

Turbo Rebuild

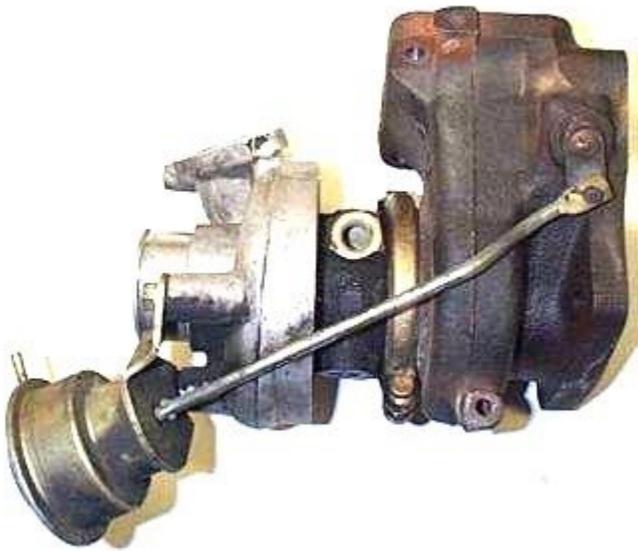
This is a VFAQ of how to overhaul a 14B/16G. Since I have a spare new 16G compressor wheel and housing, I am having the center cartridge machined to take them, rebuilding the center section, and porting the 6cm housing out to 7cm or beyond, to end up with a cheap small 16G.

NOTE that if you are going to do this yourself, you should scribe a line on the compressor wheel and shaft before removing it, and bolt it back on with the lines lined up to get it as close to balanced as possible. It is best to have a turbo shop do the rebuild, so they can balance the turbo afterwards (A turbo shop will also have ways to clean the parts properly, like using a *bead blaster*), but if you are on an *extreme* budget, you can try this and see if it works. I highly suggest you still spend the money to send it off to a turbo shop for balancing when you are done. I hold no responsibility if your turbo is out of balance and wears prematurely or grenades.

I sent my turbo off to Rob Young, who now owns [Forced Performance](#), to have it professionally cleaned, reassembled, and balanced. Since I was converting a 14B to a 16G, the center section required a little machining to properly fit the small 16G compressor wheel. If you are upgrading the compressor wheel (which also requires a 16G compressor housing, or having your 14B housing machined to fit the 16G wheel), you **must** send it off to a turbo shop to be rebuilt.

Tools needed:

- Open-end wrenches
 - 12, 13mm
 - 1/4" ratchet
 - 10, 12mm sockets
 - 6" extension
 - Circlip pliers (\$15-20, Sears)
 - Needle nose pliers
 - Flat blade screwdriver
 - Razorblade scraper
 - Hammer
 - LOTS of cleaner
 - *Turbo rebuild kit*
-



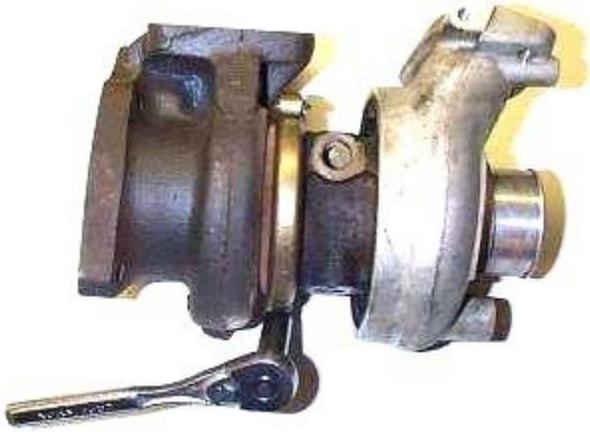
The turbo in one piece. **NOTE** that if you aren't going to do any porting of the turbo, you can leave the turbine housing on the car. See the fourth pic for info.



Removing the wastegate actuator (12mm).



Wastegate actuator off.



Removing the turbine housing band clamp (10mm). If you aren't going to port the turbine housing, you can leave the turbine housing on the car, remove the MAF hose, heat shields, oil and coolant lines, and the wastegate actuator arm clip from the turbine housing, then remove this band clamp, and pull the center section and compressor housing out of the car. This will save you a lot of time over having to remove the downpipe/O2 housing, and maybe exhaust manifold from the car to remove the turbo.



