



INSPECTION AND CORRECTION OF BELLHOUSING TO CRANKSHAFT ALIGNMENT



These instructions are designed to simplify and make it easy to understand the bellhousing runout measurement and correction procedure. The goal is to align the input shaft of the transmission with the center of the crankshaft. If the transmission is not aligned with the crankshaft, it will create a side load on the gears and potentially cause premature wear, clutch chatter, noise, and shifting issues.



IMPORTANT !!!

It is an absolute **requirement** that **misalignment** is **checked** and **corrected PRIOR** to installing the transmission. The misalignment specification for all McLeod Racing conversion kits is **0.005" (5 thousandths of an inch) MAXIMUM** misalignment. You **MUST** document the results PRIOR to installation of the transmission and then email or fax the measurements to McLeod for your transmission warranty. McLeod's Customer Service will need this information if a warranty issue arises.

Email: info@mcleodracing.com

Thank you for your cooperation to ensure the required accuracy is met.

MEASUREMENT PROCEDURE

The figures below show a simple explanation of bellhousing misalignment and corrected alignment. The large circle is the register hole in the bellhousing where the bearing retainer goes through it. The small hole is the pilot bearing in the center of the crankshaft. FIG A. demonstrates bellhousing misalignment and FIG B. Shows a corrected alignment.

FIG A.

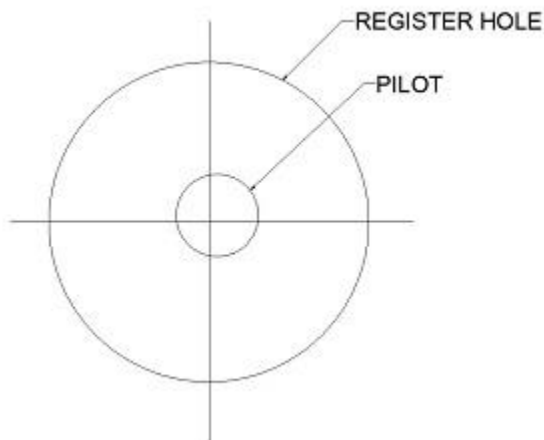
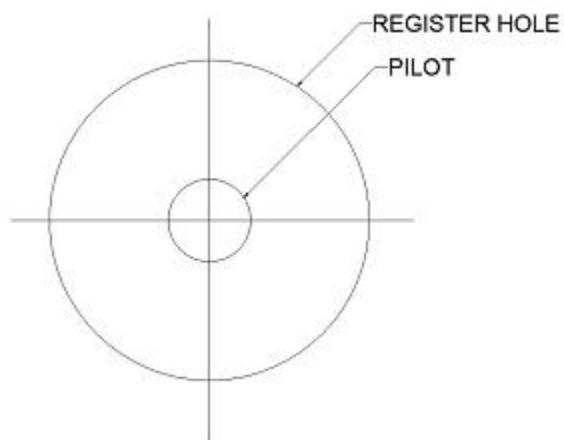


FIG B.





Tools Required:

