



THE NUMBER ONE DODGE/CUMMINS TURBO DIESEL RESOURCE

ISSUE 74

NOV/DEC/JAN 2011-2012



INSIDE: TECHNICAL SERVICE BULLETINS FOR 2011 *TDRSource on page 58*

IS THE "STEERING WOES" ARTICLE STILL RELEVANT?

Recently I had a chance to review the original Issue 74, November 2011 TDR magazine. As the editor I had to wonder if this article on "Steering Woes" and, in particular, the "Death Wobble" was still relevant to the audience.

So, I took my copy of that oldie magazine to the technical staff at Geno's Garage. Scott Sinkinson took on the task of updating the 2011 article. The following is his report.

Issue 74/page 13 – "Rebuilding Of The Trackbar?"

We do not sell a whole lot of the Luke's Links, and when we do, it is the customer that really can't afford a new trackbar, so just looking for a band aid. The problem is, if the ball socket joint is really worn out, then the Luke's Link will only be able to do so much. A much better solution is the Rare Parts G2 adjustable stock style trackbar. It has much a stronger than a factory bar, and a redesigned tapered stud housing at the frame that makes the OEM and the MOOG problem solver look puny. This track bar is also adjustable up to 3 inches of lift and is more cost effective (\$225) when compared to a BD Third Generation trackbar retrofit kit for \$499.95. However, if you've got the resources, the BD kit is a better design that eliminates the ball and socket tapered stud at the frame.

MOOG is not the company they were in 2012 when this article was written. The quality has been in a downward spiral for many years. This is confirmed by many customers, shops, and most recently, the problem of a tie rod stud breaking due to poor metal and visible porous holes.



Issue 74/page 14 Comments on the 94-02 Death Wobble

The track bar can be a large contributor to the death wobble. But the tires, the alignment and, most notably, the steering damper shock can also contribute to the death wobble. EMF has a great video showing how simply replacing worn out tires can eliminate the death wobble. So, there is no single component that will eliminate the death wobble on every truck. Just cover the basics and then if the problem is still present, use the process of elimination. It is odd that after owning four Ram 4x4 trucks over the past 21 years, I have yet to experience the death wobble. I consider myself to be lucky.

Issue 74/page 19 "Phase Three: Ball Joints and Tie Rod Ends

We now offer EMF rebuildable ball joints and we think these are a much better investment than ball joints that are not rebuildable. This is really the case if you plan on keeping the truck for a long time. EMF ball joints (\$503-\$557) have proven to be a great alternative to Carli (not available for 1994-1999 trucks) or Dynatrac, as both are more expensive. A good, non-rebuildable option is XRF.

Tie Rod Ends

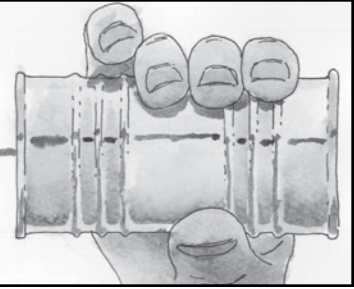
The T-style conversion that is referenced in this article only works on 2000-2002 Second Generation trucks. I am working with others here at Geno's Garage to, hopefully, offer a T-style conversion for 1994-1997 trucks that originally came from the factory with inverted Y steering. A little history: the 1994-1999 Ram trucks came from the factory with the same tie rod mating taper at both axle knuckles and the Pitman arm. The 2000-2002 trucks use a different taper at the knuckles and pitman arm, and therefore can use the popular Mopar 2008 and newer T-style steering upgrade. The only reasonable cost option for 1994-1997 trucks is to use what is referred to the "HD steering setup." These parts are from a '98-'99 truck with an 8800-pound GVW. Anyone with a 1994-1997 4X4 or a 2WD Cab & Chassis application can go to a parts store, tell them that they need a steering tie rod and draglink assembly from a 1998 or 1999 "8800# GVW" truck.

A final thing to mention is a discussion about the unit bearing assemblies used on 1994-1999 trucks and how much more user-friendly the 2000 and newer setup is. If an owner of a 1994-1999 truck wants the ease of service to just slide a rotor off the wheel studs after the caliper is removed, then the SpynTec free spin hub conversion is the way to go. It is not a cheap investment, but again, if you plan on keeping the truck for many years, this is a good long-term investment. The upfront cost most certainly will not pay for itself in fuel savings, but rather the frustration and time needed to separate the unit bearing from the brake rotor. You can also benefit from easily serviceable wheel bearings rather than a non-serviceable unit bearing.

Gear Box Update

I can go into a long rant about gear boxes if you would like to add more information. We have options available now that were not available when article was written. Just call Geno's Garage, Scott Sinkinson.

MEMBER 2 MEMBER



I think you will agree with me when I categorize Turbo Diesel owners as independent people who are not afraid to try something new. You are an ingenious membership who reinvents and improves a product to make it better serve your needs. You show a strong willingness to share your shadetree solutions. With your input each quarter, we publish the "Member2Member" exchange to give you a forum to tell other members how you solved a problem.

STEERING WOES

Introduction

by Robert Patton

In a staff meeting a Geno's Garage employee shared with me the latest find from the newsstand. The headline from Diesel-This-And-That was "Cure for the Dodge Death Wobble."

Wanting to learn about the one-size-fits-all "cure," he purchased the magazine, hoping to read about the definitive answer.

If there is a single part to cure the steering problem, all Turbo Diesel owners would like to know about it. You'll find that I'm not so bold as to suggest the one-size-fits-all approach, especially considering that we have four generations of trucks to consider.

As I read the article in Diesel-This-And-That, I looked closely for the author to give himself an "out." You know, using words like possibly; maybe; double-check your (fill in the blank); also consider (fill-in-the-blank). If the words were used, I missed them. Their suggested cure was the combination of a steering stabilizer and a replacement track bar, quite an expensive repair.

