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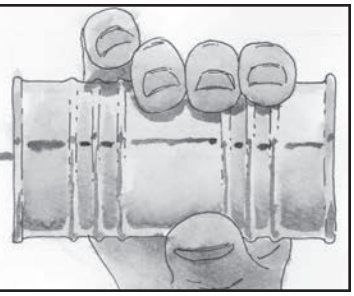

Members' Solutions to Members' Questions
This Issue features suspension upgrades by TDR Writer Doug Leno.

THIRD GENERATION SUSPENSION UPGRADES: PART THREE

by Doug Leno

In August of 2012, TDR Issue 77 (pages 42-50), I described the first part of a major suspension upgrade for my 2004 Turbo Diesel. At the heart of this upgrade was Carli Suspension's "Backcountry 2.0" system, which included multi-rate coil springs in the front and a progressive five-leaf "add-a-pack" in the rear. Also in the kit: Carli's adjustable track bar and 2-inch diameter 5160-series Bilstein reservoir shocks. To these impressive components, I added Carli Suspension control arms as well as their torsion sway bar.

Figure 1: Carli Suspension multi-rate coil spring (left) installed in 2012, provided approximately three inches of lift compared to the factory spring (right)

Figure 2: Carli suspension lower control arm, installed in 2012. The serviceable bearing eliminated the friction caused by the rubber bushings in the factory control arm.

Part Two of the project was covered in February 2015, TDR Issue 87 (pages 13-17). In this article I described the Carli Suspension "dual-opposing steering stabilizer" solution. This upgrade greatly reduced the risk of stabilizer damage in off-road situations by locating both stabilizer bodies above the bottom of the axle tube (see figure 3).

Figure 3: My (Issue 87) Installation of the Carli Suspension "Dual opposing steering stabilizers." Without using the factory mount point, the lower stabilizer is located above the bottom of the axle tube, reducing the risk of damage in off-road situations.

LET'S GET STARTED: PART THREE

In this article I will describe my repair of the factory steering linkage system and discuss my choice to upgrade to the newest factory design.

Steering Systems: "Y" and "T" Styles From the Factory

After 10 years and 150,000 miles, my factory steering system tie rod ends were showing the expected signs of deterioration and the wear produced some sloppy steering performance. To determine the repair, I first looked to see if there were any steering system recalls. I discovered "Safety Recall H46" which affected a small number of vehicles requiring a new drag link inner joint and/or pitman arm, but it turned out that this recall did not affect my vehicle. I was on my own for parts replacement.

Turbo Diesels from 2003 through the mid-2008 model year were manufactured with what is known as a "Y-type" steering system, illustrated in figure 4. In the illustration, note that the tie rod from the left front tire connects to the steering drag link, forming a "Y" configuration. Why is this important? Imagine, for example, that the steering box in Figure 4 moved upward. This action would pull the left and right steering knuckles closer together, causing the tires to "toe in" (pigeon-toed). Conversely, moving the steering box downward would push the steering knuckles farther apart, causing the tires to "toe out." The main point of interest for this geometry is that *suspension toe changes dynamically during normal vehicle operation.*

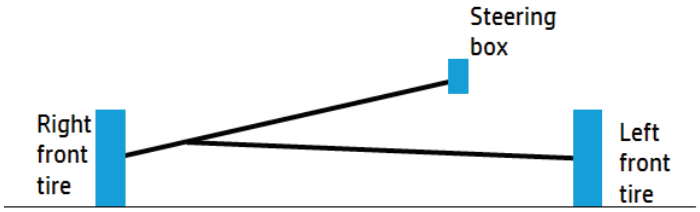

Figure 4: "Y-type" steering system supplied on 2003-2008 model year trucks. In this configuration, suspension toe changes dynamically during normal vehicle operation.

During the 2008 model year, Chrysler began to ship model 2500 and 3500 model Turbo Diesels with a different steering linkage geometry known as the "T-type", illustrated in figure 5. Note that for this geometry, the distance between the left and right steering knuckles is fixed, due to the rigid tie rod connecting the two together. *This means toe is not affected by suspension flex*.

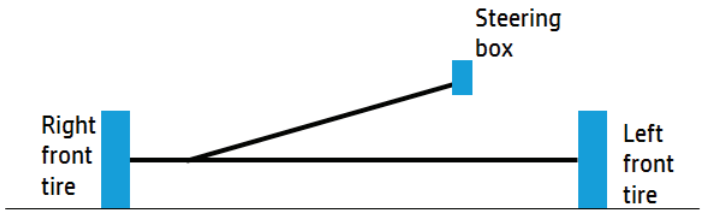

Figure 5: During the 2008 model year, Chrysler introduced the "T-type" steering system, so named because the steering drag link "Tees" into the steering tie rod. For this geometry, the distance between left and right steering knuckles remains fixed, keeping toe constant during suspension flex.