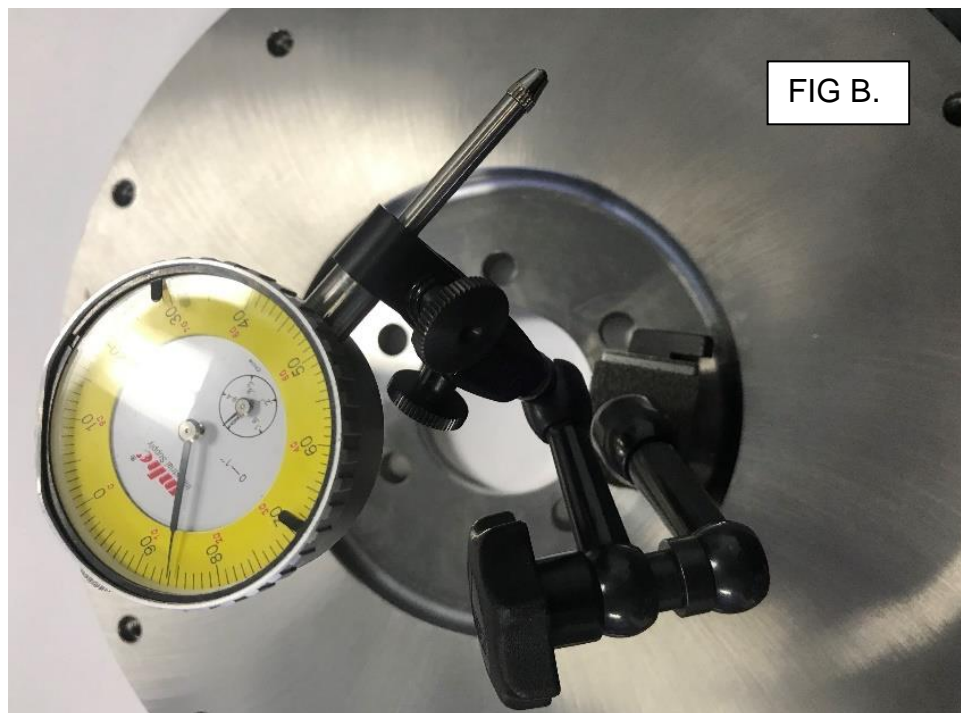
- Plunger style dial indicator with magnetic base that reads in thousandths of an inch.
- Breaker bar and socket that fits the crankshaft bolt.
- Permanent marker
- A second person to turn the crankshaft.
- Gauge plate
- Offset dowel pins if needed (Available for purchase from McLeod)
- Most importantly, Patience

NOTE: The mounting faces of the engine, dowels, and the bellhousing need to be clean and free of all dirt, oil, and corrosion. It is also important to tighten the bellhousing bolts nearest the engine dowel pins first to ensure accurate readings. All bellhousing bolts must be installed and torqued to the proper level. Readings taken with the bellhousing not tightened down properly may not be accurate.

Make sure the indicator has adequate travel in both directions and will be in constant contact with the bore register during the entire 360 degrees of rotation so that you will obtain accurate readings. Make sure the dial indicator does not lift off the bellhousing bore or bottom out. It is not necessary to begin at a certain position on the bore; any point will work. Mark the point where you begin on the bellhousing with a hash mark using the permanent marker as a reference.



1. Clean both mating surfaces and the dowel pins. If this is an SFI bellhousing, install the block plate (The plate between the bellhousing and block).
2. Install your flywheel using 3-4 bolts leaving space to attach the magnetic base (See Fig B.) The flywheel bolts do not need to be torqued but need to be tight, so the flywheel does not move.



3. Install the bellhousing and torque the bolts to factory specification.
4. Install the magnetic base on the flywheel surface where the bolts are missing.



5. Articulate the dial indicator to read from the register hole in the bellhousing or off of the hole in the alignment plate (See Fig C.)

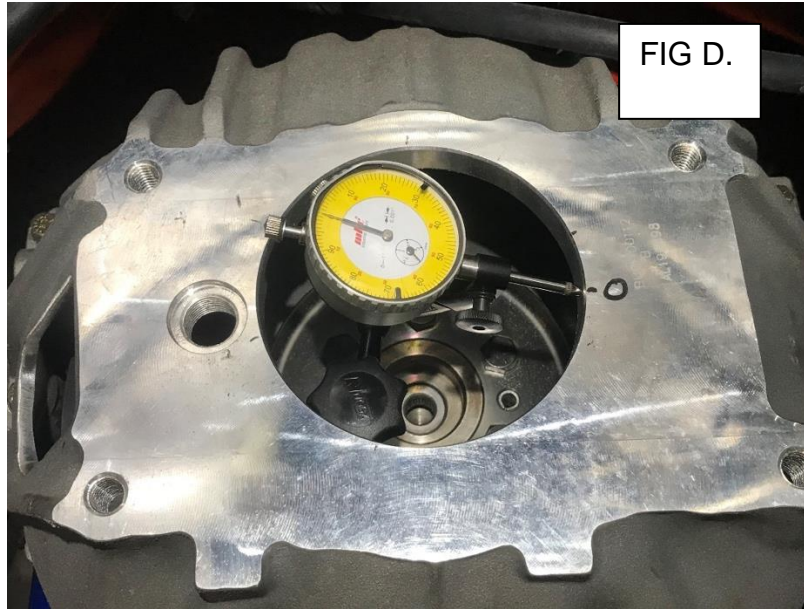


6. Always preload the tip of the indicator. The preferred style indicator is a plunger style indicator (See Fig A.). A tipped style indicator can also be used. However, these usually have a range of .045" (45 Thousandths) and care must be taken to ensure the readings stay within the range of the indicator.