You'll find that I'm not so bold as to suggest the one-size-fits-all approach especially considering that we have four generations of trucks to consider.

Again, I'm not so bold to suggest a single answer. I would rather share with you the experiences from vendors, TDR writers and TDR members. So in this article "Steering Woes" you'll find a compilation of correspondence that will get you started in the direction of correcting the problem rather than replacing parts that may or may not help. An outline of this article looks like this:

"Overview of Suspension Components,"
by TDR Writer Andy Redmond

"A Comment on First Generation Trucks,"
by TDR Writer Andy Redmond

"Is it a simple "Rebuild of the Trackbar?"
by Luke's Link owner Michael Engle

"Comments on '94-'02 Death Wobble,"
by TDR Writer Andy Redmond

"Steering Woes on a '94-'02 Second Generation Truck,"
by TDR member Brent Boxall

"Preferred Alignment Specifications Update"
by TDR Writer Andy Redmond

Finally, I am fortunate in that I have not had any steering problems with any of the five Turbo Diesel trucks that I have owned. You can chalk this up to the fact that all of my concrete-cowboy needs are met with two-wheel drive trucks. Without the need to tinker with the steering components, I am not qualified to offer advice. However, TDR writer Andy Redmond works on these trucks day-in and day-out. So, throughout the article you'll find "Andy Redmond responds:" as he adds commentary to the other writer's material and at the end of this compilation of data, he updates his Issue 53 article with new alignment specification that includes '03-'09 Third Generation trucks. Let's get started with Andy's article "An Overview of Suspension components," followed by his "Comments on First Generation Trucks."

AN OVERVIEW OF SUSPENSION COMPONENTS

by Andy Redmond

The focus of this article on "Steering Woes" is primarily written for those '94-'02 Second Generation owners. However, I thought I would put a basic table together to show the type of suspension and known problems to cover all years of Turbo Diesel with the 4x4 drivetrain.

Owners should note that in 2003 the track bar was redesigned with the introduction of the American Axle for the Third Generation trucks. With the exception of the lesser quality ball joints and hub bearing assemblies, the front suspension on these '03 and newer, later generation trucks is substantially more robust and durable.

| YEAR | FRONT SUSPENSION TYPE | KNOWN PROBLEMS |
|-----------|---|--|
| 1989-1993 | Leaf sprung-solid axle—Dana 60 | Steering shaft rag joint. King pin wear and perhaps worn bushings in leaf spring eyelets |
| 1994-1999 | Link coil (upper and lower trailing links with coil-sprung solid front axle—Dana 60). This truck uses a track bar to align the axle between the frame rails. | Track bar wears out quickly (due to ball stud end). Small eccentric adjusters on lower trailing arms allow for insufficient positive caster adjustment. Steering gear that wears over time. |
| 2000-2002 | Link coil (upper and lower trailing links with coil sprung solid front axle—Dana 60). This truck uses a track bar to align the axle between the frame rails. There was a design improvement with the dual piston brake calipers, non captive rotors, different spindles, ball joints and larger alignment eccentrics. | Same problems as earlier Second Generation trucks, but now the ability to achieve preferred caster adjustment, due to design changes in the lower trailing arms (larger caster eccentrics). Steering gear that wears over time. |
| 2003-2009 | Link coil suspension (American Axle) | Lesser quality ball joints and hub bearings. Much improved track bar design and attachment point (track bar has two eyes, versus the poorly designed earlier style eyelet/ball stud design). A switch to a Delphi steering gear from the Saginaw part. It too suffers some reliability issues. |
| 2010-2011 | Link coil design similar to 2003-2009 models | Many subtle changes including larger sway bar links, redesigned track bar, larger steering gear/steering linkages. This steering gear shows promise of being over engineered and very robust! |

I know, I know, you want to read about *the answer* to your steering woes, specifically those woes that pertain to the '94-'02 Second Generation trucks. We will get to the answer in due time. Do you dare skip ahead to my "Comments on the '94-'02 Death Wobble" or is it as simple as a "Rebuild of the Trackbar." Read on!

A COMMENT ON FIRST GENERATION TRUCKS

by Andy Redmond

As expected, the First Generation truck handled pretty well, although they didn't ride too nicely. The handling and long wearing front end parts are classic old school—a solid front axle, with leaf spring suspension, tapered roller wheel bearings and manual locking axle hubs. The steering shaft's "rag joint" is the most common steering issue. Even if the king pin (steering knuckle pivot points), and various steering end links are worn, the leaf springs center the axle (between the frame rails), resulting in a truck that usually drives fairly straight.

The handling and long wearing front end parts are classic old school—a solid front axle, with leaf spring suspension, tapered roller wheel bearings and manual locking axle hubs.

REBUILD OF THE TRACKBAR?

by Michael Engle/Luke's Link

Anyone who has experienced steering problems while driving a Dodge pickup truck knows all too well the symptoms: wandering or drifting and/or a shimmy, or even a violent shake when hitting a bump, known as the "death wobble." When trying to identify the specific problem, most people look to vehicle alignment, worn ball joints, steering boxes, or even tires. However, don't overlook the real problem: the ends of the track bar.

For the novice that is new to four-wheel drive, the track bar is the bar that sits under your differential and runs from the axle to the frame. This bar acts as a stabilizer to keep the truck tracking straight as it travels down the road. From '94 to '02 (Second Generation trucks) the track bar had a bushing on one end and a ball joint on the other end. Many people mistakenly replace the entire track bar when the true cause of the problem is simply the ball stud on the driver side end of the track bar. Internally Dodge put a two-coiled metal spring to hold pressure on the ball stud. Once this spring (which is not strong enough in the first place), flattens out, the bar sits on the ball stud and moves up and down. Below is a picture of the spring that wears out.

