RC BIKE HANDBOOK:

Technology, tips and Theory.

An essential introduction to RC Bikes and an invaluable tool to keep with you at the track.

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Foreword:

Controlling a remote-controlled motorcycle is one of the most fascinating classes of RC racing. These scale bikes look realistic flying through the racing line at extreme lean angles of more than 70 degrees through the corners. Exciting duels between competitors captivate viewers and pilots alike.

Piloting RC bikes differs in many ways from driving an RC car, although the racing lines are often similar or the same, the turning technique is completely different. For this reason, RC car drivers need a little time to adjust in learning to master the control of an RC bike.

The available RC-bikes in the market today are more technically advanced than ever, and allow tuning over a wide range of parameters. For example, a bike can be transformed by changing a few small settings from a forgiving beginner's bike into a highly agile and fast racing machine.

This manual is intended for interested beginners, those switching from driving an RC car, but also for advanced RC-bike pilots. It deals with chapter by chapter, the theory of driving, and the components of the RC bikes. It provides tips on how the different parameters and settings influence the bike's handling characteristics and driving behavior.

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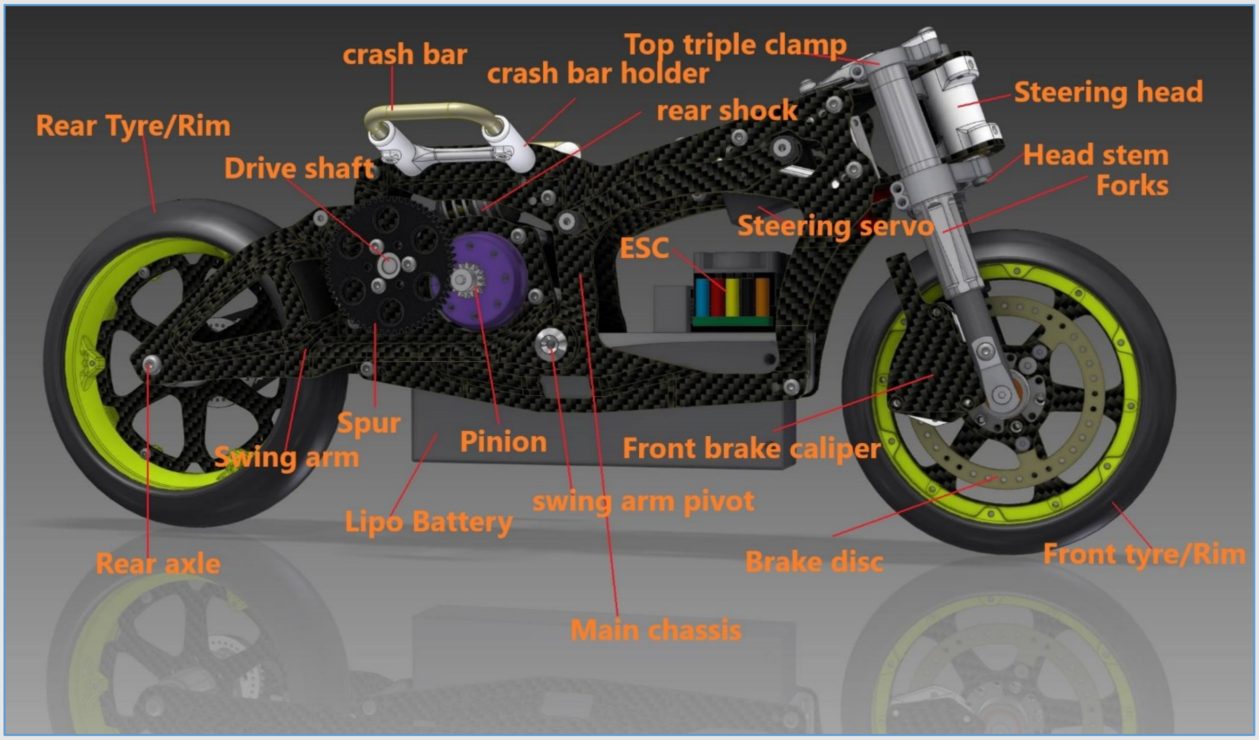
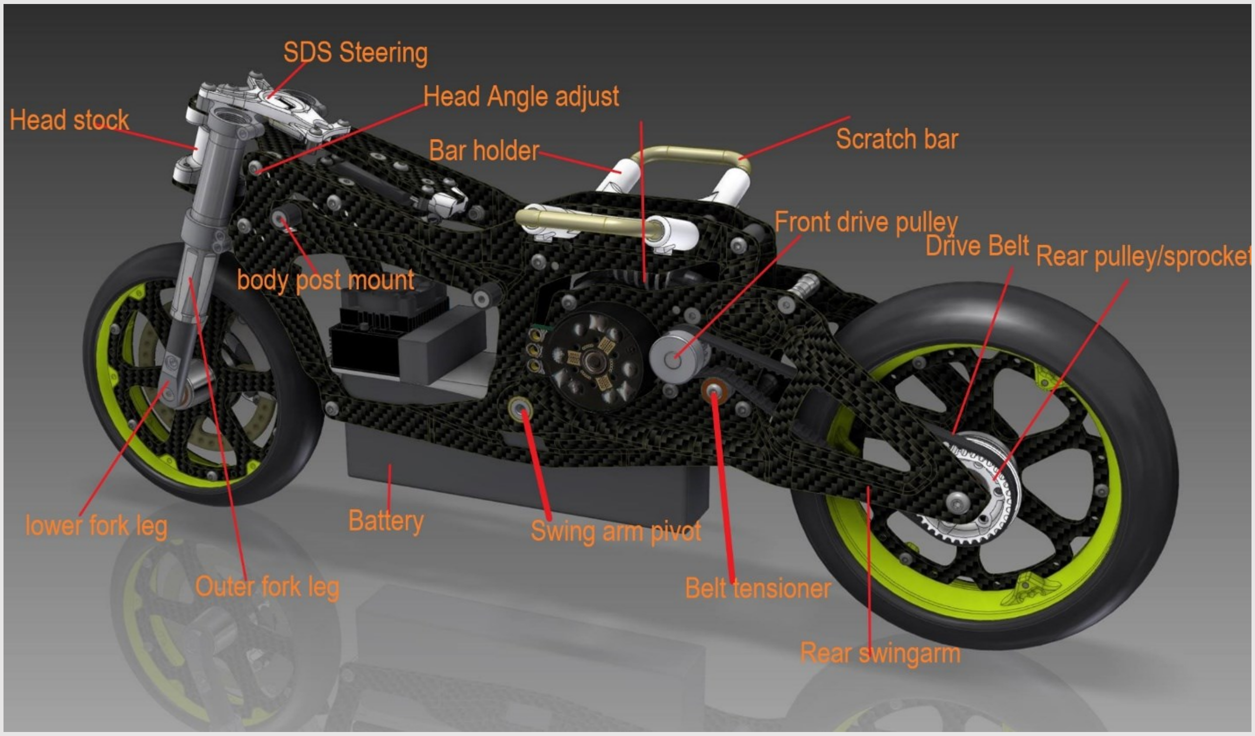
English Interpretation produced by **Davide Varricchio** from ***holeshothobbies.com.au***

