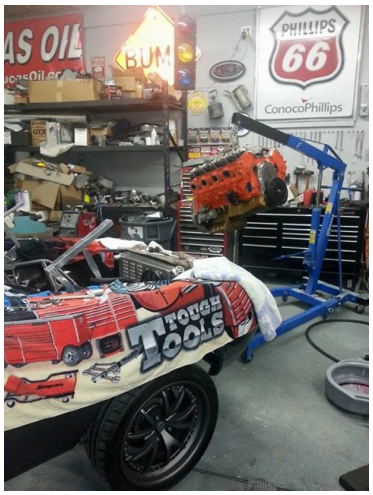
Happy friggin February! Cold enough for ya? I've consulted my Farmer's Almanac and on page 37 it said, "RJ, video games and comfy chairs are a pinch better than wrenching when its 11 degrees". I told the almanac that I have natural gas heat and a thick Raiders sweatshirt (what else would a Raiders sweatshirt be good for but getting greasy? I love the thrift stores). Then the almanac called me an idiot and my dog tilted his head the way they do probably wondering why I was speaking to a book.

It has been very tough to get motivated. Armed with coffee and country music and a black sweatshirt I did manage to get a few things done. The motor in the 67 has been making an odd noise which sounded very much like a team of small ninja elves had taken up camp in my engine bay. To protest the arrangement they would bang on the side of my precious big block with hammers anytime I would open the gates of hell I like to call the throttle. I profess to be no expert in mechanics, but in my small mind this did not seem right. The elf ninjas would be better employed with swords instead of hammers and all that racket was tiresome at best. Yanking the motor resulted in many puddles of various colors on my shop floor and the discovery of #3 having a spun rod bearing. For the record I called #4 but I will refer to my earlier comment about expertise. Now if I was George and into all that Atlantic City nightclub bling I'd think the pretty gold shiny bearings must be the better ones. But alas, this is just not so and those are completely FUBAR. They should look more like the top ones. The thought of replacing my big block with one of those new cosmic LS3 engines makes me throw up a little in my mouth so I will go big cubes or modest shortblock and twin turbos. Time will tell and next month will probably cover some of those thoughts.

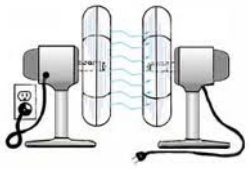


Lacking any requested topics, this month I will share my last project which was the yoga/acrobatic endeavor of replacing a transmission in an F-body. It was reasonably successful, I only lost 2 fingernails in the 3 god-forsaken times I had to remove and replace the thing and I have yet again confirmed that the 4th gen is a clear leader in the pain-in-the-ass to work on Camaro race.

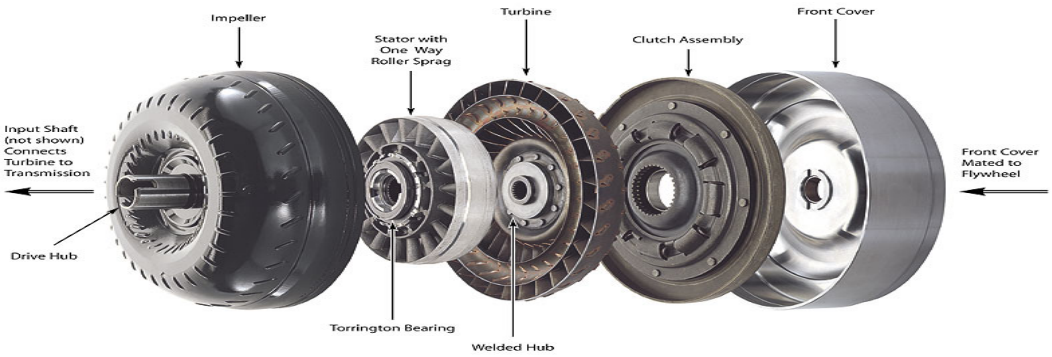
The following conversation is specific to my 4th gen, but all the principals will apply to any electronically controlled transmission more or less. So, this 98Z28 I saved from the scrapper has proven to me once again that people throw things away for a reason. Only the truly dedicated or stupid should pull cars from the jaws of death and attempt to get them road worthy once again. I found a bad rod in the motor (seems like a trend), a broken rear control arm, front control arm bushings missing, end links gone, brakes rusted shut, dents all over the body and generally way too many things to even make this car a candidate for a quick clean up and sell. So, I'm stuck with it. What does this have to do with transmissions? Absolutely nothing. I did however want to get you in the proper mindset for the general tomfoolery that happens next. I fixed everything, painted it and got the car back on the road. For some reason the torque