Pulling the turbine housing from the center section. You may need to hold the compressor side and tap the turbine housing with a hammer to knock it loose. If so, hold the turbo barely above a pillow or something to catch it, hold the turbo with the turbine housing straight down, and strike at it parallel to the turbo centerline, so when it comes off, it comes straight off, and does not hit the turbine blade.



Here you see two things - the small circle is the locating pin for the turbine housing, do NOT break this off or lose it, it helps align the turbo when putting it back together. If you break/lose it, it's not the end of the world, you just have to scribe marks on the outside edge of the mating surfaces so you can align it. The large circle is the end of the huge circlip holding the compressor housing to the center section. You can use a fine-tipped needle nose to remove them, but circlip pliers make the job *much* easier, and are safer. You also need circlip pliers for other rebuild projects on DSMs, so go buy them.



Circlip pliers in the ends of the circlip. I got the "deluxe" circlip pliers from Sears, they can be converted from inside to outside pliers instantly, and have several tips. I install the tips backwards in the pliers for this large circlip, because all the tips taper down to small ends that would break off when trying to move a circlip this large.



This is after the clip is loose, but while you have the pliers contracting the circlip, stick a screwdriver under the circlip, and pry it up and out of its groove, then work it off of the turbo. **BE VERY CAREFUL**, this clip is large and has a lot of force, it is hard to remove, and if you slip, it can hurt.



Circlip gone. The circled area is the locating pin.



Here's the center section out of the compressor housing, a better view of the locating pin.



Center section removed from the compressor housing.



If you are not sending your turbo for a full rebuild, MAKE SURE to scribe a line across the compressor wheel, nut, and the end of the shaft at this time. If you do not bolt it back together with ALL of the lines lined up, your turbo may end up being out of balance, and it can quickly destroy itself.

Put an open-end wrench on the "nut" on the end of the turbine wheel (can't remember if it is 12 or 13mm, but I have seen 12, 13, and 14mm), put a ratchet on the nut on the compressor end of the shaft (10,12mm?), and remove the nut. Be VERY careful of the wheels, the blades can really tear your hands up. It is safest to wrap them in towels, because if the nut breaks free and your hands hit either wheel, you could be seeing a *lot* of blood.

Texas Rebuild suggests to do the following - place the turbine blade "nut" in a vice, and either use a T-handle socket to remove the compressor blade nut, or when using the ratchet, make sure to hold the socket so that the ratchet is only twisting the nut, not placing any side load on the center shaft. Evidently it is easy to bend the center shaft if you place too much of a side load on it when removing the nut. When I

removed the one in the picture, I was very careful to grab the ratchet at the rotating end and put all the twisting force directly through the socket, without putting any side load on the shaft.



The compressor wheel off of the center section. I didn't scribe the wheel and shaft because I had combined parts from several turbos, and sent the turbo off to be balanced after the rebuild.



Put the nut back on the shaft, spin it on flush with the end of the shaft, and tap it *lightly* with a hammer to knock the turbine wheel/shaft assembly out of the center section.



Here's the shaft out of the center section. That sheet metal guard is NOT supposed to look like that...



Left side, *bad*, right side, *good*.



The center sections of two 14Bs, after the sheet metal guard is removed. Left side, *bad*, right side, *good*. The left side shows *severe* coking. The shaft had *totally* locked up, but after cleaning all the coking off, it spun well again.



Good center section - still a little coking, but minimal, and easily cleaned up.



BAD center section - *major* coking, *not* easily cleaned up.



This is after chipping off a chunk of coking. See how thick it got?



This is after about 5 minutes of chipping the coking away by tapping it with a flat blade screwdriver, sometimes tapping very hard. It still needed further cleanup, soaking it for several hours in solvent should have done it, but I had Forced Performance bead blast it while they were doing other work to it.



Left side, *bad*, right side, *good*. The left turbine wheel got torn up when something went through the turbo. Note the valley in the shaft that is pretty grainy on the left side - this is after cleaning it with a screwdriver. The right side shaft was almost as bad, I used a screwdriver and followed up carefully and lightly with a razor scraper, it is almost totally clean. Note the left shaft still has the bushing on it; I have removed the one on the right shaft. It just slides on.



Here's a compressor side view of the center section with the turbine shaft removed. The circlip holds a center cap in place.



The circlip removed. Note the circled area on the end cap - there is a raised lip here.



Place 2 flat blade screwdrivers 180 degrees apart under this lip, and carefully pry the end cap up and out of the center section. You might need to move the screwdrivers around the lip and gradually pry it out, depending on how tight it is in there.