Wandering or drifting occurs while driving because when the steering wheel is moved, the track bar pulls the axle, and that "play" in the bar lets the axle keep moving. This causes the driver to pull the steering the other way and you end up constantly steering the truck.

The death wobble occurs when shock or vibration is sent from the axle to the track bar, causing the bar to shake because of the play. The shake is then sent to the frame of the truck which makes the truck shake. Generally you must slow the truck to allow it to regain its "composure."

So if you are facing either of these problems, what do you do? Some might think going with a thicker track bar will solve this problem. A thicker track bar (with the same "sloppy" ball stud) will not last any longer than the stock bar. Likewise, regardless of a lifetime warranty that is offered by some manufacturers, it is likely you will be changing track bars every 6 to 12 months.

So what is the solution? Luke's Link of Colorado offers a permanent solution to Dodge pickup tracking problems. At Luke's Link our line (technically speaking, a ball stud socket collar) was designed to rebuild and convert track bars to a fully adjustable end. With this kit, you remove the ball stud and internal parts and slide a cap or C-clamp over the end. You then install the new modified internal parts with the new modified spring being the main component. Then a large plug screws into the cap to tighten everything down. With this setup, the ball joint will never wear out. If it does, you can adjust it by unscrewing the plug and putting a spacer under the plug to shim the spring down. This only takes a few minutes to adjust. This allows the track bar assembly to last for the life of the truck.



The Luke's Link replacement ball stud parts.

The inspection process:

- You need two people to complete the inspection, and at least one person should have some fairly good strength. Make sure your vehicle is parked on a solid surface with tires pointed straight forward. *Do not* jack the truck off the ground.
- Have the stronger person sit in the driver's seat and unlock the steering wheel. *Do not* start the engine! The other person should be under the vehicle with a flashlight.
- The person in the driver's seat should move the steering wheel back and forth fairly hard. Under the vehicle you should examine the ball stud joint to see if there is any movement up or down. Make sure you are looking at the track bar as well as the tie rod ends. The main objective is to use the weight of the truck against the axle. That is why it is important to leave the truck completely on the ground. If there is movement, your ball stud joint is likely in need of replacement. (Please note that the tie rod ends will swivel and that is normal. The track bar, however, should not move at all.) The entire replacement part kit for this repair is \$69.

About Luke's Link

Luke's Link has sold tens of thousands of repair kits in the United States and internationally, and is recognized as a leader in specialty auto products. We've been in business for over 25 years. We've been prominently featured at many automotive web sites and in publications including Peterson's *4x4 Magazine*. We continue to expand and improve their product line. In addition to this kit working on the Dodge track bar, it will also work on the tie rod ends from '94-'06 as well as Jeep track bars and most Ford tie rod ends up to '98. Luke's Link also has developed a kit for the Dodge '03-'07 track bar bushings. The bushing kit includes two poly bushings. This set is \$36 and eliminates the need to replace the entire \$350 track bar.

Please don't confuse Luke's Link kits with a cheap or temporary fix. Luke's Link offers low cost solutions because it permanently solves the problems, with no need to purchase expensive or unnecessary parts. See Luke's Link on the web at www.lukeslink.com or contact us at 1-800-962-4090.

"COMMENTS ON THE '94-'02 DEATH WOBBLE"

by Andy Redmond

Luke's Link is a great company with a great product. However, I've experienced only marginal success unless the repair kit was installed on a lightly worn track bar. The kit often was not able to tighten the worn parts enough, allowing continued death wobble. Unless Luke's Link has been updated, their directions state it will not work on the slightly more heavy duty Moog DS1413 track bar.

For the Death Wobble problem on a Second Generation truck, I wrote an article in Issue 46 (November 2004) that covered the installation of a truck bar relocation bracket and a new Mopar '03-'08 track bar. Since the editor sent this article to me for my review, I went back seven years to Issue 46 to see if my opinion had changed. It has not. As I mentioned, the repair is more involved than the simple rebuild of the track bar with a Luke's Link. The parts used back then were a track bar relocation bracket from Solid Steel Industries (www.solidsteel.biz, part number DSS0019402-4, \$209) Mopar '03-'08 track bar (part number 52106795AC, at about \$250). I still use these parts. Since 2004 other companies have introduced different versions of this kit; specifically, the folks at BD Power offer a bracket and track bar kit (BD part number 1032011, \$480). My experience with the BD kit is that it is more difficult to install.



The Issue 46 article (pages 154-156) has the details of the SSI bracket with the Mopar track bar.

STEERING WOES ON A SECOND GENERATION 4X4

by Brent Boxall

The problem with steering issues is that they come along slowly. Mine began at about 120,000 miles with a mechanical “clunky” feeling in the steering wheel, and with 141,000 miles on the clock, my 2001 Ram 2500 Quad cab 4x4 had developed a tendency to move around in the lane without driver input. I never experienced the “death wobble” many speak of, but I’m sure I was a DUI suspect from time to time, especially when towing. This wandering steering issue made the truck a handful to drive so I decided to fix it. Below is a description of what I did to fix my truck, beginning at about 120,000 miles and completing the repair at about 141,000 miles. This article is not intended as a how to guide, but rather is a list of the steps I took when repairing my truck. As always, your mileage may vary.

I fixed my steering in three phases: one being from the steering column to the steering box; the next from the steering box to the wheels; and finally phase three, the tie rod ends and ball joints.

Phase One: Steering Column to Steering Box – Chasing the Mechanical “Clunk”

After searching the truck’s steering system for loose motion, I decided that the steering shaft in the bottom of the column felt slightly loose. The best way to check this is to stand next to the left front wheel and reach down below the master cylinder and grab the shaft where it comes out of the column tube. Pull the shaft up and down and feel for mechanical play or loose motion in the column bearing. Remember that a little bit of motion, like 0.002-0.003” can feel like a lot in the steering wheel.