8. Once the dial indicator is adjusted into position, pick a starting point on the bellhousing and mark this on the bell (See Fig D.) The starting point for the dial indicator does not matter.



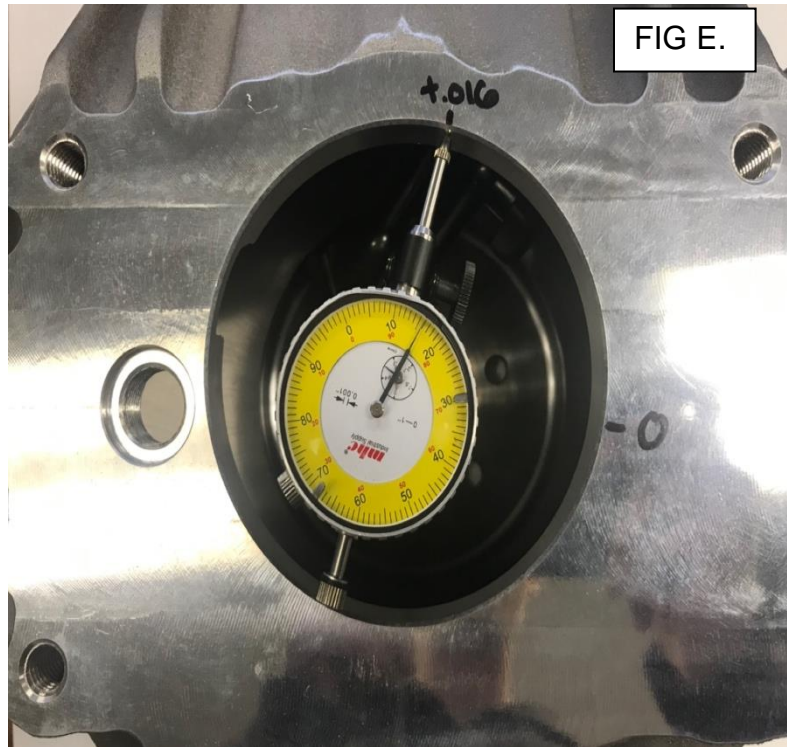
7. Zero the dial indicator

8. Have the person helping turn the crankshaft using the breaker bar while watching the dial indicator. During the initial 360-degree sweep, firstly make sure the indicator tip does not leave the bell housing register lip. Secondly make sure the indicator returns to zero at the starting point. If either the tip leaves the surface or it does not return to zero, re-adjust the indicator and re-sweep until it does.

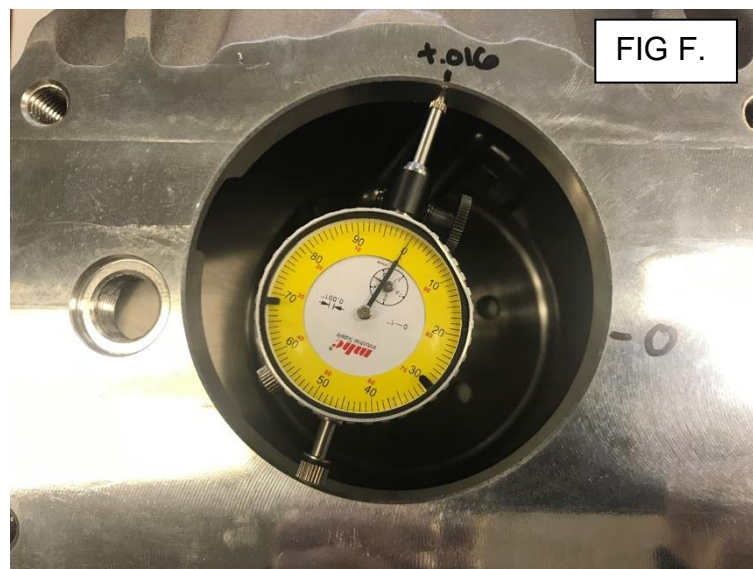
NOTE: If you are having difficulty turning the engine over, remove the spark plugs to ease rotating the engine.

