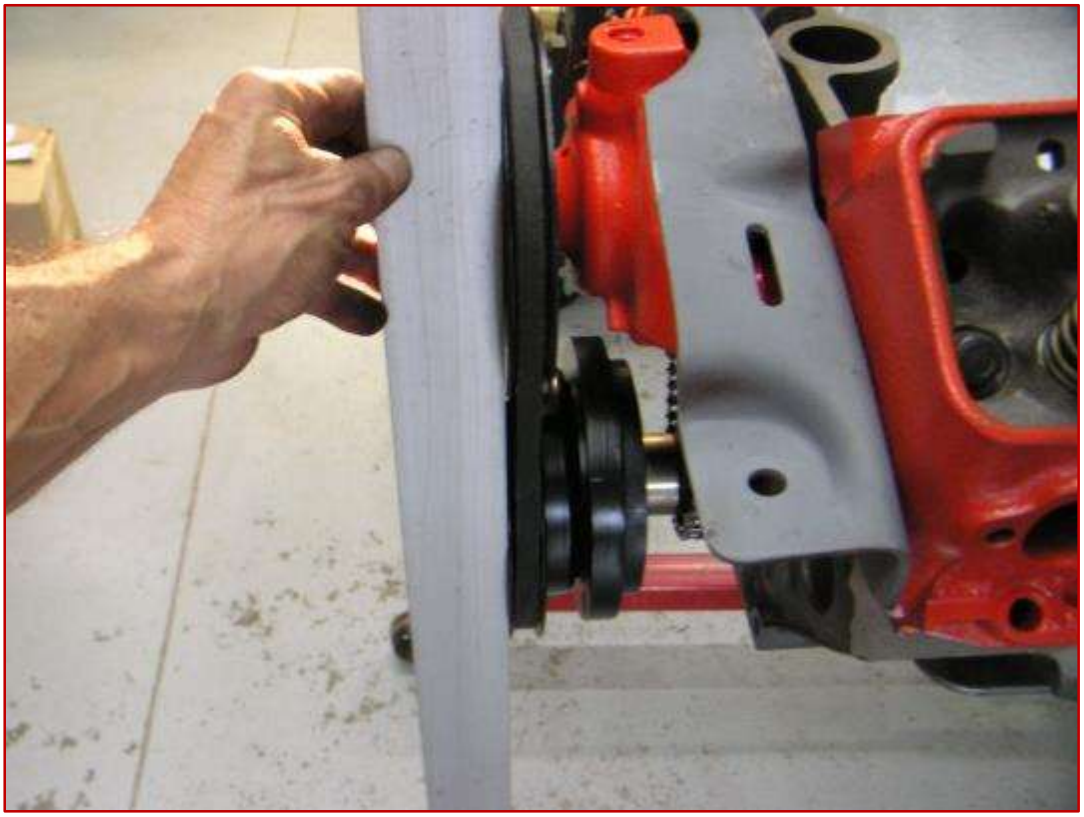
Here is the generator using the correct offset pulley again. It's off approx. 1/8" forward, measured using a straightedge as shown below. You can see the alignment error in the photo by looking at the belt as it exits the top of the generator pulley.



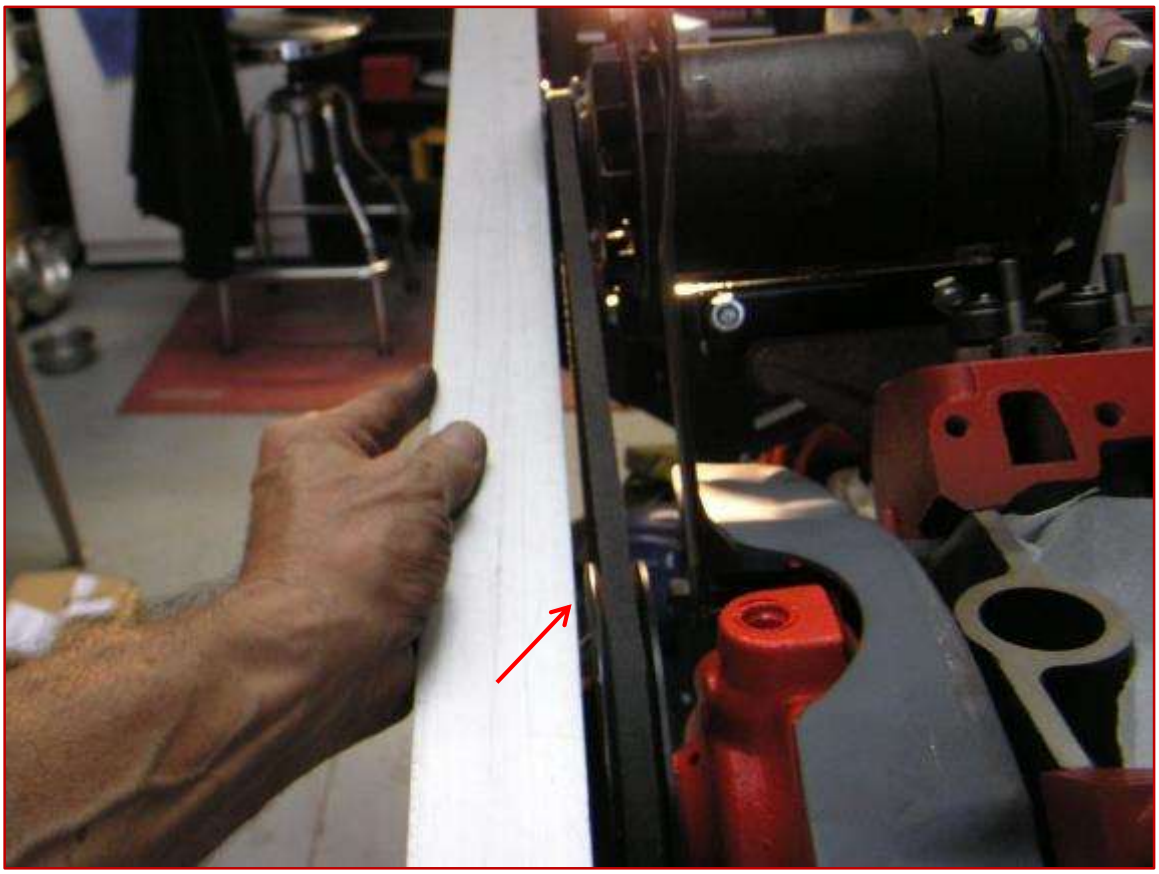


Note the rubber bushings on the lower mounts. One side has a flat outer ring. Insertion direction of these bushings in the generator end-frames can help offset small variances in the alignment. The pointer shows a ridge on one side of each bushing. Replacement bushings do not always have this feature. Because of this, the generator can move forward or rearward when tightening the adjustment brace while pulling the drive belt tight.

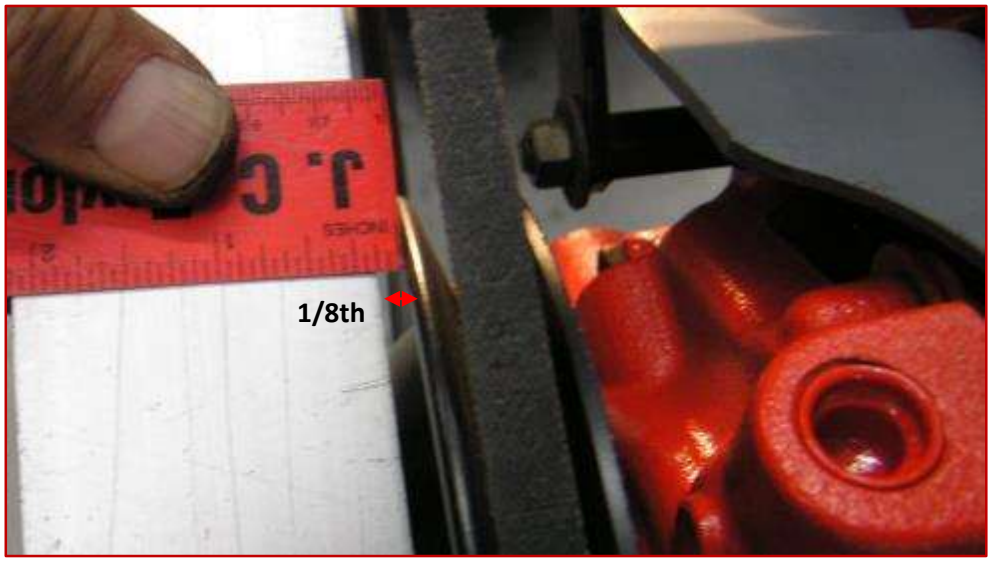
I check HB to WP pulley alignment to verify it's correct.



