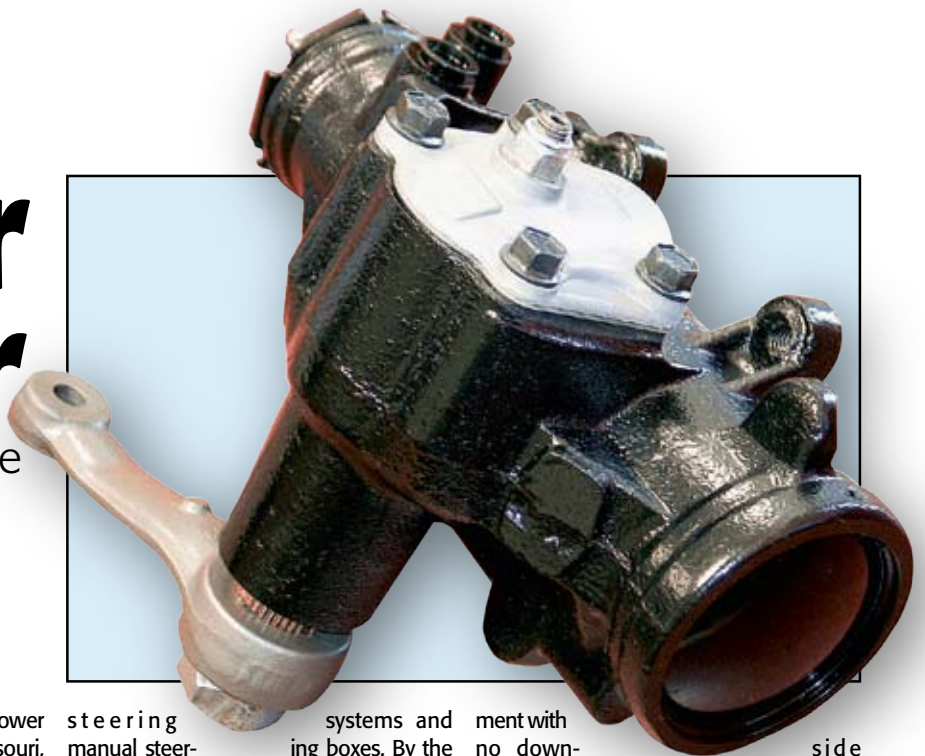


Steer Clear

Perfecting the nerve center of your GM musclecar's most important system

Text and photography by Tom Shaw



Chip Woyner, the man behind Power Steering Services in Springfield, Missouri, says that steering is the most important system in any car. My gut reaction would have been to pick brakes, but as Chip points out, if you lose your brakes on a windy mountain road, you can still steer towards the guard rail or side of the mountain, but if you lose your steering, you're probably going over the edge.

Now there's a good chance you'll never pilot your musclecar along a winding mountain road, but wherever you do drive it, you'll enjoy the experience a lot more if your steering system is tight and responsive.

Chip specializes in rebuilding power

steering manual steering systems and steering boxes. By the time a power steering box racks up six digits of miles, three or four decades, and several periods of extended storage, it's a far cry from its former self. If you think you're going to bolt on some ball joints and tie rod ends and get a tight steering system, think again. As you've got a weary steering box, you're going to have loose steering.

Chip has rebuilt power steering boxes for years and knows them like the back of his hand. When having a steering box rebuilt, there are a surprising number of options to consider. One major upgrade that just about everybody opts for is the upgrade to a quick 12:1 ratio. This is a seamless improve-

ment with no down-side that allows three turns of the steering wheel, lock-to-lock. About 95 percent of his customers request this upgrade.

The basic remanufacturing (rebuild) service costs \$159. A rebuild and quick ratio upgrade is \$239 with standard detailing. "Extreme" detailing is available for an additional charge. The rebuilt box is warranted for the life of the car to the original purchaser, excluding commercial use and modification. Turnaround time is generally under 10 days.

Chip allowed us to follow along on a typical rebuild. Here's how it went.



1



2

1 The job begins by removing the pitman arm nut, then the pitman arm is removed with a puller. "Never hit it with a hammer to remove it or use a "picklefork," cautions Chip. "That makes the case out of round for the seal, and it can crack the case." Moving around to the front, a 12-point 7/16 socket loosens the coupler (aka. rag joint), which is then tapped off with a hammer.

2 Even though it's on top, it's called the Side Cover, and it comes off next. Four bolts are removed, then the threaded adjuster stud, at the top of the pitman shaft, is turned clockwise with an Allen wrench to remove the cover from the shaft.