To investigate further I removed my original steering shaft that connects the column shaft to the steering gear box. This shaft felt good in my hands when checking for rotational slop, until I realized that I had it telescoped to a different spot in its extension range than where it rode when in the truck. Upon more careful inspection I realized that at the exact point in its extension range where it was installed in the truck it had a slight amount of rotational slop, less than 1 degree, but still noticeable.

To fix one of these issues I decided to replace the bearing in the bottom of the steering column with the bushing offered by <http://rocksolidramtrucksteering.com>. The instructions supplied with the kit were very straightforward and it appears to be somewhat easier to do on my truck given it is a manual rather than the automatic trucks with the column gear selector. One note worth mentioning here is that any time you uncouple the steering system, the steering wheel is free to turn inside the cab. This must not be allowed to happen as it may bring about the destruction of the “clock spring” inside the column. The clock spring is actually a thin ribbon cable type electrical connection between the portion of the column that rotates and the part that doesn’t rotate. The catch here is that the cable or clock spring is a fixed length so if you connect the steering back up in a different orientation than it currently is, you may run out of cable when turning left or right. The best way to avoid this is to put the truck’s front wheels straight ahead prior to disassembly. Then take a cargo strap and attach it to one of the driver’s seat floor supports, thread it through the steering wheel and connect to the other seat support as shown below:



This technique makes the steering stay put while you work which avoids clock spring damage.

Andy Redmond adds to Brent’s story: The bushing offered by “rocksolidramtrucksteering.com” is a worthy modification, more for steering column wear and noise more so than handling concerns. Dodge offers a toe plate bushing for later steering columns in the Second Generation trucks, which is used to solve the problems of column wear and noise (clunking).

To replace the steering shaft I chose the Borgeson steering shaft, part number 950. The installation instructions for the Borgeson are straightforward and easy. I highly recommend test fitting the steering shaft and then using Loctite for all set screws and jam nuts. Again, follow Borgeson’s instructions, your steering system is IMPORTANT!

While I had the steering shaft out of the truck I removed the steering gearbox to check the play in it. The easiest way to get the steering box out is to remove the hydraulic lines and remove the tie rod end on the Pitman arm. The Pitman arm retaining nut came off easily but the arm seemed not to want to move. I chose not to remove my Pitman arm since it was stuck hard even after soaking with penetrating oil. I put the steering box on my bench and tried rotating the input shaft very slightly to see if I had Pitman arm movement. Using a dial indicator I determined that my steering box had very near zero loose motion in it, so the steering gear box went back in the truck.

Andy Redmond adds to Brent’s story: To adjust the steering box for wear, I use the procedure outlined in Dodge technical service bulletin (TSB) 19-10-97. Where do you find this oldie (written in 1997)? The TDR’s web site has a summary of the bulletin and a web search on “TSB 19-10-97” will uncover the entire bulletin.

Every steering gear I’ve tightened has resulted in better steering manners (less steering wheel motion before the truck starts to change directions) after tightening the preload. Please realize that this preload adjustment does not address any side play in the sector shaft that is connected to the Pitman arm.

And, although Brent didn't remove his Pitman arm, I've found that before attempting to remove the arm it helps to wire brush everything, followed by a dousing of brake cleaner, chased by some penetrating oil. If needed, try some heat from a small torch. Sometimes a pneumatic impact wrench on the Pitman arm puller is necessary to pull a stubborn Pitman arm. I've even broken high quality Pitman arm pullers, "abusing" them in such a fashion. However, I've always been able to remove the Pitman arm without Pitman arm or steering gear damage, all with the steering gear on the truck!

One problem became readily apparent when I removed the power steering hydraulic hoses. My power steering fluid smelled burned and was unnaturally dark in color. I then decided to take the power steering pump off and check the condition of the pump. This observation fit with the extremely high temperature of the hose fittings near the hydraulic brake assist unit I have observed over the life of the truck. I decided to do something about high temperature of the power steering fluid. So I found an automatic transmission fluid cooler that would fit on the driver's side of the air conditioning condenser in front of the intercooler. I designed a bracket and mounted the cooler in line in the return hose from the steering gear box back to the power steering pump reservoir.



An automatic transmission fluid cooler in its new job as a power steering fluid cooler.

This fluid cooler plumbed into the return line worked like a charm to keep the power steering fluid cool. Even on a 100° day, after driving in traffic, you can put your hand on the return line going from the cooler to the pump reservoir and it is warm/hot to the touch, a major improvement over the "roast your finger" stock system.

Problems arise! This new system worked great but the stock pump either did not have the pressure or enough flow to operate the system if I was braking while turning during slow speed maneuvers and/or when the engine's speed was near idle. This can be attributed to the additional return line back pressure created by cooler and the additional 8-10' of hose required to get out to and from the cooler. One way to tell if your power steering pump is having trouble keeping up flow-wise, is to turn the steering wheel very abruptly when the truck is moving very slowly. You will feel the power assist "catch-up" a fraction of a second later. This is a major

indication that your pump isn't providing enough flow. The way to tell if your power steering pump isn't making enough pressure is during stopping and turning. If the pump pressure is low the power brake assist will be weak requiring more brake pedal pressure to stop and steering effort is increased especially noticeable during low speed maneuvers.

West Texas Offroad (www.westtexasoffroad.com) has a good description of the Saginaw pump pressure regulator and how to modify it, which I did, but still couldn't get enough performance from the stock pump. If I adjusted for pressure, I didn't have enough flow and likewise if I set up the pump for adequate flow I lost too much brake power assist and slow speed power steering assist.

Save a link to the "Tech" section of the West Texas Offroad website. The technique of removing a spacer washer to increase pressure is outlined in the next paragraph.