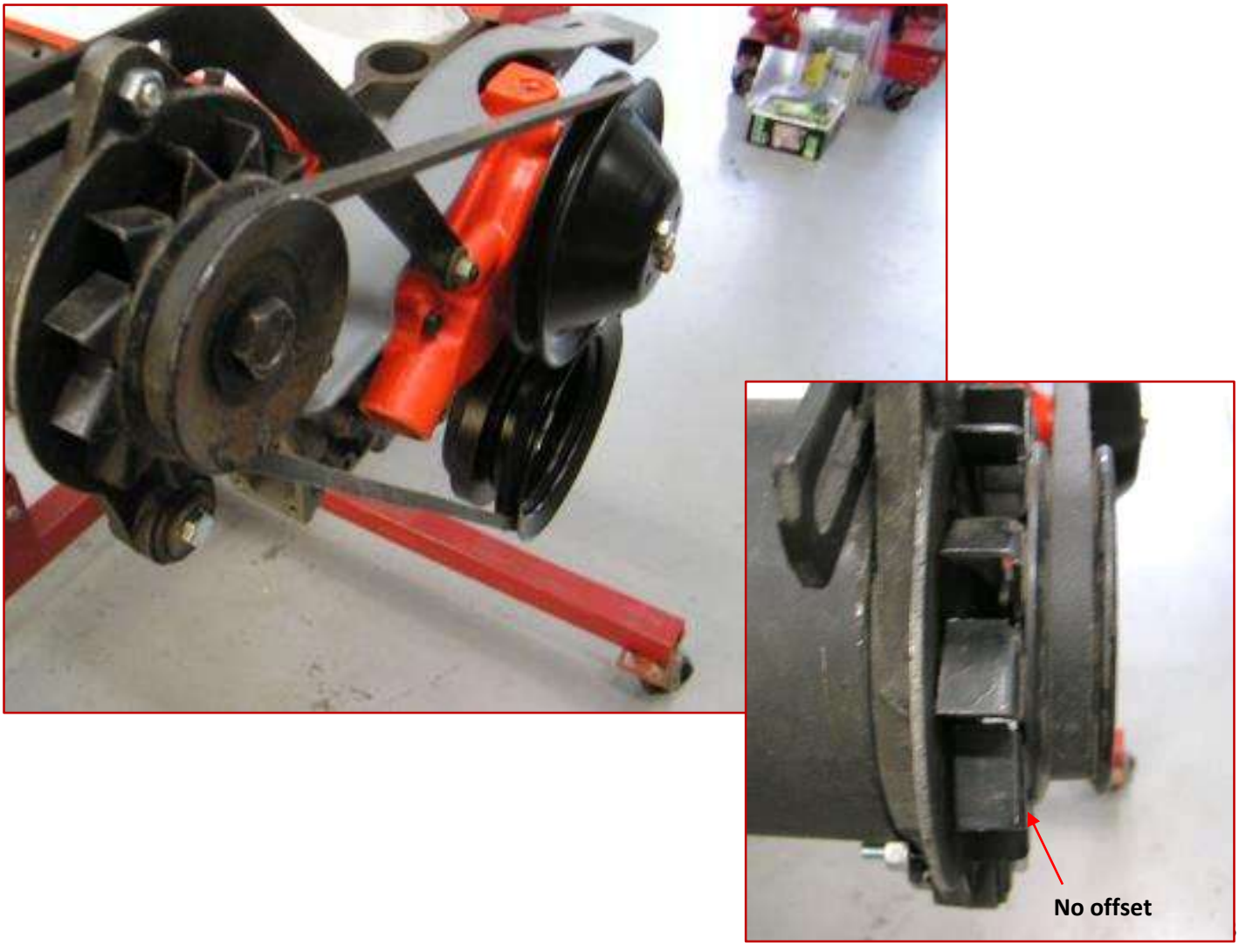
Here I've placed the straightedge against the generator pulley to see the alignment error at the WP pulley.

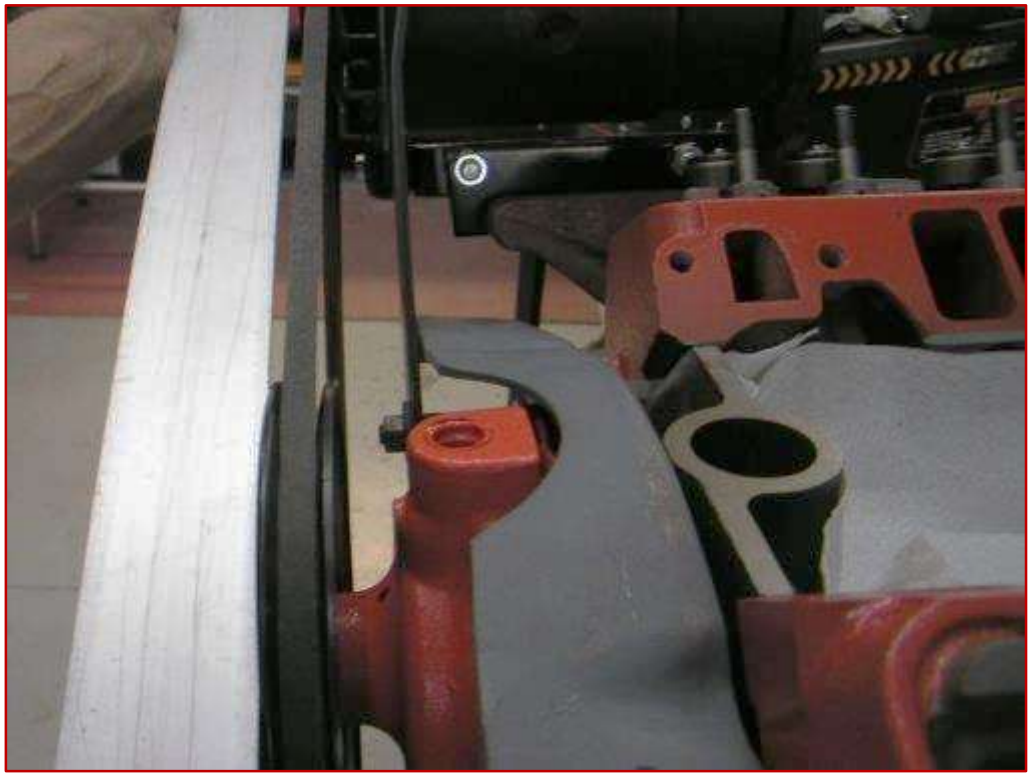


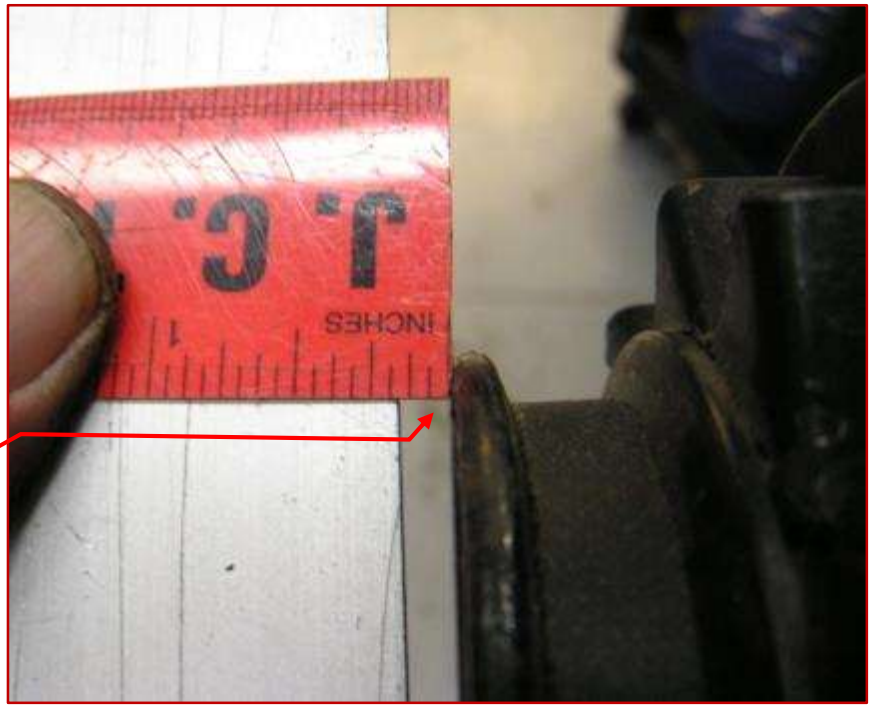
It's off approx. 1/8".



Here I've installed the NO-offset generator pulley as an experiment. It now shifts the alignment error rearward.

