Replacing U-Joints

BY BOB FREUDENBERGER
Illustrations by Russell J. von Sauers and Ron Carboni
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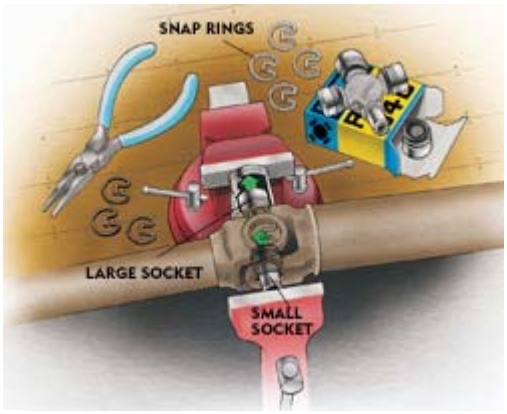
That vibration you've managed to ignore for weeks has finally gotten to the point at which it's hard to keep from spilling your morning coffee on your pant leg. You resolve to make two stops on the way home from work this afternoon--one at the dry cleaners to pick up clean pants, and a second at the mechanic's to investigate the vibration. As you accelerate away from the dry cleaners, there's a big change in the vibration. It's followed immediately by a lack of power and big clanging noises, the latter due to your driveshaft falling to the pavement. You've had a universal-joint failure.

Lack Of Lube

Most of the time, loss of lubrication is the reason U-joints fail. Original-equipment joints typically have no grease fittings, and even replacement units often have zerks that you can't reach with your grease gun. The tiny needle bearings inside the cups over the ends of the trunnions rust and eventually crumble, which results in clearance where there should be none at all.

Another destroyer of U-joints is an excessive angle of operation. This may be due to an overloading condition, which makes the tail end sag, or a set of helper springs or air shocks that puts the rear of the car up into the stratosphere. In either case, leveling the vehicle is the only way to increase the universal joints' life span.

The driveshaft itself is a simple-enough component. Unless it's bent from contact with, say, a railroad track or is out of balance due to the loss of a weight, it'll keep spinning just about forever.



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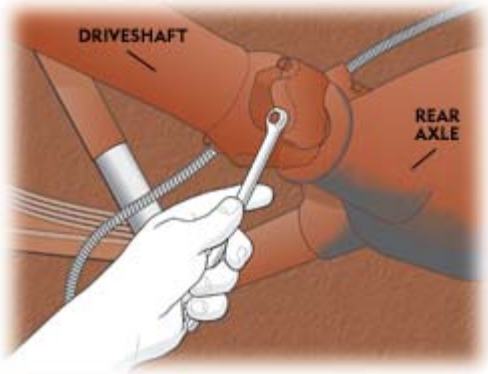
A bench vise and a pair of sockets make it simple to remove a worn-out U-joint. Use a small socket to press the cup into a socket bigger than the cup's outside diameter.

Rules Of Thumb

Vibration caused by a U-joint or driveshaft usually occurs at 25 to 35 mph, about 60 mph, or while braking at low speeds. That "body boom" that hurts your ears probably is caused by a bent or unbalanced driveshaft. A clunk when the transmission is put into gear, or when "floating" at about 10 mph, is either the result of damaged U-joints or a differential problem.

To find out if a vibration is coming from the driveline or the engine, attach a tachometer if you don't have one on the dash, run up to the speed at which the roughness is felt, and note the rpm. Then, shift into a lower gear, go back up to the same rpm and see if the vibration has diminished. No? Then you've found engine trouble. If, on the other hand, the vibes change considerably at the original engine speed, the U-joints or driveshaft are probably at fault.

Next, raise the vehicle and support it under the rear axle or suspension control arms so that the springs are compressed with a normal amount of weight and the driveshaft is at the proper angle. Grab the shaft near either end and force it up and down, then twist it hard back and forth. Any play you can see or feel is reason for replacement.



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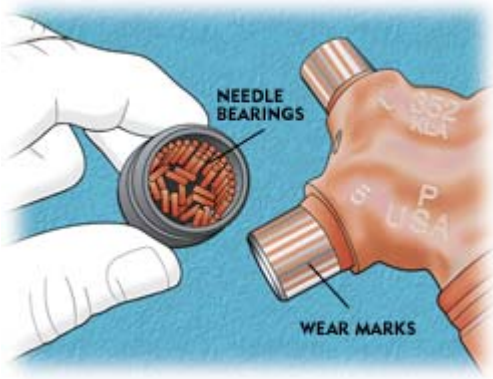
Remove the nuts on the U-bolts at the rear axle to disassemble the driveshaft.



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Dry U-joints will have rust inside, not grease. Do not try to save one that's rusty. Replace it.

