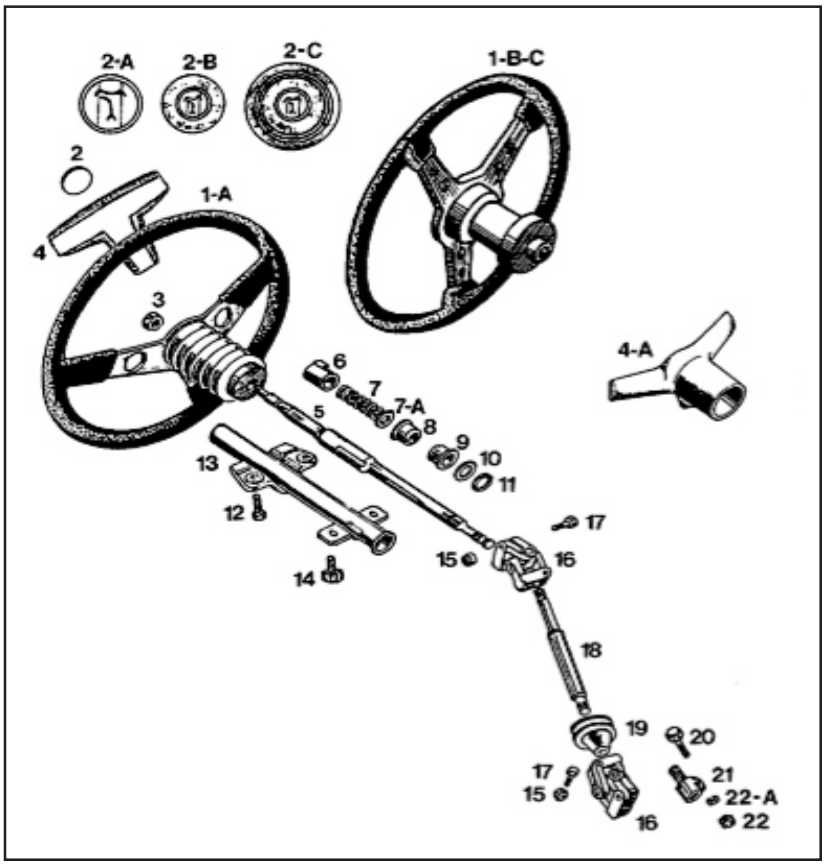
Steering Solutions

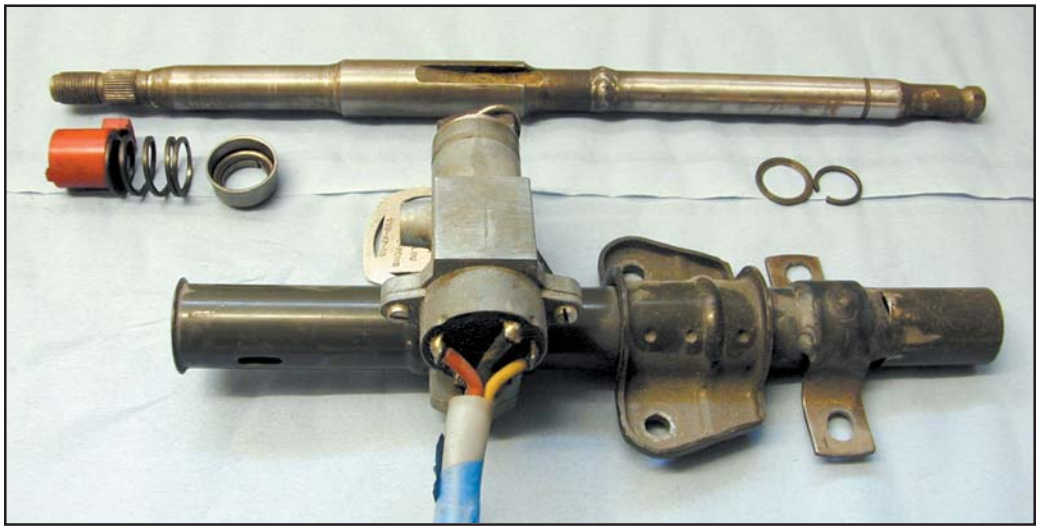
Story and Photos by Mike Drew

Among the many fine attributes the Pantera was imbued with was the steering. Contemporary road testers raved about the light, precise steering, one even going so far as to say that, "…you can drive around ants at 80 mph". Unfortunately time has taken its toll, and some Panteras have suffered degradation to their steering systems, often slowly enough that the owners haven't noticed. Fortunately, some of the Pantera vendors have identified the components that suffer from wear and have created new and improved parts to rectify the situation.