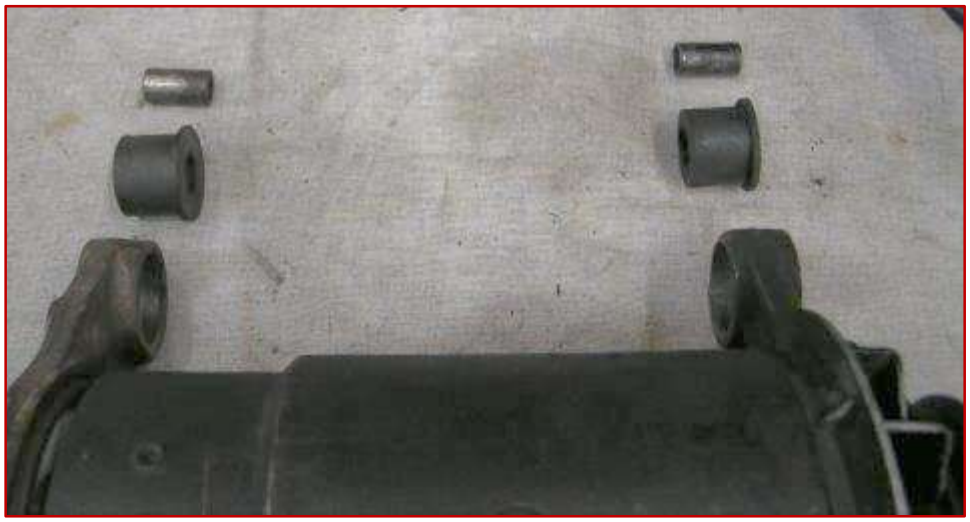






Approx. 3/16" error rearward using the **NO-offset** pulley.

Here are the generator bushings to show their profiles.

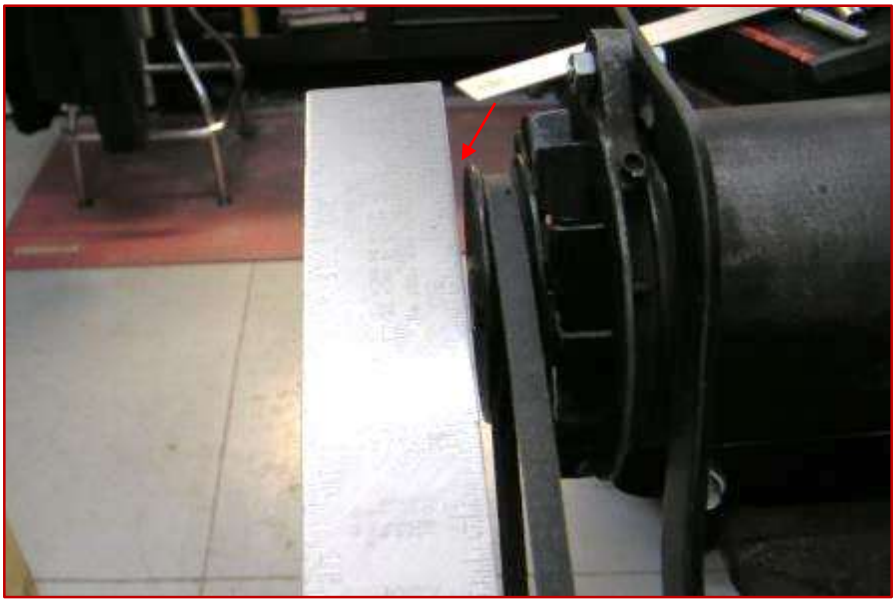


I've reversed them in the end frames.

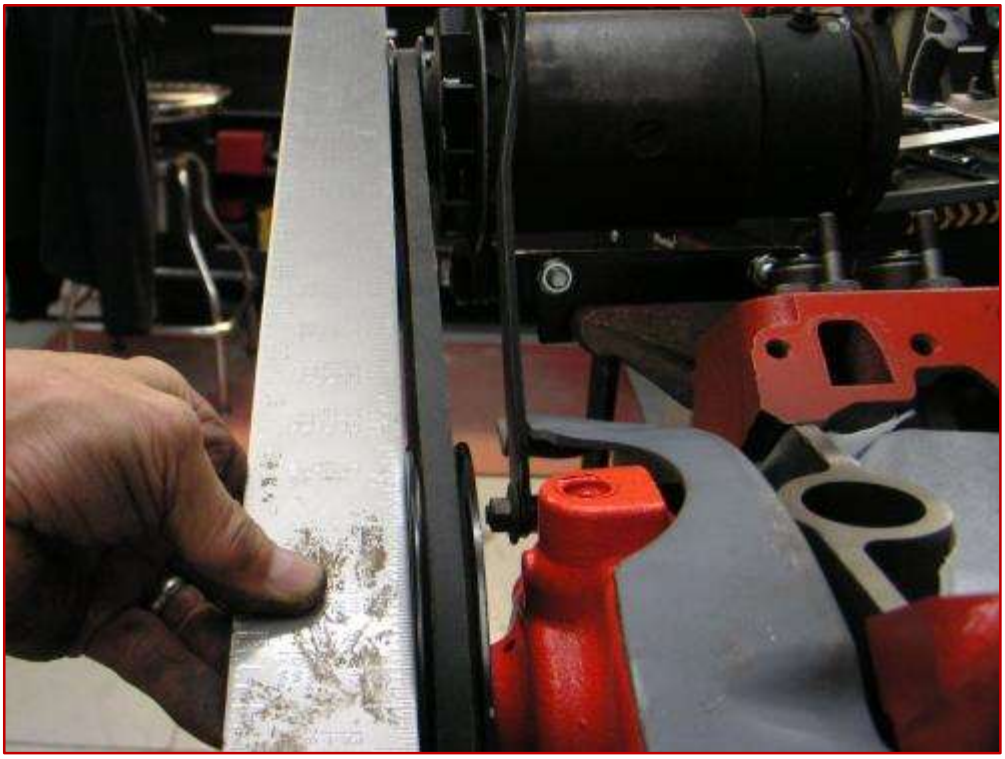
And remounted the generator.

Checking alignment again with the reversed bushings.

It's still too far rearward. This pulley will not work.

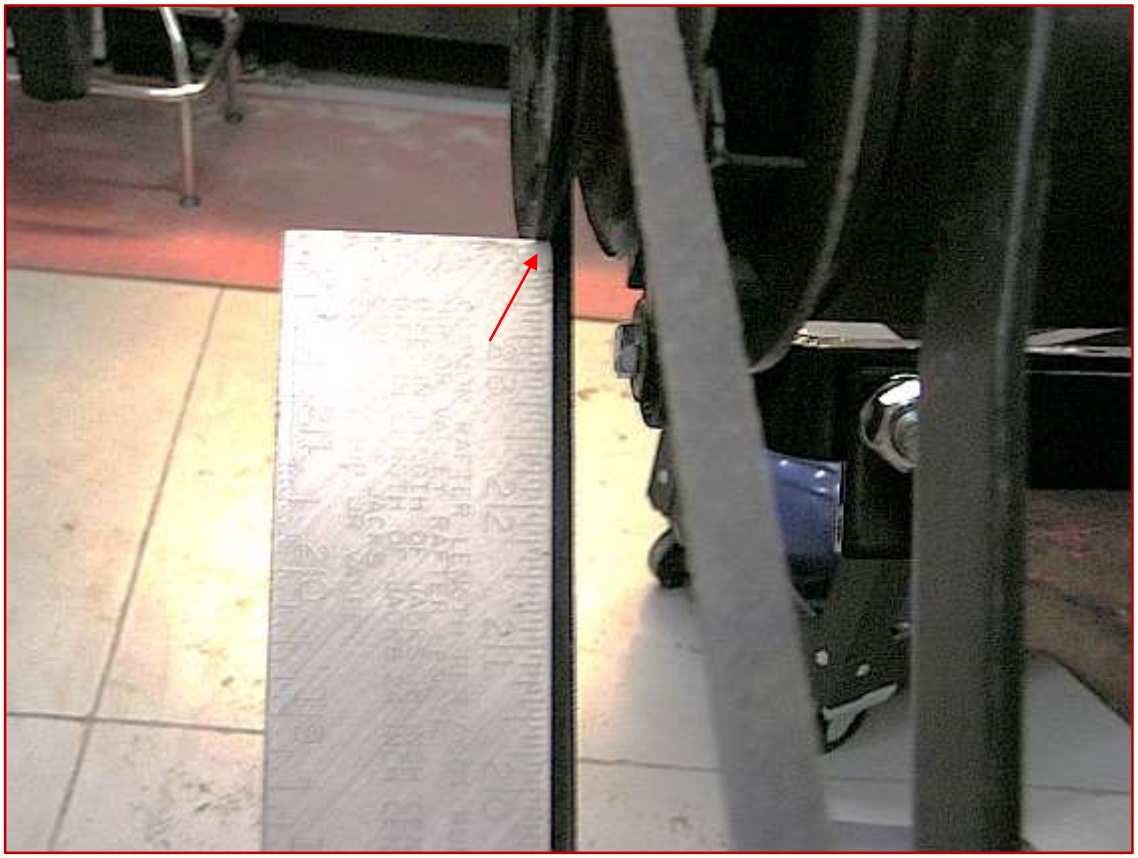


Here I have I reinstalled the offset pulley. With the rubber bushings reversed, the alignment is closer to the WP pulley.