While searching for power steering pumps, I found Performance Steering Components at www.pscmotorsports.com. After talking with them on the phone I learned that our trucks come stock with a Saginaw 1300 Series pump and PSC offers 1300 series pumps as well as a 1400 Series high performance pump. The 1400 requires a fluid cooler, which I had just installed, so I ordered their part number SP1490. After installing the pump and some Royal Purple Max EZ Synthetic power steering fluid, I figured I was set. The pump did great on flow, but required some effort to turn the front wheels in a parking lot and also a heavy foot to stop the truck.

Now the information from West Texas Offroad comes in handy on the pump pressure regulator. Take the high pressure hose off the pump and unscrew the pressure regulator per the West Texas instructions. You will notice that the PSC SP1490 comes with two pressure regulation washers on the regulator shaft. Remove one of them and reassemble. After putting fluid back in the reservoir and purging the air out of the system, it was picture-perfect. The steering was one finger, even while stopped, and all the flow you could ask for was there. I tried stopping while turning, which uses both the hydraulic power brake assist and the steering. All worked perfectly. Brake assist during a simulated panic stop was also excellent.

Andy Redmond adds to Brent's story: For 85% of TDR members considering such a modification, they would be smart to order the cooler/better Saginaw 1400 series pump from PSC as a kit.

Shimming the pressure regulator can cause exactly what Brent explains; plus, when shimming the OEM pump, I have seen the pump let go internally, leaving you with no power steering (and no power brakes—'97 to '02 hydro-boost equipped trucks), often within a few minutes of the shimming process. This is a huge safety concern. Shimming a pump is an exact science, particularly impractical without pressure gauges and a flow meter.

The Rock Solid column bushing and Borgeson steering shaft fixed the clunky mechanical slop in the steering wheel and the roasted power steering fluid problem was taken care of with the fluid cooler and high performance pump. These changes made the truck steer better than stock!

Okay, the clunky feel to the steering was gone, but the truck still wandered around in the lane, most noticeably at freeway speeds. My plan to change only so much of the system before proceeding with further changes was tested by commuting in the truck every day for a couple of months. Phase One was complete. Time to start Phase Two.

Phase Two: Steering Box to Wheels – Chasing the Wandering Ram.

One of my initial tests prior to beginning any steering work on the truck was to jack up one front tire at a time and try to rock the elevated tire in and out, top to bottom, and left to right, thinking that I could isolate loose motion to a specific ball joint or tie rod end. This test yielded no loose motion no matter how much I pushed and pulled on each tire. This made me wonder if the steering was really bad or if losing my driving skill was part of the aging process! I somehow convinced myself that the track bar must be the problem, and the truck was just too heavy for me to physically detect slop in the track bar.

Andy Redmond adds to Brent's story: Ahhh...training and experience helps when you are looking for component wear. I and other TDR writers have provided good instructions over the years on identifying loose and worn chassis parts. Our techniques are similar to Michael Engle's method (the preceding Luke's Link narrative). The basic test: an assistant sawing on the steering wheel (wheels on the ground) to test track bar and steering linkages. This, followed by a slightly raised tire, then utilizing a long pry bar (while an assistant watches) to check the ball joints and hub bearings. These methods of testing will allow you to see any worn components.

I ordered a Moog DS1413 track bar from Rock Auto and installed it. Installing the track bar is a fairly straightforward operation: just remove the bolt from the axle connection on the passenger side and remove the nut from the ball stud accessible from the driver's side fender well. Removing the driver's side wheel is a major help. To get the stud to back out of the tapered hole in the frame use some penetrating oil and a small sledge hammer to bump it out.

Andy Redmond adds to Brent's story: Ahhh...training and experience with too many sledge hammers helps when you are trying to remove tapered ball studs.

Before you resort to the hammer method, try a pickle fork, a modified Pitman arm puller or a Miller/SPX tool C3894-A to break the tapered ball stud free.

Just in case you missed it from my earlier discussion in "Comments on the '94-'02 Death Wobble," my cure-all is a combination of two parts: a track bar relocation bracket and a '03-'08 Mopar track bar. Installed on a customer's '95 Turbo Diesel 2500, his truck has over 150K miles of trouble-free operation. These parts should have been factory installed!

Although my kit came from Solid Steel Industries, I have also had occasion to install the kit from BD Power. The BD variant is more difficult to install as it also requires tedious alignment and, in some cases, later drilling holes in the cross member.

I chose Moog parts for all my front suspension replacements. It is easy to see why the Moog components are better, below is the new Moog track bar lying next to the stock bar.



This track bar replacement settled the truck down quite a bit and gave it some fairly decent road manners. I drove the truck for several months with it at this stage and decided that while it was tolerable, it still lacked the control and stability it had when new.

Since I found the steering box to be good in the Phase One inspection, I decided to look at the steering output shaft and tie rod end. I had an assistant get in the truck while it was sitting in the driveway, engine not running. I had him rock the steering wheel back and forth very slightly while I put my hands on all the joints including the steering box output shaft. It appeared that the steering shaft bearings/bushings inside the steering gearbox were good. I decided that I didn't like the steering box output shaft sticking out without any support on the "free end" and realized this could be a durability problem, so I decided to order and install a BD steering box stabilizer from Geno's Garage. The BD stabilizer is basically a steering box output shaft extension and support bearing. You remove the Pitman arm nut and then add the BD shaft extender. Next you remove the four bolts holding your front sway bar to the truck and install the BD stabilizer under the sway bar brackets, using the sway bar bolt locations and longer bolts supplied with the kit. A self-aligning flange bearing is then added to the BD stabilizer to support the newly extended output shaft. Again, follow BD's installation instructions.

*My cure-all is a combination of two parts:
a track bar relocation bracket and
a '03-'08 Mopar track bar. Installed on
a customer's '95 Turbo Diesel 2500,
his truck has over 150K miles of
trouble-free operation.*

The picture below shows the BD steering box stabilizer installation after two years of use.



