

5th Gear Swap How-to 02A/02J



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5/9/06
v 1.32

BIG IMPORTANT WARNING

WARNING!!!! This procedure discusses the way you would open up the end of your very expensive transmission in order to replace a gear that is perfectly fine. In doing so you might or might not gain any benefits. In doing this there is a large potential that you might screw something very important causing damage to your very expensive perfectly good transmission. I take no responsibility for the whatever outcome you might have. If you do screw this up there is potential that your car might stop function as per the specifications of Volkswagen. Be advised, there is also the possibility that this might result in your death if things were to fail at speeds other than being not moving. For safety reasons I cannot recommend you drive your car after doing this and should thus be considered an “Off road only” modification. I did have success with this modification in my own vehicle but your results might vary greatly. I HIGHLY recommend you obtain a legal copy of the Bentley CD manual as it includes additional detailed instructions pertaining to swapping out the 5th gear in your transmission.

This document is for educational purposes only.

Prelude:

Welcome to dave's 5th gear swap. The procedure for swapping out the 5th gear is rather simply. In short all you have to do is remove the end cover of the tranny, remove 2 retaining bolts, remove both the gears, put on the new gears, replace bolts and end cap, refill with gear oil and you are done. Sounds simple enough right?

It basically is except for the removing of the original gears, thats where things get tricky... You have 2 gears to remove, The larger drive gear with the associated selector assembly and the smaller driven gear. The smaller gear along with the selector are both pressed onto a splined shaft. So to remove both of these you will need a gear pullers. For the selector assembly any gear puller about the right size should work without issue but for the smaller gear some modification might be needed as the case is pretty close to the gear which makes getting the puller arms around the gear a little challenging. Once you get the puller on you will want to heat the gears so they expand as this should make the removal a little easier.

At about this point you would reach the scary part of the project. Once the puller is on the gear selector assembly and you are cranking down on it, it can take A LOT of force to get the gear off. Mine let out a loud crack which fortunately was the gear coming off the shaft.

Ok, If that didn't leave you horribly terrified here is the more detailed overview....

BIG IMPORTANT WARNING ***AGAIN in case you skipped the*** ***first one.***

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Parts Required

- 5th Gear Set
- Transmission End Gasket
- 2 Liters Gear Oil

.681 5th gear set.
93-2003 Transporter Synchro
02D 311 361 (32 tooth)
02D 311 158 (47 tooth)

02A 301 215A (gasket)

.658 5th gear set:
Requires modification to spring plate. If you dont know what a spring plate is go with the .681.
02Z 311 158A
02Z 311 361A

Tools Required:

- Torx socket set including a T-40, T-45 and T-60 bit.
- M8(8mm) 12 point xzn bit (three square).
- Multiple gear pullers.
- Torx screwdriver for removing plastic pieces.
- Assortment of metric ratchets.
- Propane blow torch.
- 17 MM allen wrench(Sears has them).
- Oil catch pan.
- (for MK5 only) M14(14mm) 12 point xzn bit(three square).

**You did read the warning
by now right? If you didn't,
please go back to the
second page.**

Gear Pullers:



Compliments of velvetfoot these are the gear pullers I used. The big puller I used for the big gear. Some recommend grinding down the very bottom of the finer so you can put it directly on the syncro gear. As this puller is currently, the part of the jaw just below the pulling surface is too thick to get between the syncro gear and the brass synchro on the 5th gear.

Gear puller info.

So the deal with the little puller. There is very little free space around the smaller driven gear. The problem: most gear puller arms come in at too steep an angle so that they are unable to get under the gear because they are hitting the housing around it. If you look at the picture you will see how the 2 arms have to be cut. This allows the arms to be parallel to the puller screw and keeps the gear puller arms from hitting the housing. It's kind of vague, but once you have the tranny end cap off you will understand pretty quick what needs to be done.

The bigger gear pulled pictured is :

Craftsman 2 Jaw Small Gear Puller
Sears item #00946905000 Mfr. Model #46905

With proper modification this puller can be used to pull both the bigger gear and the little one. Two separate pullers are needed though. A cutoff wheel is needed to cut off the arms for the smaller puller and a grinder is also needed to narrow the jaw arms.

First Steps... no pictures

- Jack up the front driver side of the car.
- Remove the wheel.
- Remove the engine belly pan.
- Remove all the plastic fender liner pieces.