Instead of repairing my 2004 steering system, why not upgrade my truck to the latest steering system?

The "T-type" steering system, first introduced in 2008, presented an interesting option to me: Instead of repairing my 2004 steering system, why not upgrade my truck to the latest steering system?

Beyond the geometry differences themselves, the new T-type steering system provides additional stiffness and stability via larger diameter tubes, 1.5" versus 1.25", compared to the older Y-type system (see figures 6 and 7). This made the decision to upgrade easy. Because the job would be a simple one, I decided to perform the upgrade myself.

Figure 6: My tape measure shows the 1.25" diameter steering linkage tubes used on the 2003-2008 "Y-type" steering system that I replaced. The newer "T-type" system uses larger 1.5" diameter tubes.

Figure 7: T-type steering system is made with 1.5" diameter tubing, and is considerably more robust than the older, Y-type steering system. The new system is over five pounds heavier.

Oops, A Recall of the T-Type System

It turns out that Chrysler has made a number of updates to the T-type steering system since its introduction in 2008, the most important of which coincided with Safety Recall N49 / NHTSA 13V-529. This recall, issued in January 2014, impacted some 260,000 vehicles built between February 14, 2008 and December 22, 2012. The subject of this recall was to address the following condition:

> *The left tie rod ball stud on about 264,000 of the above vehicles may fracture under certain driving conditions. This could cause loss of directional control and/or crash without warning.*

N49 is a comprehensive recall: All 2008-2012 vehicles equipped with T-type steering systems are updated with a newer T-type steering linkage at factory expense. What was wrong with the parts that are replaced under the N49 Recall? I contacted my dealer, who was (understandably) unable to give me any information beyond N49 itself (stated above).

Unsatisfied with this lack of detail, I requested permission to inspect a few steering linkages which my dealer had already replaced under the recall. I started by inspecting the left tie rod ball stud of both "new" and "recalled" systems, as shown in Figure 10. Do you see any difference? I didn't either!

Figure 10: I found no difference between "good" and "recalled" tie rod ball studs, the subject of N49. On the left is a verified "good" part which I installed on my truck. On the right is a recalled part from my dealer's boneyard.

It addresses the probability that a careless alignment technician might pre-stress the left-side ball stud during toe adjustment!

After further investigation I found what I believe to be the real reason for the recall: The recall does not appear to address the ball stud itself; it addresses the probability that a careless alignment technician might pre-stress the left-side ball stud during toe adjustment! If you carefully inspect figure 11, you will see the update: The newest tie rod has an internal mechanism to prevent the right-hand tube from rotating along with the toe adjustment collar. The older (recalled) tie rod has no such mechanism, as you can see in figure 12.

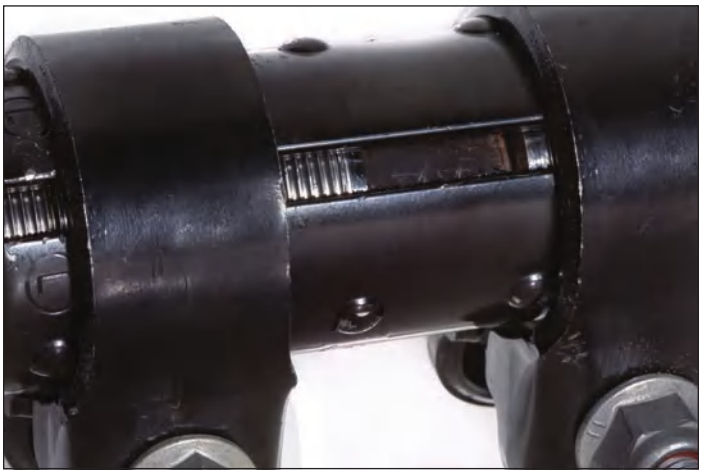

Figure 11: The adjustment collar on the newest T-style steering system. Note the inner mechanism in between the two threaded halves. This prevents the right hand tube from rotating along with the adjustment collar.

Figure 12: The older (recalled) system allowed the right hand tube to rotate along with the adjustment collar, allowing a careless technician to pre-stress the ball stud inside the steering knuckle.

A WORD OF CAUTION

A caution about installing the newer steering linkage system onto an older truck: *Even if the upgrade is performed by a dealer, Chrysler has no way of tracking or associating the new steering system to your VIN*. In fact, 2003-2008 trucks that were upgraded to the new steering system during or prior to calendar year 2014 may have received the components that N49 was designed to catch. I am aware of one Turbo Diesel owner, for example, who upgraded his 2003 truck, only to find out later that the parts he installed were recalled by N49. The good part of the story is that his dealer performed the recall procedure on his 2003 truck, even though N49 itself did not apply to that model year. So, if your 2003-2008 truck has been upgraded to the new T-type steering system, you will need to pay close attention to factory communications, TSBs, and recalls. When in doubt, take your truck to your dealer for inspection.