Components of an RC bike:

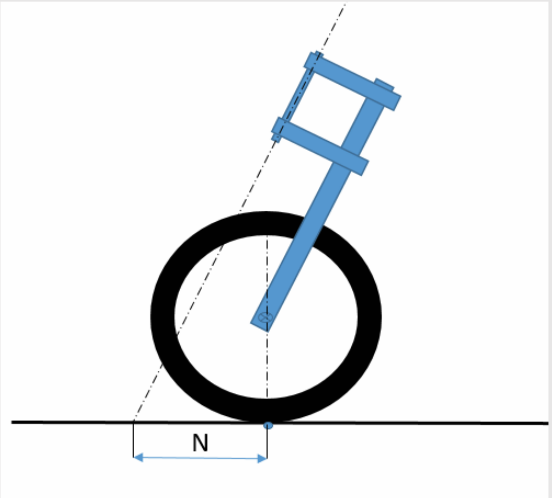




Driving physics and suspension geometry

Why do RC Bikes go straight without tipping over? From a static motorbike is a system that is based on two points and is therefore unstable. A chair with only two legs is always unstable. Interestingly though, this changes when the bike is moving. If you look at a bike that is driverless pushed forward and released, it rolls out self-stabilizing until its speed is too slow and then it falls over. Our RC bikes work in the same way.

There are basically three factors that stabilize the bike while driving. Caster / Trail, centrifugal forces and gravity.



Trail:

Trail is the distance between the tire contact point (vertically below the wheel axis) and the imaginary point of intersection of the steering axle on the road surface (piercing point). So the front wheel is running at its contact point after the puncture point of the steering axis. This measure is the lever that forces the deflected front wheel while moving back to its center position. However it also causes the front wheel to turn into the direction the motorcycle is leaning toward in a corner.

This effect is critical to driving stability. Whenever the wheel deflects in the curve to which the motorcycle leans, it turns due to the increasing centrifugal force of the counter steering and falls into the opposite direction. So straight ahead is always a slight oscillation. The speed and stability of a motorcycle cornering is determined by two factors.

1. The steering head angle is adjustable for most RC bikes in one area. Thereby you can adjust the fork angle more or less. The steeper the fork angle, the lower the trail value. Chopper vs. MotoGP. The examples give a clue that a steep fork angle position such as in MotoGP allows agile handling with less stability. With larger fork angles (Chopper) the handling is rather sluggish, the bike has to be pushed into the corner, but turns it simple again and offer good directional stability.

2. The fork offset (Offset) is the distance between the steering axis and the Wheel center. The smaller the displacement, the lower the trail value (caster). The drivability behaves similarly to the change of the steering head angle.

Gyroscopic forces:

The front and rear wheels are like 2 gyroscopes. The greater the mass and the rotational speed, the higher the stabilizing forces. I.e. it requires a large force to change the bike from its current position. Therefore at high speed the steering and correcting becomes slower. Just like caster, the centrifugal forces of the wheel cause an additional steering of the front wheel in the direction in which the motorcycle is leaned over.