However, when the straightedge is placed between the HB pulley and generator pulley, a small error persists, this time forward.....

....as shown here.



Then by loosening the generator U-Bracket, and manifold bracket, as there is a small amount of play in the holes of those mounts, I was able to align the generator even closer to both pulleys.

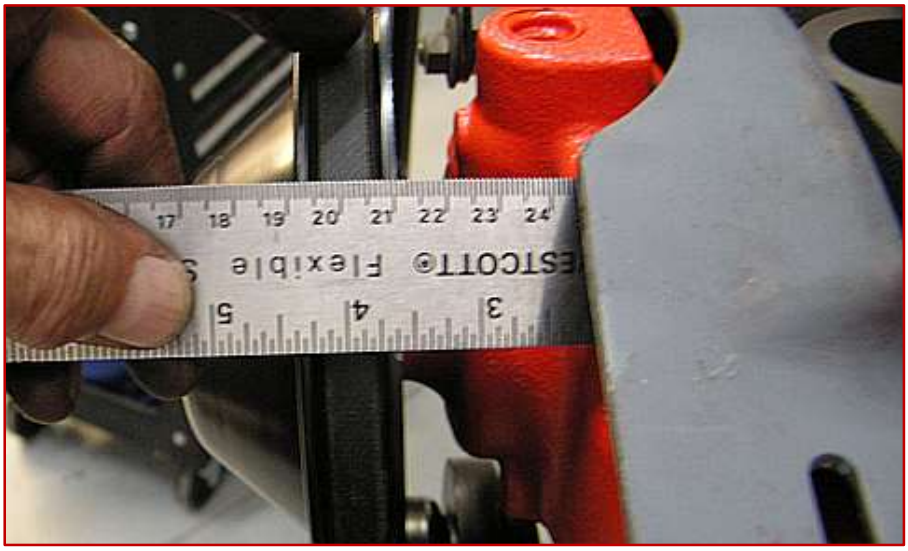
The idea here is to sometimes "cheat" a bit here or there to get proper pulley alignment; after all of the correct bracket and pulley hardware is installed.

- The Harmonic Balancer spacer MUST be installed as a baseline for ALL other alignments.
- The Water Pump Hub must be properly installed and spaced on its shaft for proper alignment.
- The generator pulley MUST be the correct offset type for proper alignment.

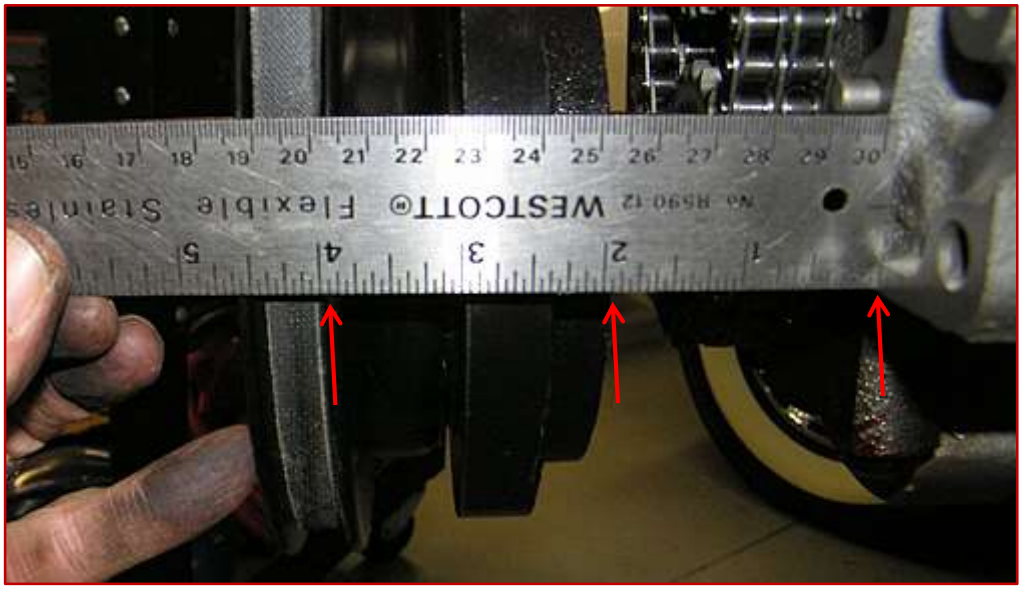
Once all of the correct pulleys and brackets are installed, slight adjustments can be made at other mount points to get the ideal pulley and drive belt alignment.

Here are a few additional measurements for reference.....

Face of engine mount brace to Water Pump Pulley.



Face of block (adjacent to Timing Cover) to HB ring and HB pulley.



End.

Addendum A - Generator U-Brackets

There a 4 different U-Brackets based on application. All 4 with dimensions are shown below.

GM part# 3728514 1956-1957 Non-FI
1 11/16" H x 6 7/64" OAL

GM part# 3750548 1958-1961 Non-FI
1 7/8" H x 6 5/8" OAL

GM part# 3750876 1958-1959 With FI
& High-Lift Camshaft
1 5/8" H x 7 1/8" OAL

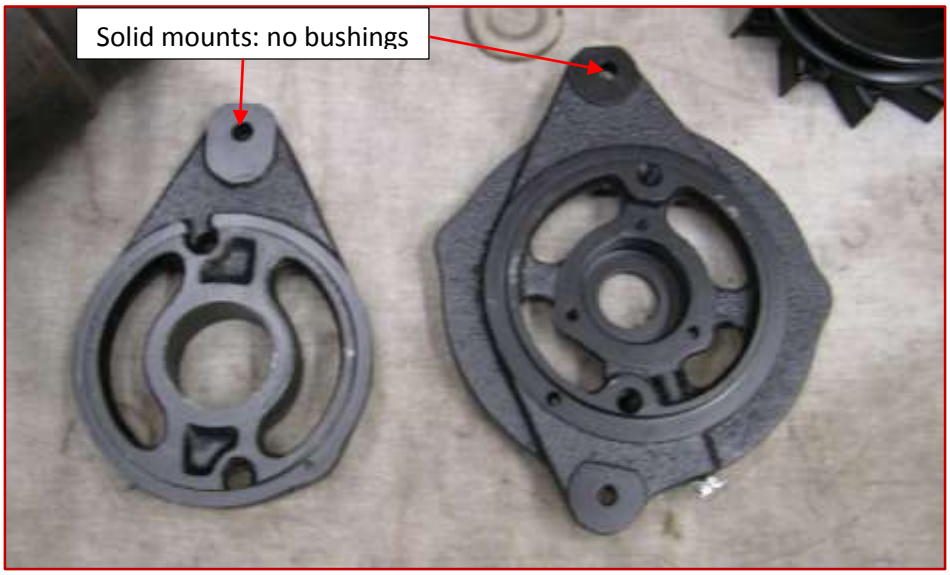
GM part# 3768152 1958-1962 With FI
(Hydraulic and? H/L Camshaft) ?? unsure
1 5/8" H x 7 1/8" OAL

Addendum B - Fuel Injection Applications

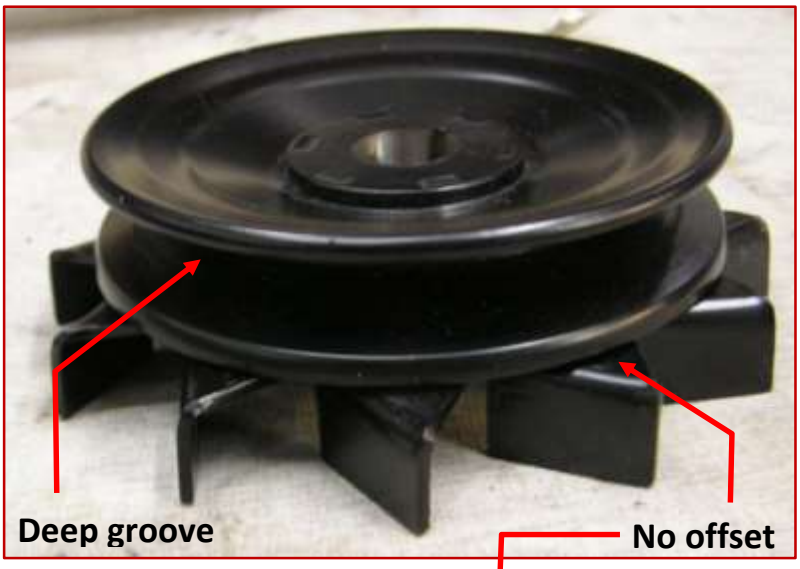
Here I've removed the **1102043 30 amp** generator and have set up the **1102268 35 amp** generator for trial fitting on this 1961 engine. This 2nd design generator is used on High-Lift camshaft, solid-lifter engines. The 1st design generator is 1102173. It has a different drive end-frame. 1958 to 1960 FI generators vary in their part numbers and configurations. Since this is a 315HP engine, I will concentrate on this only, but the principles of assembly and alignment will be similar.

