

REAR MAIN SEAL REPLACEMENT WITH THE TRANSMISSION LEFT IN PLACE

Simplified Procedure for 89 S4 Automatic

Thanks to Louie Ott for assuring me this could be done. Ultimately he was proven right even despite doubts expressed by me and many others.

The problem: Replacing a leaking rear main oil seal in manual transmission (MT) or early automatic transmission (AT) 928s is fairly straightforward. The early AT cars have a two piece flywheel with a removable starter ring gear. The MT cars have a short torque tube (TT) and removable clutch pack. This allows easy access to and removal of the flywheel. **Replacing the rear main seal in a late model 928 AT is complicated by the fact that The flexplate (or driveplate, as Porsche calls it) and long TT central shaft impede access to the flywheel, the flywheel is single piece, and it is trapped by the angled bellhousing walls and a protruding centering boss on the crankshaft end.** Thus, the recommended procedure involves **removing the rear suspension, the AT, and the TT in order to remove the bellhousing and free the trapped flywheel.** Nearly everyone I talked to that had experience with late model AT 928s said suspension and AT removal was necessary. A few thought it might be possible to leave these parts in place, but no one had clearly documented it. I verified that you *can* replace the rear main seal with these parts left in place in a late model AT 928. It only requires a few unorthodox steps to deal with the restricted access.

The basic steps are:

- Remove the bellypans
- Remove the bellhousing inspection cover
- Loosen the TT shaft pinch bolt
- Remove the flexplate
- Loosen the AT mount bolts
- Move the park brake cable out of the way at the crossmember
- Remove the bellhousing bolts to the block and TT
- Remove the shift cable from the AT
- Slide the AT back as far as allowed by the crossmember
- Remove the flywheel
- Remove the old seal
- Install the new seal
- Reassemble the above with proper torque

NB: Before we get started, it is important to be sure that the rear main seal is REALLY the source of the oil leak. There are other sources to rule out:

1. **Pan gasket:** Of course, the pan gasket is much more often the leaky part. Any 928 with over 100K miles likely has a brittle, compressed, leaky pan gasket. The leak should be apparent at areas other than where the rear main seal is located, whereas the rear main seal leak will wet the lower bellhousing and the portion of the pan near the bellhousing. Of course, it could be both. Do the pan gasket first. There is no advantage to doing the rear main seal at the same time unless you are sure it is leaking since the jobs do not involve related tasks.

2. **Rear cam end caps or cam cover gaskets:** Check for wetness at the back of the engine. From below look up at the rear of the engine and cam covers for evidence of oil running down the outside of the block and bellhousing. A rear main seal leak would not wet

the upper bellhousing exterior.

3. **Oil from block intake valley:** (taken from advice of Wally Plumley and Marc Thomas) **Even with the bellhousing inspection cover removed showing oil around the rear main seal, there is another possibility besides the seal.** There is a drain hole cast into the rear right side of the intake valley in the engine block. This drain empties inside the bellhousing above the rear main seal. If an oil pool develops in the valley and run down this drain, it will precisely mimic a rear main seal leak. This drain is **not present on early model years.** Take a close look at the valley area by removing the air cleaner and MAF and/or a fuel rail to make sure oil has not accumulated there. Oil in this area most likely is coming from a bad gasket where the oil filler joins the block.

Now that you have established that the rear main seal should be replaced, the process in detail is:

Disconnect the battery ground strap (bolt behind the tool holder panel in the rear). Remove the starter motor by removing its electrical power and the 2 Allens that hold it on. Remove the exhaust pipes. It is possible to remove the bellhousing access cover without completely removing the exhaust (remember that next time you are checking the TT pinch bolt for thrust bearing issues) using a Gearwrench to get at the rear inspection cover bolts. However, you must remove the exhaust for later steps, at least in MY89, as the rear exhaust blocks sliding of the automatic transmission backwards. Removing the exhaust involves:

- Unfasten the air injection pipe from the passenger exhaust
- Unbolt the exhaust from the headers. Leave one bolt attached in each side temporarily..
- Undo the rear exhaust hangers. Allow the rear to hang down.
- Support the cat so you can undo the last few front bolts.
- Drop the front of the exhaust a little until you can gain access to the O2 sensor. You can pull on the wire to it and gain enough slack.
- Once the O2 sensor is out, complete removing the exhaust.