CG:

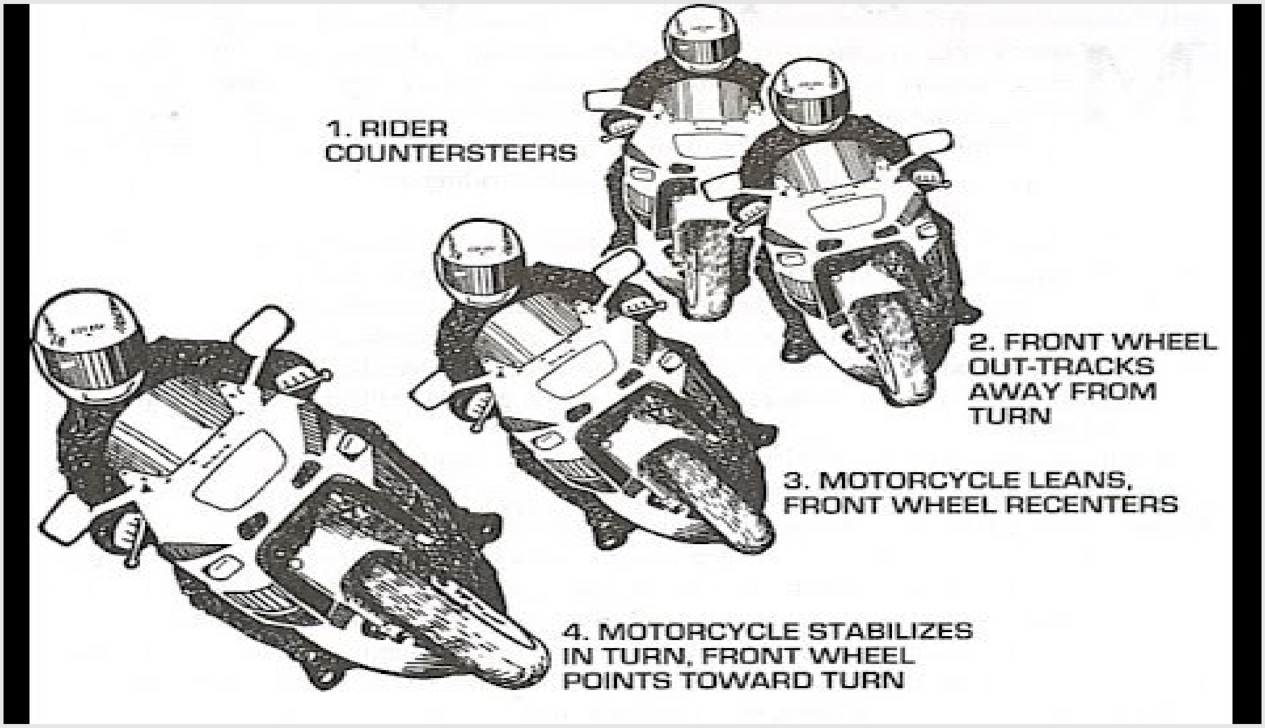
The higher the gravity, the slower the bike reacts to steering corrections. The center of gravity will also affect the maximum possible acceleration. The higher or the further back the CG, the less acceleration is possible. The front wheel lifts off the ground. A wheelie is nice to look at and fun of course, more often than not they lead to slower lap times and even spectacular crashes.

Why RC Bikes ride stable around a corner?

RC bikes are as described above self-stabilizing vehicles. So in order to change direction, it takes a "disturbance" of the stable state. A rider can shift his weight on a 1:1 bike, on an RC Bike this does not occur and the entire steering of RC Bikes relies on spring forces moving the front forks to the left and right. For this, you should know that the steering is working in reverse, also known as counter steering.

For example, to make a left turn with the bike, a small steering pulse to the right is required. First the bike is actually running minimal right. The resulting tilting momentum cause it flip immediately to the left.

Counter steering:



Once inclined in the corner forces described above, together with the steering springs (see chapter steering) provide stable cornering.

Without further impetus steering adjusts to a suitable angle by itself at any speed. This allows the bike to stand itself up at the end of the curve just by accelerating.

If the necessary acceleration due to grip or motor power cannot be used to help stand the bike an additional steering impulse is given in the opposite direction to help this.

TYRES:

The tyres on an RC bike are one of the most important factors in the setup of the bike. This is due to two properties, 1. The road-holding capability of the tyre itself and 2. The centrifugal forces generated by the wheels and tyres moving.

Without the necessary adhesion to the track surface no setup changes can help. Tyres on the bike should always have a good run-out (even and rounded profile) and they should be well balanced. As in MotoGP racing there are various tyre manufacturers and blends of Rubber, RC bikes are no different.

Basically you take a soft compound tyre for low - and a hard tyre compound for high temperatures. A tyre must always be driven only to its operating temperature (Generally around 50-60 degrees C).

Pre-heating can be done with tyre warmers. Cold tyres offer little to no grip, they have an optimal operating temperature range for each compound. To work the tyre must be warm enough to activate and interlock with the track surface. If the tyre gets too warm, it becomes too soft and again, the tyres can no longer give good traction. In addition, the wear is extremely high when you over heat them.

If wet conditions exist, special mixtures specifically for wet conditions or very soft tyres are used. The comparatively small footprint of an RC bike tyre means hydroplaning is not a problem. With reduced lean angles they also drive very well in the rain. Be sure that the rest of the bike is water resistant. Additional tyre additives are also used to help condition the tyre and make it even softer.

The weight of the tyre has a significant effect on bike handling due to the centrifugal forces. Heavy tyres or tyres with additional weights tend to make for a more stable ride. By the centrifugal effect, the bike will not easily be moved from its position. Light tyres make the bike more agile. Especially for tight tracks and high speeds, this is advantageous.