1) Moving P/S line out of the way



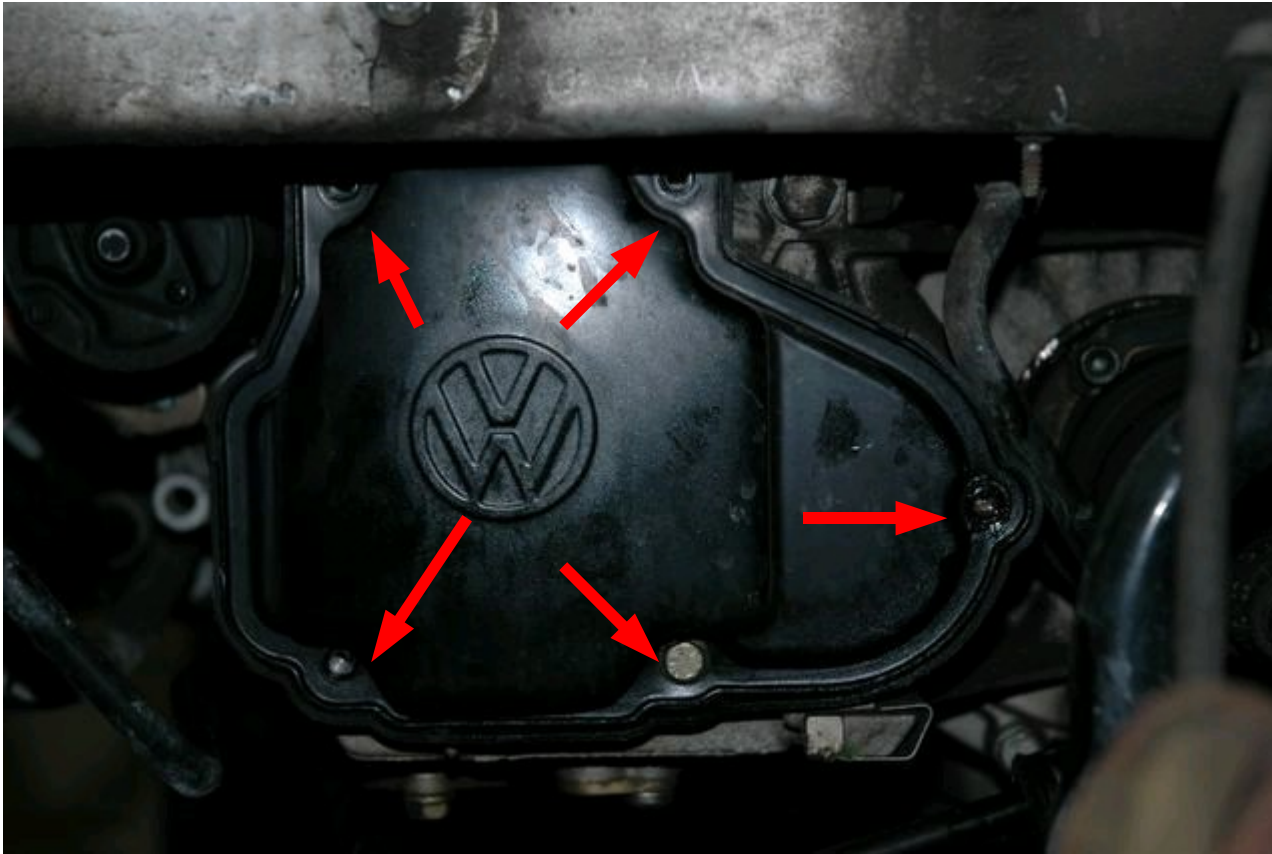
This is looking overhead into the engine bay. You want to remove the bolt that holds the power steering line here. This line kinda gets in the way of accessing the tranny.

1) Moving P/S line out of the way



Then looking in from the wheel well you want to remove the bolt that holds the same line to the bottom of the transmission.

2) Remove Tranny End Cover



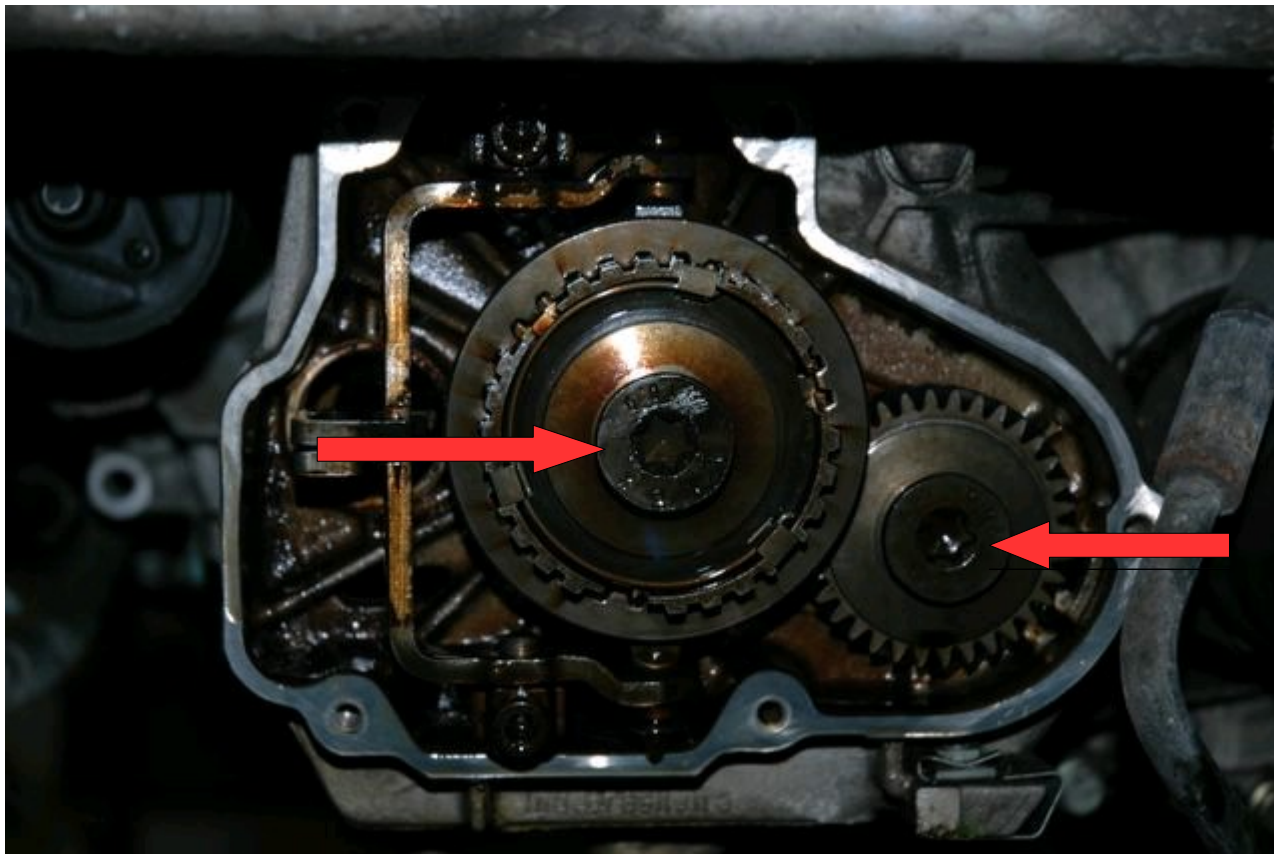
Next you want to remove the 5 bolts that hold the cover on to the end of the transmission. Remember when you get this cover off that some gear oil in the transmission will drain out so have someone nearby with a catch pan.

