

INTAKE MANIFOLD SEALING

Intake manifold sealing to the heads can be a major tuning problem and is fairly common. Many times, it is misdiagnosed as bad valve stem seals because oil puddles up behind the intake valves. About 75% of the engines we build need the intake manifold corrected. This is how we do it.

In the first place, do not be lead astray by how the bolt holes line up. It is like voting for a liberal—it won't work. The most important thing is gasket surface alignment, and this is how you check it.

The block, heads and intakes have angles on them, and each one of these angles has a +/- tolerance. If these tolerances all "stack-up" in the correct way, the angle of the intake gasket surface and the intake side of the head will match up properly and seal perfectly.

The problem is that if the angles don't stack-up properly, and that is the more likely case, you will draw oil up from the valley into the intake ports or draw-in air causing all sorts of tuning problems, on any engine.

Here is how we check the angle stack-up, and it works very well. A similar method is used by our friends at Fel-Pro Gaskets and is also shown in the March 2014 issue of Hot Rod Magazine.

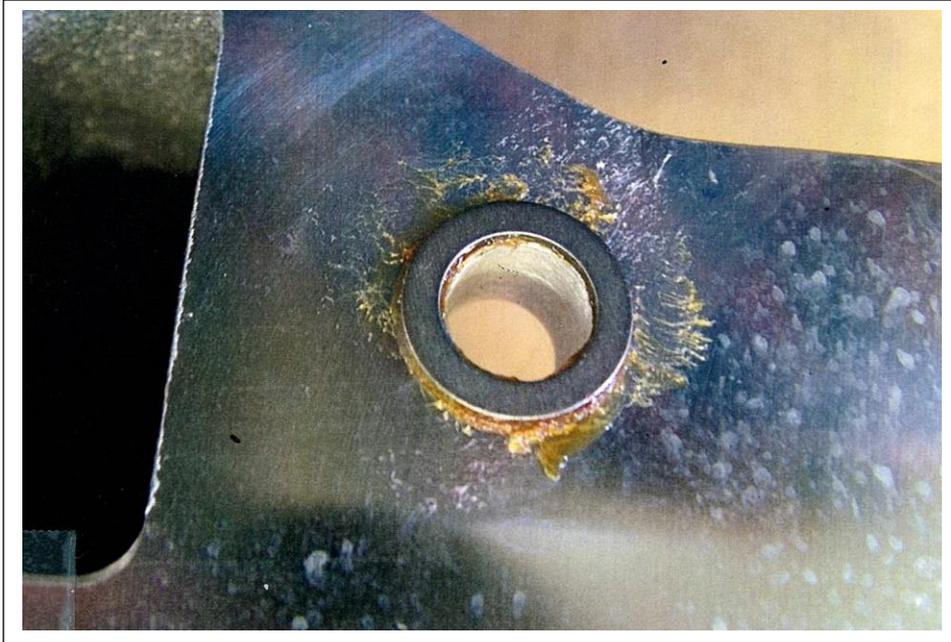
Before starting, place the manifold and gaskets on the heads to make sure there is plenty of clearance around the bolts in the manifold. Clearance the holes as requires. If you don't you will be sorry and end up doing this all over again.

Use a piece of 10 gauge (.100") wax wire* along the outer side of the 2 end ports on each head and hook it over the top of the head as shown in the photo below.



Note: If you lightly apply WD-40 to the area where the wax wire lays, it will make disassembly easier.

Now use some sticky grease to “glue” 4 washers to the manifold around the bolt holes next to the wax wire (as shown in photo below). The washers must be the same thickness at all four corners, unless you are working on a CHIVVY, then it does not make any difference.



Place the manifold gently, so as to not displace (that means move out of place for you Ford guys) the washers or the wax wire onto the heads. Install and snug the bolts down to bottom the manifold against the washers. Lightly hand torquing with a spinner as shown below is plenty. You will actually feel the wax wire compress, how sweet it is!