Beginners can start with additional weights in the tyre. Advanced pilots however, will always prefer the light tyres for improved handling. Ultimately it will be a compromise between the track conditions and what feels more comfortable and consistent to drive.

Steering:

Unlike RC cars, RC bikes have no direct linkage. This is due to the fact that between cornering speed and lean angle, there is always an appropriate amount of steering free play to allow the forks to adjust and achieve balance. A rigid linkage between the servo and triple tree cannot achieve this.

What exactly happens when cornering?

As already described in the chapter on driving physics:

"For example, to get a motorcycle leaning to the left in the curve, it is a small steering pulse to the right to initiate the left turn. First, the bike is actually running minimal right, before the balance of the bike is shifted to the left, resulting in the bike leaning into the corner and then the front wheel follows its path."

This means for an RC Bike, steering must be set in reverse on your controller, that is, a left turn input on the Transmitter causes a movement of the forks and front wheel to the right.

The bike therefore leans into the corner and the contact force of the front wheel along with the trail in the geometry generate a steering torque. This torque counteracts a restoring torque which is produced, by the force of the steering spring and its lever arm to the steering axis.

It is essential to ensure smooth running in the steering head bearings. Even minimal friction will affect driving behavior noticeably. To check the performance of head bearings, remove the damper linkage to the forks and pivot the fork slowly back and forth. This must be completely smooth as possible, any binding of the fork bearings and or steering head shaft must be checked and possibly replaced if necessary as part of a routine maintenance schedule.

Design and operation of RC bike steering systems:

Currently, there are two relevant steering systems. The classic oil-filled steering damper and a bar spring based system with decoupled attenuation.

1) An oil-filled steering damper:

Basically, the steering damper is as structured as a typical suspension damper. Oil volume flows via a piston plate from one side to the other. This makes the system smooth over road suggestions and steering inputs.

On both sides of the piston plate are springs that push and pull after each deflection and reset to its neutral position. When driving the steering servo moves the damper to initiate a turn to the forks.

Setting parameters of oil damper steering and the influence on driving behavior:

Oil

The viscosity of the oil determines the amount of damping in the system. Viscous oil generates the overflow of the piston plate at higher resistance, thus dampens stronger, but also means that the bike reacts spontaneously to steering commands. For the beginner thinner oil will make it safer and easier to learn.

Spring rate

The spring rate determines the response of the bike to changes of direction. Soft springs make the bike lazy and forgiving to drive, they also allow tighter turning radius. Stiffer springs however, make the bike more agile but also nervous at the same time. Stiff springs are great for correcting at high speeds and for quick changes of direction through chicanes.

Spring options:

For the beginner relatively soft springs are recommended to use, the general rule is as soft as possible and as hard as necessary. This rule applies always.

Spring progressiveness:

For driving under all conditions the best of both a soft and harder spring is required. The Ideal would be a progressive spring at this point. Very soft around the zero position and with increasing compression increasingly the spring is stiffer.

This effect is achieved with 2 springs of different length and hardness (2-step). A longer soft spring (immediately Engagement) determines the force to the zero position, a shorter hard spring (brings later in gear) additional force needed for quick direction changes at high speeds. Also now available are single progressive springs that work just like using 2 springs.

Spring preload:

An RC bike without any preload (or even play) in the steering springs, will have a tendency for the bike to raise itself in the corners especially with throttle input.

A bike with a slight spring tension remains in an inclined position in cornering and must be actively counter steered out of the corner to be raised again.

Both driving styles have their advantages and disadvantages and can also be used in racing to suit track or personal driving preferences. For the beginner it is recommended to start without any spring preload.

Lever arms:

The lever arm of the steering damper to the steering head axis (triple clamps) but also on the servo horn is another setting parameter. Varying the lever arm to the fork bridge (triple clamp) corresponds approximately to changing the spring rate. A change of the lever arm on the servo corresponds to the change of servo travel.

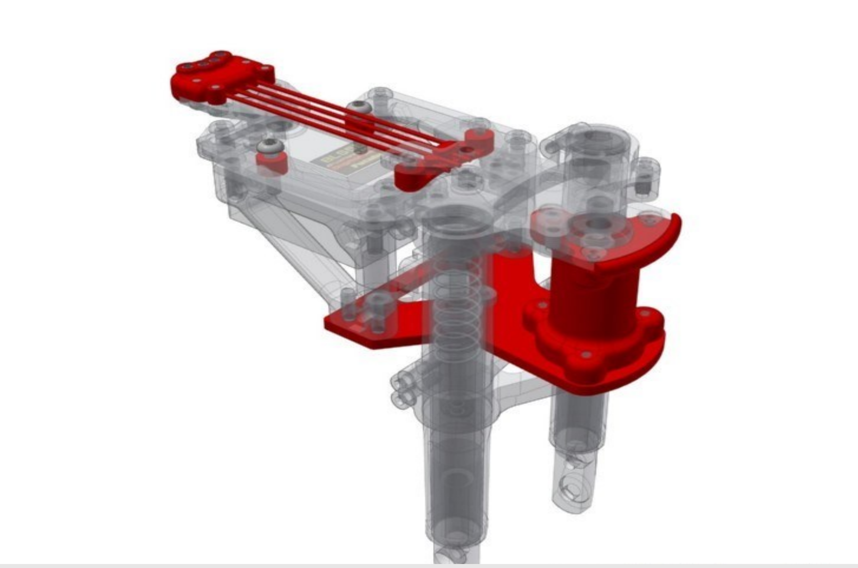
Maintenance and ease of operation:

Since the steering damper is possibly the most critical component to the RC bike, it is extremely important to ensure that it always works perfectly. Primarily to ensure smooth operation and optimum level of Silicone oil. Smooth running is achieved by regular cleaning of the steering damper, fresh oils and replacement of the O-rings on the piston rod. These sources over time easily wear out. Air bubbles in the oil, changes the properties of the damping and should be avoided when servicing.

