



# UPCHUCK!

By Richard Ehrenberg, SAE

Photos by Dick Ross and Richard Ehrenberg

**T**he more seat time we spend in new cars, everything from rentals to the latest 392 Hemi Challenger, the less tolerance we have for cars—classic Mopars included—that have steering and suspension that, being kind now, are not up to “contemporary standards”. Conventional wisdom holds that new cars all have rack and pinion steering systems, and without a major re-engineering job, there’s no way your power-steered ‘60-’70s Mopar can play in that sandbox. Well, that’s just so much bull. Until recently, all ‘Benzs had recirculating ball, and nobody ever accused them of being sloppy steerers, despite a boatload of other flaws. Ditto, for one quick example, recent Jeep Cherokees and Grand Cherokees. They all had recirculating ball and indirect linkage,

and they steered very well, thank you.

As we’ve mentioned in recent articles, Mopars of “the day” were exceedingly well engineered, it was the execution that wasn’t always up to speed. (In fairness, these systems were designed in the late 1950s, and were at least 20 to 25 years ahead of the competition.)

In the articles immediately preceding this one, we’ve showed how to reduce K-member flex (via a super-slick bolt-on Pitman shaft lower bearing gizmo), and take the slop out of the idler arm via a needle-bearing retrofit, both driveway bolt-ons. So, Vern, what’s left? Plenty!

## HEY, CHUCK!

The make-or-break component of the steering system is the steering box, also referred to as the gearbox or just the “chuck”. Back prior to mid-1973, you had about a 25% chance of getting a well-mannered chuck in

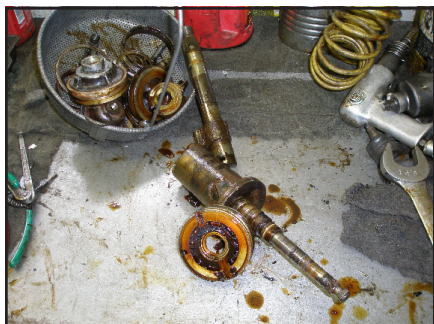


Can your 1970 Challenger steer as well as the 2012 SRT8? Uhhh, no. But we can get you surprisingly close with surprisingly few mods—all bolt-ons.

Steering chuck  
and alignment  
angles upgrades  
for precise control.



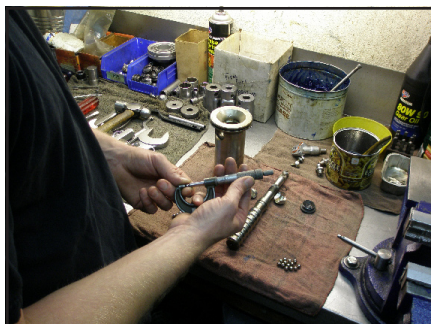
AD



(1) We sent Firm Feel our original 1962 chuck, which they immediately tore down to the last detail. The 50-year-old fluid looked—duh—50 years old. But wear was not excessive anywhere.

your brandy-new Mopar. That year, however, everything changed: Ma Mopar, awakening from a long slumber, introduced an improved chuck for police car applications. This little ditty was a sea change, within a few years this goodie was available to all comers as the S13 "Firm Feel Power Steering" option. What changed? Two main things. First, the internal reaction springs were stiffened, increasing effort, much to the chagrin, no doubt, of those ad-copy writers of the 1950s, the guys who penned "full time power steering" as a positive, when it was actually a cover-up, like you would actually believe that feather-light steering was a good thing at 80 MPH. Yeah, and the tooth fairy...

The second parameter was actually a tip of the hat to those who had been complaining about the quality control, or lack

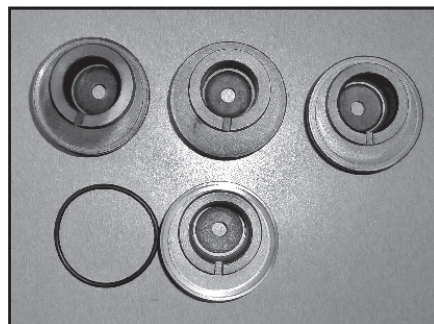


(2) In the steering box department, precision is the name of the game, and what separate the men from the Po'boys parts-store rebuilds.

thereof, in products of Chrysler's steering chuck factory. As mentioned, prior to 1973½, some new Mopars were blessed with pretty decent steering precision and control, and some felt like '54 Chevy's with 200K on the clock. Post-'73, with the S13 Firm Feel option box checked, you received a "select fit" chuck. Reality check: Yeah, we'll build this one right, the customer upped the ante by a few bucks".

