COMPUTING SPEED FROM THE TACHOMETER

Here's a bit of technical trivia for those of you who might be interested.

Anytime you change the tire diameter and/or the axle ratio on your vehicle you also change how far your car travels with each turn of the crankshaft. Each revolution of the tire creates a "stride" equal to the circumference of the tire.

If the crankshaft turns once for each revolution of the driving axle, then in a thousand revolutions the car would move a thousand tire circumferences. But the reciprocating, internal combustion engine has to turn at a fairly high rate in order to obtain the torque needed to push a car. Soooooo-we have various crankshaft-to-axle ratios. The differential provides this transformation.

These equations assume an accurate tachometer, no clutch slippage, perfect gear mesh, and no tire slippage. True speed will be somewhat less; probably around 10%.

$$\text{Eq(A)} \quad \text{MPH/RPM}(\div \text{thousand}) = \frac{2.975 \times \text{Tire Diameter (in inches)}}{\text{Differential Ratio}}$$

$$\text{Eq(B)} \quad \text{RPM} = \frac{\text{MPH} \times \text{Differential Ratio} \times 1{,}000}{2.975 \times \text{Tire Diameter (in inches)}}$$

$$\text{Eq(C)} \quad \text{MPH} = \frac{2.975 \times \text{Tire Diameter (in inches)} \times \text{RPM}\ (\div \text{thousand})}{\text{Differential Ratio}}$$

Examples: Measured tire diameter = 22.25 inches; Gear ratio = 4.222/1

Eq (A) $\text{MPH/RPM}(\div \text{thousand}) = \frac{2.975 \times 22.25}{4.222} = 15.68$

For each 1,000 RPM the car would go 15.68 MPH.

How many RPM = 55 MPH?

Eq(B) $\text{RPM} = \frac{55 \times 4.222 \times 1{,}000}{2.975 \times 22.25} = 3508 \text{ RPM}$

What is the speed at 5,000 RPM?

Eq(C) $\text{MPH} = \frac{2.975 \times 22.25 \times 5}{4.222} = 78.4 \text{ MPH.}$

Bob Ritchie, Sept. 81