9. Once your 360-degree sweep returns to zero and maintains contact all the way around, start again from your initial point and have the person helping rotate the engine slowly around while watching for the **MOST POSITIVE NUMBER**. Make a mark on the bell housing at the most positive number (See Fig E.)

NOTE: Your measurements will vary from the ones pictured

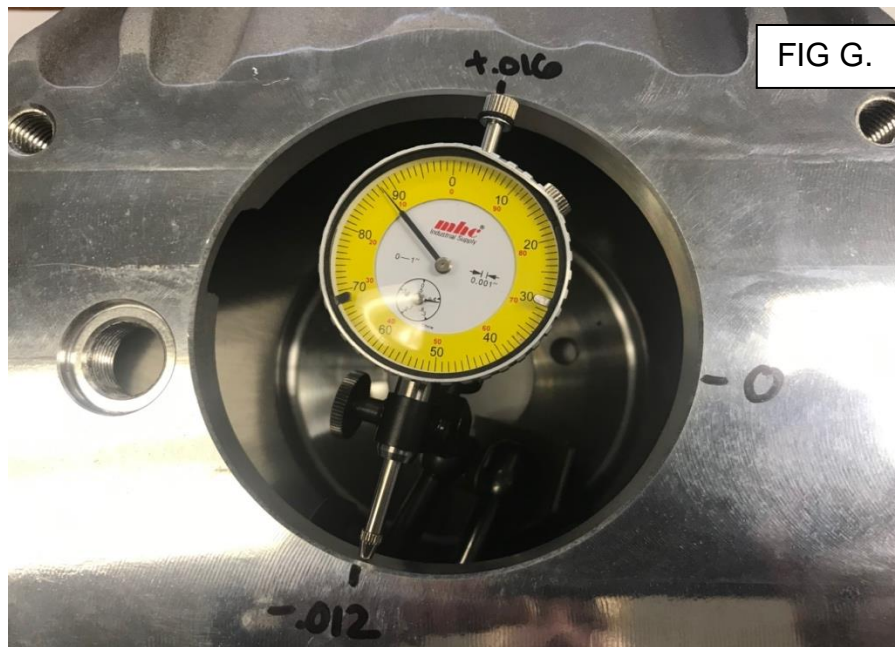


10. Now re-zero the dial on the most positive number (See Fig F.)





11. Have the person helping you rotate the crankshaft 180-degrees and mark and record this measurement (See Fig G.)



12. **Divide this number in half** and that is the runout. In the case of Fig G., the runout would be .006" or 6 thousandths. Record this number on the attached worksheet as the initial runout. If this number is .005" or 5 thousandths or less, the transmission can be installed, and no correction is required. If this number is greater than .005" you will need to correct the misalignment with offset dowel pins.
13. If using the Gauge plate, remove it before installing transmission.

If you have any trouble determining if your alignment is acceptable, call McLeod Racing Customer Service at 714-630-2764 with your measurements in hand, and we will walk you through it.



CORRECTION PROCEDURE

1. McLeod stocks offset pins in 0.007", 0.014", and 0.021" sets available for GM, Ford, Mopar, and Jeep. **NOTE:** For AMC engines refer to the factory service manual. Choose the offset dowel pin set closest to the amount of **misalignment** to be corrected.