We've had our share of steering boxes from every imaginable source, from NOS firm-feel units to junkyard, and from parts-store rebuilds to ones from Mopar-specific specialty shops. Here's a rundown:

> Junkyard. This is a major crapshoot. Until you install it, there's no way to tell if you have a winner or scrap iron. One thing's for certain: High mileage is a deal-breaker. By 75K, no matter how carefully you adjust the



(3) As a small sampling of what goes into a precision chuck, the top row shows three typical sector caps. Top left is the '67-earlier (see nice O-ring groove), center is '68-71½, (without any O-ring register, which causes no end of problems), and right is '73-later (which have a large step to locate the O-ring on). At the bottom is a FFI-reworked '68-71½ cap, now with a proper receiver groove.



(4) It is very common to find broken reaction spring retainers. FFI replaces these (broken or not) with in-house manufactured high-strength rings.



(5) FFI specifies a beefier (wider) lower sector bearing, which further increases precision. On large-spline boxes, the lower bearing can actually be doubled (two installed, "stacked").

box, the precision just isn't there.

> NOS. Good luck finding one. The part numbers you're searching for are 3643168, 3643279, 3643375, and/or 3643334. They are all large spline (see photo 8 on page 53 for more on that topic).

> Parts store: Don't waste your time,

### HANDLE ON HANDLING

No doubt about it: Mopar Action, since issue number 3 (when you truly joined the staff) has always advocated building well-rounded Mopars, ones that stop and corner as well as they go. With the "typical" smallblock now displacing 'bout 408 cubes, and the corresponding big-block 'round 528, the "go" part of the equation is almost a no-brainer. Upgrading the stop and turn factors have always been a key goal. "Turn", in M.A.'s dictionary, not only means simple G-force numbers, but steering precision, road manners and feel, and general driver satisfaction. And, where possible, we try to do this on a burger-flipper's budget, too.

Looking back over just a dozen-plus issues, we find these articles, all well written (by guess who?) Go back further, and the wealth of knowledge is truly startling....

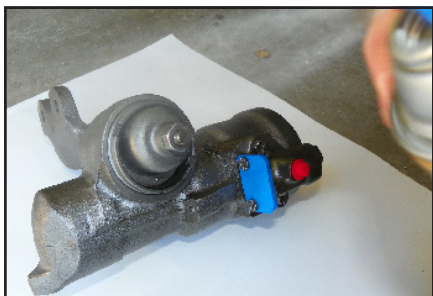
Don't have 'em? Putz. See [www.moparaction.com](http://www.moparaction.com) for ordering procedures.

—R.E.

ISSUE DATE	TOPIC
Feb. 2012	Needle bearing idler arm
Dec. 2011	K-member flex fix—bolt-on
April, 2011	Front suspension travel increase
April, 2011	Rear suspension lowering/wheel hop stop
Feb. 2011	Front suspension lowering, urethane, etc.
Feb. 2011	Ball bearing idler arm conversion
Oct. 2011	Zero-buck power steering firm-up
Aug. 2010	Dump rubber isolators, front and rear
June, 2010	
Feb. 2010	Suspension pkg. install/tune
Oct 2009	C-body handling
Dec. 2008; Feb, April 2009	3-part steering series/tips galore



(6) Ready for assembly, with all wear parts either replaced or re-machined to tight tolerances. We went for FFI's "Stage 2" build, which includes beefed reaction springs. Every box is pressure/hot-tested.



(7) Our Stage 2 FFI ([www.firmfeel.com](http://www.firmfeel.com)) steering box wash shipped to us as bare iron at our request. We shot it with rattle-can satin urethane for that "stock OEM" appearance.

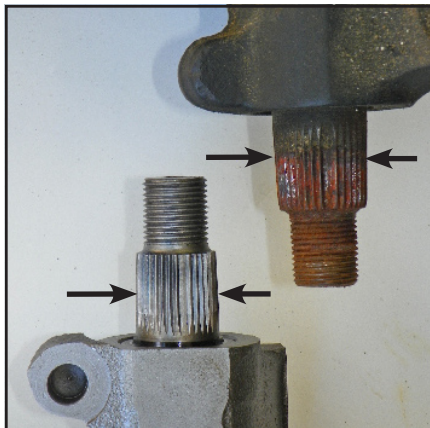
energy, or money. Every one we've ever tried has been sloppy as a greased pig and a numb as a Toyota on Novocain, and some we've disassembled have been really scary inside. The (now-thankfully-disco'd) Mopar reman ones are no better.