The steering system should be silky smooth, it is important to ensure there is not too much free play in the entire system from the steering servo to the triple clamps. A system with too much free play in ball joints and servo or triple clamp connections will affect the precision of the steering and therefore hinder performance of the bike.

2) The Bar wire system:

Unlike the oil-filled steering damper, this system uses 2 or 4 steel wires as the function of the springs. The spring force depends strongly on the diameter of the wire but also from the Length of the wire. Both parameters are used to tune driving behavior on the track to suit driving style or track conditions. Another difference is the damping. The damping element is a separate component which can be changed as a further tuning option. Unlike the oil-filled steering damper where the damping element counteracts the steering impulse. With this system there are many benefits, obviously a lot less maintenance involved but also this system gives less resistance to steering system allowing the front wheel to follow the road precisely and any adjustments are always very easy to reproduce.



Picture: 4 wire steering system from Lightscale.

Banking / Lean Angle and Cornering of RC Bikes:

This is probably the most fascinating part of RC-bikes. When several bikes are on the track turning laps together and taking corners at full lean, it looks and feels very much like 1:1 Moto GP. The pilots of RC bikes have no feedback on how close they are to reaching maximum lean angle, therefore the maximum lean angle is set by the use of scratch bars (I like to think of them as knee sliders). Depending on the available traction (grip), the maximum lean angle of the bike is set by adjusting the length and angle of the scratch bars.

The bike will handle differently at full lean vs when it is upright moving forwards, the main reason for this is the tyre contact patch is decreased as lean angle increases. Suspension handling also changes significantly when the bike is fully banked. For this reason we recommend that beginners set their lean angle around 24 degrees while building skill and confidence.

Another important benefit of having the scratch bars is for taking off with the bike on its side without the need for assistance. For this, the bike is gently accelerated without using any steering input. The bike will make circles and when a certain speed is reached, the bike will stand up due to the suspension geometry by itself. With a little practice this is achieved after a 180 ° turn with the assistance of some counter steering input.

When driving through the corners, care should be taken not to place the bars on the road as this reduces the tyre contact forces and shakes up the bike. In addition, the radius of corner increases from the moment of contact. That’s why I like to think of the bars as knee sliders. 1:1 racers use the knee as a means of feeling the limits of their bikes lean angle. The knee will occasionally come in to contact with the track. It is not used to get the bike around the corner.

The shape of the bars should be chosen so that snagging with the road is avoided. The scratch bars should be soft so when they do make contact with road on occasion they compress and absorb reducing the risk of unloading the suspension and upsetting the bike. In some occasions where traction is very poor and in wet conditions it can be necessary to use a stiffer bar to offer more support and reduce the risk of losing traction through the corners.

Brakes and brake balance

In principle, at the end of every straight we have a corner, here we use the Brakes of the bike to set an appropriate corner speed to enter the turn. For electric RC bikes, we have an engine brake on the rear wheel and a disc brake on the front wheel (except stock bikes, rear brake only).The rear wheel braking is controlled by the motor and setup of this is done via the speed controller and radio transmitter.

The disc brake of the front wheel works similar to that of a real motorcycle. The disc is clamped between two brake pads during braking. Electronic servo mounted directly in the caliper or in the bike chassis and connected with a cable to the brake caliper is how this brake works.

The strength of the brakes is affected by the servo travel and the brake mixing setting on the radio transmitter, more info on this in the chapter on channel setup.

When setting up the brakes on your RC bike start with the front brake. While on a real motorcycle most of the braking is done via the front brake, on an RC bike this principle does not always follow true. For example, for stock bike racing no front brake is allowed however the bikes can still stop well and lap with a similar pace to the superbikes.

A common mistake is to setup the front brake with strong stopping power, this can cause many issues with an RC bike. The main reason is, the RC bike has no rider on it to control the weight transfer of the bike under braking loads.

As a guide you can begin with the following test to get a base line setup, this will be then fine-tuned on the track and is something that requires adjusting all the time to suit the conditions and your driving requirements.

Base setup procedure for front and rear brake:

Front:

With the bike switched on and ready on the workbench, apply the front brake while pushing your bike forwards. The front wheel should not be locked and you should be able to push the bike forwards without the front suspension compressing. Then with the brake still applied pull the bike backwards and your front wheel should be locking here.