3 With the "side cover" off, the shaft is gently tapped out with a soft copper mallet and set aside. This one looks pretty good compared to boxes taken from cars that sit. Moisture collects in the boxes and corrodes the shafts, which will then need extensive machining or replacement.



4 Now, the lower Pitman shaft bearing, seals, and washers are driven out with a hammer and aluminum driver.

5 A pin punch is driven down through the hole in the top of the case to unseat the snap ring. Once the snap ring is removed, the input shaft is rotated to pop the end cap out. Keep spinning the shaft and the rack-piston assembly will be the next item out.



6 The end cap is removed with an impact driver, then the Teflon and O-ring seals are removed from the rack piston and discarded.

7 Moving to the rear of the other side of the case, the ring nut is removed with a hammer and flat chisel, then an adjustable spanner wrench is used to remove the thrust bearing adjuster/bearing seal retainer. The hillbilly method for removing this part is to use a hammer and punch, but that knocks the hole out of round. Skip the hillbilly method and use the right tools.



8 Now the spool valve comes out as an intact assembly.

9 Next, Chip has a look at the surface inside the case and gives it the fingernail test. Our case was within normal limits, but Chip brought out this heavily worn case as an example. Years of use with worn out seals can damage the surface, as has happened to the case in this photo. If the wear is deep enough to snag a fingernail, it's bad. Light wear can be honed out, but if the case has heavier damage it will need to be sleeved or replaced with a different case.



10 The spool valve is completely disassembled, then the Teflon seals are removed with a pick. Beneath them are rubber O-rings. They are also removed with a pick.

11 The seals are removed with a puller, one from the case and one from the thrust bearing adjuster/seal retainer, removed from the case back in photo 6.

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12



12a

12b



13



14



15



16



17



12 12a 12b This is the standard worm gear. Its ratio is 24:1, which is good for around 4 to 4.25 turns, lock to lock, in GM A-body cars. The vast majority of Chip's customers request conversion to a quicker 12:1 constant ratio which speeds up the steering considerably to three turns or less and makes it feel a lot more like a late-model car. The three commonly used worm gears are: 16:1 (top), 24:1 (middle), and the quick 12:1 gear (bottom). It looks very similar to the 16:1 variable gear at the top, but the 12:1 is distinguished by the two fine lines running along the center (inset).

13 Parts being reused go into a hot water wash. Really cruddy parts need a second trip. These did. Next stop is the parts washer where they're brushed, rinsed and blown off with compressed air. After the case and related parts are clean, a light honing cleans up the machined surfaces, which is necessary for proper sealing. Any pitting or gouging that cannot be repaired will render the case unusable.

14 Threads are cleaned up with a quick wire brush. Any hardware that will be reused is cleaned in a hot tank, then a vibratory bowl. A final rinse is the last stop before the assembly bench. The side cover's sealing surface is cleaned up on a wire wheel. It's aluminum, so care must be taken not to overdo it. The cast iron case gets some time on the wire wheel too.

15 Shaft sealing surfaces are also highly polished, and like all other critical surfaces, any damage that cannot be fixed means that the part will have to be replaced.

16 Assembly begins by installing the Pitman bearing, then the pressure seal and washer, dust seal, another washer, and finally the snap ring.

17 O-rings and Teflon seals are installed on the spool valve. There can be no twists in the Teflon seals. They must form a leak-proof seal. The sensitive internal surfaces of the case are coated with grease and oil to ease assembly and protect the machined surfaces in the event the steering box gets set aside during a lengthy restoration. Then the re-assembled spool valve assembly is installed.

18 This spool valve retaining spring is used on 1970-and-earlier spool valves. It slips over the front of the input shaft and is critical to proper operation; 1971 and up boxes do not use it.

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19 Chip presses the input shaft seal into its retainer in preparation of installing it into the front of the box. A snap ring holds the seal in place. It then screws into the front of the case with a spanner wrench. The farther it screws in, the greater the preload on the input shaft's thrust bearings. Chip sets the preload – a critical operation – by feel. It has to be tight, but not too tight. He pays very close attention, makes several passes and keeps tweaking until he gets it just right.

20 Once the input shaft preload is set to his satisfaction, Chip installs the retaining nut, snugs it up, then rechecks the preload to make sure nothing has moved.

21 The rack piston is filled with hydraulic fluid, then carefully fit back inside the case with the help of a compression sleeve, which works like a piston ring compressor.

22 Next, the Pitman shaft is lubed and installed, and lubed again. The input shaft is then rotated in both directions to make sure everything is moving freely.