2.5) Loosen Big bolts

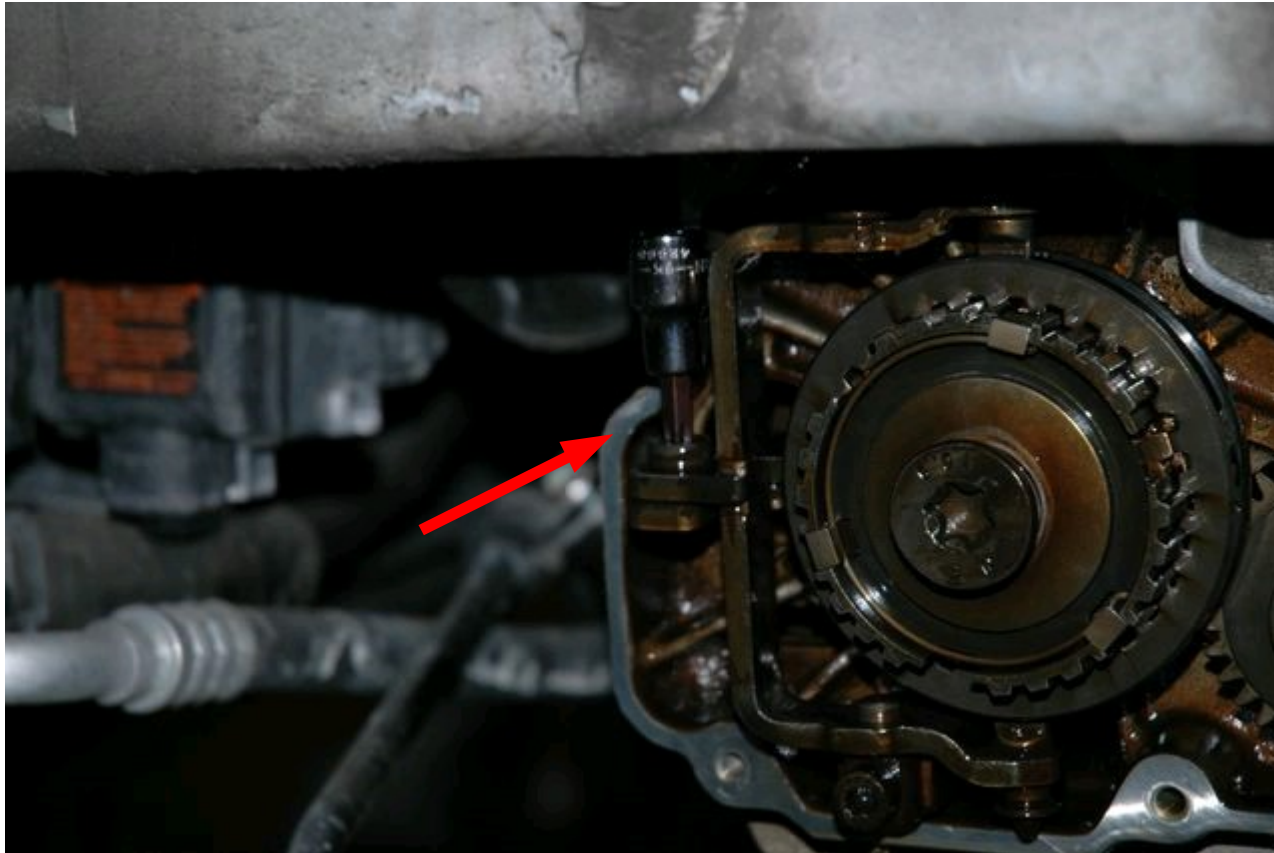
At this point you may want to loosen the 2 big bolts holding on the gearset.