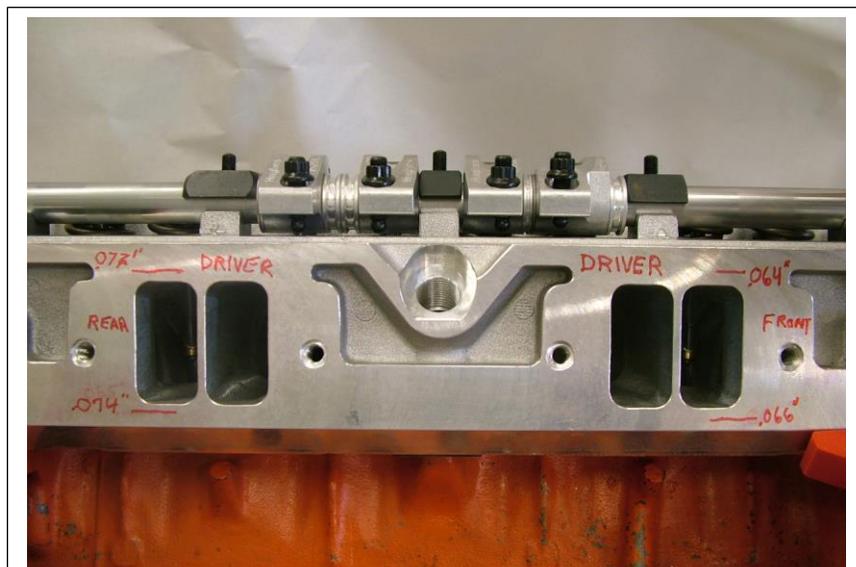
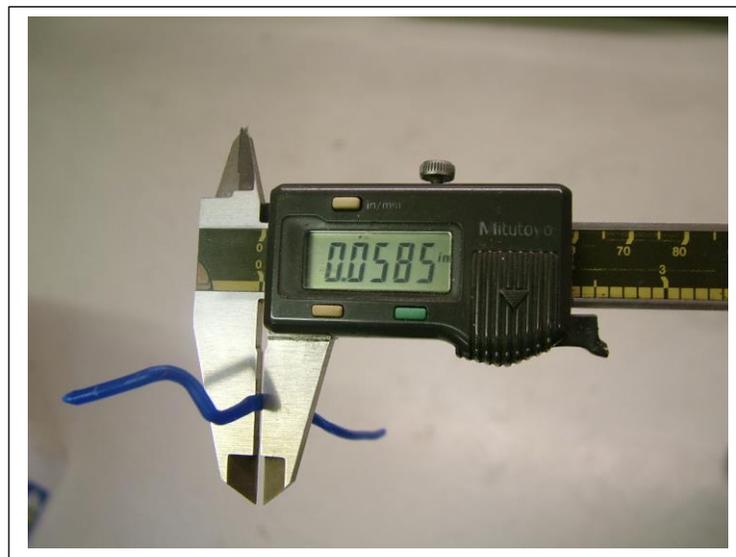


Again, wipe WD-40 where the wax wire contacts the

The photo below shows what the flattened wax wire should look like.



Now carefully measure the thickness of the wax wire using a dial caliper, as it was not as easy to crush the wax as it is with a micrometer. And, you don't want to crush the wax Bubba, or your manifold will still leak. Measure in the flattened area at the top and bottom of the wax wired and write these numbers on the intake gasket surface of the heads as shown in the 2nd & 3rd photos below.



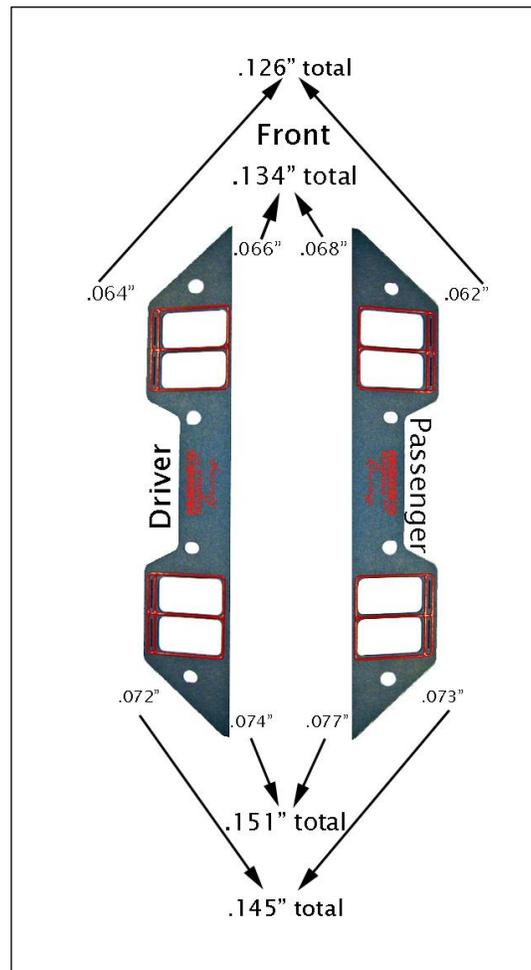
The red line in the previous photo indicates what the wax wire measured at that point on the driver's side, measure and mark both sides.

The thickness of the wax wire will tell you if the gap resulting in tolerance stack-up is good or if it needs correction. You DO NOT want all of the positions to be the same thickness. The best sealing results will be when the total gap at the top of the intake is about .006-.008" more than the gaps at the bottom both front and rear.

This test will also tell you if the manifold is too wide or too narrow (front to rear) and this can be corrected at the same time.

In the example shown below, the total gap (both sides) at the top front is $.062" + .064" = .126"$. At the bottom it is $.066" + .068" = .134"$. This indicates the front of the manifold has a .008" larger gap at the bottom than at the top.

