Saab Transaxle Repair

PART TWO

Last month we took you through the disassembly of the Saab 900 5-speed transaxle. With any luck, we should be able to turn that pile of parts on the workbench back into a working transaxle.

Since our last installment, we found some examples of the damage that's done when the pinion housing breaks. I can't overemphasize the importance of carefully inspecting the pinion housing. Cracks that are just getting started may be impossible to see without magnafluxing the housing.

If you're working on a pre-1983 model 900, your safest bet would be to replace the original pinion housing with the latest design. The cost of the housing is small in comparison to the cost of the other parts that could be damaged if the housing breaks later.

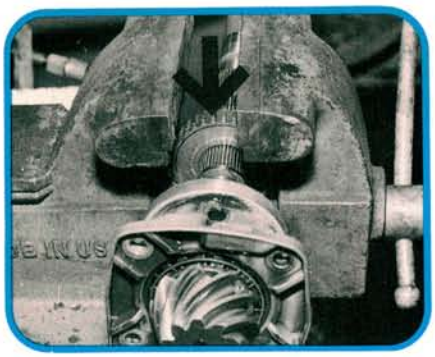
The bearing preload on the two pinion housing bearings is adjusted similarly to the pinion bearings in a conventional rear drive differential. Tightening a large nut on the pinion shaft removes the bearing end play and collapses a steel crush sleeve.

Tighten the nut slowly and stop to measure the pinion bearing preload several times using a fish scale. If you overtighten the nut, replace the crush sleeve and start over. Never loosen the pinion nut to set bearing preload.

Before you start putting everything back together, take the time to give the rest of the transaxle parts a thorough cleaning. Now's the time to find any other worn or broken parts that might be lurking under a layer of worn out gear lube. Getting this transaxle out of the car is no picnic. I know I wouldn't enjoy doing it a second time on the house.

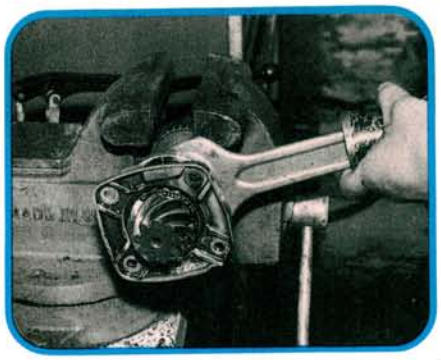
Remove any leftover gasket material from the case and cover parts. Don't use anything sharp that might damage the machined aluminum case surfaces. The primary gear case mates to the transaxle case without a gasket so both surfaces must be smooth, clean, and dry. Any gouges on either surface are an open invitation for a leak.

—By Karl Seyfert



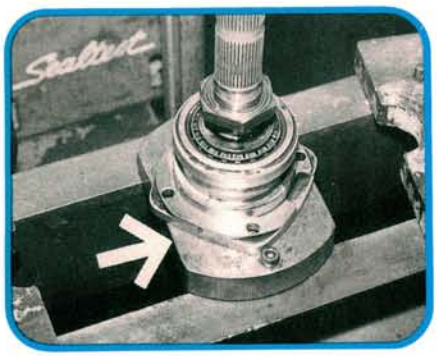
1

Necessity is the mother of invention, and I'm not talking about Frank Zappa. A scrap synchronizer hub (arrow) does a good job of holding the pinion shaft in the vice. The factory tool does exactly the same thing. Use one or the other, but never clamp the pinion shaft directly in the vice.



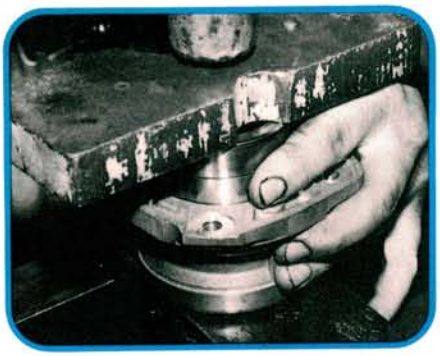
2

Use a 47 mm wrench or a really large crescent wrench to loosen the pinion bearing retaining nut. The Saab tool number for their wrench is 87 90 453. Notice the added persuasion at the end of the wrench. The nut was peened over and had threadlocker on it to boot. Never reuse the nut.