The most well-known condition involves the bushing on the passenger side of the steering rack. On the driver's side, the rack and pinion are held in close contact by means of a spring-compressed 'shoe', but on the passenger side, the rack slides through a bushing consisting of a stamped steel housing filled with a nylon bushing. Over time, this bushing wears out, which then creates unwanted play in the system, which manifests itself as up-and-down movement of the rack within the housing, which in turn leads to in-and-out movement of the passenger wheel. Most racks start to show wear after about 30,000 miles, and the bushings are totally shot by 60,000 miles. Since this is a well-known condition with a well-known fix (the stock bushing is either replaced by or augmented by an oillite (oil-impregnated bronze) bushing), I won't go into much detail here. The process has been



This drawing from the De Tomaso parts book illustrates each component in the steering linkage, upstream of the rack itself



This is the steering column disassembled; the steering wheel would be towards the left in this photo. The turn signal cam, spring, and upper roller bearing are on the left, with the snap ring and washer on the right. Not pictured is the nylon lower bearing, which is inside the tube, retained by the three punched-in portions just to the right of the clamp

documented in the POCA newsletter several times in the past, and a comprehensive step-by-step discussion can be found on Mike Dailey's website, www.panteraplace.com. The bushings normally cost about $35-40.

It is worth mentioning that the act of rebuilding the rack can lead to unwanted play if the tie rod isn't properly tightened when the rack is assembled. I recently encountered a car whose rack had been 'professionally' rebuilt; the rebuilder failed to properly peen the locking ring, and within a very few miles, the tie rod started to unthread itself from the end of the rack; fortunately the problem was discovered and fixed before the steering came apart completely!

Although this is one well-known source of imprecision, there are many other components that can use attention. Underneath the dashboard, above the pedals, the steering column has a male/female slider arrangement, where the steering column is intended to collapse in the event of a crash. There are two nylon clips with raised humps attached to the male portion, which are designed to be a press-fit inside the female portion. Unfortunately, with age and use, these nylon clips can wear out, and the female slider can distort, which results in a fairly noticeable amount of play. The steering wheel can be rotated a few degrees before the slop is taken up and the rotational motion continues downstream to the rack.

The male and female slider portions of the steering shaft system (these have been freshly cad-plated), along with the original nylon bushings (the two circular raised spots on each side are almost entirely worn away), and Wilkinson's stamped steel replacements

Dennis Quella recommends tack-welding the two halves together (an alternative if you don't have welding equipment is to drill them and bolt them together), to make them rigid (this presumes you wear seat belts and won't ever contact the steering column in the event of a crash). I elected to bolt mine together, and let me tell you, it is no picnic trying to drill those holes. The pieces are made of hardened steel, and I wore out several drill bits in the course of drilling the holes. Once done, however, a nut and bolt locked the two halves together solidly, eliminating any source of play.

A better solution, one which retains the functionality of the collapsible column, is to replace the nylon clips with new ones from stamped steel. Panteras by Wilkinson sells these replacement clips, and although they are rather expensive at about $15 each, they are highly effective. In practice, they are quite a bit too large to enable the two halves to fit easily together, which is a good thing. Once the clips are installed, the male slider has to be hammered into the female half (using a plastic or rubber mallet), which deforms the clips just enough to allow the halves to slide together without allowing any additional freedom of movement.

I have been astounded to see how many Panteras have this next problem. The steering shaft under the dash is supported within a steel tube; at the top is a roller bearing, and at the bottom, a solid nylon bearing which is pressed into an indentation several inches up from the end of the tube. A steel washer is secured by a snap ring on the steering shaft, and rides against the bottom bearing. Up top, there is a turn signal cam, a spring, and a spacer.

When a steering wheel is overtightened to the point where the spring fully compresses (coil-binds), the whole shaft is drawn up in the tube, and at the bottom the steel washer actually smashes and shatters the nylon bearing, leaving the bottom of the shaft unsupported in the tube. Almost ever Pantera I've ever seen fitted with a non-Momo aftermarket wheel has this problem (the Momo hub appears to be the proper length to keep this from happening).

In fact, when this happens, the spring at the top of the tube presses the assembly back towards the driver until it is stopped from moving any further by the U-joint hitting the bottom end of the tube. If the U-joint was removed, the whole assembly upstream would pull right out of the tube. Owners can test for this problem easily; there should be visible space between the top of the U-joint and the end of the tube, and pressing forward on the steering wheel should result in almost no play. On cars with a broken bushing, the wheel is free to 'boing' in and out as much as a half inch and the U-joint rests firmly against the tube. Besides the imprecise location of the steering wheel, the U-joint

Dennis Quella has machined a new oillite bearing to replace the often-damaged nylon bushing in the bottom of the tube

A snap ring positively engages a steel washer (which indexes on the snap ring); the other side of the washer rests against the bottom edge of the bearing

scraping on the bottom of the tube creates much unwanted friction, and interferes with steering smoothness.