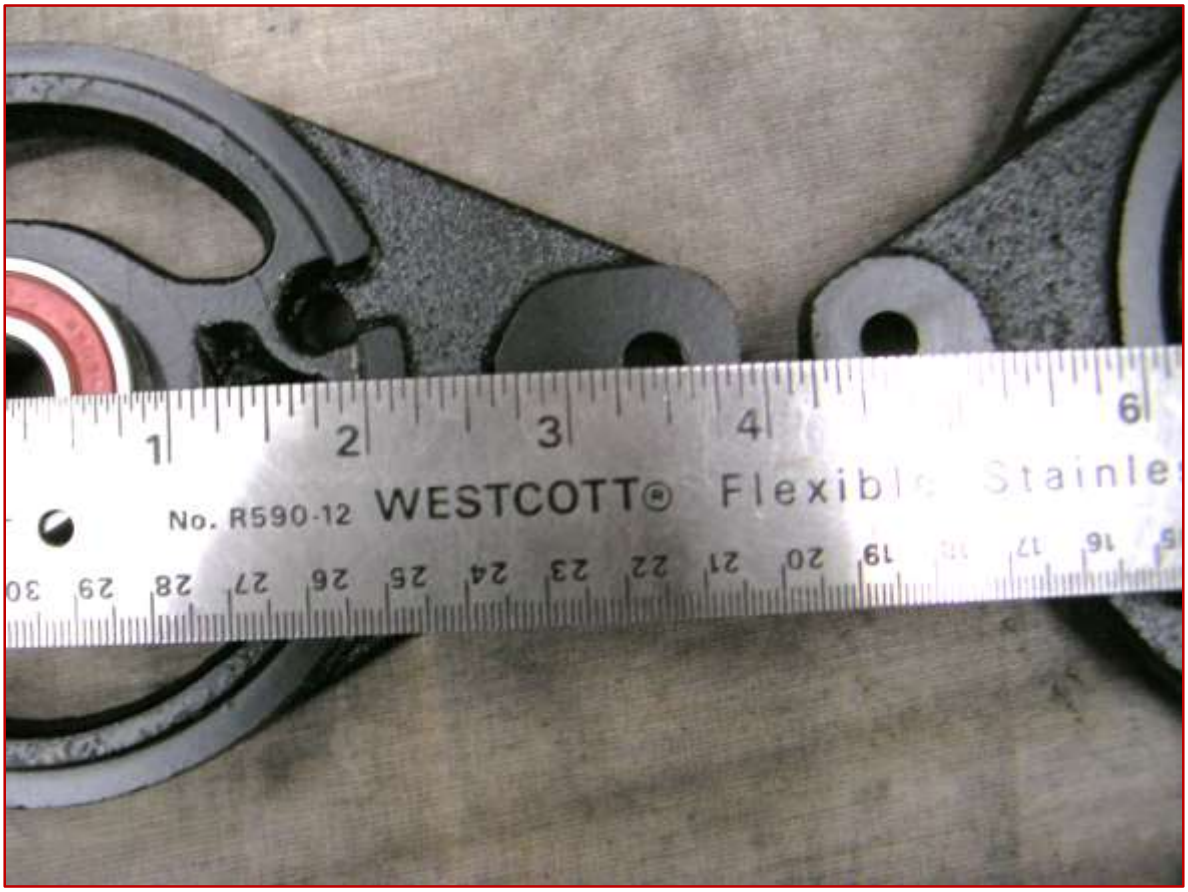
This 1102268 generator is unique as it has **no tachometer drive**, a large bearing cap on the commutator end-frame, and both end-frames contain **solid mounts with no rubber bushings**. It requires a different U-Bracket mount, the 3768152 (bottom bracket in figure above), which is spec'd at 1 5/8" H x 7 1/8" over-all length (OAL) with offset mount holes.

Here is the generator in pieces before I did a trial reassembly. Note that it's spacing between the armature shaft and mount holes is **3 1/2".** Non-FI generators with tach drive are spaced **3 1/4"**. This can get confusing, as the Passenger car and Truck base generators are also spaced at **3 1/2"**, as is the 1102268 generator.



The pulley for this application is 4" diameter, with NO offset. Also Deep Groove




No. R590-12 WESTCOTT®


3 ½” from armature shaft center to bracket mount hole.
No. R590-12 WESTCOTT® Flexible

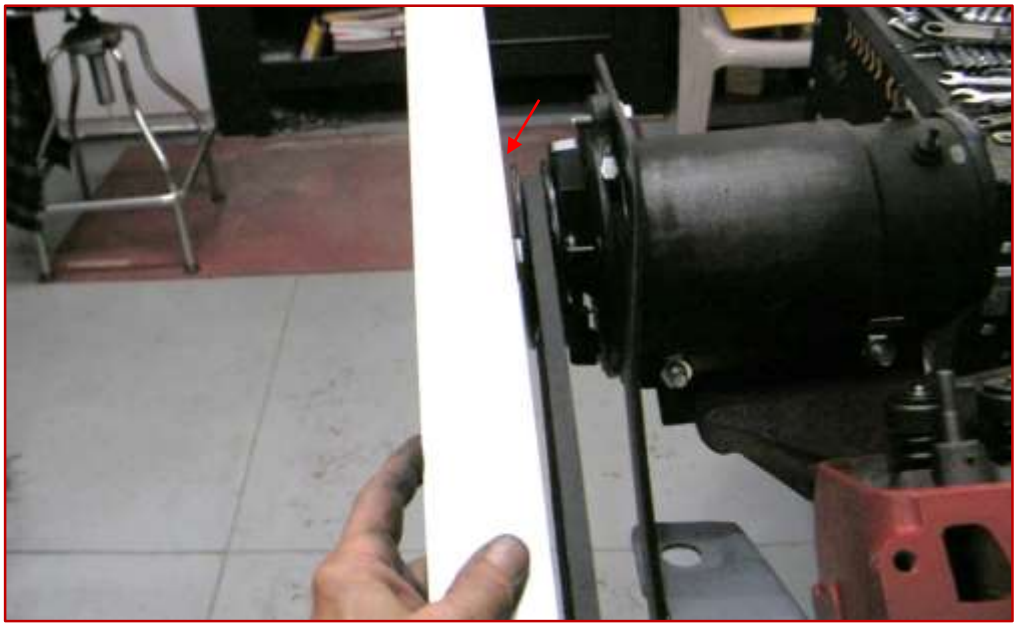

Solid mounts: no bushings


Commutator end

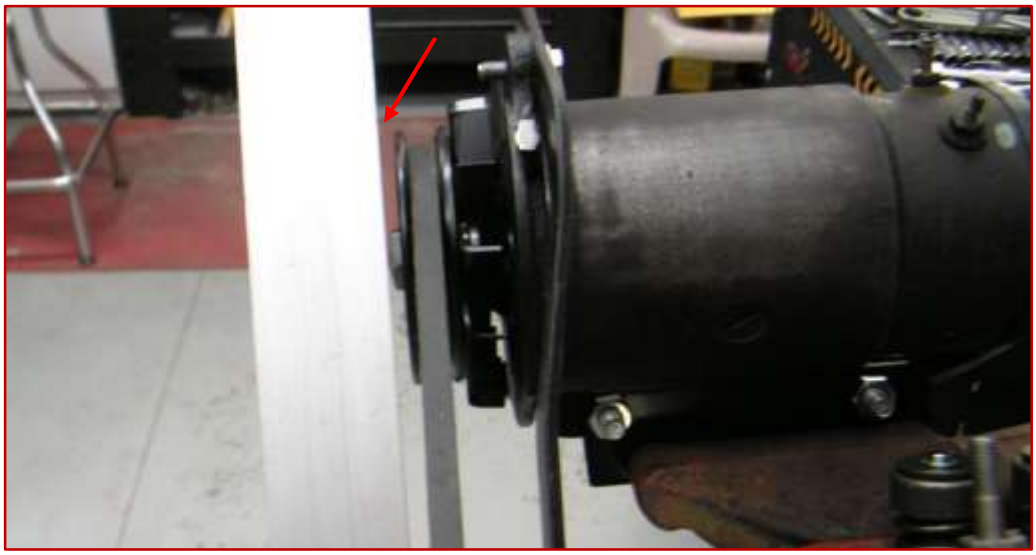
This is the FI exhaust manifold, note the **absence of the access hole** for a fresh-air carburetor choke tube.

Here the generator is mounted showing the U-Bracket. Note the solid mounts.