3

This press plate (arrow) prevents damage to the pinion gear when removing the pinion bearings and housing. Different plates are used for different final drive ratios. Use 87 91 097 for 1982 and later 900s. The plate removes both bearings and the housing from the pinion shaft in one pressing.



4

Use an old outer bearing race as a drift to install both new bearing races. The edge of the housing is chamfered so the old race can't get stuck in the housing. The races bottom against recessed shoulders. Don't apply 20 tons trying to close the shoulder gap. It's supposed to be there.

5

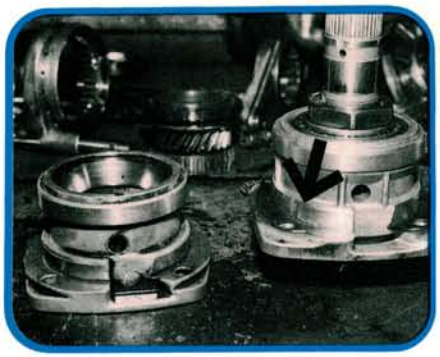
Press the new outer pinion bearing onto the shaft first. Slide a new crush sleeve over the shaft. Then place the new pinion housing over the outer bearing. Enlarge the I.D. of an old inner bearing race and use it as a press tool to install the new inner pinion bearing.

6

Lock the pinion shaft in the vice again. Apply threadlocker to a new pinion nut, then tighten it until bearing end play is removed. Wrap a rope around the pinion housing and attach a fish scale to the free end. Correctly adjusted new bearings require a 10-15 pound pull to rotate the housing.

7

After a few tries, you may be able to tell how 10-15 pounds feels by rotating the housing by hand. Don't take chances until you do. Never loosen the pinion nut if it's overtightened. Replace the crush sleeve and start over. After properly torquing the nut, peen it with a punch.



8

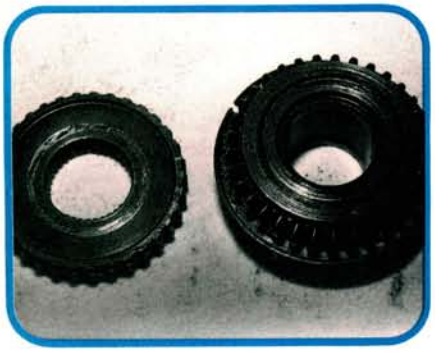
Here's a side by side comparison of old (left) and new (right) pinion bearing housings. They're both aluminum, but the one from the '82 doesn't have the strengthening ribs that the new design has. Also the machined area (arrow) near the flange is wider. This is the area where cracks occur.

9

If you're lucky, you won't be taking the transaxle apart because this happened. This 1982 pinion housing broke flush with the flange all the way around the housing. Cracks in this area can be very difficult to spot. The transmission can jam if the piece on the left starts turning.

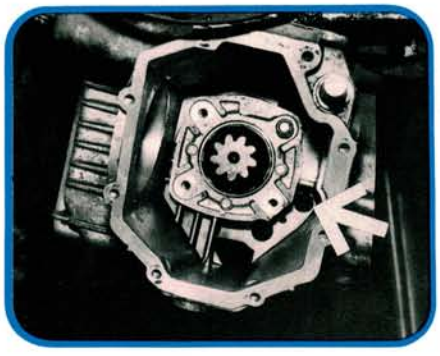
10

After the pinion housing breaks, fourth gear gets pushed against the pinion shaft support bearing in the primary gear case. Notice the wear on both the gear and the bearing faces. The support bearing race on the pinion shaft had to be split with a chisel before it could be removed.



