Nick's Porsche 996 (G.96) Transmission Rebuild Guide

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1.0 Introduction

I have seen a few posts over the past little while about 996 owners experiencing transmission noise, described as a whine or whir, or sometimes a roar, when accelerating or decelerating. Often this is caused by a failing pinion bearing. Another issue that's quite common in both the 996 and 986S transmission is the wear of the second gear shift sleeve and synchro assembly. Symptoms of this are grinding/difficulty shifting to second gear, and/or transmission popping out of second gear on its own. This report will outline how to disassemble and re assemble the gearbox to inspect and replace components associated with the common problems outlined above.

A big challenge in taking on this job is the lack of information available. The factory manual doesn't outline how to replace the bearing, so this job was completed from research on bits of information I picked up on forums, shops that specialize in these repairs, and factory parts breakdown diagrams. The purpose of this report is to compile all information I have gathered on this transmission, and help owners understand what needs to be replaced, and a guide on how to replace failed components.

1.1 Disclaimer:

One important thing I want to make clear is that this write up is to be used for information only. I cannot say for sure if my procedure is correct, but my rebuild was successful. As always, use PPE when doing any work on your vehicle and take all necessary steps to ensure your working in a safe environment. This report can be in no way responsible for damage to anything or anyone when working on the transmission, it is created strictly for a guideline to share what I have learned.

2.0 Checking the Pinion Bearing

An easy way to check if the pinion bearing is starting to fail is to pull the drain plug from the base of the transmission, poke a finger in the drain hole, bend it toward the front of the car, and see if a thick grey substance is accumulating around the magnet. Figure 1: Pinion Bearing Grease Accumulation on Magnet shows the gunk like material that you are feeling for.

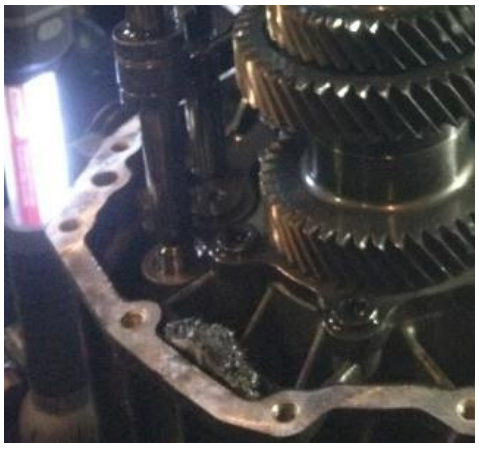


Figure 1: Pinion Bearing Grease Accumulation on Magnet

This is the grease from the sealed pinion bearing that has leaked out and gathered to the bottom of the transmission. My Transmission had both the typical pinion bearing noise and the pinion bearing grease accumulation; therefore I was confident that the pinion bearing needed replacement.

3.0 Parts Required for Pinion Bearing Replacement

I used the following parts to perform the rebuild:

a) Main Shaft Bearing (P/N: 996-302-807-00)
b) Pinion Shaft Bearing (P/N: 996-302-808-00)
c) Motul Gear 300 - Synthetic transaxle gear oil

Other Parts potentially required:

a) 1-2 Gear Shift Sleeve Assembly
b) 2nd Gear Syncro
c) Shift Rod Pins (In case any go missing)

4.0 Disassembling the Transmission

4.1 Nose Cone Removal

Once the transmission is removed from the vehicle, disassembly can begin. The first step is to remove the bolts holding the nose cone onto the transmission. Once these are removed the cone can come straight off.

Figure 2: G.96 Transmission

Figure 3: Passenger Side, Nose Cone

Figure 4: Drivers Side, Nose Cone

4.2 Shift Fork/Rod Removal

The next step is to remove the shift forks. There are a total of 5 forks, and the removal order sequence does matter so be sure to note this order. Using painters tape I labeled each 1-5 as they were removed.

First, remove the 4 bolts on the outside of the transmission case that hole the shift rod ball and springs in place, as shown in Figure 5: Shift Rod Ball and Spring Bolts. Once each bolt is removed, remove the ball and spring, then bag and tag so you don't lose them.

Figure 5: Shift Rod Ball and Spring Bolts

The shift fork is fastened to the shift rod with roll pins. I used a punch to hammer out the pin from the fork. Once the pin is removed, the rod can slide up through the fork, and then the fork can be removed. Be sure to tag each pin as removed for re-installation.