If you are **not** using an impact wrench this is the best time as it allows you to put the car in 5th gear and have your helper hold the brakes while you apply torque to the bolts.

If you are using an impact wrench you shouldn't have any issue getting these off.



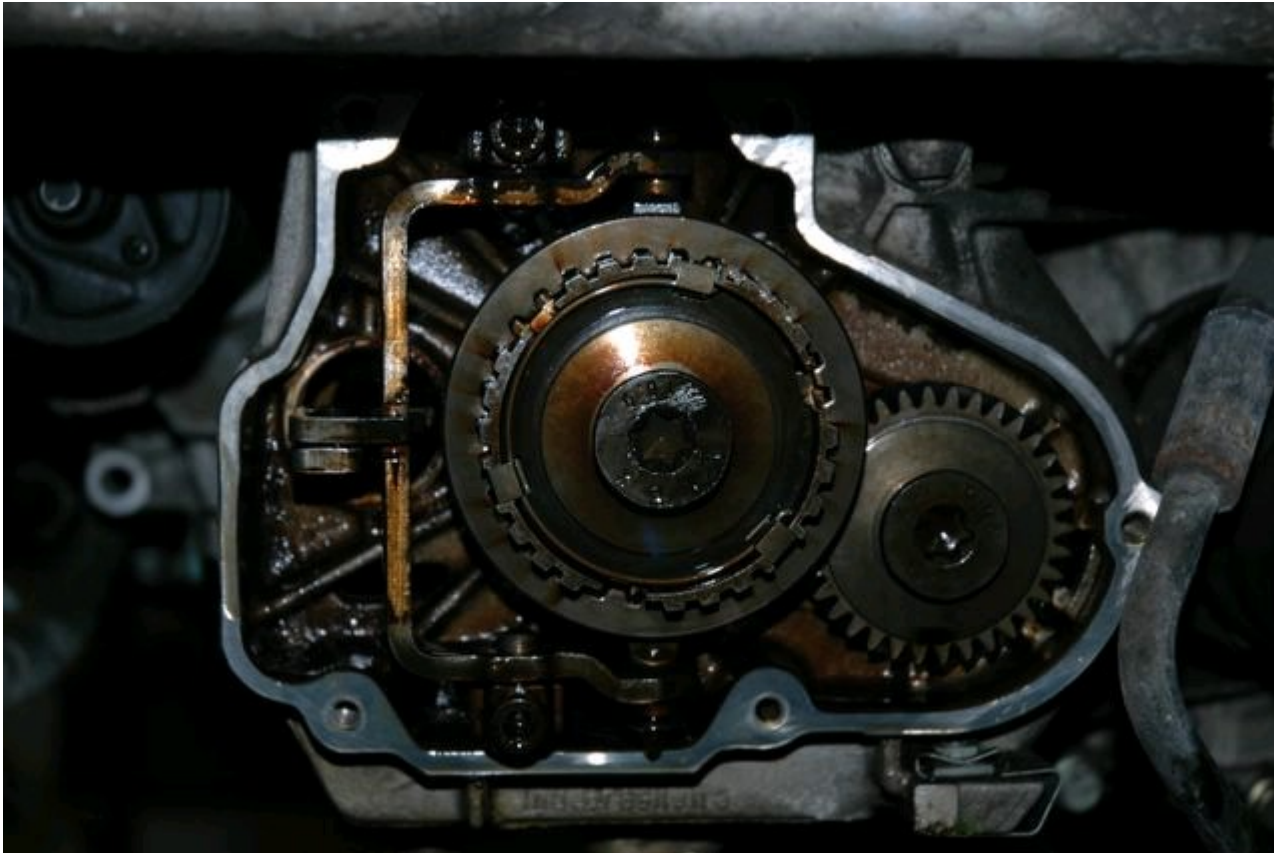
3) Remove Bolt holding selector shaft (optional)



This part is optional! Once the end plate is off you will want to remove the small bolt that connects the selector to the selector shaft. This requires the T-45 Torx bit.

The selector can be removed without undoing this bolt. If you do decide to undo the bolt be careful you don't drop the selector into the main part of the tranny.