NOTE: It is **possible** that you may be able to do this job with the exhaust system left in place, with only the front connection to the headers removed. I started that way, as shown in the early photos below. The tranny may be restricted in terms of rearward movement by the exhaust, although movement needed is only an inch. Access to the TT is blocked, but you may not need access to the TT anyway. This may vary with MY.

Remove the bellhousing lower cover. (If the exhaust is not completely removed, a Gearwrench will be needed for the cover's rear bolts, and the exhaust will have to at least be loosened at the headers to allow the rear bolts to drop out.)

Here is the view (exhaust loosened but left in place in early photos). Many think the TT

central shaft obstructs flexplate removal. Let's see.



Remove the torque tube pinch bolt. (Not too surprisingly, the shaft moved almost 1/4 inch in even though I had adjusted this maybe 20K miles ago.)

Loosen the bolts that affix the flexplate to the flywheel and the torque tube coupling. Don't remove them until you have them all loosened. Mark the position of the flexplate to the

flywheel and the torque tube coupling with paint.



Once you have all the bolts removed, slide the torque tube coupling back on the shaft as far as it will go. This is very simply done by levering the flexplate back at the periphery. Mine slid

easily.

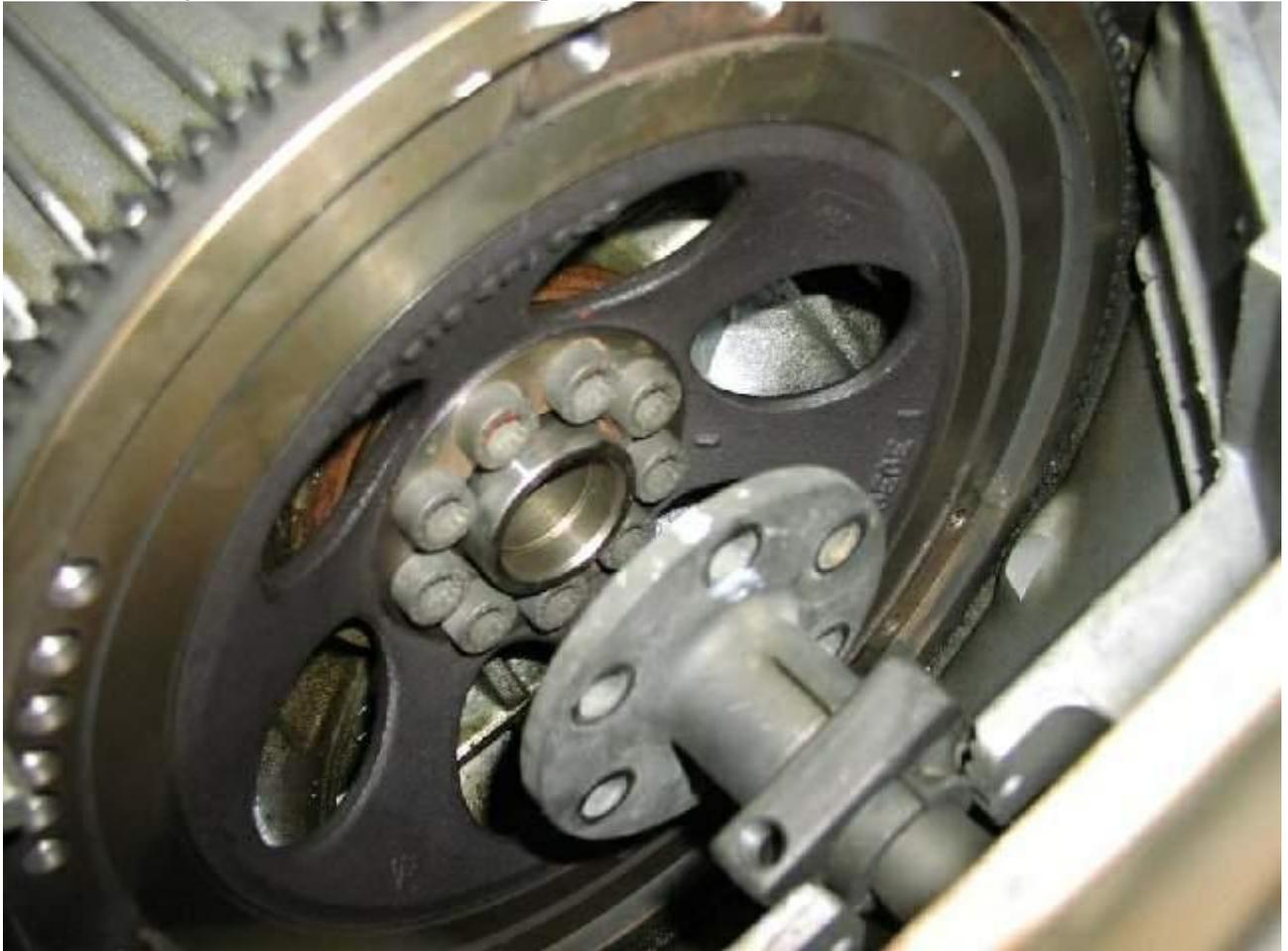


Separate the flexplate from the coupling by wiggling the plate and using a screwdriver.
Lever (screwdriver) the flexplate outer edge over the flywheel outer lip.
Lever the center of the flexplate over the torque tube end. This required almost no effort at all with just slight flexing of the plate.

Remove the flexplate.



Observe the flywheel cheesehead bolts in plain view.



The main issue now is getting the 12MM cheesehead bolt tool between the torque tube shaft coupling and the bolt head. There is not enough room to remove the coupling from the end of the shaft. All the cheesehead bolt tools I found were too long, so I had to cut it down a

little. Dremel with a cutting wheel to the rescue.



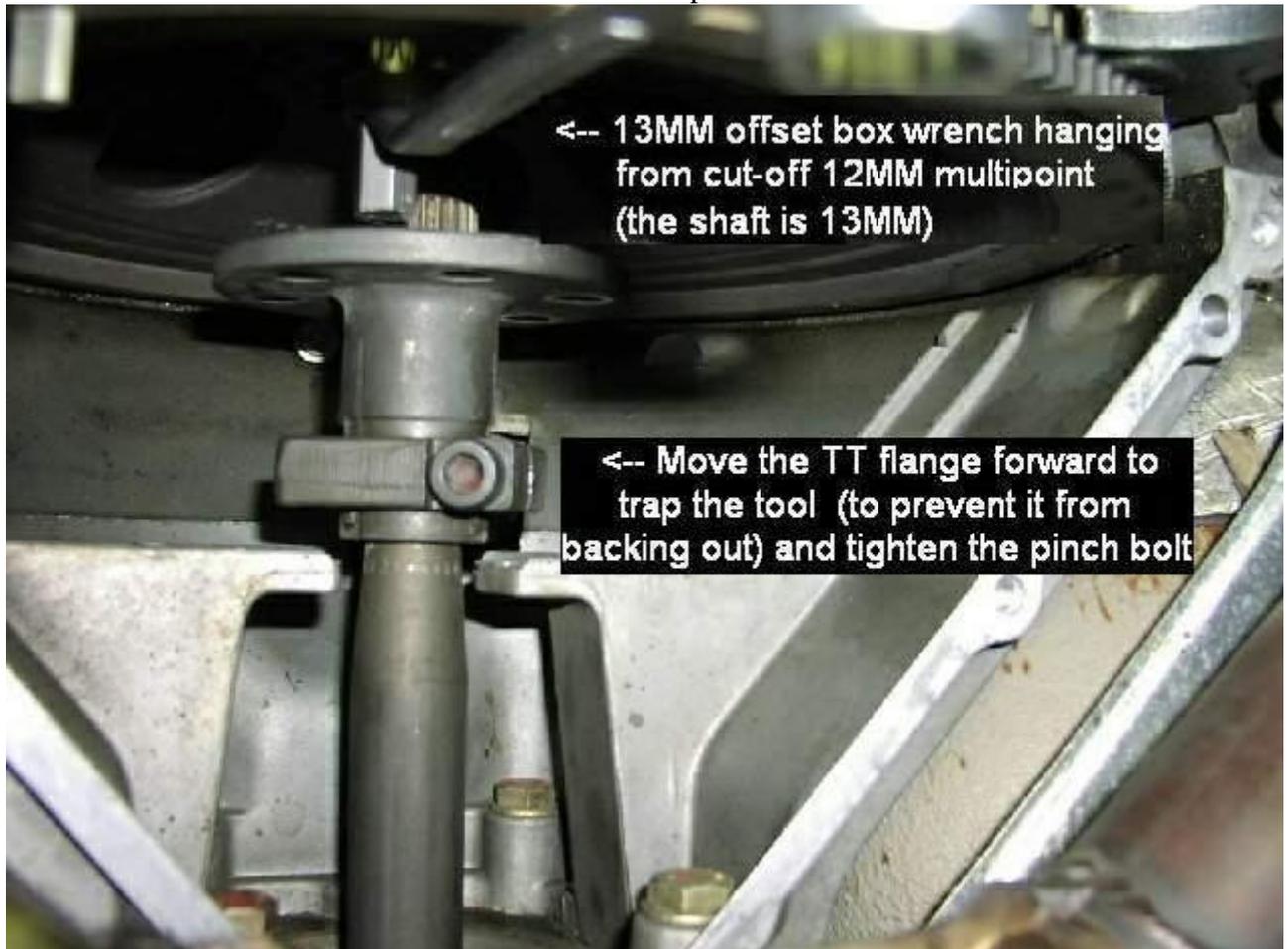
Insert the tool. This requires seating, although I got most of the bolts out pretty easily. You'll need some way to hold the flywheel. I had a friend holding the nut on the front of the crank. When he left, I jammed a VERY large screwdriver between the cat and the bellhousing with the tip against large toothed crank position ring (rather than the starter ring