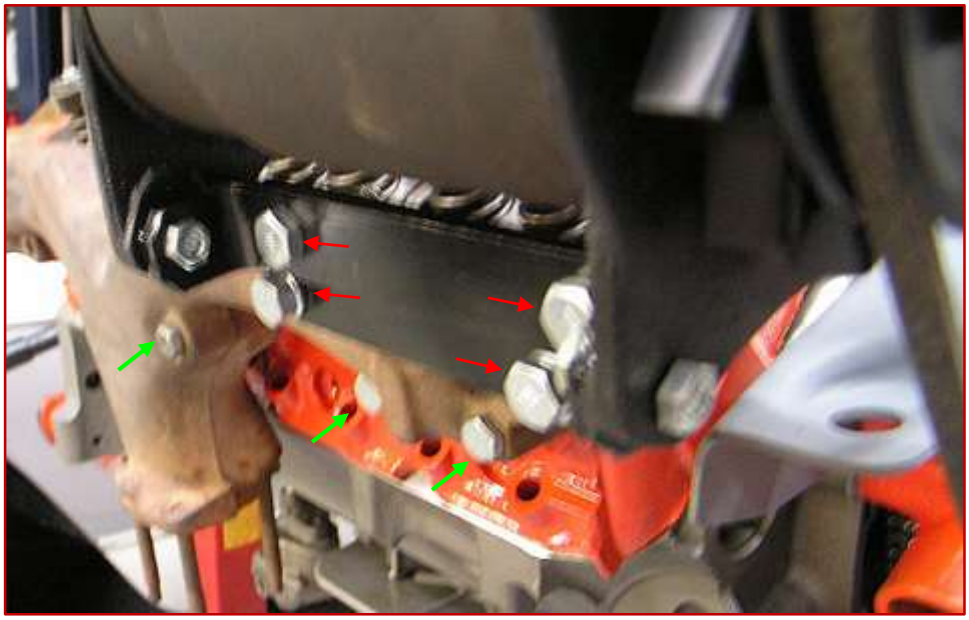
When first attached, alignment was off about 1/8"....

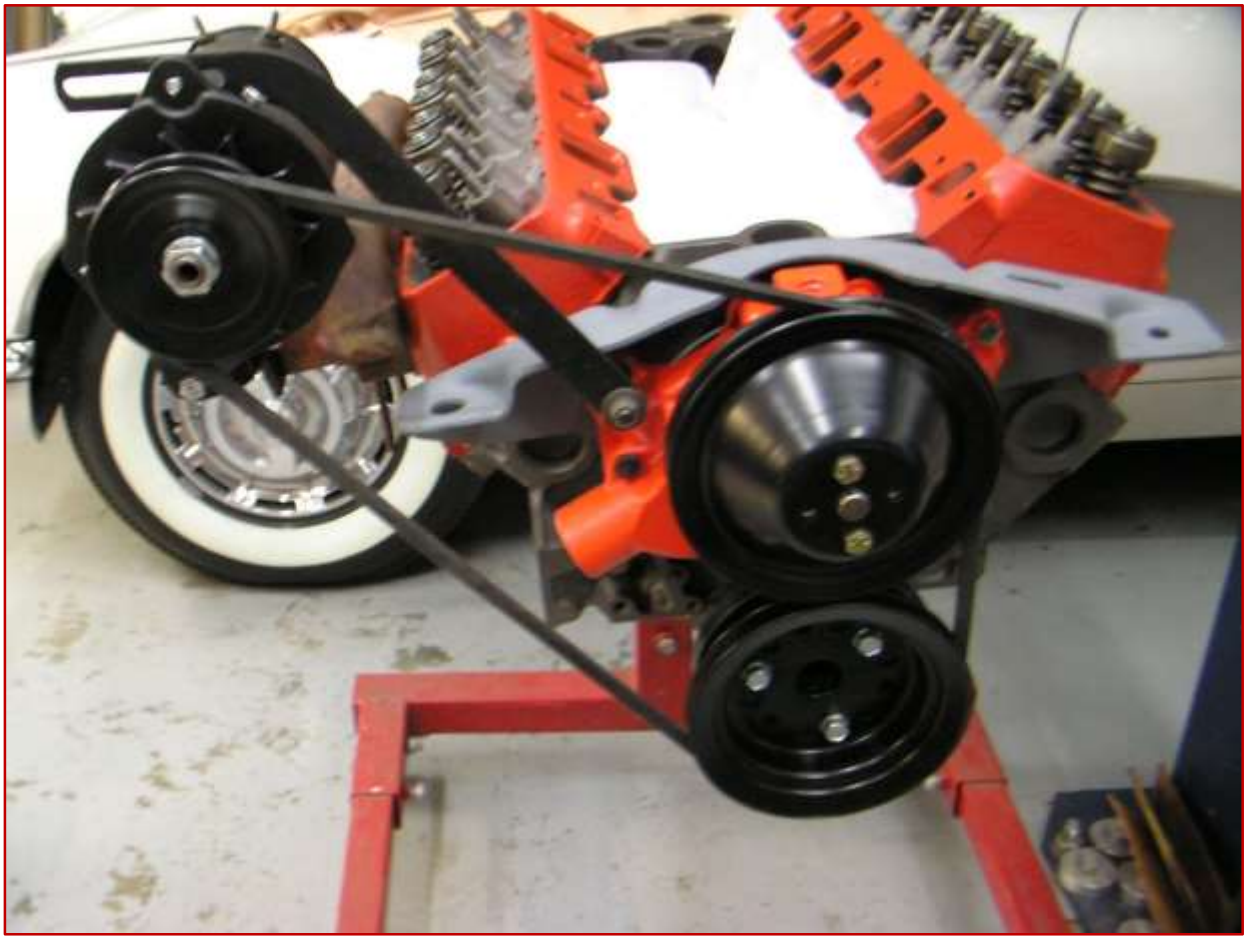


....as seen more closely here.