4) Remove bolts holding selector

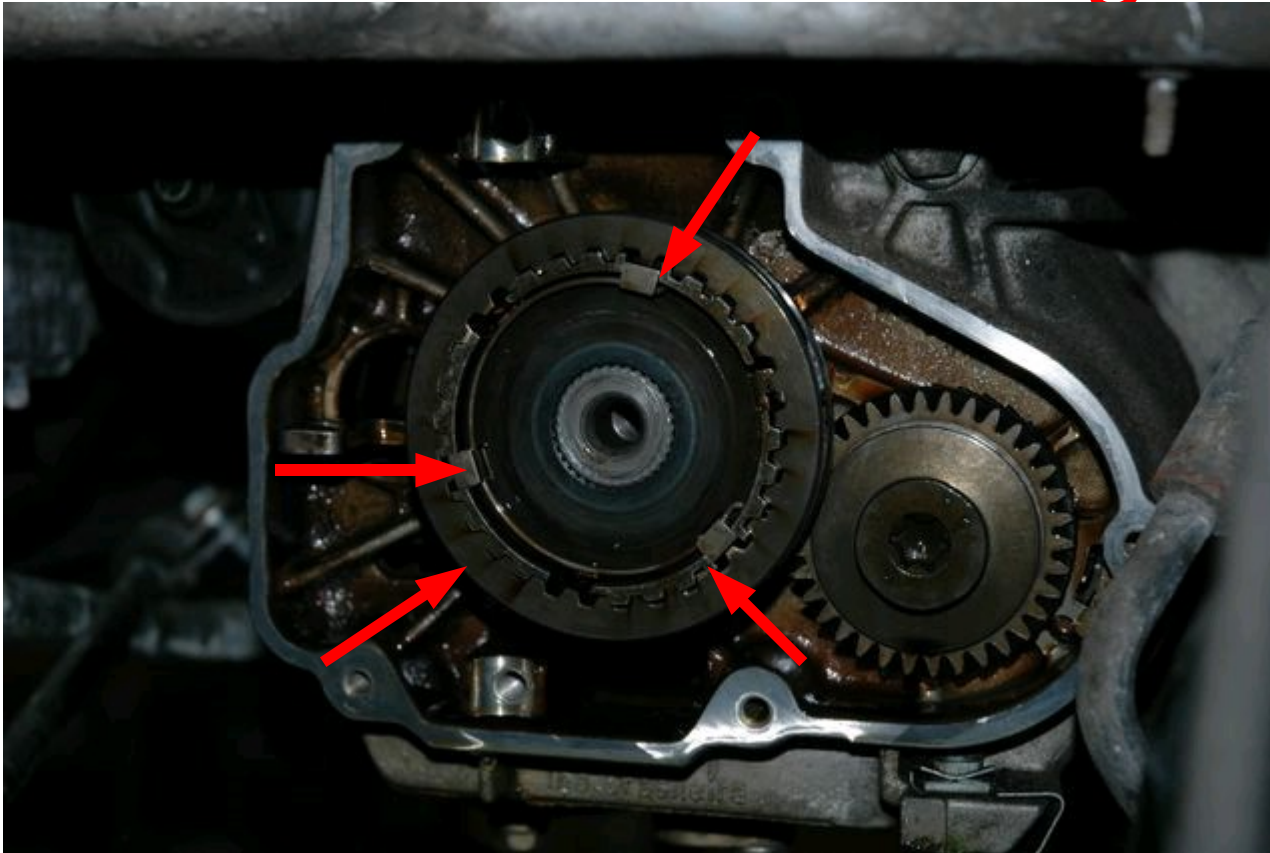


Remove the 2 bolts that hold the selector pivots into place. Once they are out the selector should easily fall right out. These should be the 3 square bolts.

So it should look something like this.