Pantera Performance Center has created a replacement bearing, made of the same material as the steering rack bushing. With the tube removed from the car and dismantled, the remnants of the old bearing are driven out, and the new one is then installed. It is a press-fit, and normally needs to be hammered into position using an appropriate-sized socket and extension as the press tool. Test-fit it on the shaft to make sure the shaft passes freely through it, and polish or sand the shaft if required (pay particular attention in the area on either side

It is important to sand or polish the steering shaft smooth, so the bearing can spin freely upon it

Once the snap ring and washer are installed on the shaft, thoroughly lubricate them with grease or anti-seize

A deep socket is used as the drive tool, to drive the new bearing into the steering column tube until it comes to rest against the stops

of the indentation for the snap ring), then use heavy moly grease when assembling it. This bearing costs only about $16.

At the top of the steering column tube, the shaft passes through a roller bearing. Inexplicably, the inside diameter of the bearing is 0.770" while the outside diameter of the shaft is 0.745", which means that even if all else is good, there is still noticeable play, with the wheel and column free to move up-and-down and side-to-side. Fortunately, Pantera Performance Center also has an upgrade in the form of a tapered, stepped bushing. This bushing is a tight fit on the steering column (in fact it may need very minor sanding to fit over the column), and its curved profile indexes upon the curved surface of the stock upper bearing, centering it perfectly. In practice, the steering wheel hub, turn signal cam and spring are removed, then the bushing is simply slid down into position, and the removed parts are reinstalled. This now positively locates the steering shaft in the center of the bearing, while allowing the bearing to turn freely. This little gem is only about $7.

Although it might be possible to conduct these modifications without removing the steering column tube from the car, normally it's a good idea to do so. The tube is secured to the chassis structure with four bolts (oddly, two of them use 13mm hex head bolts and the other two are metric allen bolts). The upper bolts pass through 'ears' welded to the sides of the tube, while

An original steering tube upper bearing on the left, with a new replacement bearing on the right. The machined aluminum centering spacer slides over the top of the steering shaft, and indexes on the curved radius of the bearing, centering the shaft perfectly

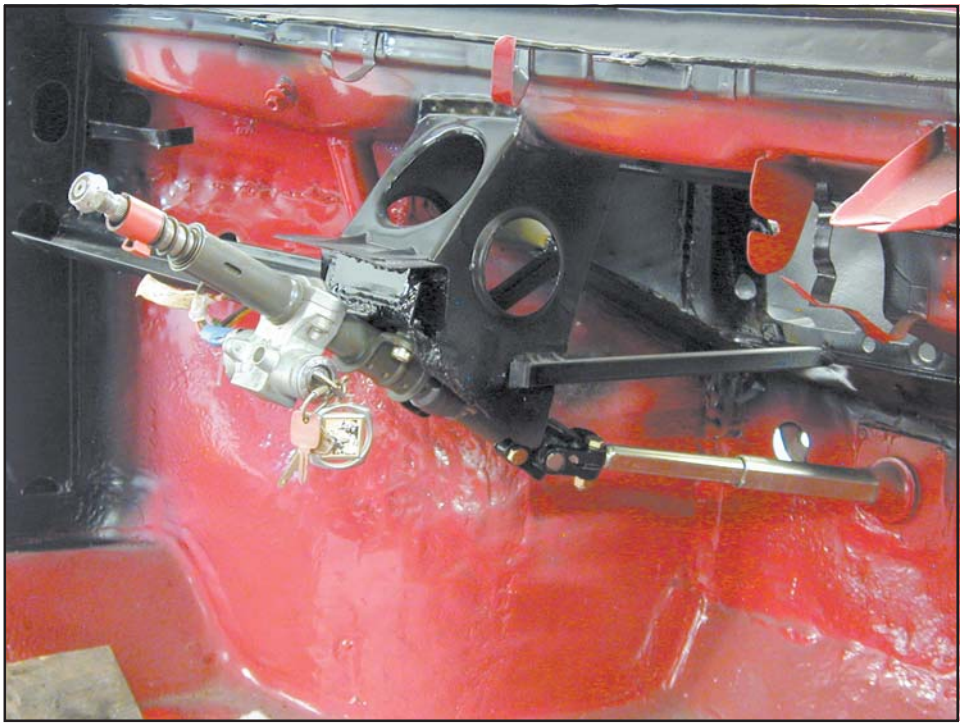
the lower ones pass through a clamp which is held to the tube with a single spot weld. On virtually ever Pantera I've seen, that spot weld has broken, which means that the whole steering column is free to move around. The solution is to seam-weld the clamp to the tube. As the clamp is very close to the bottom (nylon) bearing, if you don't remove the bearing first, the heat from welding will melt it, leaving quite a mess on your hands!