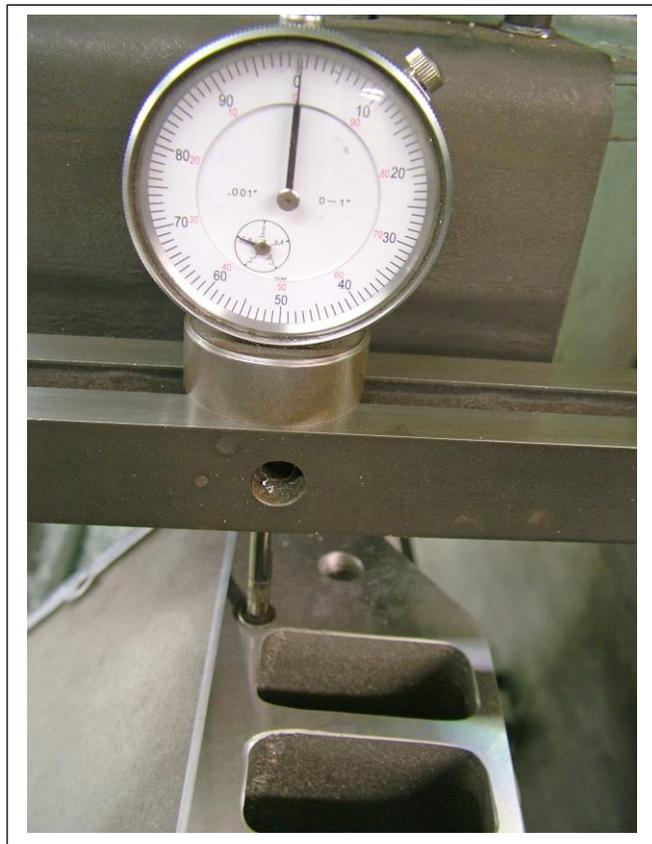
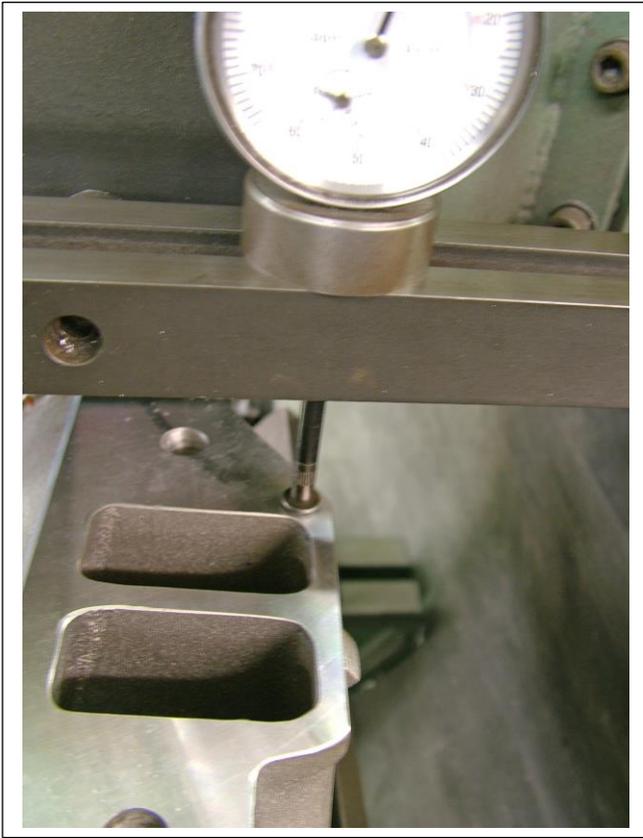
The total gap at the rear on top is $.072" + .073" = .145"$. At the bottom it is $.074" + .077" = .151"$



The example shown above indicates that our front has a .008" larger gap at the bottom, the exact opposite of what we want. The rear has a .006" larger gap, also at the bottom.

Also note that the gaps are greater at the rear. The difference of the gaps, in this case about .018" ($.151" - .134" = .017"$ and $.145" - .126" = .019"$). This means that a total out of .019" more on the front of the manifold will equalize the inequity in front to rear gaps.

As you can see in the photos below, when setting up the manifold to mill, we check in the same places the checking wax wire was located.



Now you can deal with the bolt holes again. About half of the time, you will find that some of the bolt holes in the manifold won't line up with the holes in the heads. Either elongate (that means make longer for Chevy guys) or enlarge the hole so the bolts start and screw in with your fingers. Do not force the bolts into their holes and pull them down with an impact wrench, which will cause the manifold to buckle and leak unless you have a Chevy and then it's alright.

* Wax wire: A roll of 10 gauge wax wire with enough there to do about 100 engines is available from www.freemanwax.com or you can call us and we will sell you 4-8" pieces which is enough to do 2 engines for \$6.50 (plus shipping).

