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IH: Engine Mechanicals - Sub-03A

Installation of the Top End

1. Put the rocker boxes on the heads at 18ft-lbs / 200 in-lbs. ¹⁾
2. With the cylinders still loose at the base nuts, drop the heads on and run the head bolts in until contact, then loosen 1/4 turn.
3. Get your intake manifold and align the heads (rotate cylinders and heads to get ports to align to manifold)
 1. If, when all is assembled, you cant wiggle the carb/manifold/ac in relation to the motor (solid mounted) then you've got problems. If you go to split clamps also then your as good as you can get with rubber-band seals. ²⁾
 2. The O-ring set up is subject to the same principals. Its more robust in mechanical design than the band, so it's even more reliable. But, it's more misunderstood in the way it goes together, so it gets a bad rap. If you have O-ring heads, not using the O-ring is just shorting yourself.
 3. If not, going to the O-ring will be more attractive.
 4. The advantage of the O-ring is that the clamp can be used to help make a solid connection between the manifold & the heads (no rubber in between). This totally removes the rubber / metal interface of clamp /rubber-band / spigot (the core of the degradation you are trying rid yourself of). The reason most O-ring setups fail is the commonly held idea that the closer the manifold and head get to 'no gap fit' the better the O-ring will seal which is totally wrong and the cause of 99% of O-ring sealing issues. When the manifold is set tight against the head, there is a groove created that the O-ring lives in. Common belief is the O-ring seals in this groove. It doesn't. In fact, this makes the groove smaller in volume than the O-ring volume. So, when the clamp compresses the O-ring on its way to getting tight to spigots, the O-ring fills the groove and forces the manifold away from the head in order get enough volume to fit into. Now nothing aligns right and it leaks right from the start.
 5. The right action is leaving a gap of .030" - .060" (1/32"-1/16") between the head and manifold at the skinny lip. This gap needs to be even all around on both heads at the same time. It's in this little gap that the O-ring seals when the clamp squeezes it. When setting the heads & jugs for alignment and installing the manifold & O-rings with no clamps in place, the inside of the manifold should match the inside of the intake port all by itself with no forcing. Don't worry if the gap seems too big. It will shrink when the heads & jugs get tightened. The last test is when clamps get tightened, that the alignment is still on. Before you tighten the clamps, you will note that the O-rings are proud of spigot diameters. When the clamps squeeze the O-rings to the spigot dia., the seal to gap occurs. During the tightening, you may have to tap the manifold back into alignment until the clamps grab onto the spigots. ³⁾
 6. One thing to remember when using O-rings is that they should be conditioned before use using a dielectric grease. You could also just wet the O-ring with oil or grease. What this does is it softens up and swells the O-ring so you get better sealing. ⁴⁾

1. Snug the cam side center (of vee) base nuts. ⁵⁾
2. Re-check alignment.
3. Snug cam side center head bolts.
4. Re-check
5. Tighten base nuts. Don't go ape on torque. Iron heads use fine threads, cars use coarse. Fine threads have way more mechanical advantage.
 1. Torque up the base nuts using a torque wrench and a ground down crows foot. The base nuts take 30ft Lbs or 360 in/lbs. With the crows foot, you torque to 335 in/lbs to make up for the extra leverage. [If you grind down the crows foot like this](#), it works quite well. ⁶⁾
6. Tighten all head bolts somewhat. ⁷⁾
7. Re-check.
8. Get a nice 3/8" breaker bar with a nice 9/16" socket and tighten all 8 head bolts to the same feel.
9. Now switch to torque wrench and check all 4 primary side bolts (a beam or dial wrench is a bit less tedious).
10. You will find your 'feel' is pretty damned consistent.
11. All that's left is to get the feel for 60-70 ft-lbs.
12. Just creep up to it.
13. Usually you will find that right in the 60-70 range is when the bolts attain the 'socked down hard' feel.

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<http://xlforum.net/forums/showthread.php?t=https://www.xlforum.net/forum/sportster-motorcycle-forum/sportster-motorcycle-era-specific-and-model-specific/ironhead-sportster-motorcycle-talk-1957-1985/173827-crankcase-drain-plug/page5?t=1864035&highlight=Ironhead+Crankcase+Drain+Plug&page=8>

²⁾

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<https://www.xlforum.net/forum/sportster-motorcycle-forum/sportster-motorcycle-era-specific-and-model-specific/ironhead-sportster-motorcycle-talk-1957-1985/113554-intake-manifold-leak-plague/page2?postcount=30#post2390770>

³⁾

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⁴⁾

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⁵⁾

<https://www.xlforum.net/forum/sportster-motorcycle-forum/sportster-motorcycle-era-specific-and-model-s>

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