Offset Dowel Selection Chart

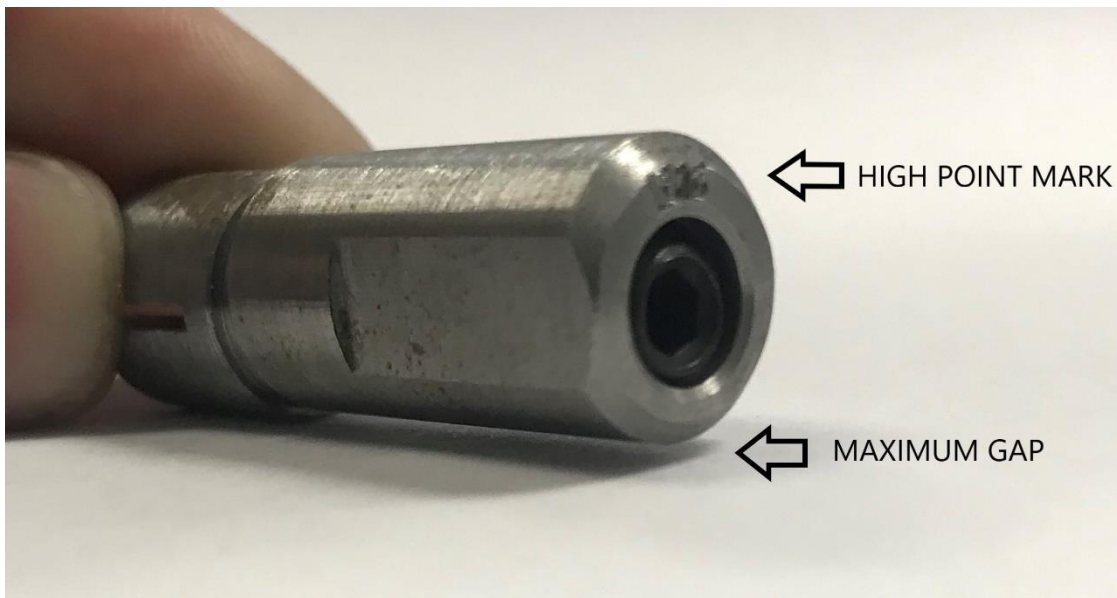
0.005" → 0.010" misalignment requires 0.007" offset pins
0.011" → 0.017" misalignment requires 0.014" offset pins
0.018" → 0.026" misalignment requires 0.021" offset pins

If your bellhousing misalignment is greater than 0.026" (T.I.R. > 0.052"), first check the dial indicator mount and setup for movement. Check to make sure no wires are pinched between the bellhousing and the block. Remove the bellhousing and verify that the mating surfaces are clean. Make sure the bellhousing dowel holes are in good shape and that the dowel pins are not damaged. The bellhousing should fit snugly over the dowels and not be able to move once it is fully seated.

2. **Remove the stock dowel pins;** Once you have determined that your bellhousing alignment needs correction and have obtained the correct offset pins, the old pins need to be removed from your engine block. The first thing to check is if your dowel holes are drilled all the way through the block where you can drive the dowels out from the front with a hammer and a drift or punch. If not, they will have to be removed from behind. There are many ways to accomplish this; here are some suggestions or possibilities:
 - a. Twist them out using locking pliers.
 - b. Put locking pliers on them with a gap between the pliers and the block face. Then, use two pry bars between the block and the pliers.
 - c. Drill a hole in the center, thread it, insert a bolt, and pull out with a slide hammer.
 - d. Weld a bracket or bolt head to them to obtain leverage for a slide hammer.
 - e. Make your own custom puller! Weld a bolt head or piece of all-thread to each of the old dowels with the bolt threads pointing back towards you. Drill three holes in a piece of angle iron or rectangular tubing about 1 or 2 inches apart. Install bolts through the outer holes, with nuts on the back side of the angle iron, to act as legs on the puller. You could use short pieces of rectangular tubing or steel rods as legs if that is easier.



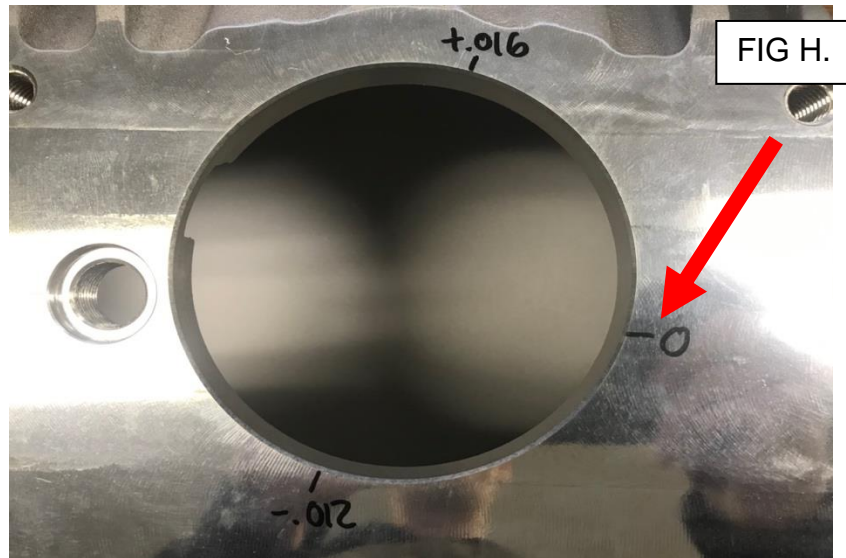
- f. Then, assemble the new tool to the engine with the dowel pin bolt coming through the center hole. Thread a nut onto the dowel pin bolt, and as you tighten it the dowel pin should be pulled out.
 - g. Heat may help.
3. Determine where the maximum offset is on each new pin by rolling the engine side of the dowel on a hard flat surface and looking for the maximum height point as it is being rolled. Mark the high spot with a dot from a paint marker or permanent marker. If you purchased offset dowels from McLeod the high spot is already marked with a stamped number.