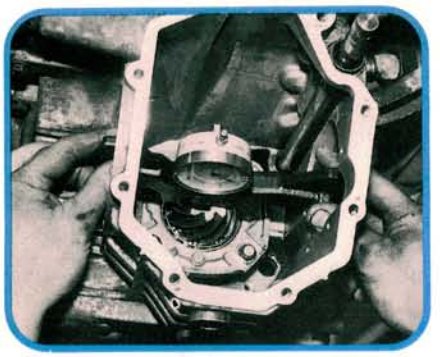
11

Fourth gear (right) should spin freely on the pinion shaft. A broken pinion housing will push fourth gear against the 3-4 synchronizer hub (left). The added friction and heat can weld the synchronizer hub and gear together, leaving you stranded in fourth gear.



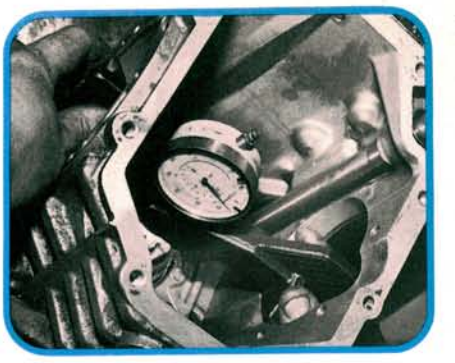
12

Clean the pinion housing bolt holes in the case. Install the pinion depth shims, then reinstall the pinion housing and shaft assembly. Install the beveled corner of the pinion housing facing the cluster shaft hole (arrow). Apply threadlocker to the bolts, then torque them evenly to 20-25 Nm.



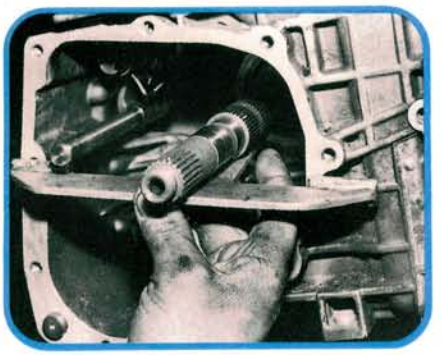
13

The correct pinion depth setting for each ring and pinion set is scribed on the pinion. This pinion was marked −5, meaning −.05 mm. There's a pinion depth tolerance of ±.05 mm. The Saab dial indicator must be used to measure the pinion depth when a new housing is installed.



14

Hold the tool against the bearing housing openings in the case. Rock the tip of the dial indicator up and down over the face of the pinion and note the highest reading. If the reading is higher than the correct value, increase the shim thickness. If it's lower, remove shims. We're right at −.05 mm.

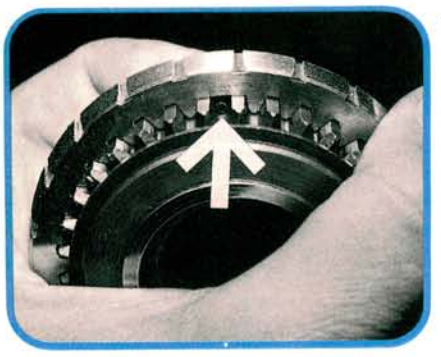


15

Place the pinion housing installed height measuring tool as shown, then measure between the tip of the tool and the pinion shaft nut. This tool tells you how thick a spacer to use between the pinion nut and reverse gear. The original spacer should work if pinion depth has been reset correctly.

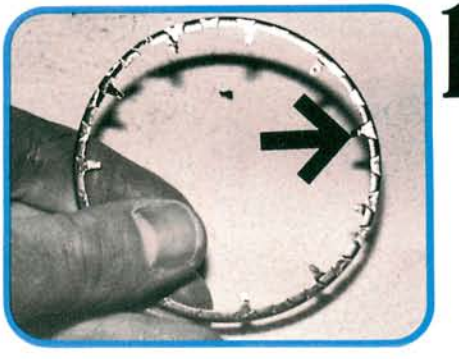
16

Disassemble the synchronizer assemblies. They're all different, so take them one at a time. Hold the brass synchronizer ring down, then remove the retaining ring. The synchronizer rings for each gear are different. They can be identified by the number of marks (pointer) on this inside edge.



