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# REF: Service Procedures 9U

## Transmission Access Door Alignment

Transmission door "alignment" explained. (Dr Dick) <sup>1)</sup>

This applies mainly to 1957-1976 cases.

It's most likely accurate for 1977-E1984 cases also because I feel the manufacturing procedure is the same as 1976<.

I can't prove it but I believe it.

If you fit any door other than the one that came with the bike from the factory, you will usually will find that some kind of misalignment between the 4 case to door bolt holes that you didn't have before (if you don't have bolt alignment issues it's probably because the holes in the "new" door are larger than the holes in the original door. NOS factory replacement doors were like this).

That gets you thinking about "matched" components and the possibility that your "not matched" any more. The normal response to this to gather info on how to regain the "match" with your new part set. So you logically turn to the ever-present HD line-ream & line-lap as the remedy to your problem. And line-ream/lap is the right way to realign out of alignment bearing elements in order to get them back into reliable service.

The above paragraph makes the assumption that the bolt hole misalignment will be carried onto other, more critical, alignments. Anyone who is serious about these bikes won't dismiss this misalignment. At least with out a good reason. That's a solid point of view and necessary for refining your ride.

Wanting to grab on to something we can sink our teeth into, each of us will tend to embrace the theory that seems most sensible. Unfortunately, concerning old info, good solid reasons are rare. Lost to time. And because of that, conjecture rules. After awhile the "legend becomes fact".

Food for thought. Matched cases are definitely machined as a set at the factory. Yet HD would sell you either half or a door as a separate "replacement" part. No special instructions on how to "match" to your existing mate. Why?

I'll try to explain why. Also I really hope this post will show that our bikes weren't built using the procedures in the SERVICE manual. That point, when not taken into account, fosters a lot of misinformation.

They were built using a different, much more informative set of instructions, blueprints.

An informed understanding of how the factory builds these bikes helps separate the cream from the crap in your assessment of "is this a symptom of a deeper problem" versus "it's like this because of how they

were made”.

So the 1st two things you need to know are these two facts.

1. The very first ancestors of our bikes, the 1952-1953 K, didn't use any transmission door at all. This is important so you can understand how the raw castings were machined into a set of cases. The overall machine procedure on the 1952-1953 is the same as on the 1957-1976 cases. In this post I'm gonna leave out the 1954-1956 ones. These were the 1st bikes with a door. These doors were removable but weren't manufactured to be interchangeable due to the double tapered cone dowels they used. This is whole thread in itself that's not applicable to OHV bikes. For 1957-1976 cases, the door gets bolted to left case early on in the manufacturing procedure so it mimics the 1952-1953 (no door) cases. The door/left case assm turns into a one piece artifact as far as the rest of the machining is concerned. It's this bolting on procedure that shows up as misalignment when swapping doors/cases. In 1952-1953, in order to work on the trans you had to split the cases. And when putting cases together, you needed to have the entire trans and shift tower shimmed and assm'd to the left case as well as the flywheel assembly.
2. Fact 2: If you bought a new set of replacement cases, when they were available, you got way more than 2 case halves. Again because of how they were made. you got in addition to the cases:
  - A door bolted to cases. (when you unbolt the door its the 1st time its first time its been loosened. ever).
  - Gen idler bushing installed pinned and bored to location and size in right case.
  - Shifter shaft bushing installed in right case half.
  - Kicker bush installed in left case, even if it's not gonna be used (68-76 XLH)
  - A few case bolts. The ones HD used to bolt the case halves together well enuff to machine the cylinder base surfaces, holes for cylinder spicket, and drill and tap the cylinder stud holes.
  - Dowel pins installed. How many and where depending on year. Case part seam 3 or 2. Cam cover 2 or 1. Kicker cover 2. If hump case 1 for primary cover. Most importantly though 2 for the ever-present pre installed trans door.
  - Shift fork shaft hole in right case plugged with expansion plug.

At this point, if cases sets are to be sold as replacement parts, they are done. “ready for you to use”. On the flip side, if the case set is going to be used for a new motor, more work gets done before they will be considered “ready for use”. Left side gets kicker stop, transfer valve, and 7 studs (3 rear motor mount 4 cylinder studs) installed. If hump motor, gets primary drain plug installed.

Right side gets cylinder studs, cam case strainer screen/gasket/pin, oil line fittings, chain oiler fitting if hump motor, motor and trans drain plugs (except 1970 and E1971), cam torringtons, c shaft torrington, shifter seal, right rear top motor mount stud on some years (67-72?) hump motors. 900's get 5 oil pump studs. And for in house right side gets two more things.

It's here that this thread really starts.

Installed and fitted. Pinion race and main shaft race.

Common belief is that these get line lapped as per the FSM. Not so. They get rigid honed. Without the case halves being assm'd.

This kind of independent fit and finishing is NOT what the fsm prescribes.

It is what you would evolve to if you built motors night and day for 1/2 century. And you would get so good at hitting size, location and finish that every build used the exact same roller size. The "standard" size. pinion, trans mainshaft, con rod big end. And you figured out how to do it without the cumbersome assm-lap-clean-check-repeat routine. You got so good you do it without the trail and error.

So (other than for cyl interface) what I believe really happened in the factory the day your motor was built is that both case halves get machined independently to such tight and repeatable tolerances that any right will fit to any left. Two random halves got put together. All machine work is done except for the cyl interface.

