J-14 Measuring Odometer and Speedometer Accuracy

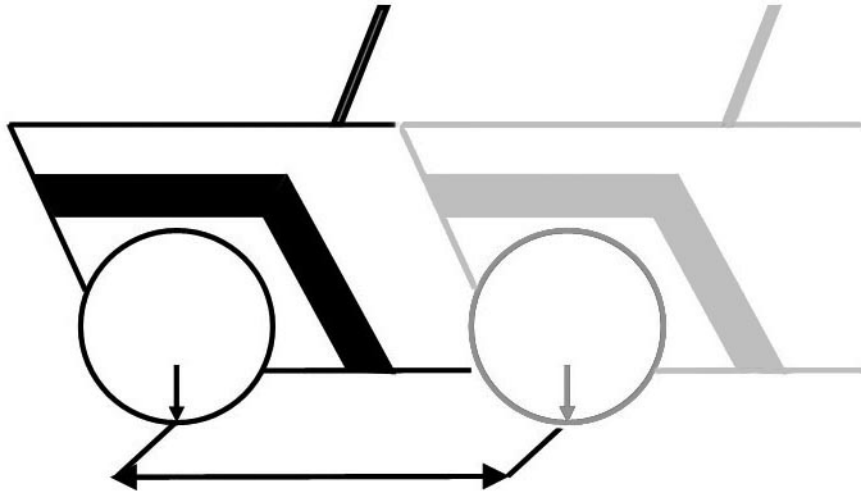
By Bob Olbers.

The speedometer is really two instruments in one: an odometer and a speedometer, each of which may have different errors. Because the odometer is directly gear-driven from the speedometer cable, its accuracy is determined solely by the gear ratio relative to the actual distance traveled per revolution of the speedometer cable (as long as the cable does not slip inside the front wheel hub). The speedometer needle, on the other hand, is magnetically coupled to the cable with a calibrated return spring and so may be affected by changes in the magnet strength or spring tension over time.

Many speedometers are designed to indicate 60 MPH (one mile per minute) when the cable is turning at 1000 RPM; I believe this is true for the KM unit, which is a common design used in early Jeeps and other vehicles. The cable is directly driven by the front wheel without gear reduction, so the actual distance traveled for each revolution of the cable is the tire circumference. At 60 MPH, in one minute the car should travel one mile; at 1000 RPM, the cable should complete 1000 revolutions during this time.

So for an accurate odometer reading, the tire circumference needs to be such that 1000 turns of the wheel cover exactly one mile, or 5280 ft. This requires a circumference of 5280 ft. / 1000 = 5.28 ft. or 63.4 inches. If the actual circumference is smaller, the tire (and cable) spin faster for a given actual speed, inflating the speedometer and odometer readings; the opposite is true for a larger circumference.

Note that it is specifically the circumference of the left front tire that matters, since that is the wheel that drives the gauge.



Measure tire circumference between marks

An easy way to measure the tire circumference starts by making a chalk mark where the tire meets the ground. Mark both the ground and the tire sidewall. Then roll the car until the mark on the sidewall again meets the ground and make a second chalk mark on the ground. The distance between these marks is the tire circumference. For my Carlisle USA

Trail tires, I measured 56-15/16 (56.9) inches. Because the actual circumference is less than the required 63.4 inches, the indicated odometer mileage should be (63.4-56.9)/63.4 x 100% = 10.3% higher than actual.

To check this result, I went for a drive with my GPS in trip computer mode. At the end of the trip, the GPS said I had traveled 27.8 miles. Taking this base distance and adding 10.3% (2.9 miles) gives an expected change of 30.7 miles in the odometer reading. This is precisely what I observed.

The easiest way to check the speedometer accuracy is to compare it against a GPS unit. Be sure to find a stretch of road that allows the car to maintain a consistent speed over at least several seconds for best accuracy (typical GPS units update their display once per second). With the help of a long, gentle slope I found that my speedo read 60 at 48 actual MPH or ((60-48)/48) x 100% = 25% high.

If I were sufficiently concerned about this, I could have my speedometer recalibrated to read 60 MPH at 1000 RPM, then add external gear reduction to correct the 10.3% error due to the tire circumference.

I'm not planning to do any of that. Besides, you can always tell your "real-world" speed from the number of cars stacked up in traffic behind you! □