23 The end cap is installed and tightened very securely.

24 The O-ring is covered in lube and set in its channel, then the end cover is replaced and secured by the snap ring. Once everything is in place, a few light taps with a brass mallet gets things seated. Hey, this thing's starting to look like a steering box.

25 An O-ring is set with stiff lube into the channel of the side cover, then the top of the Pitman shaft is rotated to bring the side cover down flush, and four new bolts are installed. A dab of silicone sealer is then applied to the shaft where it extends through the side cover. "The only place you ever use silicone in a power steering system is right here on this little bolt," Chip stresses, adding that silicone and power steering systems are a very bad combination.

26 Adjusting the gear lash is another critical step. "You can't adjust this on the car with any degree of accuracy," cautions Chip. Attempting to adjust it in your driveway by the seat of your pants invites a long list of dangers and accelerated wear. Chip

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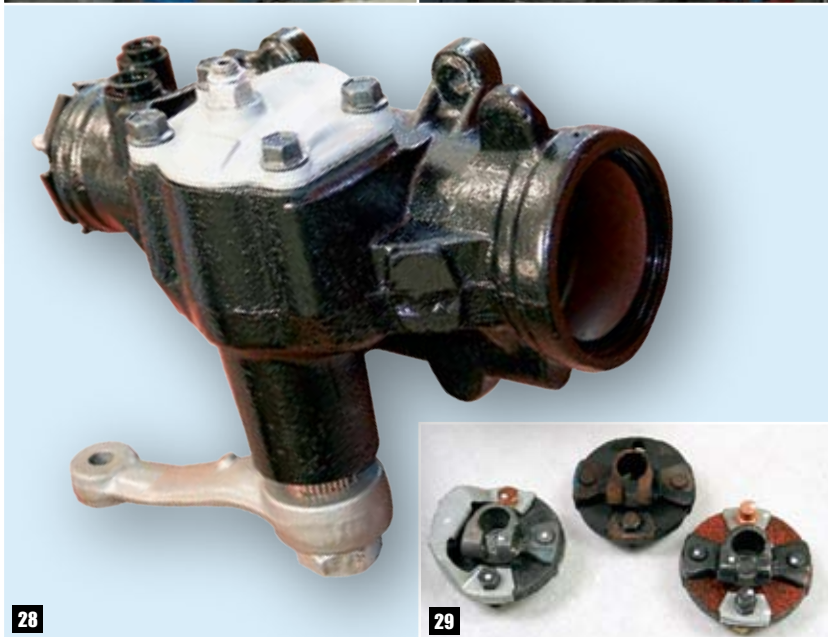
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won't even do it. He adjusts gear lash on the bench only. When it's got just the right feel, the lock nut is tightened, then the setting is rechecked. This completes the mechanical rebuild.

27 Once the box is buttoned up and all the adjustments are made, Chip screws in two Schrader valves to the hose connections and pressurizes the box with 110 psi of compressed air. Then he sprays soapy water on areas where leaks could occur and checks for bubbling. Chip says that air will leak before hydraulic fluid, so if a box is air-tight, it won't leak fluid. This one passes the air pressure test easily.

28 The case is cleaned with degreaser, shaft ends are protected from overspray and the Side Cover is masked off with tape, then the box is painted gloss black (OEM color for a 1964-1967 GTO) and the Pitman arm cast gray. A final coat of clear keeps the bare aluminum Side Cover from oxidizing. The finished box is now rebuilt, correctly set up with the quicker 12:1 ratio, tested, and ready to ship. Extreme detailing is also available.

29 Two details yet remain—the flex joint and the old power steering pump. Flex joints, aka couplers, rag joints, donuts,

etc., are available in OEM style (right), and an updated design that prevents steering loss in the event of a flex joint failure. Chip discounts flex joints from \$69 to \$59 when you get a steering box rebuilt. The last item needing changed is the power steering pump. It's full of 40 years worth of dirt, sediment, varnish, moisture and plenty of other contamination, and as soon as you connect it to your rebuilt steering box, it's going to share the mess. Also, older pumps generally have some loss of pressure, so don't cut corners now. Replace the pump too. Chip also discounts pump services if the customer is getting a steering box rebuilt.



STEERING BOX DATE CODES

On the Side Cover is a stamping that resembles this. The group of three numbers is the Julian day of the year, in this case it's the three-hundred forty-third day of the year. The year is indicated by the single number to the right, a five. That would put this box as being manufactured in early December, 1965, which would be correct for this '66 GTO. Date code on a steering box should precede the car's build date by 30-90 days. ■

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