Then when together, the cyl interface got machined as a set. That's when the set got a belly #. That number allowed you to backtrack sequencaly if a problem gets identified. As well to track numurious other parameters. \

If you're still with me-back to the trans door.

Remember 1952/1953 had no door. Let's start there. You got 2 raw castings from the foundry - a right and a left case half. Totally unmachined. You need to hold each raw casting somehow in order to get 1st machining step completed. This 1st hold needs to position casting accuratly enuff that all other machining is on target. This is no small issue. All subsequent work will be based on this 1st operation. After a time you get this 1st operation down solid. In the instance of the left K model case, you machine one "side" then flip casting over, register off the 1st side machining, and machine the opposite (2nd) side.

There are a few machine operations that get carried out afterwards that aren't "face on" to the parting or the parallel primary side. Rear motor mount top mount holes. Tool box stud hole. Timken feed and drain holes. Same for right side. All though the amount of secondary "off flat" machine work is much more extensive.

At this point all the trans machine work is complete. If you didnt do it on the 1st operation, you did it on the 2nd. On both case halves. Before they ever were bolted together as a matched set.

Now add a removable trans door, a 3rd casting.

How? You pre machine the case for door mounting and mount the door to case so this assm is a mimic of the no door earlier one pc case half. This gets done before any trans bearing bores gets done.

You machine a mounting surface into the door casting. Then you put a 4 bolt hole pattern in door casting. The hole pattern is regisitered to the outer profile of door casting. The hole pattern needs to be regisitered to casting outer profile because soon you will put same bolt partern in case. And mill a mating mount surf with boundries consistant to that common pattern into left case half. So the door fits in your case pocket with no interfearence. What locates door to it's case pocket is the 4 bolts (the dowels dont exist yet).

Now your case-door assm mimics the earlier no door k left case half. And you can apply the same tried and true machining operations. Those machine operations do the main and counter bearing bores. These door bores are located based on the dowel locations at case seam. The holes for door dowels are done now too. This makes the relationship of door dowels to trans bearing bores location consistent.

But the relative position of the 4 bolt holes to the dowels is not constant due to all the positioning variances that come into play when the door is first attached to case half. So the misalignment of the

bolts is not indictive of misalignment of the trans bearing bores.

It's getting the dowel holes re-machined with accuracy that I hang my moniker on while the bike is together.

That's a little more challenging.

Check out the bolt holes in this 72 door. This is very common on swapped doors.

Some times guys will move the dowels to "improve" the alignment. Some times after an explosion repair, the case dowels will be hacked back into "position". Some time when using a heavy after market door, the door isn't made as well as it should be as far as critical locations. None of these scenarios is too cool.

Thinking that the trans is able to tolerate a certain amount misalignment is, imo, a dangerous assumption. Considering most welded cases are welded in the trans area. Exploded transmissions wreck cases 10x more often than exploded motors. Especially on 1972< cases. The 1973> cases and doors are stronger than the earlier. Usually strong enuff to stay in one pc after a trans explosion. Because the 1972< usually blow the cases and door apart when trans lets go, people may conclude that the door/cases let loose taking the trans with it.

I don't agree. I believe most times in a case breaking explosion, a power transmitting component fails. A gear tooth or a dog breaks off. This is more dangerous than blowing a gear in half or snapping either shaft. Because that little pc will not act as fatal when it happens as the split gear or shaft does. So you may keep riding down the road until that little pc gets caught between meshing teeth, forcing the shafts apart. The 1973> can survive this much better.

My point being that misalignment may skew the way the teeth or dogs engage to their mates. Concentrating loads across a smaller area. Breaking them off.

If you got a high powered ride, you really need to have the trans in top build if you figure it to transmit reliability. So alignment is fundamental. In my head, if alignment isn't assured, explosions may be in the future. A totally unacceptable way for me to build a bike.

Getting screwed up alignment correct is easy when the cases are apart. Doing it with the bike together is a windfall for your wallet. And doing it so the dowels are positioned where they belong brings you to best possible repair.

So, pull the transmission. Pull the dowels. In a mill, reshoot door dowel holes in correct position. Dia of holes to large enuff that the same size hole will give a good bore for case side of new pins to be solid. In position and press fit.

Buy a chucking reamer of correct size that will cut holes in case. This reamer is .001" smaller than new door holes. So when reaming case the door hole will act as a reamer guide.

For hole position in case to be in correct spot, the reamer needs to be guided at 2 places along it's length. These locations in relation to the case aren't arbitrary. They need to be on location so holes the reamer makes is also on location.

This is how I made that happen. As chevelle said, I made concentric mandrels. One end of each fits in main and counter bear bores of right case. The other end of mandrels fits thru door bear bores.

This is how it's done with precision.







Now this goes over motor sprocket shaft and mandrels.



And gets screwed to primary surface aligning door because both ends of mandrels are held in correct position.

Undercut allens now bolt door to case in position.



Run reamer thru outer bush into pre bored door hole. Spin reamer with hand drill.



Then pull every thing apart. Make dowels and install. Open bolt holes in door where necessary. If you ever change to different door with different dowel size, pull old dowels and make stepped dowels.

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<https://www.xlforum.net/forum/sportster-motorcycle-forum/sportster-motorcycle-era-specific-and-model-specific/ironhead-sportster-motorcycle-talk-1957-1985/131421-trans-access-door-alignment?t=1392866>

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