> Specialty rebuilder: There are but two. One, which is located in the Midwest, seems to be little, if any better than the generic rebuilds. The other outfit, Firm Feel, Inc., (in Washington state, [www.firmfeel.com](http://www.firmfeel.com)) builds chucks that are truly amazing. One word: Excellent. This is what we're installing (dumping one from the other guys).

> Rebuild it yourself: You can—sort of. Yes, you can replace the bushings and seals, maybe double up on the reaction springs, etc., but unless you're doing a dozen, and willing to have the first 10 or so be little more than learning tools, the subtleties involved in getting it right—even following the letter of the FSM—are so tricky that this is another frustrating waste of time.

### ANGLE FINDER

In addition to a well-mannered, slop-free chuck, there's a second necessity: A significant amount of positive caster. Why? OK, here's your engineering lesson: When the caster is positive, the pivots of the steering (the upper and lower ball joints) are angled so that a line drawn through them intersects the road surface slightly ahead of the contact point of the wheel. This



(8) Note that there are two pitman spline sizes. All A, B, and E-bodies, prior to 1973, excepting '70-'71 fast-ratio, used the smaller size, which measures approx. 1-1/8". Everything 1973 and up, and all C-bodies and B-vans, used the larger (1-1/4" spline). (B-vans were the last Mopars to use Chrysler-built steering chucks, circa 1993). And, oh, a few hundred 1965 B-bodies were built with the large spline, for reasons unknown. We opted for the stock small spline to re-use our mint pitman arm.



(9) There are myriad return valve bodies, besides differing angles, '67-up used 1 1/2" hose, while '66-down was 3/4". They just bolt on (don't forget the two O-rings). There's also a few pressure fitting versions, all of which can also be swapped. Starting in 1967, the mounting bolts were increased from 3/8" to 1/2", earlier boxes can be drilled for the larger bolts (always make to bolt holes at least 0.040" larger than the bolt, this allows the chuck to wobble a tad to "seat" on the K-member pad).

makes for self-centering steering- the wheel "casters" around so as to trail behind the axis of steering, just like a shopping cart. This improves directional stability (reducing tendency to wander), although, in low speed maneuvers, steering effort is increased (as you turn the wheel, you're actually lifting one corner of the car by a small amount). This is why, back in the day, the FSM specified negative caster for manual-steering vehicles, a tip of the hat to the poor slob who ordered—and tried to parallel park—his '72 Satellite wagon, 400-4, pistol grip 4-speed, with manual steering. (Yes, such a vehicle actually existed.) Chrysler was really quite proud—justifiably—of the low manual-



(10) Installation is just nuts and bolts. Step one is to remove the pitman arm. Use a puller, as SSS (SuperStudShaughnessy) is doing here.

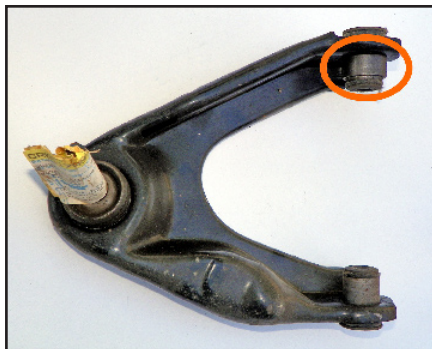


(11) And out it comes. Generally, the left motor mount must be unbolted and the engine jacked, and sometimes the left header or exhaust manifold loosened and swiveled up out of the way. Installation was similarly a cinch.

steering effort in their cars, especially once the excellent Chrysler-built manual steering chuck was intro'd in 1962). But, like most fun things, enough is enough, and too much is lousy. Excessive caster angle will make the steering annoyingly heavy and less responsive, almost spooky at high speeds if you go too far.

There's another, seldom-thought-about, but very good reason for having significant positive caster: Safety. Huh? Here's the rationale: if you lose a tie rod end, etc., the car will still basically go straight, and you will, depending on the failure, have some modicum of steering control. But if the caster's negative, the affected wheel will immediately pull, and you're virtually guaranteed to have that smile wiped off your puss. Ask me how I know this. (OK, don't).