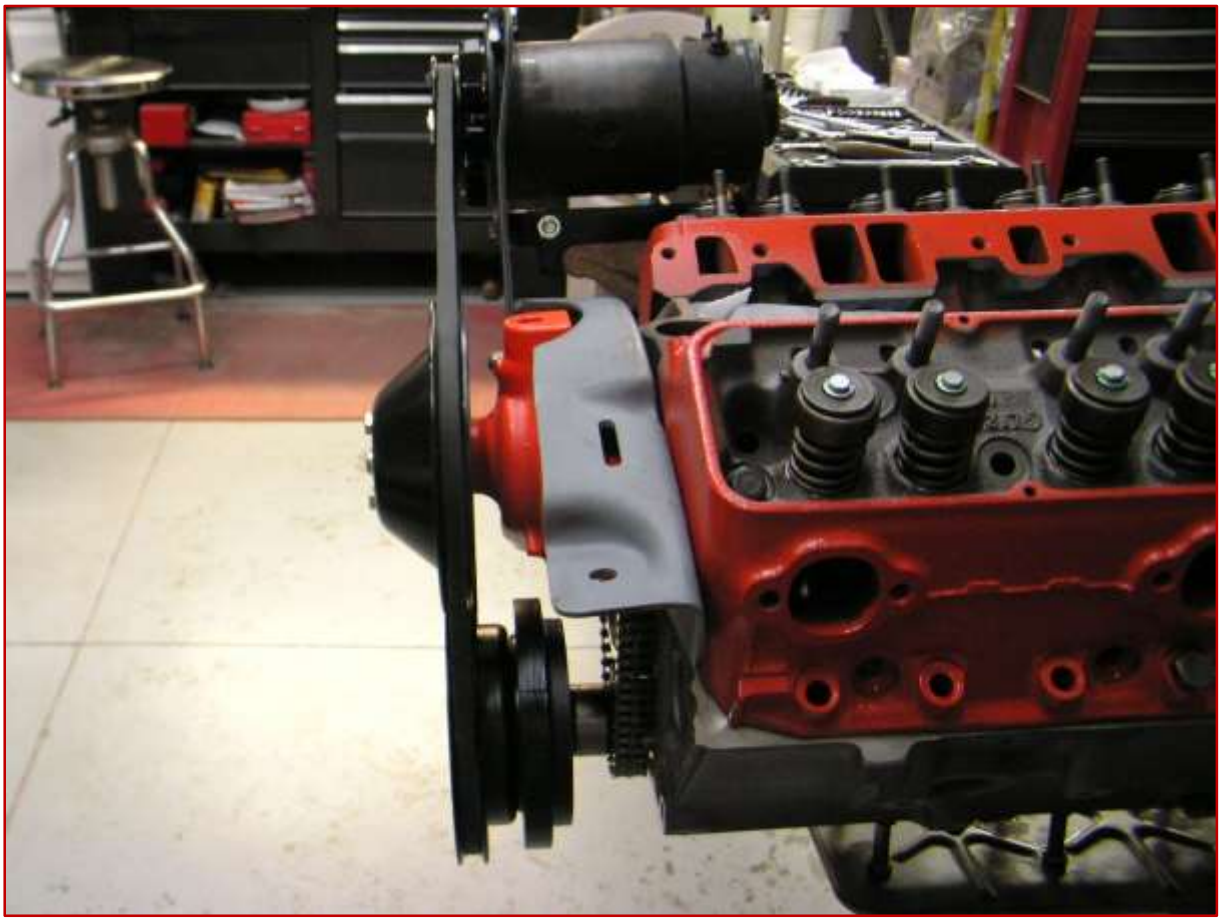


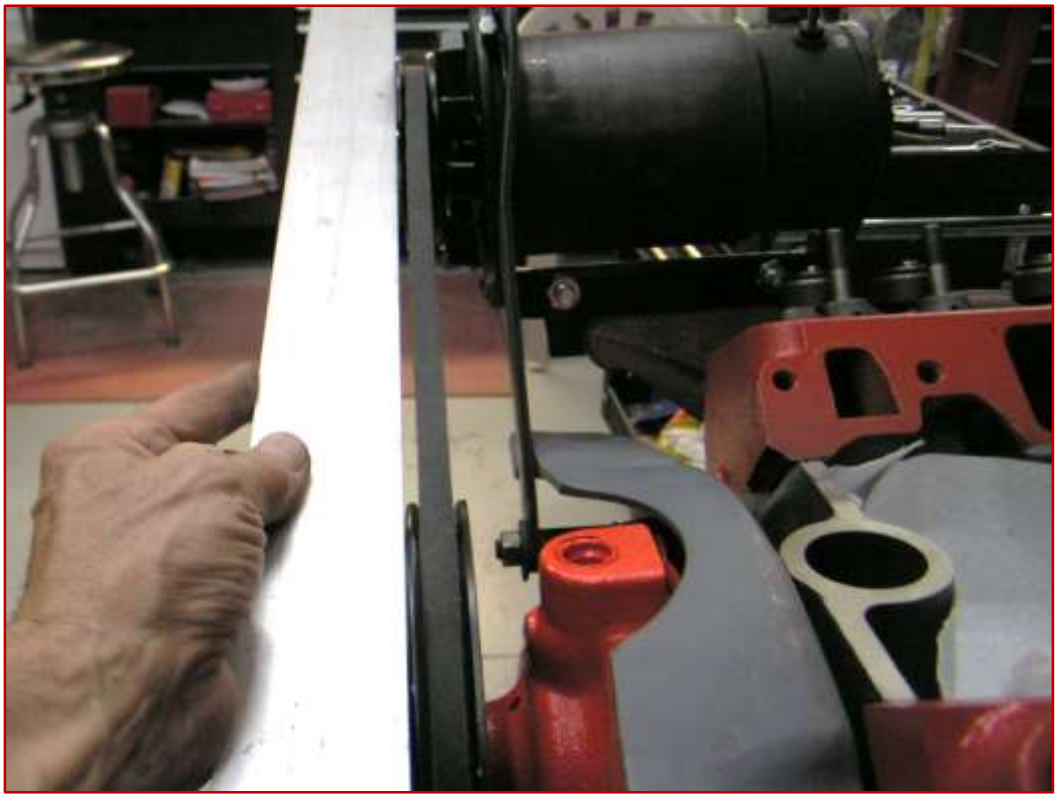
By loosening all bracket bolts, as well as the exhaust manifold bolts, and then pulling everything more forward before re-tightening, I'm able to bring the alignment in to near perfect.





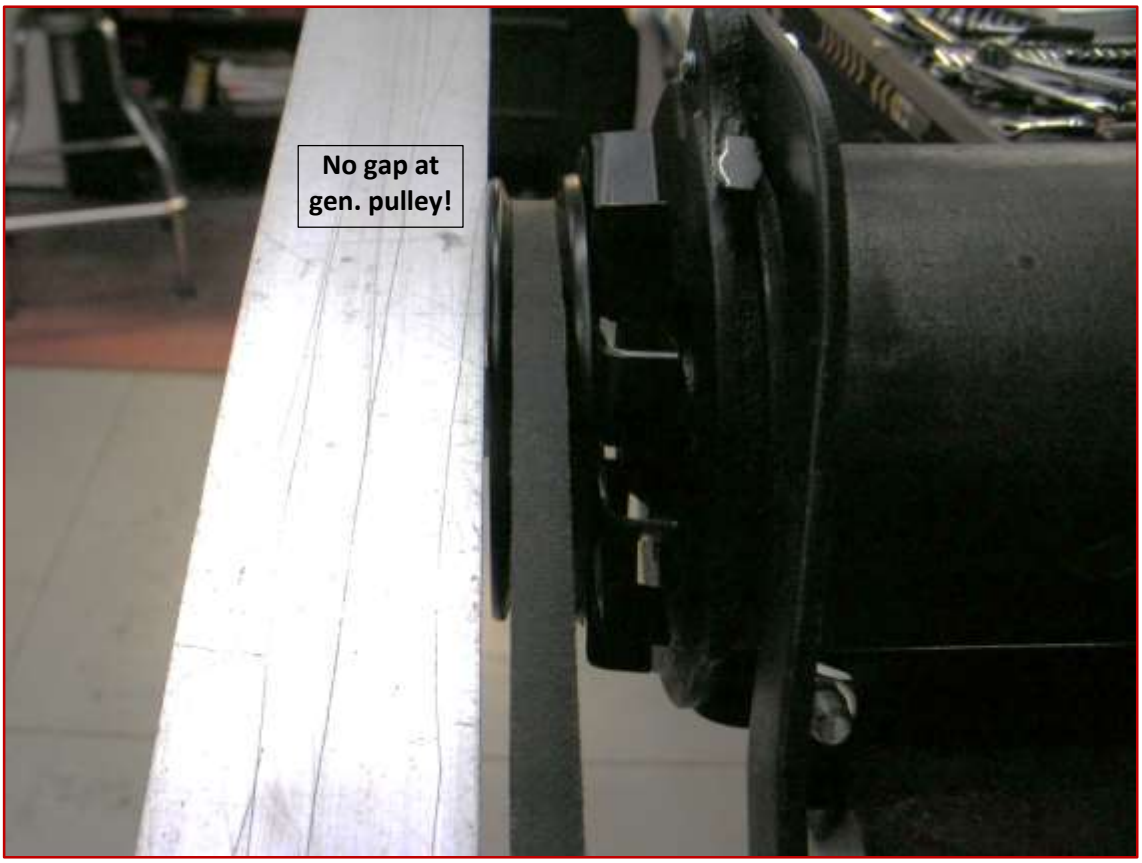
Here is the result of making minor adjustment to all generator mount points.






No gap at WP pulley!

This is proper generator alignment.



