

BEGINNER'S GUIDE TO CHOOSING YOUR NEXT BRUSHED ELECTRIC MOTOR

You are ready to replace that old electric motor in your RTR for a better one. You have a bewildering number of racing motors to choose from. To complicate the process of choosing a motor, the motor interacts with other parts of the car. Therefore, your motor choice will influence your pinion gear and speed control choices, too. This article will help point you to the motor that best fits your needs, and help you make sure your electronics work together smoothly.

Choose Your Category

Are you going to enter racing competition? If so, you'll need to decide which class you'll race in—stock or modified or brushless. To determine this, visit a track in which you plan to race, and ask about race classes and rules. For this report, we'll assume you've chosen a brushed motor class.

If you are not going to enter competition, we suggest getting a stock motor for ease of driving. Get a modified motor only when you have developed good control of the car.

Stock Motors

If you choose to race in the stock category, your choice is simple—the Reedy Stockstar motor. You can skip the *Turns and Winds* section of this guide and jump right to the *Choose Your Pinion Gear* section.



If you are unsatisfied with the top speed of your RTR motor, then getting a modified motor will give you a boost in speed. Read the following sections carefully if you wish to change from RTR to modified brushed motors.

Modified Motors



There are several divisions and subdivisions of motors made for the modified classes. Generally, you'll first choose a modified motor based on whether you'll drive on road or off road. On-road motors generally need more RPMs (revolutions per minute), while off road uses more torque. Motors with larger commutators generate higher torque. The smaller commutators create more RPMs. Despite these qualifications, racers are freely mixing motor types in their racing for good effect.



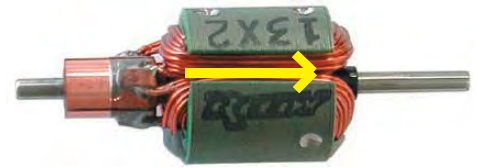
Here is the commutator portion of the motor armature.

Probably the most important determining factors will be the number of the turns and winds of wire around the armature. Also important will be your choice of pinion gear and speed control. Let's look at each of them.

Choose Your Turns and Winds

Turns

All modifieds are labeled according to their turns, such as *Reedy Flash 10T*. The *10T* refers to ten turns, which is the number of times the wire has been wound, or turned, around each armature arm.



Wires are turned around each arm of the armature.

The fewer the turns, the more RPMs and the faster the motor accelerates. So if you want to accelerate quickly, choose a motor with a fewer number of turns.

Speed isn't the only consideration, however. You need to consider the type of track. If it is small, or has many turns, you'll want a motor with more torque, not RPMs. You'll always be scooting from one curve to the next, so for shorter tracks, get a motor with a larger commutator or fewer turns.

There are trade-offs, however. Motors with fewer turns draw more power, which can reduce your run time. Consider this chart:

FEWER TURNS	MORE TURNS
more acceleration	smoother acceleration
faster battery drain	slower battery drain

As you choose fewer turns (toward the left), you'll gain quicker acceleration, and drain the batteries faster.

Winds

You'll find the modified motors identified as *12 turn single*, or *8 turn triple*, for instance. Winds of double, triple, or quad refer to the number of strands of wire wound around the armature, double being two strands, triple being three, and quad being four. In general, winds with fewer wires give the impression of spinning your wheels (have a very "aggressive power band"), while winds with more wires have a smoother feel.

So if you have a very slick track (poor surface traction or grip, like loose dirt or dusty surfaces), then winds like single and double may cause more

wheelspin. Other winds, such as triple or quad, may give your car better traction and control.

It's nearly impossible for the inexperienced racer to detect the subtle differences between winds. Ask other racers at the track what they've found.

Modified motors are more expensive than stock motors. That's because the wires are laborously wound by hand. For the budget-conscious, Reedy includes a machine-wound modified motor called the Flash.

Choose Your Pinion Gear



The pinion gear on the motor turns the spur gear, which interfaces with the transmission to turn the tires. You are again confronted with a number of choices. Pinion gears differ in the number and pitch of teeth they have. How do we match a pinion to the correct motor?