Brutal R&R

Odds are, you'll need to raise the vehicle off the ground (unless you're driving a giant-wheeled 4x4). Ramps are great for this, but a floor jack and a pair of jackstands will do the job fine. To replace a U-joint, unscrew the nuts of the U-bolts that clamp the universal's cups to the rear axle's yoke. Mark the parts so that you can put them back the way they were. Using a big screwdriver, pry the shaft forward until the joint is free of the yoke, then lower it and pull it out of the transmission tailshaft housing.

While a hydraulic press is ideal for driving the cups out of the yoke ears, you might be able to manage with a husky bench vise. Or, you can drive the cups out with a drift and a heavy hammer. If these are the originals, they're probably retained by injected nylon, which will simply be destroyed in the process. Another option is to see if there are C-clips in grooves in the inner or outer sides of the ears. The inner type can be forced out easily with a screwdriver and hammer, but you may need snap-ring pliers for the outer variety.

Whether you're using a vise or a drift and hammer, place a socket that's bigger than the outside diameter of the cup against one ear to accept the cup. Then, with a vise, put a smaller socket on the other cup to push it through the hole in the ear. Now, turn the vise screw as necessary to force the cups through the yoke. If you're doing the pounding routine, position the large socket under one ear and use a big drift against the opposite cup. This probably will take an extra

pair of hands.

When it comes to installing the new joint, first make sure it was packed with grease at the factory. The cups should be filled to about one-half of the needle length with the proper grease (usually SAE 140). While forcing the cups into place, you must be careful not to dislodge the needle bearings or jam them at an angle.

Shaft Shivers

If you believe the driveshaft is out of balance, first make sure that the problem isn't due to a defunct U-joint, an excessively worn slip yoke or transmission tailshaft housing, wheel imbalance, or excessive runout of the shaft itself (generally, this shouldn't be more than about 0.040 in. as measured with a dial indicator).

Next, give the shaft a thorough visual inspection. Make sure it's clean--in high gear, it rotates at the same speed as the engine, so a lump of undercoating would be enough to give a car the shakes--then look for evidence of a thrown balance weight. Also, see if it's bent.

If you still haven't found the trouble, disconnect the shaft from the rear, rotate it 180°, bolt it back up, and road test. If the vibration is still present, you can resort to the old hose clamp trick:
1. Raise and support the car as safely and solidly as you can with the rear wheels off the ground.
2. Start it up, put it in gear, and have a helper step on the gas and rev it up to 40 to 50 mph.
3. Tape a piece of chalk or a crayon to a broomstick, hold it firmly with both hands and slide it under the car. Slowly move it so that it has the least possible contact with the shaft just ahead of the rear joint, then just behind the one at the front. The heavy side will be making a larger circle than the light one, so the mark should appear where the excess weight is.
4. Shut the engine down and install two worm-gear hose clamps around the shaft with their heads 180° from the mark you just made.
5. Rev it up to 65 to 70 mph and see if the vibration has disappeared. If it has, give it a road test to be sure. If it hasn't, rotate the clamp heads about 45° away from each other and try again. Getting better? Then keep moving the clamp heads apart until you get it right.

As you probably know, the basic function of a U-joint is to allow two shafts to operate at an angle to each other. But you may not realize that while the driving yoke rotates at a constant speed, the driven one speeds up and slows down twice during each revolution. At an angle of 4°, the variation in speed is a negligible 0.5 percent.

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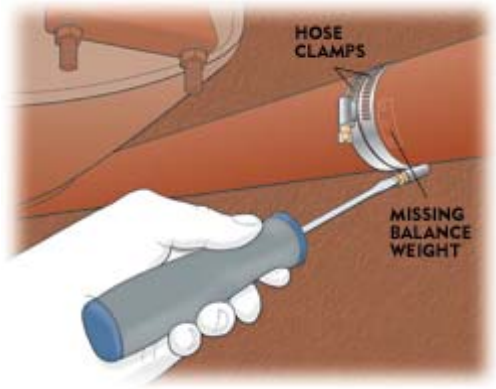
A new U-joint should have a zerk fitting even if the original did not. Fill the joint with grease until it runs out of the seals.



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Hose clamps are an acceptable field fix for a missing balance weight. Move the heads apart to adjust the weight.

At 10°, however, the change is 3 percent, and at 30° with the yoke going 1000 rpm, its partner goes from 866 to 1155 rpm each quarter of a revolution. You can imagine the surging vibration such an arrangement would set up.

Fortunately, this condition is eliminated by the use of two joints with the driving yokes rotated 90° from each other. As long as the angle of each joint is about the same, the acceleration and deceleration of one is canceled out by the deceleration and acceleration of the other, and a smooth transmission of power is accomplished.

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