The BD steering box stabilizer enhances the truck's steering system by giving the steering shaft support out past the point of load application which reduces stress on the steering box's output shaft bearings. It also stiffens the frame rail near the steering box mounting location, reducing side-to-side flexation.

Phase Three: Ball Joints and Tie Rod Ends

The ball joints and tie rod ends are the only tasks left! Many will advise putting the truck in four-wheel drive prior to removing the front axle half shafts. Engaging 4WD puts the spline engagement collar (central axle disconnect – CAD) inside the axle housing half on the intermediate shaft and half on the passenger side half shaft. This allows you to remove the passenger side half shaft without the collar falling down in the housing. If you leave the truck in 2WD as I did and remove the passenger side half shaft, the spline engagement collar will fall down in the engagement housing. This is not a major issue at all since you can disconnect the 4WD sensor and remove the four 1/4-20 bolts holding the spline engagement actuator/housing cover.

Once removed simply put the collar on the intermediate shaft while reinstalling the passenger side half shaft. Then position the collar on the spline so that the actuator fork engages the collar and you can bolt up the actuator/housing cover. I recommend removing the spline engagement housing cover anyway to wipe the old differential lube and crud out of the sump.



Spline engagement housing on back side of front axle.

Before you put the truck up on the four jack stands, remove the hub caps and take the half shaft hub nuts off. This requires first removing the cotter pins and then a 1 11/16" socket. Penetrating oil and patience are important components for this phase of the project. In my experience the best penetrating oil you can get is mixture of 50% acetone and 50% automatic transmission fluid. One word of caution is that the penetrating oil isn't friendly to the clear coat on your aluminum wheels, so caution with runoff is necessary. However, repeated application of penetrating oil over a week's time prior to disassembly will make the job go much easier, especially with the bearing hubs.



My old Chicago Pneumatic 1/2" impact wrench having a go with a 3/4" socket adapter and 1 11/16" socket. Both nuts are standard clockwise tighten so remember patience and penetrating oil. My impact wrench took about 20 seconds per side and the nuts were off.

Safety Reminder

For working on the front suspension the truck must be up in the air so that you have clearance to work. For pressing ball joints out of the axle you will need quite a bit of ground clearance for the 'C' frame press.

I had two jack stands with a capacity of six tons each and thought that would be plenty. After using my floor jack and placing my two jack stands under the frame rails just aft of the control arm brackets I decided I had too much weight too high! The truck was fairly steady but it was possible to move it around slightly by pulling on it with my hands. It only took a second for me to decide this wasn't secure enough for me to lie under so I purchased two additional six-ton jack stands and added them under the axle.

The jack stand configuration I used is shown below.



Once the truck is safely up on the jack stands and you are confident it is there to stay, remove both front wheels. The next step is removing the brake calipers. Plan to hang them from the control arm using a wire, a Ty-wrap, or a hook so that the brake hose is not stressed. Never drop the caliper or allow the hose to hold the weight of the caliper. The brake rotor should now slide off to reveal the bearing hub. (Unless you have a '94-'99, which is a different design.)

With the brake rotors off both sides, this is a great time to break this project down into two projects: tie rod ends and ball joints. (Well... maybe four projects. You may want to change the front differential oil while the steering components are out of the way.) I recommend removing the steering damper at the axle, the tie rod end out of the end of the Pitman arm, and the tie rods from each steering knuckle.

*With the brake rotors off both sides,
this is a great time to break this project down
into two projects: tie rod ends and ball joints.*



Remove steering damper.



This allows the entire steering tie rod system to come off in one assembly so the new components can be assembled to match. Care must be taken when handling the entire steering system as an assembly since it is heavy and the tie rods can allow the components to rotate and pinch your finger(s) between the various rods. (Ask me how I know.)

With the tie rods and steering damper off, now is a good time to get a drain pan under the front differential and remove the differential cover. To remove the differential cover, remove all the bolts holding it on and use a putty knife to separate it from the differential housing. If your oil needs to be changed, draining it now will limit the amount of oil that drips on the floor while the half shafts are removed.

Remove all the residual sealant from the sealing surface on the differential housing and differential cover, taking care not to allow any sealant flakes to get into the differential housing. Don't forget to take a clean rag and wipe the wear particles out of the bottom of the differential housing. Your gears and bearings will thank you.

Now for the bearing hubs! With the rotors off, half shaft nuts removed and the tie rod end removed from the steering knuckle, the fun of getting the bearing hubs off begins. Remove the ABS sensor if equipped and tie it back out of the way so the cable and/or sensor can't get damaged. Many pullers exist that connect onto the lug studs and push on the end of the half shaft in an attempt to get the bearing hub off. I don't like these since the reaction force is pushing the half shaft back into the axle. The factory service manual instructs one to back off of the four hub/bearing housing bolts ¼ inch each. Then tap the bolts with a hammer to loosen the hub/bearing from the steering knuckle. Welcome to Fantasy Island! With 141,000 miles on my truck, the bearing hubs didn't respond to "tapping with a hammer."

The solution turned out to be a Lisle (LIS39300) Front Hub and Knuckle Separator from ToolTopia.com and my pneumatic impact hammer.



Andy Redmond adds to Brent's story: I've used all the methods for stuck hub bearings and by far both the easiest and best method is the deep socket extension trick or Snap-On Tool DHP1. Use of the Snap-On tool wedged against a loosened bolt and against the axle tube while an assistant turns the steering wheel will pop them loose every time. Alternate the tool between the bolts to walk it off little bits at the time. In fact, I can even do it by myself, although it's a lot of running back and forth. Most DIY's don't have an air chisel or compressor with adequate power for Brent's pneumatic impact hammer task, plus you don't ruin what bit of hearing you have left, huh?