Rear:

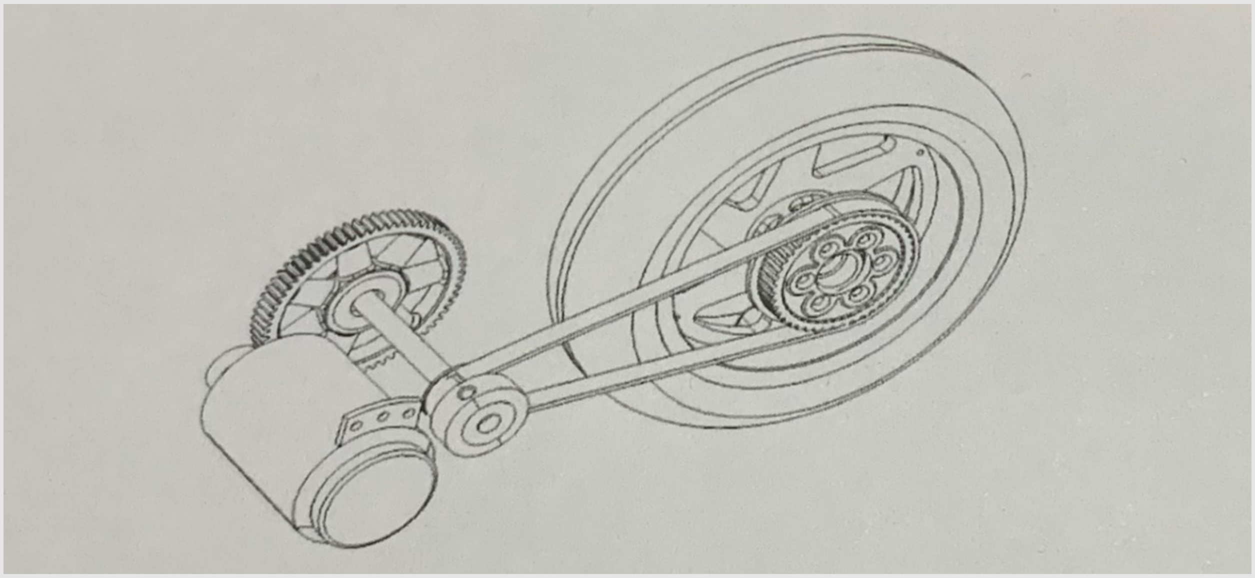
This setting needs to be adjusted on the track. Generally you want to start with about 50% brake strength adjusted via the Radio and or ESC. Then on the track, the strength of the rear brake should be continuously increased until the bike begins to slide indicating the limits of traction, from here take the setting back a couple of notches to keep in the safe zone.

With experience and skill level, it becomes easier to adjust the ratio of front to rear brake and to read the conditions, to know what the ideal brake balance will be. If your bike exits the track at the end of the straight when braking without warning - often with rollovers - it is usually due to an over-adjusted rear brake.

Too much front brake usually manifests itself primarily in a slipping over the front wheel. Or in other words, when the rear is over-braking causing the rear of the bike to rotate in the curve (oversteer), when the front brake is too much the bike will turn out of the curve (Understeer). These situations can also be referred to as high-side crashes and low-side crashes.

Drive:

Here we will be looking at electric bike only to keep it simple for now. The drive concept of an RC bike is essentially similar to that of a real motorcycle, however an RC bike has a fixed gear ratio and no transmission changing gears. The driving torque of the engine is in the first gear via the motor pinion and Spur gear. From there via the second transmission stage via the chain or belt to the rear wheel.



Currently available on the market there are two different concepts on the geometry and placement of the motor on RC Bikes.

1.) Motor in Swing arm:

In this type of bike, the concept is the motor and the drive shaft are arranged in the rear swing arm, the swing arm pivot is in front of the motor. The main benefit of this system is the motor can help in weight transfer on acceleration and braking. Of course like everything there are always positives and negatives of each system.

2.) Motor in Chassis:

The second concept is the drive shaft is also the pivot for the rear swing arm suspension and the motor is in the main chassis. Since the distance from the drive shaft to the rear remains constant in both concepts, regardless of the spring or the torque and tension produced by the chain or toothed belt.

1:5 scale electric RC Bikes use brushless motors that 1:10 electric RC cars use. Typically with a power range of about 200 - 800 watts. The hard case Lipo batteries used are also the same as 1:10 electric cars. The complete drive train runs on ball bearings, these bearings are subject to some wear and should be checked regularly and replaced if necessary.

Another important point is the secondary drive, a belt or a chain always need the correct tension, if the belt or chain does not have enough tension, it can cause the belt to skip and wear out prematurely, too much tension will load the bearings and the belt, and increases the friction and drag in the drivetrain.

The gearing between the motor pinion and Spur gear should be set according to the track you run on. The motor should rev out to make max RPM on the straight at full acceleration before you hit the next braking point.

In the controller, the maximum current should be set so that the bike can take off without huge wheelies and or lots of rear wheel spinning and forcing the bike sideways.