Addendum C - Removing and Installing the Harmonic balancer

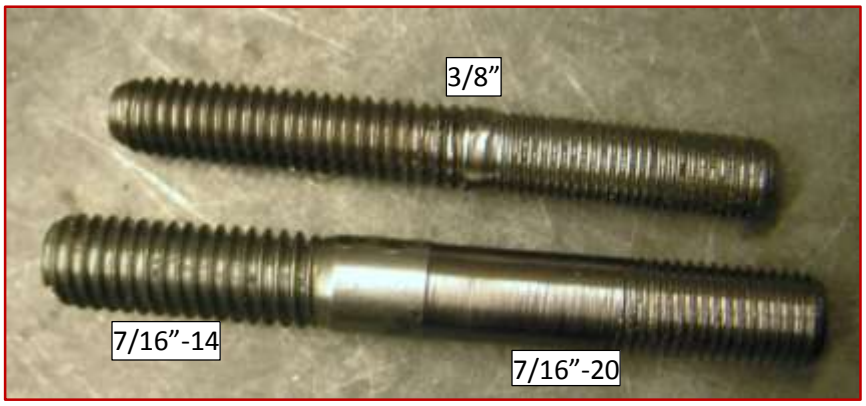
Harmonic Balancer Installation

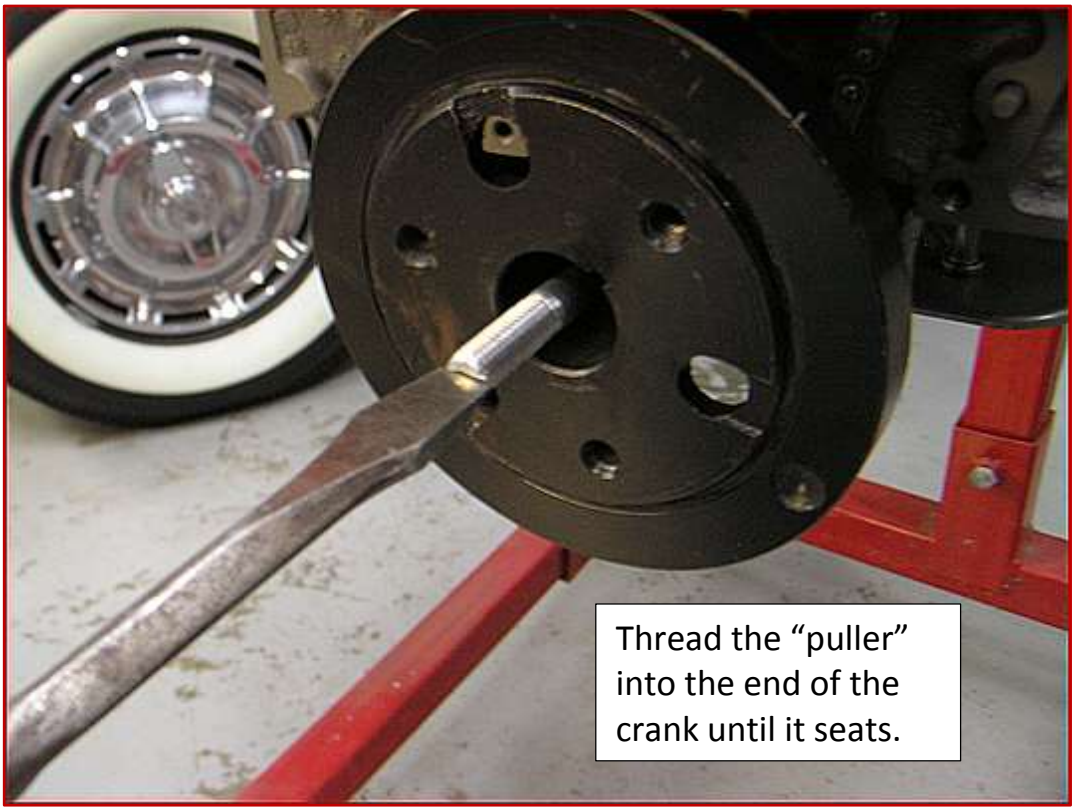
HB Install with a Threaded Crankshaft:

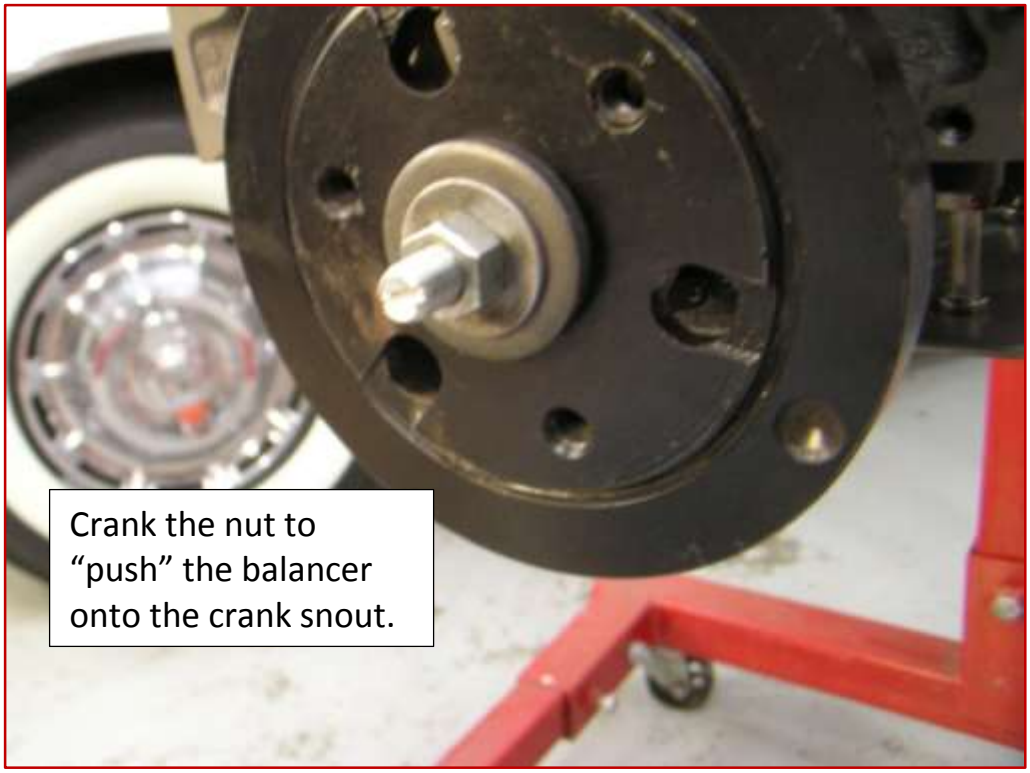
It is best not to install the HB using the attaching bolt as there is a danger that you might strip the threads. The bolt is a 7/16”-20 2 1/4" bolt, Grade 8, with special thick washer and lock washer. It should be torqued to 60 lb. / ft. after it is installed.

Rather than using the HB attaching bolt, you can use a “puller” (see below) to install the HB onto the crankshaft. If not available, acquire a threaded Grade 5 bolt 7/16”-20 about 3" long, cut the head off, then using a thread die, thread it to the appropriate size at the cutoff end. You can use *coarse thread* there.

These are my home-made "Pullers". Simply thread the stud into the crankshaft **until seated**, install the HB and using a nut on the forward end, pull (or should I say “push”) the HB over the crank. The large one below is 7/16"-20 & 7/16"-14 on the "nutted" end. The smaller one I had to make for a different car which had 3/8" threads in the crankshaft and a safety-wired wired bolt on a '56 race-car.




Thread the “puller” into the end of the crank until it seats.


Crank the nut to “push” the balancer onto the crank snout.

To remove your puller you may need to “double nut” it and remove it by turning the inner nut CCW to back it out as shown below.

Installing the HB without a Threaded Crankshaft:

My process to install an HB is basically what is described in the GM Service Manuals of the period but along with some additional methods. The books say something like this...."Using a wood block, drive it on with a hammer until home."

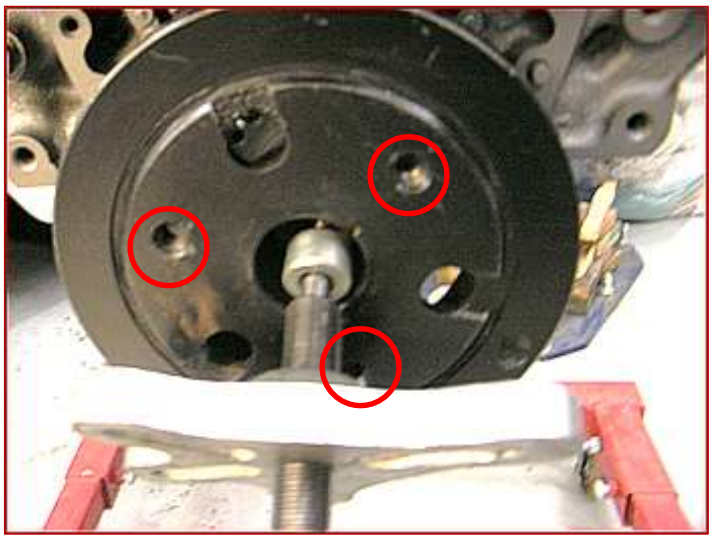
If the engine is out of the car, I position the rear of the engine against a solid wall or beam. This helps absorb the shock of the hammering. After installing the HB spacer I start by pushing the balancer, **with keyway aligned to the key**, onto the crankshaft as far as possible. I mount my HB Puller frame tightly against the HB face, **flat side to the HB face**. Using a solid block of oak hardwood and a 3-4 lb. hammer I simply drive it on hitting the block with the hammer until the HB seats home.

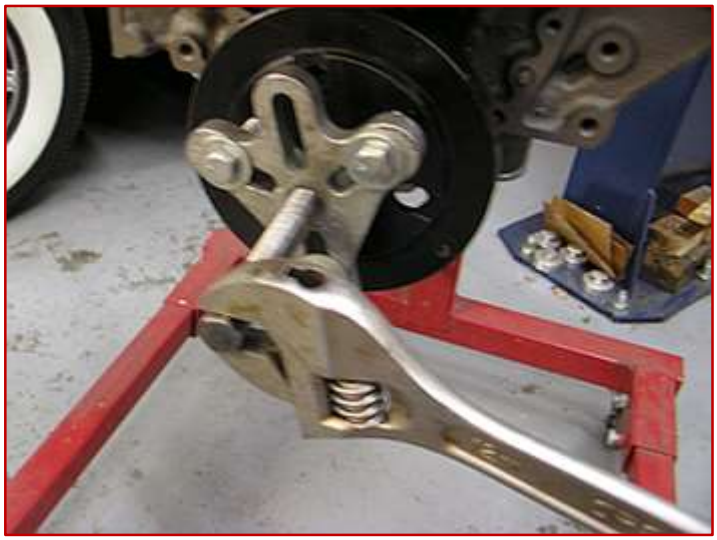
If the engine is in the car and you have limited space, just use whatever can reach in that tight space. Sometimes you have to pull the radiator and fan shroud to get enough room. You obviously cannot back-up the end of the crankshaft so use caution and solid hammer action.

Harmonic Balancer Removal:

To remove the balancer, use an HB Puller. This one can also be used as a steering wheel puller.

Attach the HB puller to the HB using the bolts with appropriate threads for the holes (circled below) in the balancer. Make sure the “swivel” tip is in place.





End.