Figure 6: Shift Forks

Note: Use caution when removing the center fork (shortest) as there are 4 little washers that fit into a profile in the transmission case that can fall and go missing.

Figure 7: Shift Forks and Rods Removed

4.3 Gear Cluster Removal

Now that the forks are out of the way, the gear cluster can be removed. Start with removing the torx bolts that fasten the cluster base plate to the housing.

Figure 8: Gear Cluster

The cluster is now held in place by the tolerance fit of the pinion bearing and Mainshaft bearing in the case. To remove this, I heated the case slowly using a propane torch (not to hot, the case is cast aluminum), then used some pry bars to carefully remove from the case.

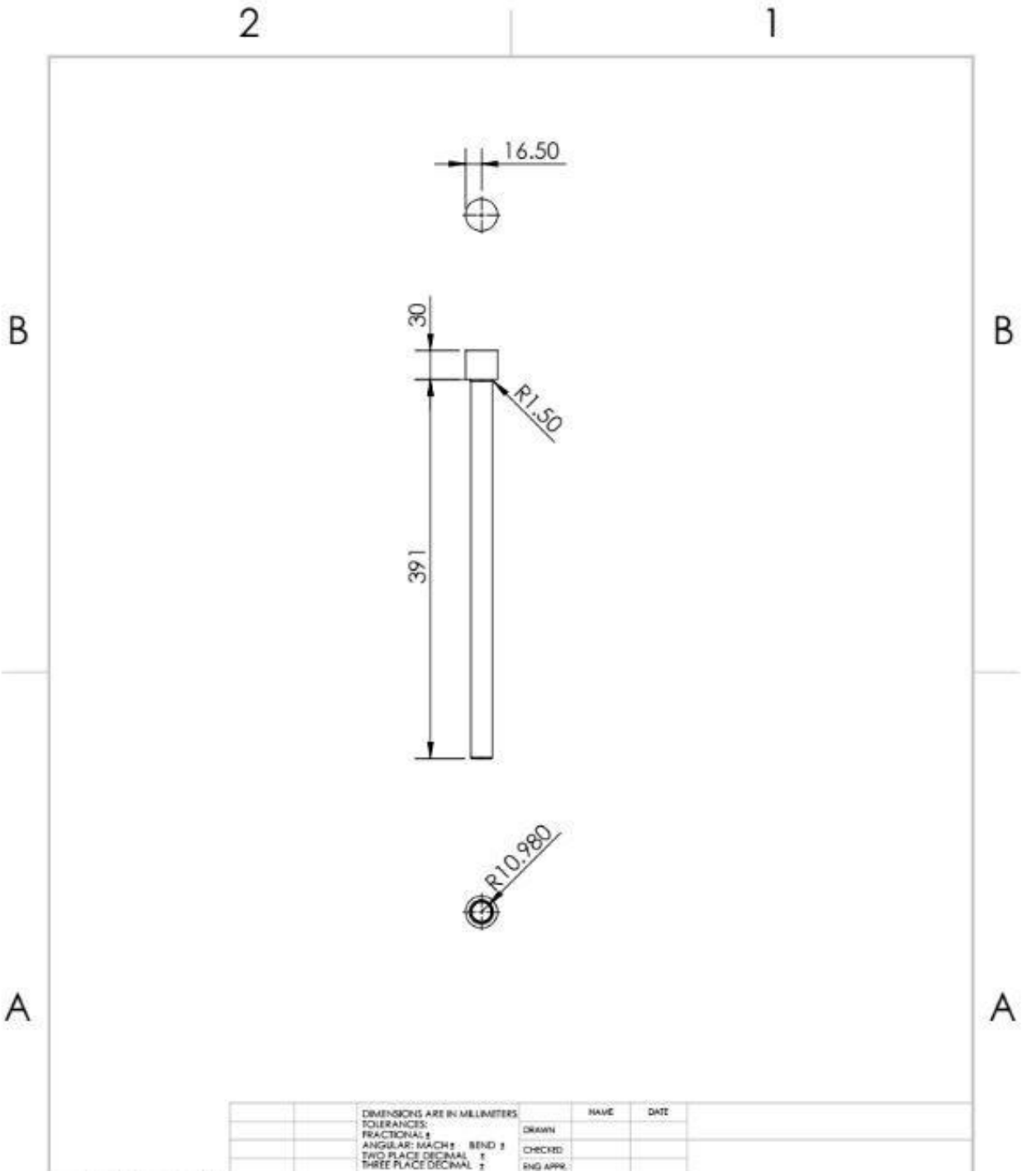
Figure 9: Gear Cluster Removed from Case