One additional concern I had was the possibility that T-type steering systems might be aligned differently than Y-type systems. For example, witness the recommendation from Carli Suspension to align T-type systems with 1/8" of positive toe-in, and Y-type systems with zero toe. Would a shop be able to recognize, for example, a 2004 truck with the steering system from model year 2012?

After discussing this concern with three local alignment shops who were gracious enough to look up the alignment specs published by Chrysler, I came to the conclusion that there is really nothing to worry about. The factory spec is the same for both systems: 0.20 degrees +/- 0.10 degree. ***(Editor's note: it is frustrating to see alignment specifications in "degrees" versus the layman's understanding of "1/8" toe-in or 1/16" toe out." How do degrees translate to an "inch" measurement? Check out the website www.ingallseng.com and the conversion chart tells me 1/16" is .12°, 1/8" is .24°, and 1/4" is .50°)*** Turbo Diesel owners who are particular about the actual toe-in set point should discuss this subject with the shops they trust.

Installation

Installation of the new T-type steering system is easily accomplished in a home garage with the front axle on jack stands. For removal of the old system, a pitman arm puller and a little patience are all that is required beyond standard garage tools. Table 1 shows my shopping list:

Mopar Part Number	Description
52122362AF	T-type steering linkage (1)
68039930AA	Pitman Arm (1)
6505623AA	Nuts (3)
52122370AB	Steering Damper (1)

Table 1: part numbers required for upgrading 2003-2008 tucks to T-type steering.

From my "Part Two" (Issue 87) article you know that the Carli Suspension steering stabilizers are already installed on my truck. Therefore, I did not purchase a new factory damper, but I did have to update my Carli Suspension stabilizers with different mounting hardware, which I will describe later.

After removing the Pitman arm from the steering box, the entire system can be removed by loosening the nuts on the left and right ball studs (see Figure 8).

Figure 8: Dropping the old Y-type tie rod from the driver-side steering knuckle. The nut in this photograph (circled) is only partially removed.

Setting the initial Toe

Although most of us rely on alignment shops to check or perform the adjustment, our Turbo Diesels are easy to align, even in a home garage. "Total Toe" is the only adjustable alignment parameter, determined by the length of the tie rod set via the adjustment collar. This meant I had to set "Total Toe" myself, at least initially. Rather than measure the parameter directly on the vehicle, I decided to pre-adjust the length of the new tie rod to match the length of the old one (see figure 9), and then go to an alignment shop for final adjustment. It turned out my pre-adjustment was only 1/32" off!

Figure 9: pre-adjusting the length of the new tie rod before installation.

Adapting the Carli Suspension Stabilizers

Carli Suspension's dual stabilizer system is compatible with either "Y-type" or "T-type" steering systems. As is the focus of this article, the newer steering system is manufactured with larger diameter tubes, which means that a different Carli suspension clamp is required for the upper stabilizer (see figure 12). Carli's low-mount stabilizer utilizes the factory supplied clamp, shown in figure 13. Note that for these photographs, I decided to break with tradition and show the installation after several hundred miles of road use. You won't see shiny new parts in these photos, but you will see how road grime accumulates, and how the axle tube itself protects the lower stabilizer (figure 13).

Figure 12: Installation of the Carli Suspension "High mount stabilizer" required a new clamp to accommodate the new tube diameter.

Figure 13: The Carli Suspension Low-mount stabilizer utilizes the factory supplied clamp, repositioned to the correct location per instructions from Carli Suspension.

Conclusion/Notes

Overall I am very pleased with my truck's steering performance after upgrading to the T-type drag link. Stiffer tubes and new tie rod ends are good! Here are some additional summary points:

- Chrysler has demonstrated a commitment to the T-type steering system, first introduced during the 2008 model year, and this system is an attractive upgrade to the older Y-type systems found on 2003-2008 trucks. With the N49 recall behind us, the currently available replacement steering systems are a good choice. The upgrade is frequently installed by dealers.

- Turbo Diesel owners who upgrade their 2003-2008 model year trucks to the new steering system will not be automatically notified of Chrysler-initiated updates or recalls that are model-year or VIN specific. Care should be taken to ensure that such installations remain current with the latest information intended for 2008-present model year trucks.

- Aside from the above, there are no serviceability issues or risks associated with installing the newer T-type steering system onto 2003-2008 trucks. The upgrade is a drop-in replacement for Y-type steering systems, and subject to the same factory alignment specs. Turbo Diesel owners who are particular about the actual toe set point should discuss the upgrade with the alignment shops they trust.

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TDR Writer