converter would not lock up. All this work and now I have transmission problems? If I didn't just spend 50 hours straightening the body I would have drove it off a cliff, torque converter unlocked and all. Yes, 50 hours. I'm no Billy Speed and mine still looks a metric shit ton worse than any of his art on even a bad day.

Torque converter lock up is commanded when a certain set of parameters are met in the PCM. But before we go there, let's understand lock up and converters. I can't stress enough that this is a very elementary explanation. All the gear heads will probably cringe and desire to throw things at me. But I like to think of torque converters like 2 fans facing each other. When power is applied to one fan, the air moving will eventually get the other fan facing it to spin. In your car, one fan is attached to the engine via the flywheel. It spins with engine rpm. The other fan is attached to the input shaft of the transmission. As the engine increases in RPM, the air (fluid in reality) moves and begins to spin the opposing fan hooked to the transmission. The vanes of the fans are tuned so that it will begin to spin or engage at a certain RPM. This is why you can sit at idle in gear in an automatic. The engine will not stall and brake pressure is enough to keep the car from moving. The idling engine has not reached a high enough RPM to fully engage the other "fan". Tuners will play with different torque converters to get cars to launch in the powerband they desire. With a "3500 stall", the car will not move until the engine reaches 3500 RPM (in theory). Again, this is very basic, and trust me when I say there is a bunch more that goes into this and converters don't always flash to the exact advertised RPMs. I will say though that one of the best bang for the buck mods you can do to an automatic car is to raise the stall on your converter. It's almost like revving a manual car up a bit more before releasing the clutch. They are lots more fun to drive with a higher stall, but of course there are pros and cons to every modification. I'd be happy to discuss these with anyone interested and obviously mods aren't for everyone.



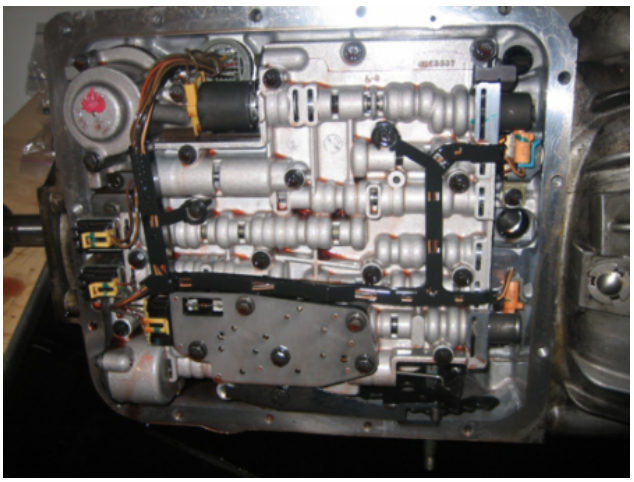
With the 2 fan image in your mind, look at the inside of a converter and you can sort of begin to see how they work:



See that clutch assembly there? In most modern automatics there is a "lock up" option that occurs electronically. When cruising down the road at a reasonably constant RPM and load there is really no need for the give or cushion that occurs between the "2 fans". In fact you lose a bit of efficiency as one fan turns the other at an intended 1 to 1 ratio. The clutch locks up the "2 fans" so you get a true mechanically connected drivetrain during certain conditions. This helps lower engine rpm and increase efficiency and gas mileage. But what happens when that doesn't work?