The brass thrust bearing sitting on the center section, oriented as it is in the center section. Note the steel bushing in the center of the thrust bearing. Note the hole in the thrust bearing that fits over the rollpin in the center section.



The center cap and thrust bearing turned over. Note the oil feed journal in the thrust bearing, fed by the circled hole in the center section.



The steel bushing out of the thrust bearing. *Note that the thrust bearing and its' steel bushing are upside-down in this picture.*



The compressor side turbine shaft bushing removed from the center section.



Circled is a tiny circlip inside the center section. There is one on each side; they keep the center bushings from slipping into the center. I removed them using two pins to contract them, then pushed them out of their groove, then pulled them out with needle nose.



Remove the compressor housing O-ring. Mine broke in several places while removing it, as it was dried out.



Remove the end cap O-ring. Here the O-ring is part way out. Then clean the entire center section thoroughly. Brake parts cleaner works well.



The center cap with the spring-loaded plate on it. This pushes the thrust bearing against the turbine shaft, to keep it from moving end-to-end.



Here's a 16G rebuild kit. *Note* that it is different than a 14B rebuild kit. The center cap has a different profile to match the backside of the 16G wheel.



The 14B compressor wheel is on the left, the 16G on the right. Note that the back of the 14B wheel is flat, while the 16G is tapered. If you were to put a 16G wheel on a 14B center plate, the wheel would be sitting too high on the center section.



The 14B center plate is on the left, the 16G on the right. Note the taper on the 16G plate.



The old 14B spring plate and bushing on the left, 16G on the right. The top pic shows the spring plate, bushing, and sealing ring. The second pic shows the bushing in place, with the sealing ring above it. Carefully slip the sealing ring over the top of the bushing. It will be a loose fit. The bottom pic shows the spring plate assembly ready to go into the center cap.





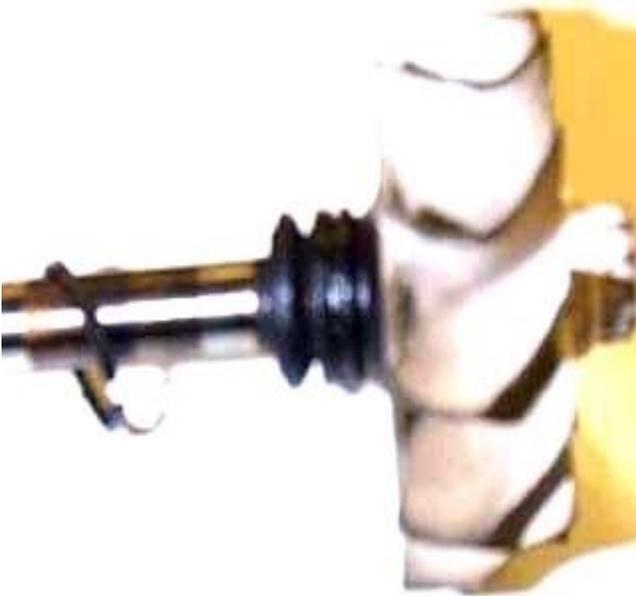
Front and rear views of the 14B and 16G center cap assemblies. When you press the spring plate assembly into the center cap, do it carefully, you want to slowly compress the sealing ring down until it tightly fits into the hole in the center cap. Make note of the gap in the sealing ring, and press the spring plate assembly into the center cap starting *opposite* the gap in the sealing ring, so that it can easily contract as you press it into place.



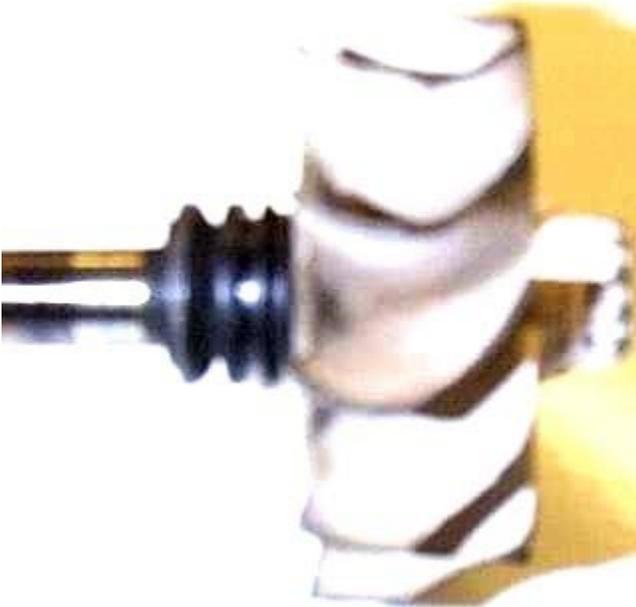
Here is the old turbine shaft and wheel, with the old sealing ring in place.



