



Geared for Speed

For racers and track day riders who visit different tracks, often the overall gearing of the motorcycle doesn't suit the course. Many times it is too "tall," meaning the motorcycle can't achieve its top speed on the track because you will run out of room before you can reach your maximum mph. This can make the bike have a lack of acceleration coming off the corners and in general make you feel like you aren't in the proper gear for certain sections of the track.

When you buy your bike, it comes with stock front and rear sprockets, which utilize the chain to deliver power to the rear wheel. How did the manufacturer decide this was the best combination of sprocket sizes? Things would be considered such as acceleration of the motorcycle and top speed. I suspect that sometimes the manufacturers desire high top-speed numbers, thinking this will help sell the bike.

The internal gear ratios cannot be changed by the rider (at least

not easily) and when going to a new track we are left with changing the "final drive ratio," which is the counter shaft sprocket on the motor side of the chain and the rear sprocket mounted to the wheel.

Let me give you a general rule – even though there can be exceptions for certain tracks. The idea is to have the motorcycle almost hit redline in sixth gear on the fastest section of the track, which is usually the longest straight. This typically requires a larger rear sprocket than stock or a smaller counter shaft sprocket. The effect is a lower top speed but better acceleration everywhere.

For example, our team's Ducati 1098S comes geared for 172 mph top speed, but we can never have enough time to get there because most U.S. tracks are just too short with the exception of Daytona.

At Summit Point Raceway in West Virginia, the last turn before the main straight is relatively fast and I would enter the straight at about 100 mph and could achieve about 157 mph before having to brake for turn one. Of course this is still 15 mph less than the top speed possible by the bike if I had room. We made some changes to the final drive by changing the sprockets.

By reducing the size of the counter shaft sprocket by one tooth (from the stock 15-tooth to a 14) we reduced the theoretical top





ON TRACK

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speed of the motorcycle. Just like using the small front sprocket on your bicycle, acceleration improves and top speed is reduced.

The result was that now coming onto the front straight at about 100 mph I was right in the power band in fourth gear and accelerating hard, moving quickly through fifth and into sixth gear. Accelerating harder than before, we were able to achieve a speed of 162 mph before having to brake for turn one, a gain of five mph. The potential of being able to run higher top speed didn't help us on this straight away since we ran out of room before we could get there and it hurt our acceleration instead. Using an overall lower gearing let us actually achieve a higher speed down the straight.

If you think about this, our acceleration is improved everywhere on the track, just like using the lower gears on your bicycle lets you accelerate harder.

There are always exceptions! We recently raced at Beaverun Raceway near Pittsburgh, Pennsylvania. This is a nice flowing track that feels pretty fast with more than one turn at over 80 mph, but top speeds are not so high. Because of the gearing we had with us as well as the limitations of how small the front sprocket and how big the rear sprocket can be on our bike, our final selection was to run the bike using only five gears. Less than ideal in the world of MotoGP, but in every turn we had a gear that worked well so we were exiting the turn with the motor at about 7,000rpm — just coming into the power band.

As a general rule, gear the motorcycle so that you are a few hundred rpms below the rev limiter in sixth gear on the fastest part of the track. Why 200-300rpm below? If you are drafting someone and can actually run faster due to the lower wind resistance, you won't hit the limiter as you try to draft pass. 🇺🇸

Smaller front sprockets have lower top speed but better acceleration.



The rear sprocket behaves inversely to the front: the larger it is, the better the acceleration.



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