Your kit instruction manual should show starting settings that mate the pinion and spur gears with the turns of the motor you use. Check your motor's number of turns and match it to the pinion selection for a recommended "starting point." For example, the instruction manual of the RC10B4 buggy tells us to use a 23-tooth pinion gear with an 81-tooth spur gear for a 14-turn modified motor.

MOTOR	PINION	SPUR
24° stock (torque-based)	24	81
24° stock (RPM-based)	22	81
36° stock	22	81
14 turn modified motor	23	81
13 turn modified motor	22	81
12 turn modified motor	21	81
11 turn modified motor	20	81
10 turn modified motor	19	81

Our instruction manuals give you starting recommendations for the pinion and spur gears.

Pinion gears determine your top end speed and acceleration. You may want to choose a pinion gear with a different number of teeth than the

manual indicates. For example, if you want more top end speed (such as for large tracks where you'll punch it down the straightaway), get a pinion gear with a couple teeth more than indicated in the manual. Or, for quicker acceleration (such as for small or twisty tracks), get a pinion with fewer teeth than the number listed in the gearing chart.

Keep in mind that what you gain in top end, you'll lose in acceleration, and vice versa. You cannot get a motor with both the fastest speed and quickest acceleration any more than you can get two people sitting opposite each other on a see-saw high in the air at the same time. This is where the art and science of matching motor and pinion comes in. While you juggle one set of options, other options are taken out of your reach. Which options are most important to you will depend on track surface, layout, and size, as well as your driving style and run time.

MORE TEETH ← → FEWER TEETH
more top end quicker acceleration

As you choose more teeth (toward the left), you'll gain more top end, but lose some acceleration.

As for spur gears, you can stay with the spur that comes with your RTR. However, you might want to try a particular gear ratio (explained next) and need to try a different spur to fit in the pinion gear you want. Larger spur gears will help acceleration off the corner and a smaller spur gear will allow the motor to "spool up" (get up to speed) faster.

You can figure out your gearing mathematically:

$(Spur \div Pinion) \times Trans. Ratio = Final Drive Ratio (FDR)$. The higher the FDR, the more acceleration. Lower FDR equals more top end. Examples: $81 \div 30 \times 2.6 = 7.02$ (more top end) $81 \div 19 \times 2.6 = 11.08$ (more accel.)

We have some handy online calculators that will calculate gearing.

Don't be afraid to experiment with gearing. You may find that making a slight change to the final drive ratio can make a big difference on the track.

It's always best to have a collection of pinions and spurs to try a variety of gearing combinations to help you find the one that is best for the track conditions.

For more about gear ratios, please see the *R/C Handbook* on the RC10.com web site.

Check Your Speed Control Specs

The speed control, as the name implies, controls the RPMs of your motor, and thus the speed of your vehicle, according to the throttle position of your radio transmitter. It regulates the flow of power from your batteries to your motor.

If you have been accustomed to using a stock motor and want to move up to a modified motor, you'll need to make sure the speed control (ESC) can handle the turns of the motor. For instance, your Associated RTR's ESC can handle 17-36 turn motors.

Speed controls differ, in part, based on the range of turns they'll accommodate. For example, the LRP Quantum Super Sport will accept motors from 13 turns and up. The LRP Quantum Pro Sport version will accept 11 turns and up. The Quantum Pro Sport will accept 7 turns and up.

It is the ESC, not the motor or kit, that determines whether your car goes in reverse. So choose an ESC with reverse if you want to equip your car with reverse capability.

Most racing rules forbid ESCs with reverse. Choose an ESC without reverse, or that is capable of turning the reverse mode off, if you are going to race. Choose a competition ESC for serious competition. Competition ESCs do not include reverse capability, but they generally supply more power.

As you get to understand ESCs better, you'll be able to make more discerning choices based on individual features, such as choosing ESCs with high amp numbers and low on-resistance numbers.