Even when the tube is rigidly attached to the chassis, and is properly supported at both the top and the bottom, there can be unwanted movement, caused by flexing of the supporting structure. Particularly on early cars, the structure under the dash was notoriously under-engineered, consisting of a poorly supported sheetmetal box. Enormous gains in rigidity can be gained by simply welding a pair of supporting strut braces between the back of the box, and the 'firewall'. Triangulating this structure will make it rock-solid. Of course this is best done with the entire inte-

The mounting bracket for the steering column tube is held in place with just a single spot-weld in the center of the bracket; on this car, as most cars, this weld was broken. This bracket was seam-welded along its entire length. Note the indentations on the left which locate the bottom bearing. Be sure to fully remove the remnants of the nylon bushing before welding the bracket, or the heat will melt the nearby bushing and make a real mess. (Don't ask me how I know this!)

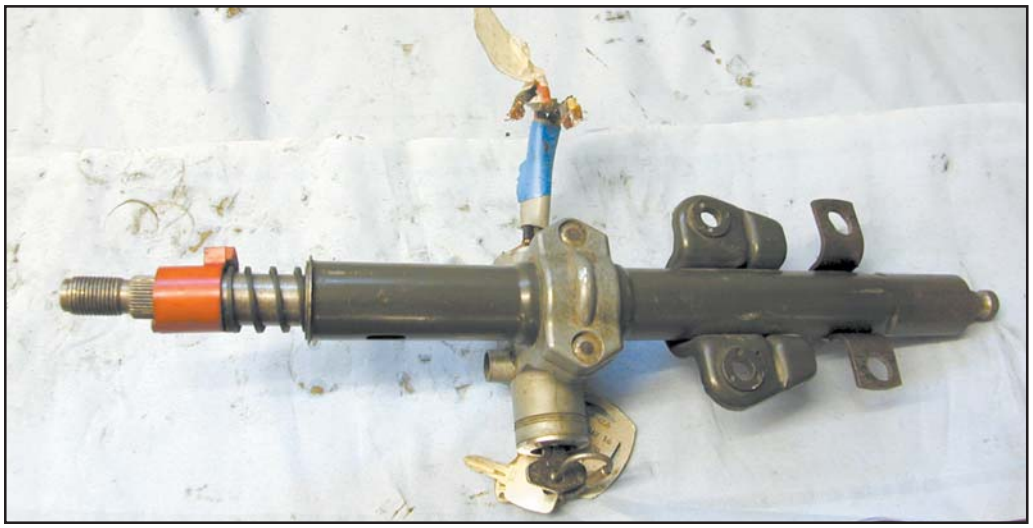
rior removed from the car, but if caution is exercised, it can be done with the car assembled. When routing the struts, ensure that they will clear any components that aren't installed at the time, such as the pedals and pedal support.

I had performed all of these modifications to my own car over the years, and was less than pleased to see that it still had sub-standard steering, which manifested itself in a constant shake or judder at the wheel. With the help of an assistant who gently turned the wheel back and forth to take up the slop while I inspected it from underneath, I discovered that the lower U-joint was dramatically worn internally, and allowed enormous amounts of rotational movement before transmitting that movement to the downstream components (this was the only portion of the steering system I hadn't touched yet). Also, I was shocked to discover that whoever had assembled it had stripped the pinch bolt, so that it was rattling loose on the splined shaft! Fortunately I happened to have a spare U-joint and was able to change it out.



This photo shows the steering column mounting structure on a very early European pushbutton Pantera, #1256. The sheetmetal box was completely unsupported and very flexible; vigorous driving would see the whole steering column moving around. Note the two reinforcements made using half-inch steel tubing (the second one is visible by looking through the hole on the side of the box). These two tubes made a tremendous improvement in rigidity. Later cars had a sturdier arrangement from the factory, but still benefit greatly from reinforcement

I now wonder if the fact that the entire steering assembly was bolted solid contributed to the failure of the U-joint; any shocks from chassis flex which would have been absorbed by in-and-out movement of the slider would now have to be taken up by the U-joint. Although the quality solution would probably be to dismantle the male/female slider and replace the through-bolt with Wilkinson's clips, in the short term I have elected to simply use a smaller-diameter bolt. This will clamp the inner and the outer halves together to prevent rotational movement while theoretically affording the opportunity for slight in-and-out movement.



The overhauled and blueprinted steering column, ready for installation in the car

I am pleased to report that after performing all these minor upgrades to my car, the steering is absolutely superb, easily on par with a Lotus, which is known for its steering precision. Best of all, all these modifications can be performed in a single day, with a parts cost of only about $65. It's the best $65 you'll ever spend!