The converter clutch is controlled electronically and engaged with fluid pressure. When a certain set of conditions are met, the PCM or computer will send a signal down to engage the clutch and lock up the converter. In my case the converter was locking, but unlocking and staying there perfectly happy to enrage the dumb driver. The first thing to check is the signal coming out of the PCM to see if its commanding it to disengage and enrage the dumb driver or is the converter and trans doing it on its own. In my case scanning the computer showed a constant "engage" signal even when the converter unlocked. In case you will not be able to sleep tonight without knowing the kinds of things that lock a converter, I will tell you. Off the top of my head for a 98 Camaro, and I am probably forgetting something, engine temp must be over 165, throttle position must be at a certain percent (think cruise) and vehicle speed and current gear also come into factor. I've got mine tuned a bit funny, for performance but generally the computer is looking for a low load cruise type situation. Lay into throttle or slow down enough and it will unlock. There is another aspect of a 98 that deals with pulse width modulation but I'm not going to get into that. In a nutshell it "softens" the engagement of the clutch and is for sissies. Most performance builders eliminate the PWM circuit from the trans and most of us hack tuners will cheapen if not disengage it all together electronically. I've also seen engine misfires cause unlocks even when they are not frequent enough to throw an engine code. I was sure to rule that out by maxing that table in the computer and eliminating that as a possibility. After scratching my head for a few hours I removed the harness and put my sensors on it and beat it up a bit. The PCM sends a ground signal to the trans so I thought maybe the harness was cut and bumping something causing it to unlock. I saw no indication of that. I then decided that a few beers might help the situation but they did nothing more than give me a headache and remind me that I'm old and should no longer drink and or shave my chest hair, 2 things I thought extremely important in college.

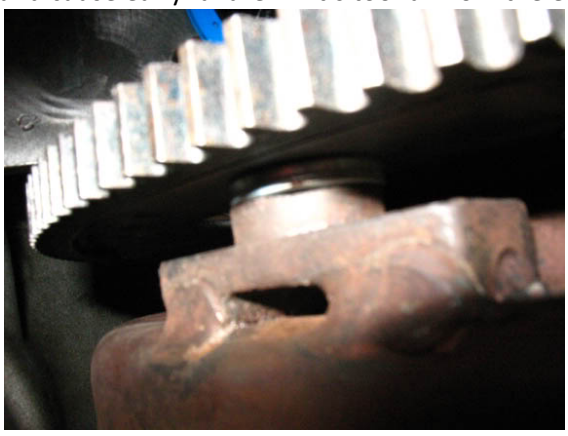
I then swapped out the valve body in the trans. You see, when I said the clutch is controlled electronically and engages with fluid pressure, it uses a solenoid. The bore of that solenoid in the valve body is a common failure. It wears out, leaks a bit and the lock up slips out. Computers are funny things. When they see stuff like that, I mean like a clutch showing more slippage than it is used to, they freak the hell out like a 13 year old at a Justin Bieber concert and throw codes. It will usually throw a P1870 code if the valve body is worn. I didn't have one but for grins I swapped it anyway because I like throwing $200 out the window and I'm too stupid to trust a computer. Especially the 98. This can be done by just dropping the pan. The best part about it is crappy stinky trans fluid will drip on your face, and in your ears, and chest



hair if you are not wearing your Raiders sweatshirt. Overall it's a pretty easy swap. Being easy will generally guaranty that it will not fix my problem. The reason for this is that in the 14th century one of my ancestors had angered God. Something to do with a horse and a wall and Jerico or something. Of course that did not fix the problem. For some reason I then got the bright idea to swap the converter. To say this is no small endeavor is like saying walking to the North Pole in tube socks and Bermuda shorts with a Chihuahua under one arm and a trombone is pretty tough. I can tell you that as an old person who is sober and in full command of his man hairs this is not fun. But I did it. And it fixed nothing. I thought maybe the clutch in the converter was slipping and disengaging, but my scanner told me otherwise and well I really need to learn to trust computers. I also may be a glutton for pain. I also may need something to complain to my wife about. At this point I was fairly certain it was an internal trans issue. What, how and why I cannot tell you. But I basically ruled everything else out. So I ordered a built trans from Performabuilt over in PA. I figure if I'm going to spend money on a worthless car I might as well be completely stupid about it. Do you see a trend here? I mean why put a stock trans in? I'm a gearhead. We do not do stock. I always recommend that if you have trans issues, you should probably change your converter as well. If any material was floating in the fluid, it was in everything to include the lines and cooler. You don't really want that screwing up a new trans. I picked up a billet 9" FTI 3200 converter, which is probably worth more than the whole car. But again, I'm stupid. Higher stall converters will generate more heat so always, always install an aftermarket trans cooler. The ones in the radiator are ok, but not really good enough to cool a hard working trans and stall converter. The secondary thing is that if the radiator ever fails you can get cross contamination of coolant into the trans lines. This is bad and relatively unlikely but remember the 14th century.

