



CHANGING GEARS

The rear-end ratio of a vehicle is selected carefully by the manufacturer, who may have many criteria to achieve. In a gas crisis, manufacturers opt for unusually tall ratios which help highway fuel efficiency but seriously hamper acceleration and pulling power for towing, not to mention contributing to excessive clutch wear. With many older vehicles, as highway speeds have increased, we find the engine turning too fast, making the engine noisy and thirsty. The overall ratio of a vehicle can be changed dramatically by installing larger or smaller diameter wheels and tires.

Many vehicles come ill-equipped to handle different driving needs. Add a trailer or just desire a little more "zoom in your broom" and the condition gets worse. In an attempt to make the vehicle pull better we are inclined to open the hood for more power, when in fact our money is better spent by changing the rear-end ratio. Suddenly the engine pulls better, cools faster, the transmission ratios work better and there is increased engine braking for improved vehicle control down hills.

We must first determine the vehicle's rear-end ratio. If it is a 4x4, both front and rear ratios must be checked and changed. Both Ford and Dodge have ID tags on the differential cover bolts, but GM has numbers stamped on the axle tube. Call the dealer, or you can refer to the option list. If all else fails, mark the drive shaft and the tires with chalk, turn both wheels forward one turn and record how many turns the driveshaft makes. To give an example: if the driveshaft turns 3 and 3/4 turns for one turn of the wheel, you can assume the ratio is 3.73:1. Most manufacturers' ratios move up in increments of approximately .25:1.

For example: 6.00:1 6.20:1 6.50:1
5.14:1 5.38:1 5.71:1
4.10:1 4.56:1 4.63:1 4.88:1
3.08:1 3.23:1 3.42:1 3.55:1 3.73:1 3.91:1
2.26:1 2.41:1 2.56:1 2.73:1 2.94:1

When dissatisfied with a vehicle's ratio it is necessary to move at least two steps, and only after serious consideration, perhaps move a third increment. Some popular examples are:

- Ford and Dodge 1 ton - 3.55:1 to 4.10:1
- Chev 4x4 - 3.08:1 to 3.73:1
- Ford Mustang 5L - 3.08:1 to 3.55:1 or 3.73:1
- 60's Chev, Dodge, Ford pickup - 4.10:1 to 3.54:1 or more when possible.
- Toyota 4x4 - 4.10:1 to 5.29:1 especially when taller tires are installed.

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Changing Gears, continued

To check the ratio, divide the number of teeth on the pinion gear into the number of teeth on the crown (ring) gear; this gives the gear ratio.

- i.e. 11 into 39 equals 3.55:1
- 11 into 45 equals 4.09:1

Most vehicle engines reach their ratio number in rpm at approximately 150 kph (high highway speed); at this speed the rpm can be determined by simply adding a zero on the end of the ratio.

- i.e. 3.55:1 gives us 3550 rpm @ 150 kph
- 4.09:1 gives us 4090 rpm @ 150 kph

A vehicle with 3.08:1 gears turns approximately 1800 rpm at 90 kph. If the rear-end ratio is then changed to 3.73:1, the engine speed will increase to 2179 rpm at the same speed. Simply divide the old rpm by the old ratio and multiply by the new ratio to get the new rpm.

- i.e. 2000 rpm divided by 2.73:1 (old ratio) and multiplied by 3.55:1 (new ratio) gives 2600 rpm.

For an 8 cylinder vehicle, multiply the tire diameter in inches by 12 to get the optimum rear-end ratio. For a 4 or 6 cylinder, multiply by 14.

- i.e. 8 cylinder - 28" x 12 gives a ratio of 3.36:1
- 4-6 cylinder - 28" x 12 gives a ratio of 3.92:1

Only the experienced should venture to replace rear-end gears. The procedure requires special tools and undivided attention to detail, especially to the gear contact and how it can be adjusted to run smoothly and quietly. Some manufacturers use different crown gear carrier heights for different ratios just to make things more complicated. Also, in many cases the speedometer would have to be corrected. The speedometer could be corrected, usually by changing the plastic driven gear in the transmission after a simple calculation. Divide the number of teeth on the speedo driven gear by the old rear-end ratio and then multiply by the new rear-end ratio. This gives the new speedo gear tooth count.

- i.e. 18 tooth gear divided by 3.08:1 multiplied by 3.55:1 equals 20.75

Install a 20 tooth gear for a "very slightly" fast speedo reading for safety.