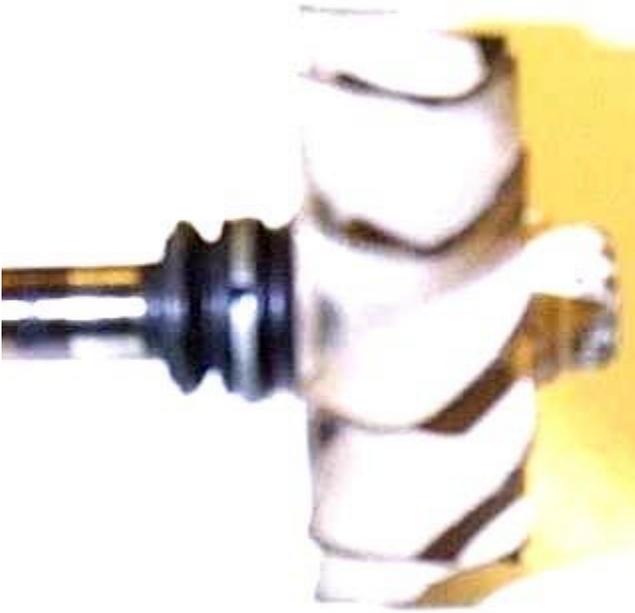
Slide two straightpins under the old sealing ring, and work it out of its' groove.



Here the sealing ring is out of its' groove. Look at the groove carefully, and you will see that the groove is filled with coked material. I used a straightpin to clean the groove out.



Here the groove is cleaned out. Even with the out-of-focus pic, you can see that the groove is nice and square. Now carefully work the new sealing ring onto the shaft and into its' groove.



Here's the sealing ring in its' groove. Note the gap on the ring - that will close up when you put the shaft into the center section.



Install the new compressor housing and center cap O-rings (ignore the fact that my center section is not clean, I did not install the O-rings, I sent it to Forced Performance without some of the parts installed to make disassembly for a *thorough* cleaning easier).



After installing the small center bearing circlips (not shown, as I did not install them, due to the pending Forced Performance work), place the compressor side brass bearing into the center section.



Place the thrust bearings' steel bushing onto the center bearing.



Place the brass thrust bearing into the center section over the steel bushing.



Press the center cap into place and reinstall the circlip.



Install the turbine side center bearing into place. Again, note that I did not fully clean the center section, as I sent the turbo off to Forced Performance for a thorough cleaning, machining, reassembly, and balancing.



Place the new heat shield on the center section and carefully slide the turbine shaft through the center bearings.



Carefully press the turbine shaft into the center section. You will feel it "click" into place when the turbine shaft sealing ring compresses.



Turn the center section over and slip the compressor wheel onto the shaft. ***If you scribed marks on the shaft, wheel, and nut, now is the time to line them up.*** Then torque the nut to 70-78 in-lb. (***not*** ft-lb.!!!). It might be best to use some blue threadlocker on this nut, even though most I've seen are self-locking.



Place the center section into the compressor housing, making sure to line up the locating dowel in the housing with the notch in the center section.



Install the compressor housing circlip.

THAT'S IT! Bolt the turbine housing to the center section, bolt the wastegate actuator on, reinstall the turbo in the car, and have at it.

Questions, suggestions, comments, constructive criticism and/or corrections? Go to:

<http://www.vfaq.com/Email/index.html>.

This document can be reprinted for personal use or reference for your mechanic(s) with no prior permission needed. It can be linked to directly, as long as you have a link to the main VFAQ page of <http://www.vfaq.com>, though linking to the main page instead is preferred. ***This document CANNOT be reprinted for profit/resale/redistribution of ANY type without expressed WRITTEN permission from me in advance.*** Bulk copying of this document onto your web site without prior permission will not be tolerated, link to it instead.

Last modified: Dec 20, 2000
Copyright 1997-2000, Tom Stangl
VFAQ.COM, <http://www.vfaq.com/>
<http://www.vfaq.com/Email/index.html>

Permission granted for reproduction and redistribution to Gabriel Tetrault on 5/8/02.