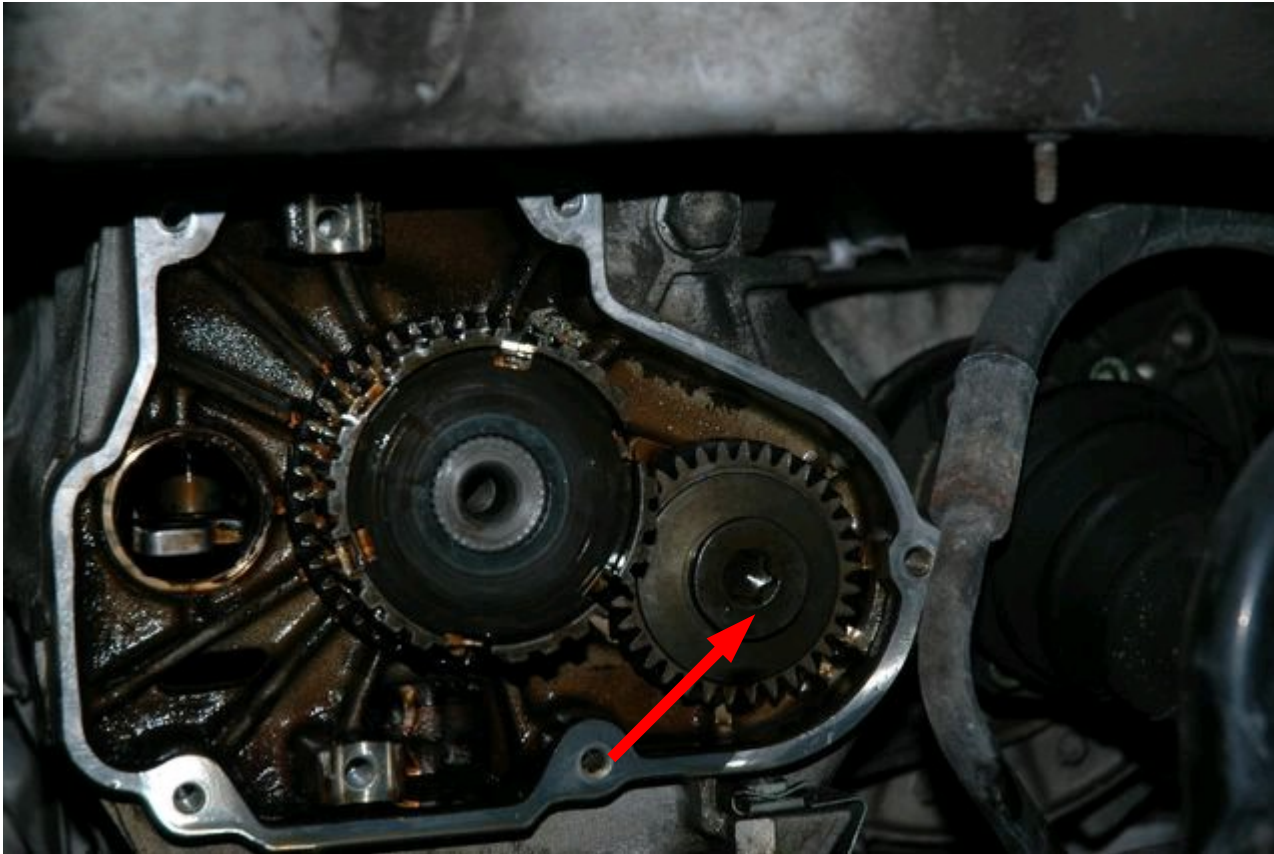


5) Remove selector ring



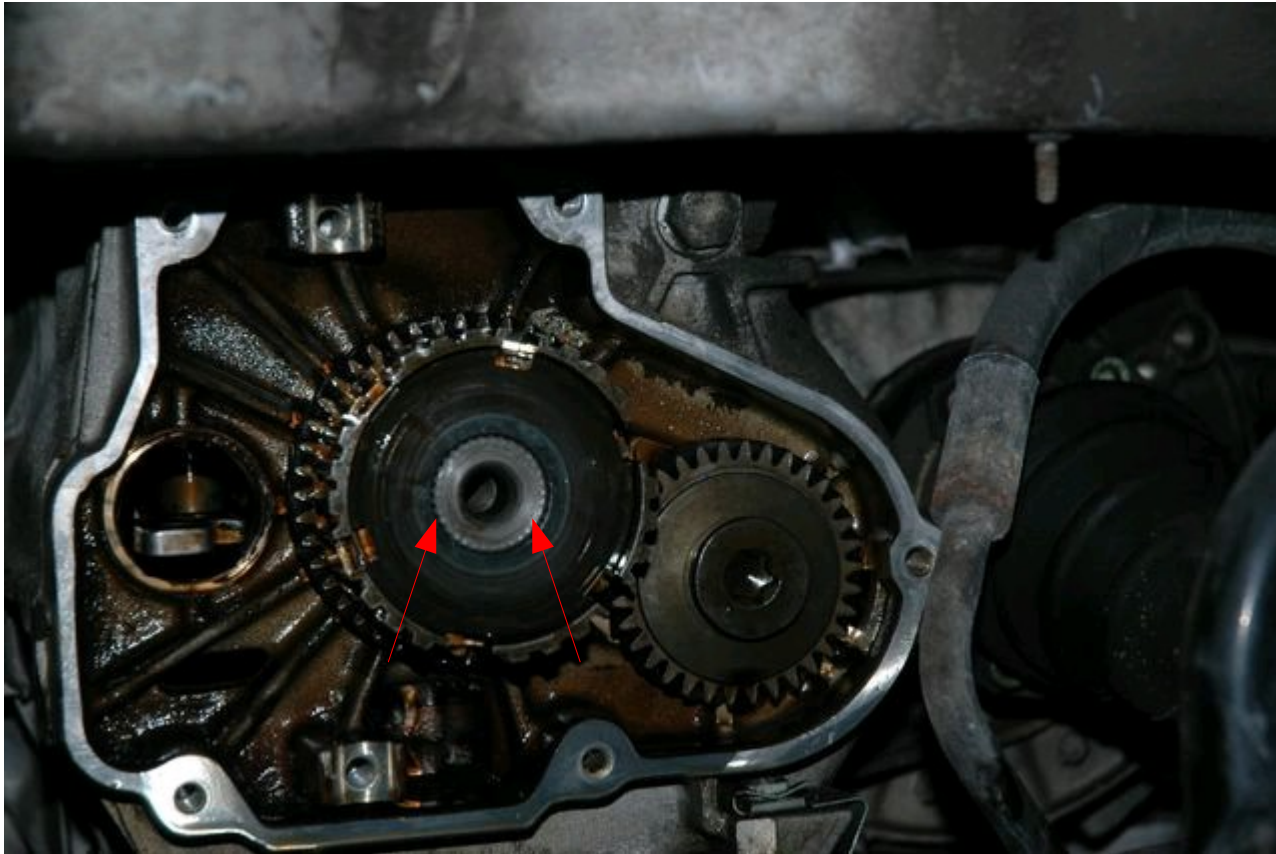
No good pictures of this, but it just pulls right off. With it will come 2 C(one front, one back) clips and 3 little locking teeth things. **Pay attention to how this is oriented as you will have to put it back together later.**