gear whose teeth might chip.). This worked great.



Also, the cheesehead tool is hard to seat. I moved the shaft coupling against the end and clamped it there to prevent the tool from backing out. I used a 13MM offset closed end held captive on the tool by the coupling. This worked great. Picture below shows the flange still a

bit back from the end of the tool. Should be moved up and cinched down.



PROBLEM: The bellhousing obstructs removal of the flywheel with the starter ring gear. Unfortunately this is one piece and the ring gear cannot be removed. Note the obstruction points on the bellhousing marked in red. Note boss on the crankshaft marked with the red arrow showing the distance the flywheel must move back to clear it. So, obviously, the bellhousing must be loosened if not removed, and this alone will not allow enough space

for the flywheel to clear the crankshaft boss.



The shop manual describes removing the bellhousing in MT cars by removing the bolts on the tranny mounts and "apply tire iron on transmission and rear axle cross member" so the housing can be removed. Hmmm.... Let's see if this might work for my AT. First loosen

the 4 17MM bolts that hold the housing to the torque tube.

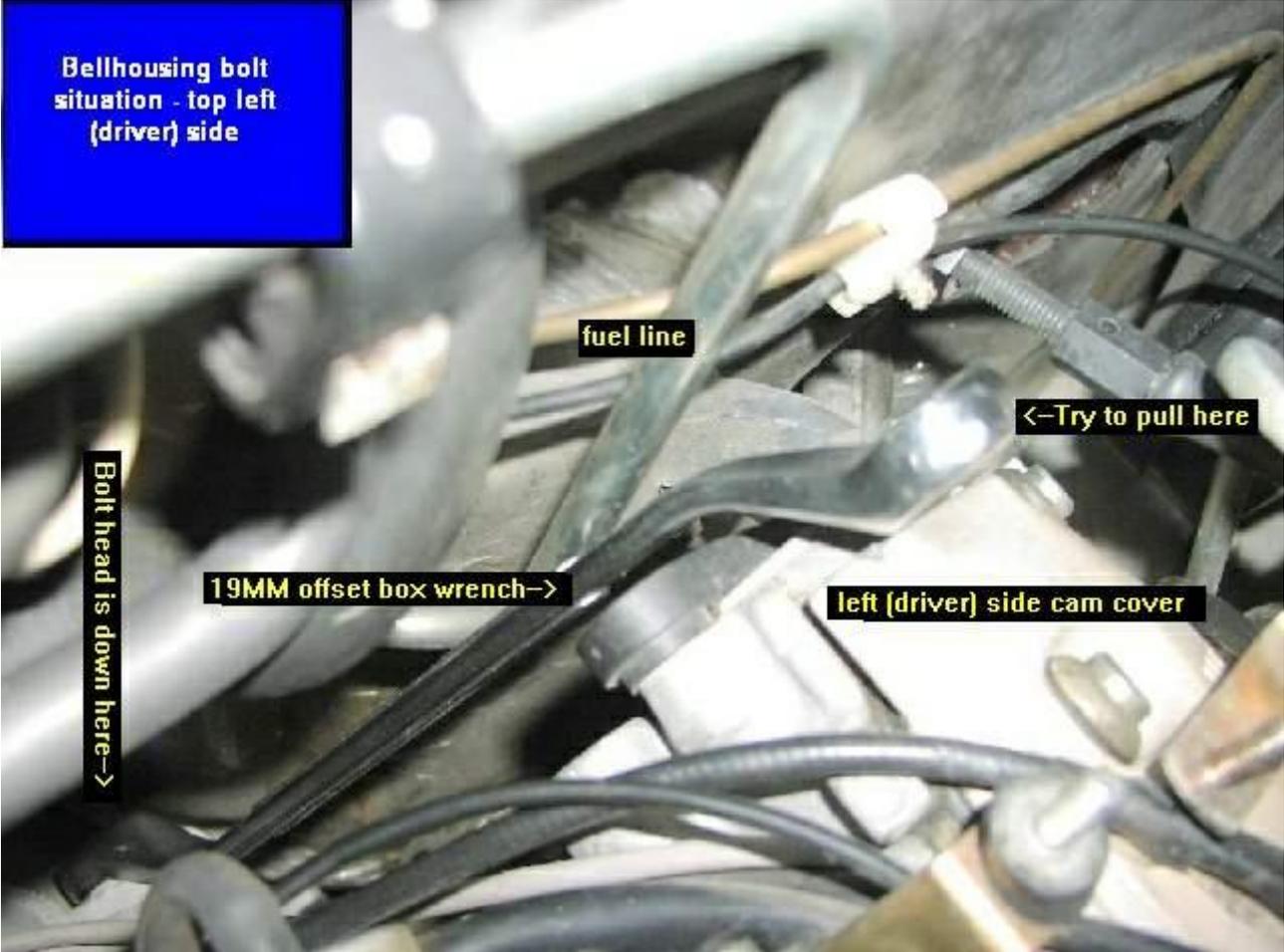


Then loosen the 19MM bolts that hold the exhaust hanger at the header joint, one on each side of the bellhousing. These go through the housing into the block.



The last bolts that hold the bellhousing are at the top, one on each side, accessible by removing the air cleaner housing. This picture shows the bolt on the driver side. The bolt head is in the lower left corner of the picture. This is my first attempt to remove it, using a 19MM offset box wrench. I can get it on, but I need a pipe to act as a leverage extension. Also, the crook in the offset hangs on the housing and forces the box off the bolt head. However, it DID work to put the bolt back in later, as when turned the other direction

there is no obstruction to force the box off the bolt head.



Final solution was a 19MM flexhead Gearwrench. It's a bit short. I extended it with a LARGE (19MM) Allen that fit the open end perfectly and gave great leverage. The Gearwrench's 5 degree ratchet was invaluable as there was room for only 15-20 degrees of

motion. This shot shows the wrench being held by a ViceGrip.



Here is a shot of the Allen slipped into the other end of a LONG combination wrench. This was used the the passenger side. The driver side needed the flexhead Gearwrench, though much shorter, in order to get the right angle on the bolt and because of the limited travel on that side. I cannot determine where I purchased the large size Allen set. Harbor, Northern

and JC Whitney do not list a set.