If you want, you can review my write-up on the Snap-On Tool DHP1 by looking at TDR Issue 69, page 120.

Use the LIS39300 with your pneumatic hammer on the backed off bolts, maintaining a solid backup behind the impact hammer so the blows work the LIS39300 instead of reacting back into a loosely held hammer.

The face of the LIS 39300 is hollow so it won't beat up the hub/knuckle bolts. With patience and penetrating oil (and sometimes a little heat) the hubs will come out. With the passenger side knuckle turned to the right you run the impact hammer on the front two bolts, and with the passenger knuckle turned to the left, the rear two get the impact hammer. Opposite for the driver's side. One thing I noticed is that the housing must be "walked" off evenly. As you run the LIS39300 equipped impact hammer on the front two bolts the hub will come out on the front. Place a putty knife and then screw-driver in this gap so when you begin to hammer on the rear bolts it will help to force the hub out. Once the bearing hubs are off, gently ease the half shaft out of each side and lay them on newspaper. The trick here is to keep the spline and sealing surface of the shafts clean and scratch free.

With the bearing hubs and half shafts out, remove the nuts on the ball joints and the large retaining ring off the bottom ball joint as shown below.



Also note extensive use of penetrating oil, it really does help.

The next task is to get the steering knuckles off the ball joint studs. This job can be done easily with your pneumatic impact hammer and the Lisle stepped pickle fork kit (LIS41400) at www.tooltopia.com. Run the largest fork between the knuckle and the axle yoke at the lower ball joint. Then take a sledge hammer and tap the knuckle near the upper ball joint. With patience and penetrating oil (maybe a little heat), the knuckle will pop free.

With the knuckle off both sides it is time to remove ball joints. For pressing the ball joints I ordered the QT1065 press set from www.quad4x4.com. This kit had very clear instructions and worked great. The best feature of this kit is that all the different press stubs and receivers are numbered and the instructions list which ones to use for removing and installing both the upper and lower ball joints. Again, patience and penetrating oil will get the ball joints out. This is a great time to clean up the steering knuckles, especially the bearing receiver bore.

Reassembly

Now to put it all back together again. All components should be cleaned and mating surfaces checked for damage. Leave the grease fittings out of the ball joints until after installation, as the grease fittings are easily damaged.

The first task at hand is to apply anti-seize to the new ball joints and install them per the Moog instructions. I used Loctite C5-A copper based anti-seize lubricant, part number 51007. Again, I used the Quad 4x4 instructions for operating the QT1065 press.

Notice that Moog specifies that the ball joints are to be oriented with the grease relief INBOARD when installing. Take extreme care to get the ball joints started straight so that they don't 'dig in' and scar their receiver bores in the axle yoke. Verify that the lower ball joints are pressed in far enough to allow proper installation of the new snap ring which is included with each new Moog lower ball joint. The boot must be installed on the lower ball joint after installation. This is best done with a 1-1/2" PVC pipe coupling and a small sledge hammer. Make sure you have the correct orientation for the boot, grease relief notch to the inside, and place the boot onto the ball joint and push using the PVC pipe coupling to hold it in place. Take the side of the head of a small sledge hammer and bump the bottom of the PVC pipe coupling and the boot should install correctly. Verify that the boot is installed evenly all around.

Install both steering knuckles with anti-seize in the tapered ball joint stud bores; install the ABS cable brackets under the upper ball joint nuts; and torque all nuts per the instructions supplied with the Moog ball joints, paying particular attention to the torque sequence, intermediate torques, and final torques. Make sure to install the cotter pin on each ball joint stud/nut after achieving final torque.

Andy Redmond adds to Brent's story: Another precaution about leaks: be careful not to put the axle in a bind with an extreme ball joint angle ('94-'99 trucks). A member that read Issue 53 e-mailed recently complaining of axle shaft seal leaks after installing upper adjustable ball joint sleeves. The fix was to use the lower trailing arm eccentrics and the adjustable upper ball joint sleeves in tandem to achieve about four degrees of positive caster versus his chosen value of six degrees. This allowed the spindle and axle to return to a more neutral and centered position, easing the stress on the axle seals. This was the luckiest guy ever. When he returned the adjustments to my recommendation, the seals stopped leaking. This is certainly not typical. Be forewarned: it's a big job to change these seals. On the driver's side the differential carrier has to be removed from the axle housing (labor guide—7 hours).

The next step involves installing the half shafts into the axle tubes. Visually check on the passenger side by looking down the axle tube to see that the splined collar is in position, which it should be if you shifted into 4WD prior to beginning this project. If it isn't, you will see that it has dropped down and is too low to engage the passenger side half shaft. If the ring has fallen down, the procedure that follows will get you going again.

If you left the truck in 2WD, as I did, open the spline engagement housing or central axle disconnect (CAD) housing and place the spline collar onto the intermediate shaft's spline. You should clean

out the housing sump at this time. Leave the CAD open until after the passenger side half shaft and bearing hub are installed.

There are two tasks to pay close attention to when installing the axle's half shafts: one is to get the spline and the oil seal sealing surface super clean and then apply a light coating of grease; the second is to keep it clean during the installation process by rolling up a piece of heavy paper and putting it inside the axle tube. Ideally the paper should be stiff enough to support its shape and wide enough to stretch from the oil seal to outside the tube where it can be grabbed after shaft installation. The object here is to *never* allow the spline or shaft to touch the inside of the tube since rust or dirt particles could be picked up and deposited on the oil seal lip resulting in an axle oil leak, hence the need for the paper. Once the half shaft is installed the paper is removed by pulling and tearing, you'll want to verify that all the paper came out. I used the front and back cover off a Bass Pro Shops catalog, which worked perfectly.