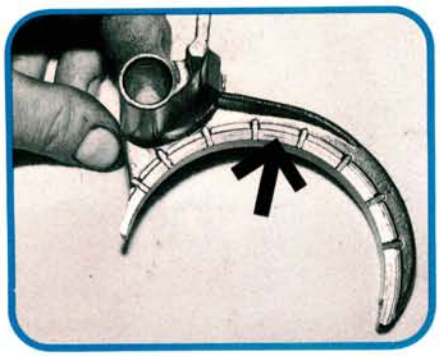
17

Note the proper position of the retaining spring (arrow). The bent end of the spring must fit in this gap in the teeth of the synchronizer ring. The bend at the opposite end of the spring fits in a gap in the retaining ring. The springs are color coded for identification.



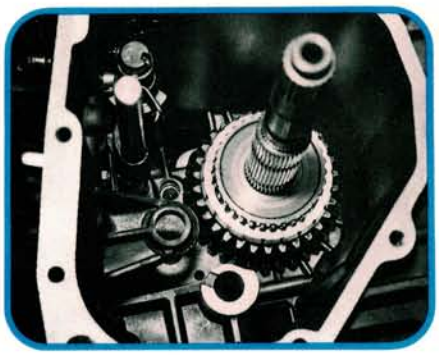
18

The synchronizer spring retaining rings can get worn by the gears they bottom against. This ring from the damaged transaxle is an example of extreme wear. Worn retaining ring ears (arrow) let the ring slip past the gear. Then the retaining spring gets tangled in the gear.



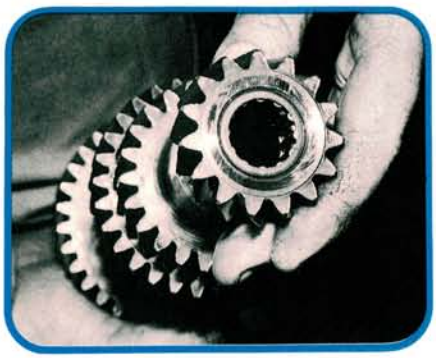
19

Check the shift forks over carefully. If the owner is in the habit of driving with his hand resting on the shift lever, the fork may wear in this area (arrow) from rubbing against the shift collar. Match each fork to its shift rod and check for excessive wear between the two.



20

Install the selective washer chosen in photo 15, then start loading gears back onto the pinion shaft. Seat each gear completely before installing the next. It's easier to reinstall the selector shafts and shift forks if the reverse gear shift linkage is moved all the way back.

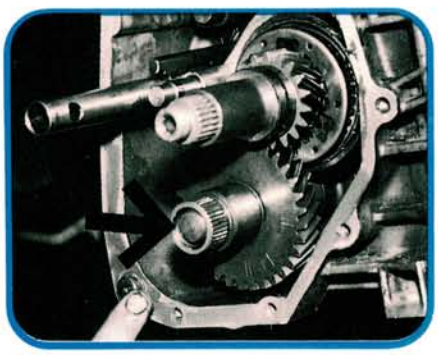


21

Make sure that this caged bearing in the end of the cluster gear is in good shape before you reinstall the cluster shaft. Pull the bearing out of the gear and check the bearing bore inner surface. Also inspect the cluster gear shaft for wear in the area where the caged and needle bearings ride.

22

Hold the cluster gear in position in the case, then guide the cluster gear shaft into position. The Saab tool we used in part one (arrow) helps here. Have an assistant hold the gear in position. Slide the shaft in until it reaches the end of the cluster gear. We'll finish installing it later.

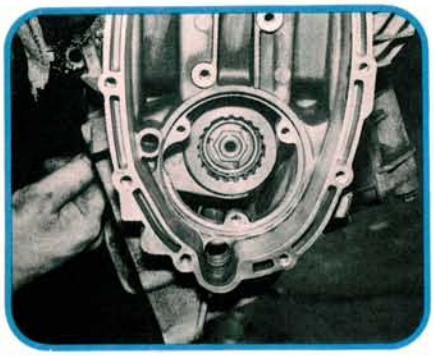


23

You can see the end of the cluster shaft (arrow) in this photo. The primary gear case mates to the main transmission case without a gasket. Clean both mating surfaces, then apply a thin coat of RTV. If the faces are smooth and clean, you shouldn't need a lot of sealer.