The situation on the right (passenger) side is more ominous, with some AC lines in the way, but there is room to the far right of the mess. The bolt head is dead center of the picture with a wrench on it. I used a VERY LONG 19MM box end (Harbor Freight) to reach the passenger side bolt and seat on the head. With the assistance of the "extension" this came

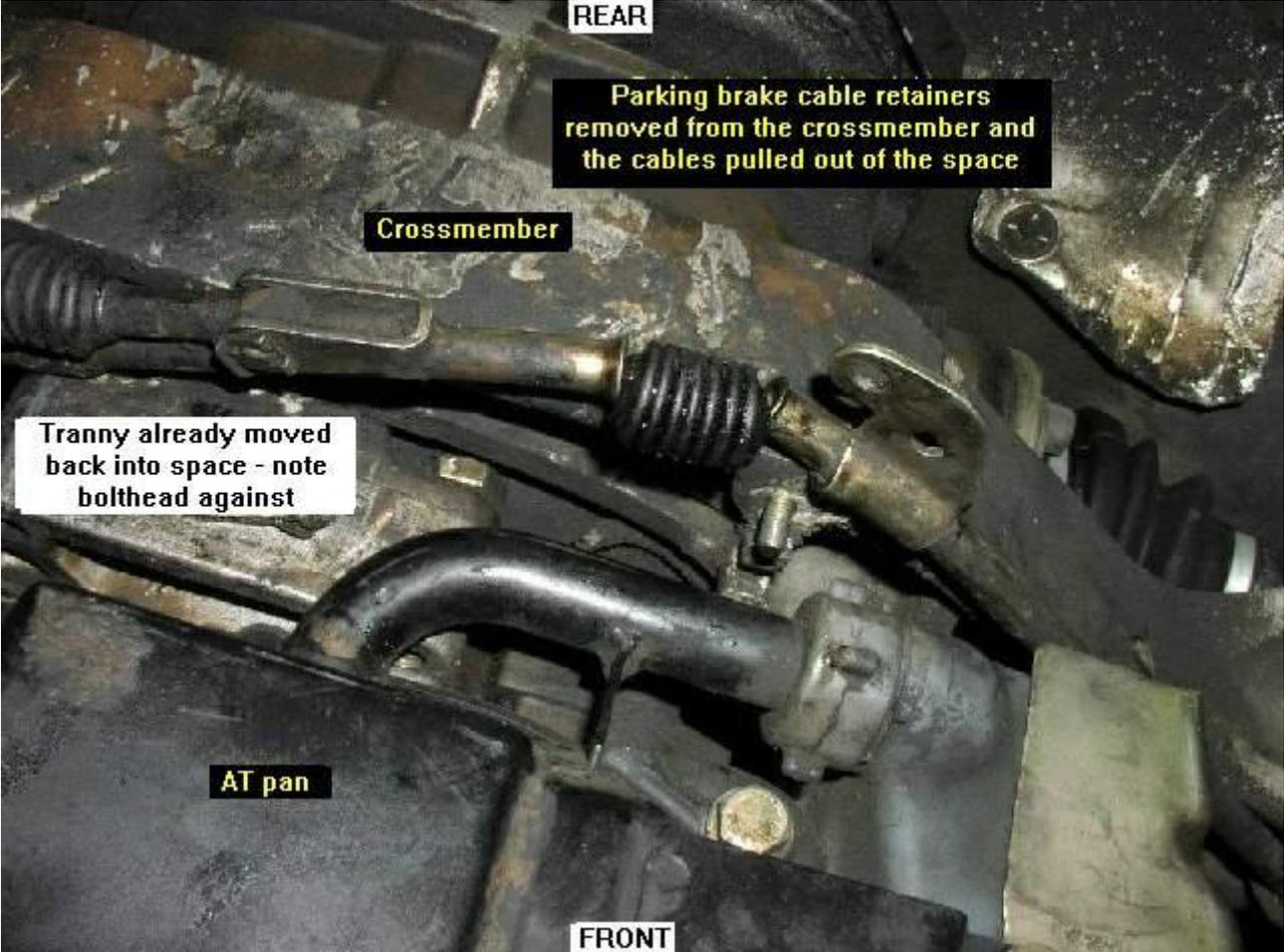
loose.



Next problem will be sliding the AT back to allow the bellhousing to move back. There is no way I can see to move it more than an inch short of dropping the whole thing. Is that enough?



Brake cable pulled out of the way so AT can slide back.