4.4 Disassembly of Gear Cluster

Once the cluster is removed from the case, it is time to start breaking down the gear stacks. Note that the pinion bearing is the larger of the two bearings (above the pinion gear in Figure 9: Gear Cluster Removed from Case). The pinion gear is fixed to the counter-shaft, so all gears stacked above the pinion bearing must be removed to replace the bearing which makes this job challenging.

A special tool is required to start pulling gears off the counter-shaft. The counter shaft is hollow so a conventional puller has no surface to push on. I had the tool in the photo below made up. This tool serves two purposes – a surface for the puller to push on, as well as a support for the hollow counter shaft when high press forces will be needed to pull the tolerance fit gears.

Figure 10: Countershaft Support Tool


2
1
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DIMENSIONS ARE IN MILLIMETERS
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FRACTIONAL ±
ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±
NAME
DATE
DRAWN
CHECKED
ENG APPR.

I started the process by pulling reverse, first and second gear off the stack. To do this, start by removing the large circlip at the top of the stack. Using a large gear puller, secure legs on first gear and pull using an air or electric impact gun. I used a 1/2" electric impact gun and was able to pull the gears relatively easily. When all components are free off the shaft, stack the assembly on the bench exactly as it came off, both the order and side that goes up/down. Take a lot of pictures while taking apart. If possible, try not to separate components as they are removed.

Figure 11: Pulling 1st Gear Assembly

Next, remove second gear and associated components from the stack in the same method and first and reverse. Take extra caution to try and keep these assemblies together when removing from the shaft. The first and second gear shift sleeve has 3 little balls and spring loaded into the sleeve, if this comes apart the balls and springs will fly everywhere and you will spend a month of Sunday's looking for them.