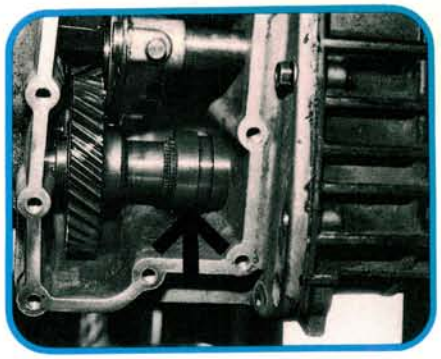
24

Reinstall the primary gear case. It may be kind of tricky because you have to line up all three shafts at once. Install a new pinion shaft lock nut with threadlocker. Peen the nut in three places after torquing it to 50 Nm ±10 Nm.



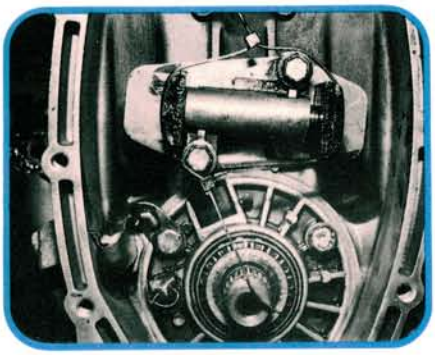
25

Reinstall fifth gear and its selector assembly. Slide the shift fork over the selector shaft, then reinstall its locating pin. Hold the selector collar and fork in this position while guiding the transfer gear and bearing into the front of the primary gear case.



26

Hold the input gear needle bearings and collar in place while reinstalling the input gear. Slide the cluster gear shaft into the case to support the input gear. Slide the collar (arrow) back between the input gear and the cluster gear, then reinstall the retaining ring and side cover.



27

Here's a tip that makes the transfer chains and gears easier to reinstall. Wrap tiewraps around the tensioner feet to hold them in against the spring tension. Apply thread sealer to the tensioner bolts to prevent oil leaks between the chain housing and the clutch housing.

28

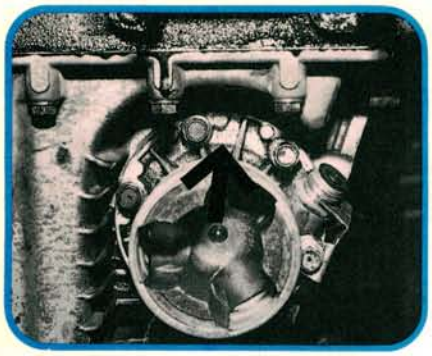
Reinstall the chains and gears. Reinstall the retaining ring to lock the upper gear in place. Install a new nut on the lower gear, then torque it to 100 Nm ±10 Nm. Peen the nut. Reinstall the primary gear housing cover. Reinstall all remaining primary gear housing bolts.

29

Install new seals on the side bearing housings. Remove the snap rings that hold the stub axles into the housings. Then push the stub axles out of their housings. Replace the seals and o-rings, then reassemble the housings. The preload shims will only fit one way on the housings.

30

Check the differential side bearings, then reinstall the differential. If the pinion depth has been set up properly, backlash should be where it was before repairs began. If pinion depth and backlash aren't reset close to original, noise may result when reusing a ring and pinion set.



31

Reinstall the side bearing housings. They're both marked top (arrow). Apply sealer to the housing bolts to prevent oil leaks. Tighten the bolts evenly to avoid damaging the sealing o-rings on the outside of each housing. Torque the bolts to 20-25 Nm. Reinstall the speedometer driven gear.

32

If you don't have a measuring instrument built into your wrist, check backlash with a dial indicator. The specification is 0.17 mm ± .05 mm. Mount the indicator button perpendicular to the ring gear tooth. Reinstall the differential cover, then refill the transmission.