I yet again found the inner strength to perform the cirque de soleil of automotive endeavors that is swapping transmissions. For those still with me, it can be done on jackstands with hand tools in around 3 or 4 hours. With all this new stuff I thought I would go through the trouble of spacing the converter properly. I will be honest and although I don't usually run automatics, in the few I've done I've never properly spaced a converter. This is probably bad. However, I will also say that none have failed so I either got lucky despite the 14th century, or didn't have them long enough to see the premature failures that can occur. I'm betting on the latter.

Remember the whole story about the torque converter being hooked to the trans and the engine? Well it is literally sandwiched between the 2. There is some play in the trans side, so with it unbolted from the engine, you can move it back into the trans a bit. Bolting it to the engine sets it in "place". If it's too far from the trans, the splines that engage the trans pump will not be deep enough and cause early failure. If it's too far from the engine, it could not be set in the crank well enough and bottom out in the trans pump again causing early failure. When unbolted and pushed back into the trans, there should be around 1/8th inch air gap between the flywheel and the converter mount pads on a 4L60E. If it is not, you shim it to get the proper distance. I had a little trouble with this next part. The material you use is grade 8 washers. Wait, what? The fate of the entire drivetrain is bound with bolts and



washers? 3 of them? How this is possible defies my understanding of mechanical physics and I truly had to research a bunch. I found every builder uses grade 8 washers. Whatever, ok 14th century come get me. Use washers to eat up the distance and it will place the converter correctly. If you don't have enough gap something is wrong and always ensure you have about 1/8" of the converter snout in the crank. When choosing washers make sure you bring your dial caliper with you and at least select 3 washers that are the same thickness. China sometimes makes washers and China sometimes sucks.

All that behind me, the trans in filled with fluid and broken in properly and it was now my moment of truth. All my hard work, purple nails, stinky hair and eyes would now pay off as I blissfully cruised down the highway all locked up and purring along. Well it didn't work so I bought an Audi the end.

Ok, all that is true except the "the end" part. Remember I'm stupid. The turbo Audi is fun though. I let a few days pass because had I not I would have kicked something very hard. I got the scanner back in the car and did some driving. Sure enough my cruise RPM was pretty high. The car also felt pretty sluggish. It took me another day to realize that in order for these trans to select a certain gear, 2 solenoids must be in various on/off configurations. One of these solenoids controls both 1st and 4th gears. High cruise RPM, sluggish performance… could it be? No, it's a brand new trans. I took it out again and sure enough it was starting in 2nd gear. This will have done a number on my 2nd clutches but well, the 14th century… at least I'm making progress. The car was in 3rd, not 4th when cruising and the converter was in fact locking when I sent a command through the computer. At least we now have a different problem. I dropped the pan and ohmed out the suspect solenoid. With the harness off it should be between 19-30ish ohms. Mine checked bad then I realized I forgot to remove the harness. I tested it again and it checked good. Dang. I removed it anyway and made up a harness to apply 12V to it and sure enough it was not engaging. You can very clearly hear it "click" when it works. Even if it does click, you can blow in it to see if its leaking air. Transmission fluid does not taste good or freshen your breath so try and clean it first. This brand new transmission had a bad solenoid. Since I had 4th in the old one, I was confident that solenoid was good and swapped that in. Finally, the thing works as advertised.

I rejoice and damn the 14thcentury! During my celebratory dance around the car which included much whooping and hollering and selfie high fives and "I'm the man gestures" at my Raiders sweatshirt covered I noticed something hit the front bumper and took 5" of paint off.

14th century, ya got me again.