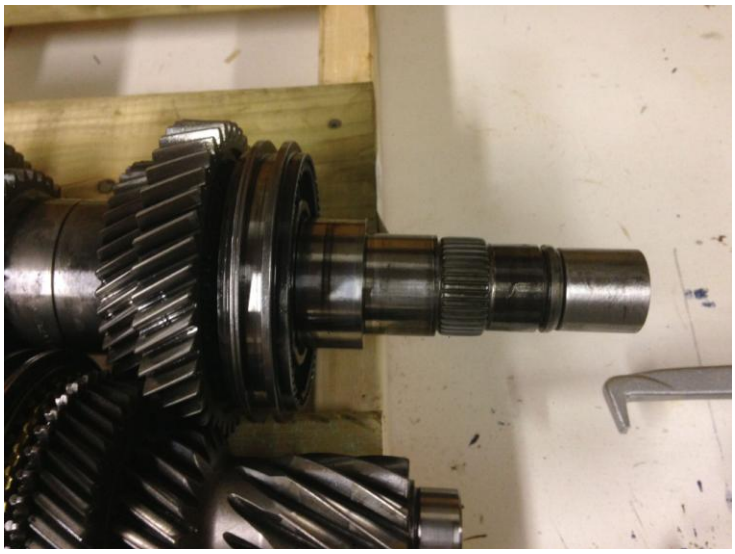


Figure 12: 1st Gear Assembly Components Removed

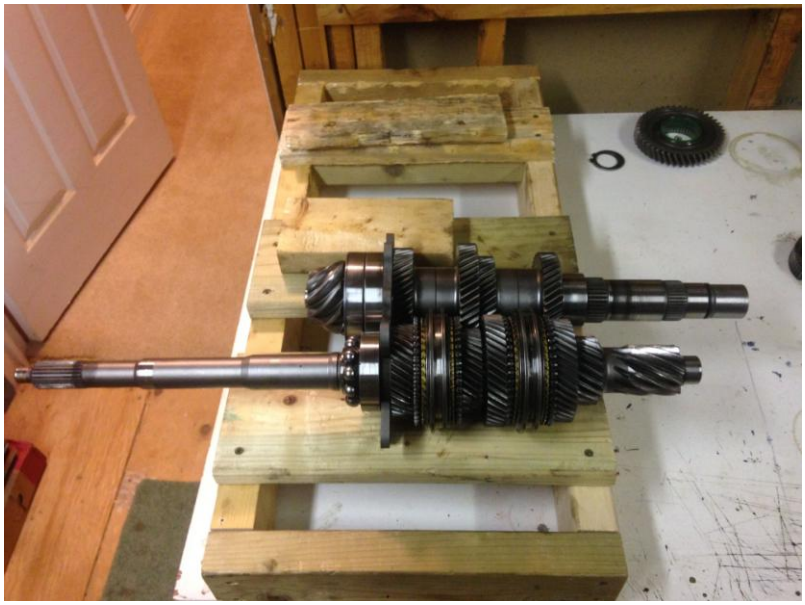


Figure 13: First and Second Gear Assemblies Removed

With the reverse, first and second gear assemblies removed, I went ahead and removed the mainshaft bearing to be able to separate the two shafts. Because there is very little room between the bearing and the cluster plate I couldn't figure out a way to press or pull the bearing off. To remove, I cut the outer race using a Dremel rotary tool. All the balls and cages can be removed, and then the mainshaft can be maneuvered out of the plate to isolate the countershaft.

Figure 14: Cutting the Mainshaft Bearing

Figure 15: Mainshaft and Countershaft Separated

Then, using the Dremel rotary tool, I made one cut in the inner race of the mainshaft bearing to free from the mainshaft.

Figure 16: Mainshaft Inner Race Removed

This is as far as I was able to break down the transmission myself. Gears 3-6 on the counter shaft take over 30 T of force to remove, so I brought it to a local automotive machine shop with the new pinion bearing. Although difficult, they were able to press the gears off, replace the bearing, and then heat the gears to re shrink onto the counter shaft.

Here is the counter shaft with the new pinion bearing installed after picking up from the shop.

Figure 17: Counter Shaft with new Pinion Bearing

5.0 Re-Assembling the Transmission

5.1 Re-assembly of Gear Cluster

With the new pinion bearing installed, it's now time to start the rebuild. First step was to fit the countershaft and mainshaft back together. Once fitted, the new mainshaft bearing was greased, and pressed on using a 20 T shop press. Once lined up the bearing pressed on with ease. Install the spacer and circlip in position. The two shaft assemblies are now locked together.

Figure 18: Pressing Mainshaft Bearing

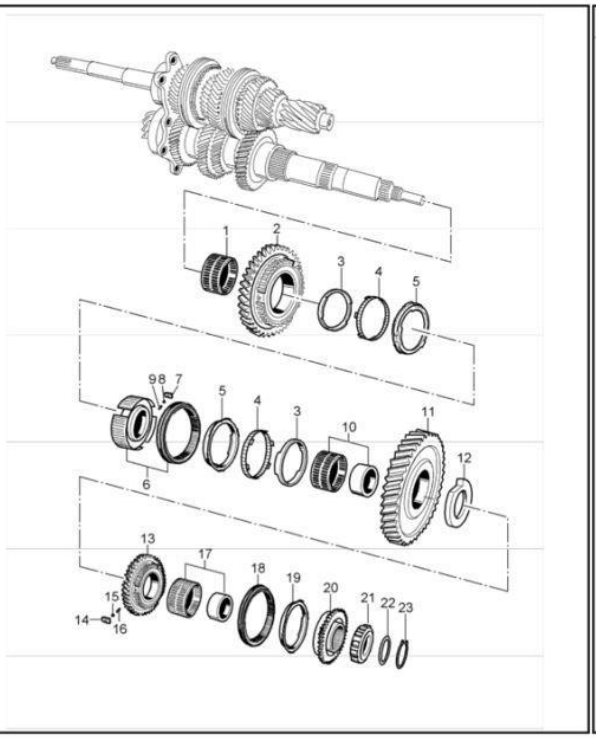
Now it is time to re-stack the first, second and reverse gear assemblies. The easiest way I found to do this is lay each item out on the bench in the order it came off the shaft. Be careful when taking apart the assemblies as mentioned above the shift sleeves have the balls and springs that fly when released. When I released the shift sleeve from the center part, I wrapped it in a rag in a clean room so when it came apart it would stay in the rag. Again, take note on not only the order, but the up/down orientation of each component.