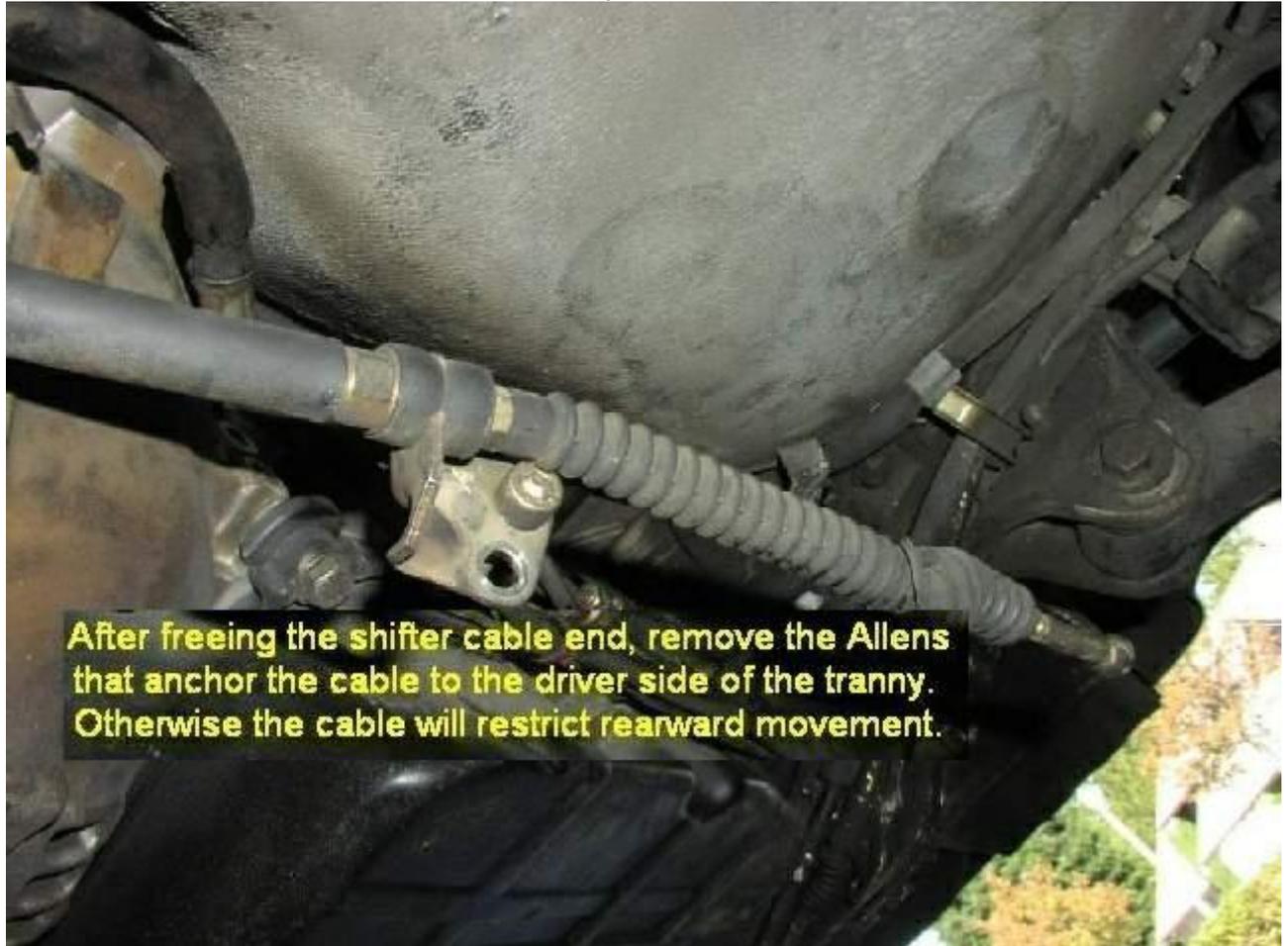
To allow the tranny to slide you need to loosen the tranny fluid hose brackets, but the hoses themselves can stay in place.



Shift cable needs to be unhooked.



As well as the shifter cable anchor on the tranny.



In the engine compartment the Bowden cable needs to be detached from the ball mounts and throttle bracket.



NOTE: Loosening the hose clamps on the TT, as shown below may not be needed. The tubes clamped to the TT by this may be able to move back with the TT without limiting the bellhousing movement. If so, you do not need to remove the exhaust and insulating

shields. You do need to get the wood block up above the front brace, as shown below.



