



**By Mike Weinberg
Contributing Editor**

Every transmission-shop owner would like to be more profitable. There are endless ways to manage your business better and increase your bottom line, but one of the simpler methods is to add services for your customers. You already have the facility and the labor force; why not expand into other areas of vehicle repair?

One profit center for the shop is rear-end or differential repair. This is a service you can perform without investing in any special tools or equipment, and as word gets around that you do ring-and-pinion work, you will find a large market for this type of repair.

The rear end or third member of a rear-wheel-drive vehicle is one of the simplest yet least-understood parts of the vehicle. The ring and pinion in passenger cars and light trucks use hypoid gearing for strength and silent operation. The pinion gear is supported in the rear-axle housing by tapered bearings, and pinion depth is set by shims. There usually is a "crush collar" that, as its name implies, deforms when the

Looking At Rear Ends — The Differential Kind

yoke is bolted onto the pinion to set preload on the tapered bearings. Typical preload on the pinion with new bearings is 15-20 inch pounds, so don't screw it down with a half-inch gun.

A typical rear-end repair starts with a customer complaint of noise or grinding while driving. A constant bearing whine that increases with road speed but does not change with throttle position usually is caused by worn carrier, axle or wheel bearings. Worn pinion bearings or a damaged ring-and-pinion set will be noisy while the vehicle is being driven, but the pitch of the noise will change with throttle position. The noise might be worse under acceleration but

quiet down on coast, or it may be quiet on acceleration and make noise on coast.

It now is important to identify which rear you are working on. Count the number of bolts on the rear cover and make a note. If you are lucky there may be an ID tag on the rear cover or a series of numbers imprinted on the outside of the axle tube. Remove the rear cover, the differential cross pin and the axle "C" clips and slide out the axles. Count the axle splines and add the number to your notes. Mark the differential carrier-bearing caps for left and right, and remove the diff carrier and ring gear. Make sure to match the carrier shims to the side from

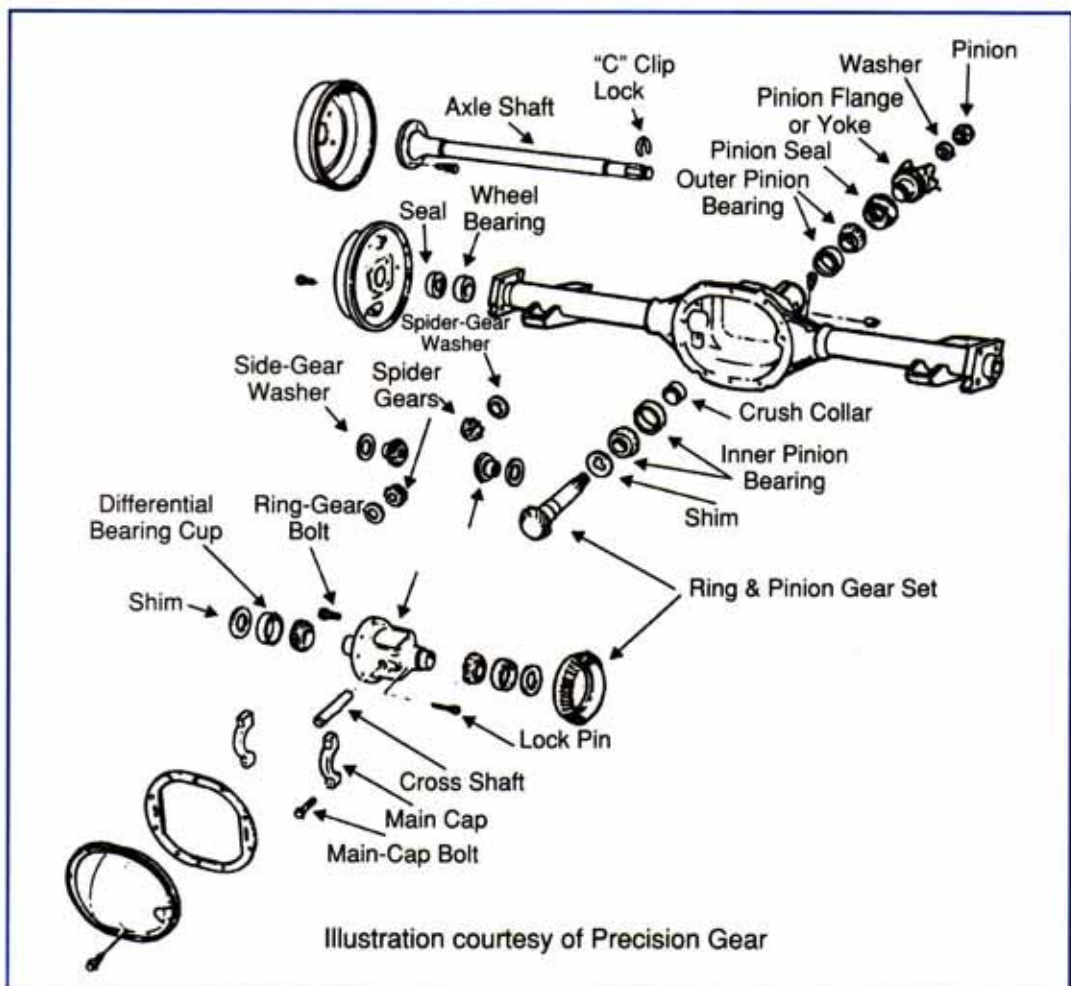


Illustration courtesy of Precision Gear

which they came.

Count the number of bolts that retain the ring gear, and add that to your notes. Inspect the outside of the ring gear for identifying part numbers. Measure the diameter of the ring gear and put this with your previous notes. Inspect both sides of the ring-gear teeth (drive and coast) for wear, abnormal patterns, and cracked, chipped or broken teeth.

Carefully count the teeth on the ring gear and pinion and note them. Divide the small number (pinion teeth) into the large number (ring-gear teeth) and you will have the rear-end ratio. Example: 41-tooth ring gear divided by an 11-tooth pinion gives you a 3.73 ratio. Carefully inspect the differential carrier for wear, cracks and deformation of the bore that houses the cross pin. Now you are ready to make a parts order. The information in your notes will make it easy for any

qualified gear supplier to get you the correct gearset.

Ring-and-pinion gears are sold as matched sets. They are lapped together during manufacture to ensure silent operation. NEVER interchange parts in a set; the result will be extra work for you as the rear sings a nasty song. On 4WD vehicles it is critical that the front and rear diffs have the same ratio for correct 4WD operation. Also, if you are working on a front-axle differential, let your supplier know this, as the gearset rotates in the opposite direction from the rear-axle differential.

This being a free (albeit expensive) democracy, everyone has an opinion as to what constitutes a quality repair. Scar tissue, experience, loss of hair and brain cells, and big-time bar tabs have shown me that when I rebuild a rear I replace all the bearings, the ring-and-pinion set, and the side and spider gears. You get only one

chance to charge the customer and be profitable. Anything you overlook or take a chance on will come out of your pocket if the job doesn't ship or comes back. Most quality gear vendors sell a ring-and-pinion kit, an installation kit that should include all bearings, shims, crush collar, yoke seal and marking compound. Also available are side-gear kits that will have the side and spider gears, cross pin and retaining bolt.

In the next issue we will do an in-depth look at installing and setting up a new ring-and-pinion set. This is a simple repair that if done correctly is very profitable for the shop. **TD**

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