Anyway, hopefully we've convinced you of the need for a few degrees of positive caster for any kind of performance driving. But there's always been a rub: You can't get there from here. On most muscle-era Mopars (with cam-adjusted alignment settings), you can, typically, get the camber where you want it (around 1/2 to 3/4° negative for that same style of moderately aggressive street driving), or get a degree or two of positive caster, but



(12) Stock upper control arms are models of efficient engineering. As long as they are not fatigued to death, they cause no problems, except that there was occasionally an issue with the press-fit on the bushings—the fit was too loose, allowing movement and the attendant alignment accuracy loss. When encountered on the assembly line, the factory added a press sleeve on one bushing (circled).



(13) Close-up of aforementioned press collar. Mopar P/N was 1857840. Repros exist. A small mig'd spotweld also works great. Do one or the other.



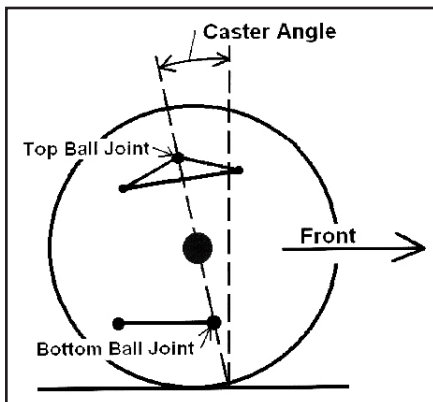
(14) Unfortunately, a bushing swap sometimes causes this type of failure. Weld!

not both at the same time. (Briefly, here's the general alignment procedure, with all parts stock and in good condition, for techs "in the know": Set all cams fully inboard, measure both sides. Then move the front cam out for the best caster/camber compromise and equality side-to-side).

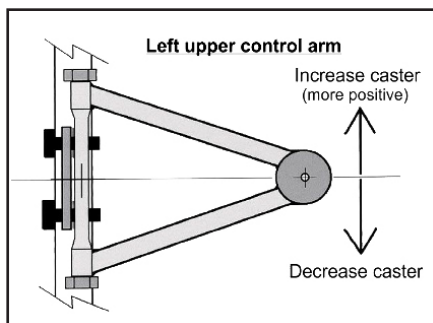
To get the desired specs, some parts need to change. The classic method has always been to use the aftermarket rubber offset upper control arm bushings, but throw away the instruction sheet, installing the front bushing on each arm 180#SYMBOL √ "Symbol" 176 from the documentation's method. This effective moves the upper ball



(15) After a few years, stock style rubber bushings aren't pretty. They've gotta go!



(16) In a totally stock configuration, the primary less-than-ideal facet is the inability to get the caster positive enough.



(17) To achieve said caster, the upper ball joint must move back, but the stock adjustment range will rarely allow enough.

joint back while leaving camber unaffected, and this works pretty well in most cases. Unfortunately, however, the offset bushings have a very sparse rubber wall thickness on one side and therefore aren't models of durability, and the rubber's pretty soft and squishy on the opposite side, adding to overall suspension squirm.

There's two ways to fix this:

The first has been around for a while but is almost unknown in the US: Offset urethane UCA bushings. These are made down under by Pedders Suspension ([www.pedders.com.au](http://www.pedders.com.au)), and are truly excellent. See photo 20 for more details.

The alternate is the "clean sheet" approach: Tubular upper control arms. This



(18) The time-honored fix for insufficient caster has always been offset bushings. Durability is 50-50.