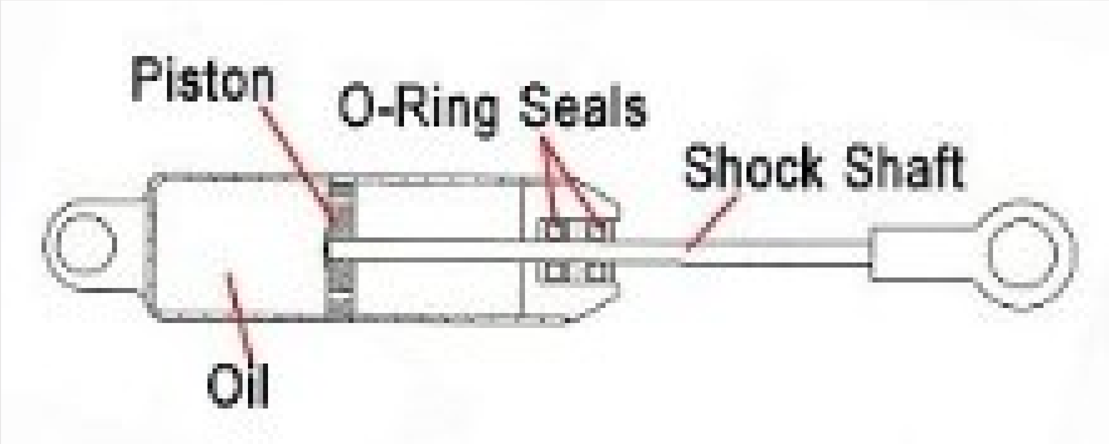
That's most of the theory taken care of, but what you should really take into account in practice with your RC bike? Below are some helpful tips on what setup changes do and how to use them.

Suspension and damping

We can disregard comfort as the main task of suspension and damping in RC bikes, so what is the main job of suspension and damping?

The object of suspension / damping is to compensate for unevenness of the road surface and to keep the wheels in contact with the ground at all times. To ensure this, the system must be fast responding in both compression and extension of the suspension. Un-sprung weight is also very important in affecting the bike setup and handling characteristics, ideally we want this weight as low as possible. (Wheels, tyres, front brake)

The job of the spring is to determine the force which counteracts the deflection of the bike, the damper determines the speed that the deflections occurs and the rebound of the spring. The silicone oil viscosity in the damper determines the resistance that the piston must move through in a compression / rebound cycle. Thicker oil more resistance and a higher damping effect, the exact opposite when using thinner oil. On the track a balance is key to good bike setup.



Relationship between the suspension and damping

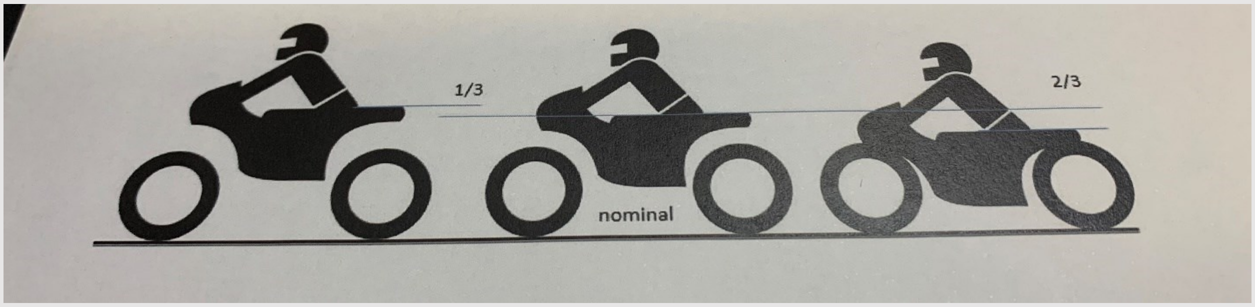
A suspension without any damping would respond very quickly to changes in road surface, but the problem with that is the bike would not absorb the bumps and settle itself, It would permanently oscillate and most likely end in a crash. This is what is referred to as under dampened suspension.

If the oil is too hard for the used spring, the spring cannot manage the surface bumps quickly enough before the next one arrives. The tyre can lose contact with the road surface in this case, again more than likely ending in a crash. This is referred to as over dampened suspension.

What is the ideal balance for a bike?

The general rule for spring rate on an RC bike is, as hard as possible and as soft as necessary. When you have a smooth track with good grip use hard springs and thicker oil. This setup is important for the bike performance and helps with cornering clearance when the bike is at full lean angle. However, as most tracks have some uneven and bumpy areas it is always necessary to find the right balance and compromise between soft and hard setups.

At 45 ° of lean angle the bike is pushed by a factor of 1.41 of the weight in the springs, consider a road where there is unevenness up and down, the bike must be able to compensate for both. That is, the bike must never stand in a fully rebounded / extended position. This is also referred to as suspension sag. The relationship between full suspension compression and droop can be adjusted as a guide with 2/3 to 1/3.