The next step involves installing the bearing hubs in the steering knuckles. One of my observations when looking the truck over at the beginning of this project, was that while my bearings had no noticeable slop or loose motion in them, they made a clicking sound when rotated by hand. Given the suspicious clicking noise, and the fact that you can't disassemble the bearing hubs to inspect and repack the bearings, I decided to replace my bearing hubs. I chose the Timken HA590203 bearing hubs from Rock Auto since my truck has four-wheel ABS.

To install the bearing hubs first make sure the half shaft splines are clean and coated with anti-seize. Next, coat the bearing receiver bore in the steering knuckle with anti-seize and install the bearing hubs, ABS sensor hole up. Don't forget the brake rotor shield goes on with the bearing hub. Make sure to get all four bolts on each bearing hub to proper torque incrementally: top front, bottom rear, lower front, top rear.

With the bearing hubs installed, the hub shaft nuts can be installed, although final torque can't be achieved until the truck is back on the ground. Since the half shafts are installed, the front differential cover can be reinstalled and the differential filled with the proper lubricant.

Dodge doesn't use gaskets on the differential housing, but instead uses a gray colored sealant which must be completely removed with a razor scraper prior to reassembly. I chose to put the differential cover back on with a Felpro axle housing gasket, AutoZone part number RDS6095-1 for the Dana 60 front axle, since I'm not a big fan of the gasket-less assembly idea.

Now the tie rod end assembly can be replaced. I laid my entire assembly out on a table as it came off the truck and then laid the new parts next to the old ones. Pay particular attention to the amount of engagement the old rod ends have in the alignment adjusting sleeves. The object here is to build up the new assembly to exactly match the old one both with tie rod orientation and lengthwise adjustment. The truck will still require a front end alignment, but it is better to get as close as you can to save on tire wear enroute to the alignment. This is a great time to take a thread file and thoroughly go over each new threaded rod end prior to assembly. I found that the cardboard thread protector tube had come off one of mine inside the shipping box and had collected some dings in a couple of the threads. These nicks make for hard turning adjustments during front end alignment.

Once the new tie rod assembly has been built up it is time to install it onto the truck. Prepare the tie rod stud receiver hole in the Pitman arm and in both steering knuckles by cleaning them, inspecting for cracks or other damage and coating it with anti-seize. Carefully lift the assembly to the truck and install into the steering knuckles and Pitman arm. Verify that everything looks right and then install the steering damper. Install all tie rod stud nuts to proper torque and install the cotter pins.

This concludes the assembly of the steering system. Review every aspect of your work to make sure that all components are installed correctly and that all proper torques were achieved during installation.

Once satisfied that everything is in order reinstall the front brake rotors with anti-seize on their bores and install the brake calipers. Make sure that the rotors are clean and lubricant free. Install both front wheels and place the truck back on the ground. Now comes the torquing of the bearing hub / half shaft nuts using the 1-11/16" socket and following the Timken installation instructions for proper torque. After final torque is achieved, install the cotter pins.

Parts used on this front end rebuild are:

| Description | Manufacturer | Part number | Quantity |
|-------------------|--------------|-------------|----------|
| Steering damper | Monroe | SC2964 | 1 |
| Tie rod end | Moog | ES3526 | 1 |
| Tie rod end | Moog | DS1462 | 1 |
| Tie rod end | Moog | ES3527 | 1 |
| Tie rod end | Moog | DS1460 | 1 |
| Ball joint | Moog | K7394 | 2 |
| Ball joint | Moog | K7397 | 2 |
| Track bar | Moog | DS1413 | 1 |
| Bearing hub w/ABS | Timken | HA590203 | 2 |

Andy Redmond adds to Brent's story: Many members may also have severely worn upper and lower arm trailing bushings, which can also allow unwanted fore and aft axle movement. Replacement bushings are available from Dodge and the aftermarket to re-bush the trailing arms. This is most easily accomplished by removing the trailing arms, then removing/installing the bushings with a shop press. Urethane replacement bushings (Energy Suspension) are available, but these require periodic grease lubrication to prevent squeaks and may add harshness to the ride. (Urethane does not flex like a rubber bushing.) My favorites are the beefy lower links from Solid Steel Industries. The SSI Lower Adjusting Links are recommended for heavy off-road use and ease of caster adjustment. Modifications are necessary to use these on the '94-'99 trucks, as the installer must provide inner bushings to bush the link's inside diameter down to the OEM fastener shanks.

Conclusion

Well, gang, does that conclude the correspondence on steering woes and the solution to the Second Generation truck's death wobble? Since most all of the components were replaced, I would hope the answer is "yes."

Brent Boxall
TDR Member

Editor's note: My thanks to Brent for the complete write-up covering Second Generation steering problems and to Andy for his additional Shop Floor insight. To close out this article, please make note of Andy's updated alignment specifications for '94 to current 4x4 Turbo Diesel trucks that is shown below.

PREFERRED ALIGNMENT SPECIFICATIONS UPDATE

by Andy Redmond

| YEAR | TOE | CAMBER | CASTER | COMMENT |
|--------------------------------|------------------------------------|--------------------|---------------------------|---|
| 1994-2002 | 0 deg. or (+0.10 total toe in) | 0 deg. (±.50 deg.) | 3.5-4.0 deg. positive | '94-'99 trucks will require an offset fixed or adjustable upper ball joint sleeve to obtain these specifications (caster). Trucks needing camber adjustment will also require sleeves, and the '00-'02s upper adjustable ball joints. |
| 2003 to present | 0 deg. or (+0.10 total toe in) | 0 deg. (±.20 deg.) | 4.0-4.5 deg. positive | 0-2" Leveling kits seem to like about 5 to 5.25 deg. pos. caster. |
| 2003 to Present Cab Chassis | 0 deg. or (+0.020 total toe in) | 0 deg. (±.20 deg.) | 3.75-4.0 deg. positive | These differences are likely due to these vehicles being used at GVWR capacities. |