6) Remove the big bolts



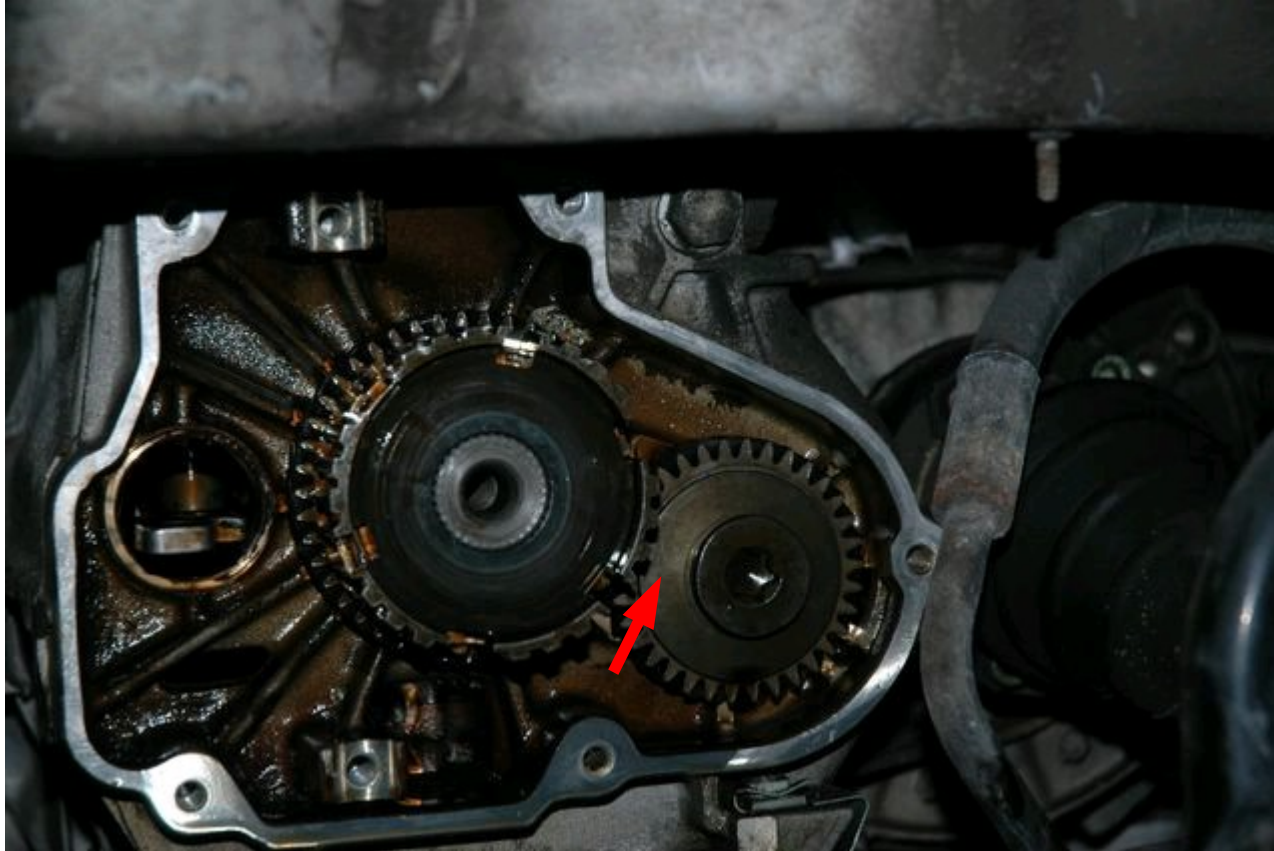
Next remove the 2 big 8mm 12 point bolts that hold on the little gear and the bigger selector gear. These will take some torque to come out and it may be helpful to have someone put the car in like 3rd gear and hold the brakes to keep everything from spinning as these take a good deal of torque. In the picture the bolt on the left gear is already removed.

Check the gear and selector position.