Note: Another common problem with this transmission is the wear of the second gear shift sleeve and syncro assembly. Inspect and if worn this may be a good time to replace. See Part Breakdown Diagram below to find part numbers for the shift sleeve and syncro for purchasing parts.

Part Breakdown Diagram

Use the parts breakdown diagram to check to ensure the components are being stacked in the proper order and orientation. This should be the main piece of documentation used when re-assembling the gear cluster.

Model	Year	MG	SG	Illustration	Restrictions	UPD	13:40	24.01.2010	PORSCHE	PET	PORSCHE
996	2005	3	03	303-10		248					



Pos	Part Number	Description	Remark	Qty	Model
		gears and shafts	-01 02-		G96.00/30 G96.01/31
(1)	996 302 815 01	needle-roller bearing		1	
(1)	996 302 815 03	needle-roller bearing brown	02-	1	G96.01/31
2	996 302 042 00	loose gear wheel 2nd gear		1	
3	950 304 617 20	ring		2	
4	996 304 613 20	cone ring	-01	2	G96.00/30
(4)	996 304 613 21	cone ring	02-	2	G96.01/31
5	950 304 611 20	synchroniser ring 6 teeth	98	2	
(5)	996 304 611 00	synchroniser ring 7 teeth	99-	2	
6	996 304 061 02	guide sleeve 1st/2nd gear		1	
7	996 304 651 00	stone		3	
8	900 108 058 00	ball		3	
9	996 304 661 00	compression spring		3	
10	996 302 816 00	needle cage		1	
11	996 302 041 00	loose gear wheel 1st gear	-01	1	G96.00/30
(11)	996 302 041 05	loose gear wheel 1st gear	02-	1	G96.01/31
12	996 302 281 00	thrust washer 1st gear		1	
13	996 302 094 00	loose gear wheel reverse gear		1	
14	996 304 451 01	stone		3	
15	900 108 058 00	ball		3	
16	996 304 461 00	compression spring		3	
17	996 302 816 00	needle cage		1	
18	996 304 431 02	shift sleeve		1	

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Some components that in the stack such as the bearing inner races, the inner portion of the shift sleeve, spacers and end bearing are a press fit onto the shaft, but fortunately don’t require a press. Heating the parts in the oven at 350 F for 20 minutes expanded the components enough that they easily dropped onto the shaft in position. Once the parts are installed it's important to work quickly as once they contact they shaft they cool fast enough that after a couple of seconds it will be impossible to remove without a puller. I picked out the components requiring heat and put in the oven before starting to stack to speed up the process.

Figure 19: Stacking Components onto the Counter Shaft

Notes on stacking:

1. The most difficult part of this job was loading on the balls and springs into the second gear shift sleeve. It took over an hour as the balls have a tendency to shoot out when attempting to load the spring to fit in position.

2. Once all components are installed, the top spacers and circlip should install in position. This will confirm correct spacing for proper shifting and for installation in the case.

3. At this point you should be able to slide the shift sleeves up and down to ensure the transmission is able to go in and out of each gear.

5.2 Gear Cluster Installation

Now that the cluster is re assembled it can be installed into the transmission case. The bearings are a tight fit into the case, so I put the cluster in the freezer for a couple of hours and heated the case with a propane torch for a few minutes before installing. It took a bit of wrestling to set in position but once it's installed deep enough the torx bolts holding the plate can be installed and this will fit the cluster all the way down.

Figure 20: Gear Cluster Installed in Case

The shift rods and forks can then be installed reverse of the disassembly method. Don't forget to load the balls, springs and bolts into the transmission case after installing the rods.

Figure 21: Shift Forks/Rods Installed

The last and one of the most difficult parts is installing the nose cone. The shift rods must fit into the nose cone in the appropriate location in the case and it can be difficult to line up when the nose cone is already on over. I tied zip ties around the base of the fork to pull on while installing the nose cone to achieve proper alignment. After around 25 tries the cone was installed. Then I was able to pull the nose cone off the housing approximately 1/4" to apply RTV to seal the two pieces together. Install the nose cone bolts and torque to finish the job.

Figure 22: Assembly Complete