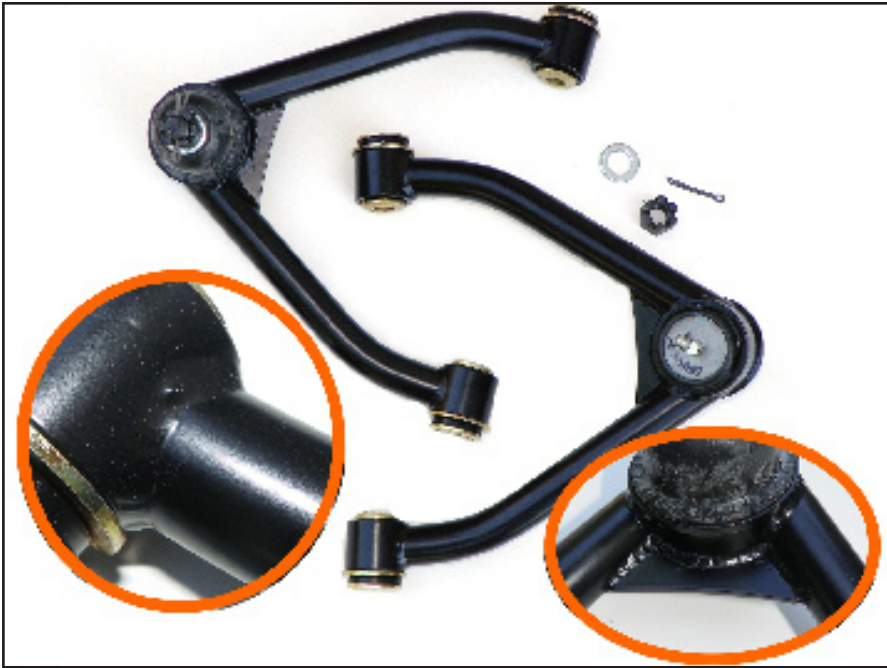


(19) To increase caster, you install the front bushing on each side offset outboard (shown), per instructions, but the rear one with the offset inboard (arrow pointing away from UBJ).

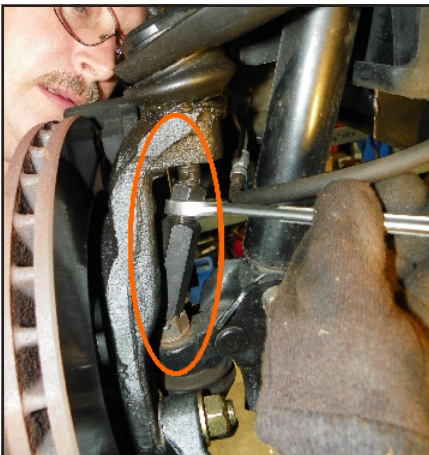


(20) The best of both words can be had—urethane, Pedders P/N EP6215 (a set of 4, enough for two arms). These come from down under, see [www.pedders.com.au](http://www.pedders.com.au).

option gives the engineer/fabricator total freedom to put the ball joint exactly where he wants it, which, for most Mopars, means a tad more negative camber and more than a little additional positive caster. This option also takes well-used and abused, frequently rusty and fatigued, arms out of the picture, which is great. But it also introduces another potential large trouble spot: You now have



(21) Firm Feel's tubular upper control arms come ready to bolt in (just add Multi-Mileage lubricant) and are things of beauty, and get the caster (and camber) spot-on for serious driving pleasure. But beauty is only skin deep. The welds are critical—your butt is on the line. FFI's arms (and the welds) have passed Zyglow-test and engineering scrutiny in several countries where motor vehicle inspection standards are much more stringent than any U.S. state. These are as good as it gets—the final answer.



(22) Installation of the tubular arms is identical to OEM. If you have future plans for your stock uppers (swap meet bait, etc.) be sure to use the factory tool, or aftermarket equivalent, to pop the upper ball joint stud out of the knuckle. No pickle forks need apply.

an arm which is welded together from five or six parts, replacing the not-much-to-go-wrong factory stamping. Done right, this is no problem at all. Done by the Chinese, this can be a very scary proposition. The upshot: Know your source. Well. At this point, it will probably come as no surprise to learn that our UCAs also come from FFI (Firm Feel, Inc.). They bolt in like stock (see photos for the steps of both the UCA install and the steering box swap.)



(23) A plastic dead-blow hammer will seat the arms without marking them. A block of wood and mallet also works.



(24) For future ease of disassembly, coat the adjuster cams shanks with anti-seize compound.



(25) The tubular arms present a racy appearance which will intimidate the best road kill you can find. A trip to the alignment shop is all that remains.



(26) The FFI chuck, however, is totally stealth in appearance.

## CONCLUSION

While, with a good digital level and some patience, you can do a passable wheel alignment on your garage floor, a professional alignment, performed by a well-versed tech, is money well spent. Depending on your driving style, negative camber could be set anywhere from ½ to two degrees, and caster two to three degrees positive (in both cases, higher angles are best matched with more spirited cornering on a regular basis, and higher speeds).

With all the upgrades now performed, our 50-year-old B-body steers like a better-than-average modern car. OK, it still isn't quite in Viper, LX/LC SRT8, or 1st-gen Neon ACR territory, but it is close. All who have driven it have returned with a mile-wide grin. It's that good.

Any lame excuses you had for not playing with the new kids on the block have unceremoniously been deleted. Do it to it.