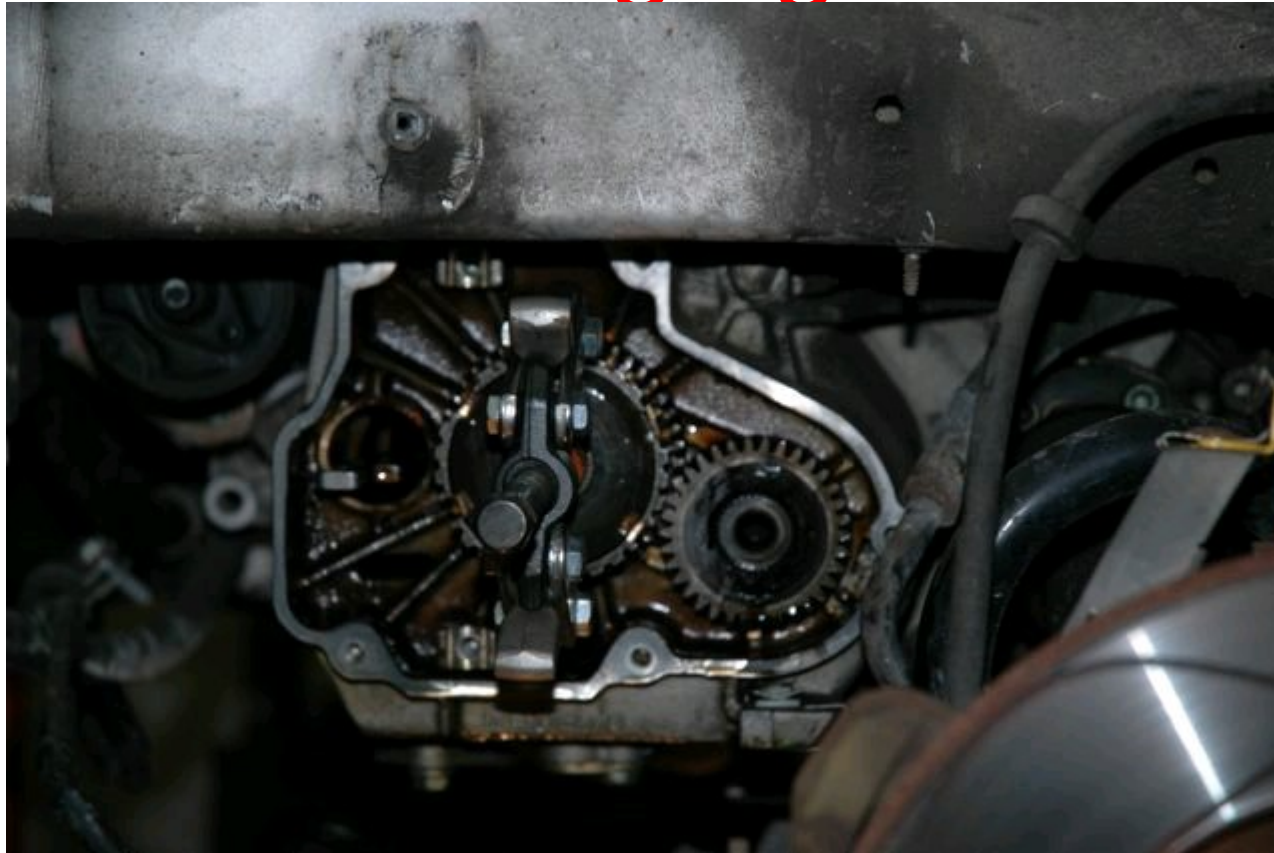
At this point you should check the position of the selector in relation to the shaft. You want to observe how flush it is with the end of the shaft so when you reinstall you have it just as far on as it was originally. You will also want to note the position of the small gear in relation to its shaft also.

7) Reinstall bolts



Both big bolts have a big washer behind them. Once you get them off you will want to take the washers off and then put the bolts back in. The gear puller needs something to push against and the bolt head works well. The bolts when it without the washer will allow you to pull the gear like $\frac{3}{16}$ of an inch at which point you will need to remove the bolts to get the gear the rest of the way off.

8) Remove large gear FIRST!!!!.



At this point you are ready to pull the gears off and you MUST do the big one first. On mine I tried heating the selector gear(not the the 5th gear you are replacing) and using the puller to pull on the 5th gear that I was actually trying to swap. This worked but required a lot of torque and I chipped a few teeth in the process but it did work.
.... Please Read the next page for a possible alternative though.

Alternative method.

After reading how others did this it, it sounds like there is a better way to get this gear off. Whats attached on the driven shaft is the selector gear, not the actual 5th gear. But there is very little space between the brass syncho and the the selector gear. From reading others procedures it sounds like they filed down the jaws of the puller so that they could fit the jaws between the brass syncho and the selector gear so that they were only pulling on the selector gear.

Again, you will want to heat the selector gear and not the shaft before you try pulling anything.



Should look like this



With the big gear off this is what you should see. The syncho and 5th gear along with the needle bearing it rides on will just slide right off now.

8) Remove little gear

Once the big gear is off you can repeat the whole procedure for the little gear. This one came off much easier than the big gear.

NOTE: YOU CANNOT REMOVE THE LITTLE GEAR UNTIL THE BIG ONE HAS BEEN REMOVED!!!!!!!

I made that mistake and it resulted in my chipping a bunch of teeth on the little gear. The teeth of the little gear down clear the dog teeth on the bigger gear that the selector slides over.

With both gears off



Pretty easy wasn't it?

9) Reinstall new gears, little first



The new gears go on easy. Put the little gear on first. I started by carefully tapping the little gear on first with a rubber mallet until it wasn't going on easy any more. Once its that far on you can pull it down the rest of the way with the bolt and washer that hold it on. Too make this easier you should preheat these gears prior to installing.

Then put the big gear with synchro



Put the synchro from the old gear on the new gear and swap the needle bearing over too then you can just slide it onto the shaft.

10) Selector gear.

I told you to note how the selector gear went together when you took it off because now you have to put it back together. Its only 7 pieces in total and if you have gotten this far with everything you shouldn't have a hard time getting it back together.

Make sure you put the teeth into the 3 little slots as opposed to the 3 slightly larger slots. Their should be very little side to side movement of the teeth when in the proper place.

There are detailed diagrams in the bentley CD manual of how this goes together in case you are having issues.



Selector assembly on shaft



Once you have the selector assembly together its time to get it back on the shaft. Again I used the rubber mallet to get it started and then tightened it down using the washer and bolt that holds it on

Reassembly



At this point all you have left is the simple reassembly which is all just the reverse of how you took it apart. Then replace the transmission drain plug and refill with gear oil.

Torque Specs:

Transmission End Cap, 5 bolts:	7 ft-lbs
Big T-60 Bolts, 2 bolts:	59 ft-lbs
Pivot Pin Bolts, 2 bolts	18 ft-lbs
Selector shaft to selector arm bolt, 1 bolt:	18 ft-lbs

So thats all I got, I hope some of you find this helpful.