4. Clean the dowel holes in the block and check the inside diameter with a pair of calipers. Then, measure the outside diameter of the new dowel pins and compare. You want to tap the pins in and still be able to twist them using the wrench flats on the offset dowels for fine-tuning of your alignment, but not have them loose enough that they will not stay in place. It is very important that the pins be sized correctly, and the inside of the holes are clean and rust-free.
5. If your number is negative (like the example from the measurement procedure on page 5 and 6), point the high point of the offset dowels away from this number.



6. (See Fig H.) If this number is positive, point the high point of the offset dowels towards this number **Always orient both pins in the same direction!**



7. Once the pins are oriented correctly, lock them in place by tightening the center screw. Re-install the bellhousing and repeat the measurement procedure again to confirm that runout is less than .005" or 5 thousandths. Record this number as the Final Indicated Runout on the worksheet. **NOTE:** Minor adjustments to the orientation of the dowels may be needed to ensure runout is less than .005" or 5 thousandths.



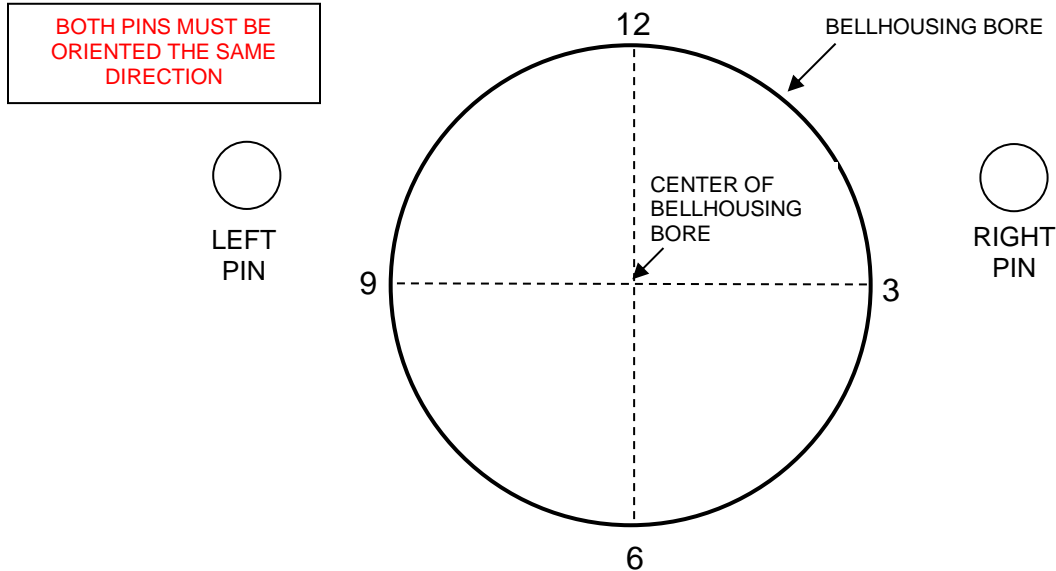
Use this worksheet to determine your bellhousing alignment and correction. After you have it completed, please email it to info@mcleodracing.com.

Name: _____ Date: _____

Sales Order or Invoice Number: _____

Please record your Indicated Runout before and if needed after your correction.

Correction pins selected: _____ Installed Orientation: _____ (clock position)



Initial Indicated Runout: _____

Final Indicated Runout: _____

*****REMEMBER TO EMAIL YOUR WORKSHEET TO info@mcleodracing.com THIS IS NEEDED FOR YOUR WARRANTY!*****