Understanding Gear Ratios

ARMED AND DANGEROUS

Before we get to figuring out what to do with all this information, there are a few generalities to soak up.

First, two terms will continually bob up in discussions about rear ratios: tall gearing and short gearing. Tall gearing refers to a low numerical figure (e.g. 3:1) for a final drive ratio while a short gearing refers to a high numerical figure (5:1).

Here's what to expect from different ratios in different cars:

Nitro with short gearing

Lots of acceleration, maybe excessive wheelspin and poor handling (one follows the other here), poor fuel economy and maxes out way too easily (and can go bang!).

Nitro with tall gearing

Lots of top end speed but less acceleration, less wheelspin, better fuel economy, easier handling because tires aren't breaking loose. Be careful here though, if you go too far then you will be laboring the engine out of every corner, using too much fuel as well as stressing the engine.

Electric with short gearing

Lots of acceleration, maybe excessive wheelspin and poor handling, less current draw, better run time, easier on motor.

Electric with tall gearing

Lots of top end speed, less acceleration, less wheelspin, easier handling because tires aren't breaking loose, lots of current draw, short run time, maybe motor smells bad and stops, speed controller goes "POP!"

Safety first

It's better to err by gearing nitro tall and electric short. Most car manufacturers include a recommended gear ratio chart and it is good policy initially at least to follow their guidelines. They built the car for all-round performance and some experimenting on your part will enable you to work out which way you should go.

Traction or lack of it will also influence your gear ratio selection. In cases of high traction, shorter gearing is generally the way to go while with poor traction, taller gearing usually works better.

What you are searching for is a ratio which gives you an easy driving car and the best, most consistent lap times for the full length of the race.

A few more terms

While you are on your "research" around the pit tables, you'll come across two terms racers use regularly—undergeared and overgeared.

An undergeared car has too tall a final ratio while an overgeared car has too low a final ratio. Earlier on this page we explained them a different way but they basically mean the same. An undergeared car will have too small a pinion or too large a spur gear with the reverse for an overgeared car.

TWO SPEED TRANSMISSIONS

To do justice to a two speed transmission set-up, we'd need far more space than we have here, however we'll endeavor to provide a very quick and basic guide.

Two speed transmissions are designed to deliver quick acceleration out of corners and killer speed down the straight. They do this by providing a low ratio (acceleration) and a high one (speed). There are not only two spur gears but also two pinion gears. When the car starts from the grid, the larger gears (low ratio) come into play. At a predetermined point, as the car builds speed, a small metal arm comes into play (as a result of centrifugal force) to engage the smaller (higher) ratio.

You work out your gear ratio and final drive ratio much the same as you would with a single speed tranny although you have two sets of figures to deal with. The trick is to adjust the timing of the change point to extract maximum performance. We'll leave that for another day.

MORE ABOUT GEAR PITCHES

(from Associated's Tech Help FAQ)

In the R/C hobby we use mostly 32, 48 and 64 pitch gears. The pitch has to do with the size of the tooth, not how many teeth, on the gear. 32 pitch gears are the largest pitch with fewer teeth per inch. Less teeth per inch means the teeth are larger and therefore stronger. The disadvantage is you have fewer adjustment options over a specific range of drive ratios. Also the pressure angles of the teeth as they mesh is greater so these gears tend to be less efficient and noisier. We use this pitch for our off road gas truck because of the power the engines can develop—which is enough to rip the teeth off 48 or 64 pitch gears.

With 48 pitch gears the teeth are a little smaller but still strong enough for electric off road applications. These gears are a little more efficient and quieter because the pressure angles between the teeth meshing is improved, which makes the gears more efficient and quieter. You also have a 50 percent increase in gearing options over 32 pitch gears.

64 pitch gears are more common for on road racing where you do not run into a lot of rocks. (Rocks can damage the teeth on 64 pitch gears easily.) Also the teeth on 64 pitch gears are so small that they are not strong enough for off road applications where the teeth have to be able to handle the shock loads that occur when you land after a jump. Because of improved pressure angles, again, 64 pitch gears are quieter and more efficient beyond 48 pitch gears. You again have a 50 percent increase in adjustment options over 48 pitch gears.

Roll out charts

So far as a roll out chart goes, each table in the set would be for a specific tire diameter. The set may start at 55mm and progress down to 45mm in 1mm steps. The column and row headings for each table are spur and pinion gear teeth numbers. Roll out figures can now be calculated to fill out the body of each table using the math as described earlier in the article. A driver would measure the driving wheel's diameter and consult the appropriate table. Knowing their desired roll out figure from experience, they can select a spur/pinion combination which best suits.