

G80 Locker Differential modification

By: Matt Dupuis

I think it's pretty obvious to state that by doing this mod, you must have faith in your skills, your tools, and that this is what you want to do. It's irreversible, and by screwing up at any stage, you can cause eventual failure to your differential unit.

This doesn't just mean that the locker won't lock - this could mean that the bearings will disintegrate, seizing your differential suddenly and unexpectedly (though with PLENTY of aural warning), sending you spinning into the nearest ditch. Ask me how I know!

Also, this locker is designed to unlock above 25 MPH so that you may be safer. If you're on a highway and one wheel starts to spin, you keep going straight. If the locker kicks in and both spin, you can spin into the nearest ditch. Again, ask me how I know.

By modifying your locker, you give up this safety feature in the name of increased performance and dorifto ackshun. You asked for it.

Here's the filthy chunk. Remove the bearing caps after marking their location and orientation for later installation.



Undo the bolts holding the axle end plates in place.



Pull the axles out a few inches - it might be necessary to whack on them a bit to break them loose.





There are two major components to the actuation of this locker. The flyweights (screwdriver, holding them apart) and the governor pawl (to the right).



At low speeds (below 25 MPH) the governor pawl sits in this position, held by a torsion spring:





And at higher speeds, centrifugal force on the big counterweight overcomes the spring and it sits like this. Remember this for later...



Getcher tin snips and cut thru the oil slinger/bolt retainer thingie - no other diff has this so it must be a Volvo thing - I'm sure it has a purpose, but meh.



Mark the position of the ring gear relative to the differential housing, and remove the gear.



There are three T27 Torx screws holding the case to the ring side plate. Remove these, and tap the plate off the case. They only go back together one way and it's pretty easy to see, so no marking is necessary.



Voila! A mess!





Here's the mechanism as it sits when it's assembled. There are a few pieces missing, like the caps that capture the clutch ears, but that's not important now. It's plain to see that the flyweight shaft is geared to the ramp, which is driven by the side gear. When one wheel is spinning, either the case will turn faster than this side gear or this side gear will turn faster than the case, depending on which wheel is spinning.



When the flyweight spread, one of them will hook onto the governor pawl and stop the shaft from turning.





When the side gear and ramp are in the neutral position, they look like this:



But when the flyweight shaft stops the ramp and the side gear rotates a little bit more, the ramp is forced by the matching ramps on the side gear into the clutch pack, which locks the differential.

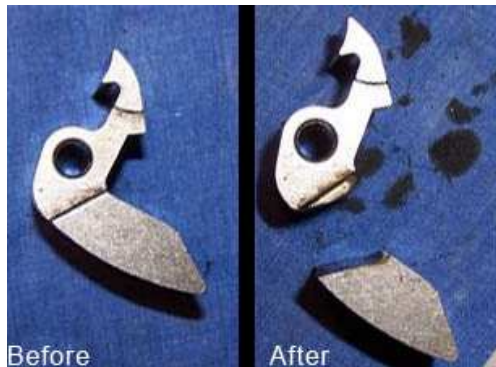


Again, at low speed, this is how the governor pawl sits, with the spring pulling the hooks into the flyweight shaft. And at higher speeds, the governor pawl counterweight overcomes the spring, pulling the hooks away from the flyweights, which just lets the flyweights spin. This keeps the differential open above 25 MPH.





Here's the governor pawl. You can see by the general shape that the hooks are oriented to catch the flyweights in either direction. The counterweight is massive enough to overcome just about any spring, so don't bother trying to modify the spring here...



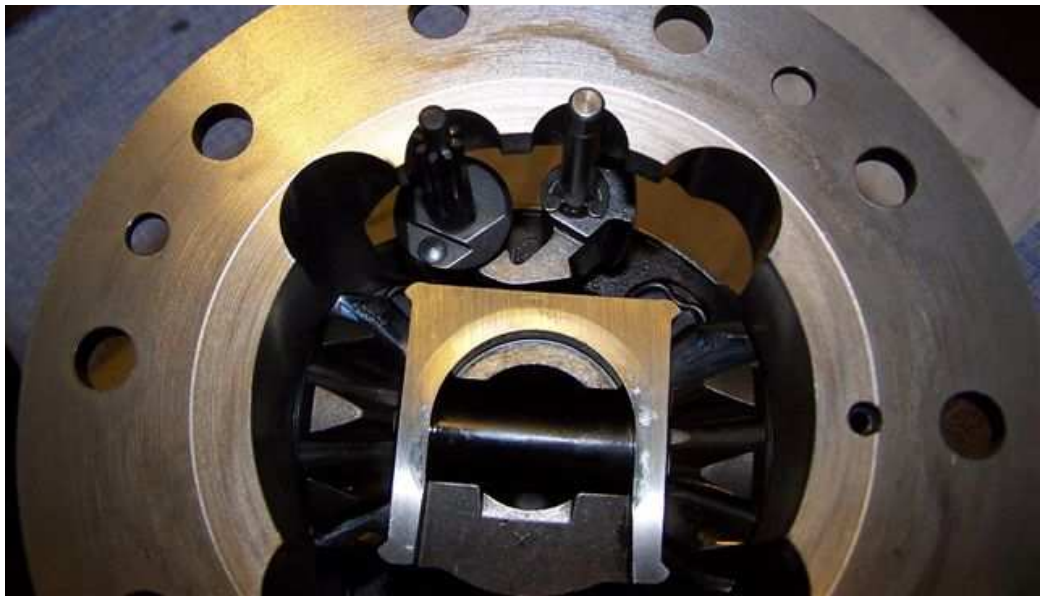
Using a thin carbon cut-off blade on my angle grinder, I just whacked the entire thing off. If you're not afraid of experimenting and you want to keep SOME function to the governor, you could hack off some of the weight, reassemble, see where it stops locking, and do it over and over until you got it right. So after reading that, yours probably looks like mine does. You probably were also amazed at how much gear oil this hardened steel lump "sweat"...

After clipping the governor and spring onto the shaft, reinsert the pawl like you see it here:



And then, pushing the pawl in while holding the spring out, insert the flyweights.





Note the orientation of the weight and spring, in this and earlier pictures.



Reassembly of the ring side plate starts with replacing the shim,





reassembling the side gear clutch packs,



and inserting them into the side plate. Make sure the ramp and side gear are in "neutral" and that you remembered the clips that capture the clutch ears.



After you slip the governor and flyweight shafts into the side plate, the assembly slips together. Using a few of the differential bolts to line the cases up, insert the T27 machine screws and work your way around the case a few times, pulling it all together. The diff bolts hold the whole thing together, so don't worry too much about these machine screws - they only hold it during assembly.





Bolt the ring gear on, using the marks you made earlier to line them up, and you're done. Make sure you have a manual to provide you the proper torque settings and tightening sequence for the ring gear bolts and the bearing end caps in the differential housing. I didn't have the manual, so I used my calibrated impact wrench, in a modified star pattern, working my way slowly and evenly around the case.



Fin.