Ready to pull back the tranny. Use a large screwdriver between the bellhousing and the TT flange. Check in back to make sure the parking brake cables have not slipped back into the gap. Once a good gap is created up front, lever the flywheel backwards with a large screwdriver to get it off the crank end boss. A minute later, it should look like

this. SUCCESS!



Here is the heart of the matter - the rear main seal. Notice the notch in the block exposing a small section of the seal. This is the point of attack to get the old seal out of the block.



The seal is rubber coated metal, so it is rigid and firmly stuck in place. I took a large screwdriver and whacked it against the side of the seal exposed in the notch area. You definitely do not want to hit the crank, of course, but the seal is very sturdy and the exposed area is large enough that you can whack on it safely. The idea is to dent the side of the seal just enough to create a place for the screwdriver tip to grip in order to lever the seal out. It takes some levering, but the seal will start to lift and you can work it out even with just this

notch access. It's partially out in the shot below.



Voila! Seal out. Area cleaned up. The old seal had no obvious flaws.



The rigid seal does not want to go in easily. It should be pressed in evenly. It tends to cock to one side, and as you press the high side in, the low side backs out. You will have to improvise to get the new seal in as you do not have much direct access with the TT still in place. It would be best to fabricate a seal "press" out of metal that would use the flywheel bolts to press in the seal. It wouldn't have to be a complete circle, but just two strips that can be fastened on opposite sides to 2 or 3 of the bolts. I did not have the materials to do this. So, I did manage to get the seal started after a bit of trial and error and used the old seal as a buffer tapping it with a hammer head to drive it in. There is so little access that I had to use a

variety of objects as a "hammer." Best to fabricate a press. Anyway, new seal in place.



In order to get the flywheel back in you MUST jack the front of the motor. It took me a while to realize the motor had pivoted on the mounts just enough to change the geometry and make it impossible to position the bellhousing back in place high enough for the flywheel to clear the centering boss. Jacking up the front of the motor brings things back in alignment, so

the flywheel can get where it needs to be.



Once the flywheel is in place and the bolts reinstalled there is a challenge to deal with - torquing the flywheel bolts with lousy access with the TT in place. I used a 1/2 inch combination wrench, with the open end fit over the head of the torque wrench. This acts as a torque extender. Re-calculate the torque taking into account the longer torque arm. Torque in two stages, starting with 30 ft-lbs, then following with 66 ft-lbs, as the manual indicates.



I wedged a large screwdriver between the flywheel timing gear teeth and the floor rail to hold the flywheel stationary. This is OK in S4 and later as the timing ring gear and flywheel are a single piece and not press-fit. Certainly. Some kind of lock using the flexplate attachment bolts would be preferable, but this worked. Don't use the starter gear teeth - those could

break.



All torqued down, slip the flexplate back up into position. Piece of cake. Use the lower bolts on the bellhousing to draw it back together with the block, then the lower bolts between the bellhousing and TT to draw the TT (and tranny) back to the front. The TT is perfectly located height-wise by the 1x2 block, so the bolts should go right in and the locator pins should line

up.



The rest is just continued reinstallation.

- flexplate bolts to the flywheel and torque to 23-28 ft-lbs.
- TT flange bolts to flexplate and torque to 39-46 ft-lbs
- bellhousing bolts and torque to 51-60 ft-lbs.
- bellhousing to TT bolts and torque to 28-33 ft-lbs.
- tranny mount bolts and torque to 61 ft-lbs.
- tighten pinch bolt to 58 ft-lbs (some recommend torquing to 66)
- reinstall shift cable to tranny and re-affix hoses
- re-affix parking brake to crossmember
- reinstall starter and hook up electrics to it
- reinstall bellhousing inspection cover and torque to 14-17 ft-lbs.
- reinstall exhaust - a chore. Support the front of the exhaust so you can reinstall the O2 sensor, then hang the rest. You can take up the O2 sensor wire slack by removing the carpet in the passenger footwell and removing the lower central panel wood piece. You will see the wire right next to the center console area.
- reinstall MAF and air cleaner assembly
- re-affix battery ground

START CAR AND OBSERVE - NO LEAKS!!