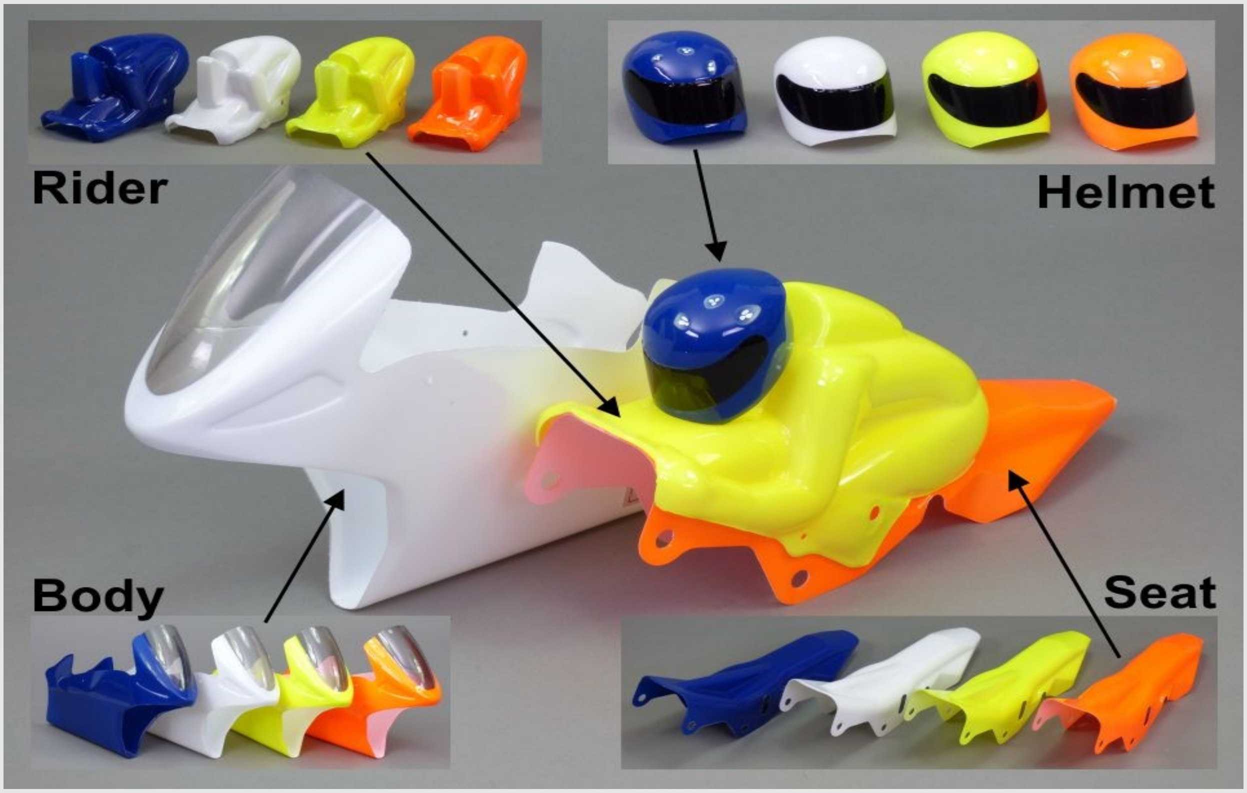


The fairing and pilot:

In addition to customizing the bike the body also serves as a protection for the chassis and all the components within it. The fairing is made from clear polycarbonate as with other RC cars. The polycarbonate is flexible and absorbs impacts from crashing well.

Many RC bikes kits supply the Lexan fairing un-cut and drilled. Care needs to be taken when cutting the fairing out and mounting it to the bike. You want to ensure that the body does not interfere with the forks or steering in any way and also take not off the clearances when the bike is at full lean.

As with most polycarbonate shells, paint and or decals is applied to the inside of the material. Be sure to use only paint suitable for this purpose. A good tip when choosing a colour or livery for your bike is to have as high contrast as possible to the road and other bikes on the track. It is best to mount the body unpainted and check all the clearances and fitment before painting.



Channel Setup:

To be able to properly control an RC bike, a radio transmitter of with at least 3 channels and with the ability to program channel mixing for the front brake.

Channel 1 steering:

Controls the movement of the forks, remember this channel may need to be reversed on some bikes and controllers to achieve the correct setup. When you make a steering input to the left for example, the forks will move to the right and vice versa. Servos commonly used are low profile 1:10 size servos also some bikes may use the midi size servos.

Generally if not specified or supplied with the kit, a servo horn 10 – 20mm long is used. When setting up the end points of the steering it is helpful to set the end point so that the damper compresses or extends past full lock. (Usually set between 1.5 – 2.5mm of extension / compression past full mechanical lock on the forks). From here you can fine tune steering and reduce/increase the sensitivity of it with the D/R function. The mechanical center position is set as usual with sub-trim.

Channel 2 gas / brake:

For correct calibration and programming of the controller, the servo travels are set to 100% on the transmitter. Once you have calibrated the transmitter and ESC together, then the end points of the rear brake can be adjusted and controlled by the transmitter.

In the ESC Setup the "forward-brake" function is selected. To adjust the braking force while driving, it is handy to program a suitable trim switch on the radio and get used to adjusting it on the fly.

Channel 3 front brake:

To increase stopping power of bikes and slow both wheels down simultaneously we use a front brake controlled by a servo in Ch.3 of the radio. Here the mixing function in programming of the radio is required.

The brake servo of Ch.3 is mixed with throttle/brake of Ch.2. The end point of Ch.3 must be 0 in the Throttle direction, and adjusted to work in the Brake direction of Ch.2.

The strength of the front brake can be adjusted by changing the end point servo travel. Have this setting available on another trim switch and get used to adjusting it while piloting the bike. The sub-trim function here is used to ensure the front wheel runs freely without brake and also to set the servo so it engages the brake as soon as the trigger is pushed forward.

Setting parameters and their effects:

SETTING	MORE	LESS
BANKING/LEAN ANGLE	More corner speed, smaller turning radius but also less contact patch at full bank.	Less corner speed, larger turning radius, bike is safer to drive on full lean, greater contact patch.
RAKE	Slower driving behavior, reaction to change in direction is lazy, bike has more rear grip	Agile handling, fast response to steering inputs, less rear grip, bike can more nervous in the front and stays leaned over on banking.
FORK OFFSET	AS ABOVE	AS ABOVE
STEERING SPRINGS	Harder springs give agile handling and response they also increase the turning radius, give less traction especially in banking. The bike stays leaned over in banking.	Softer springs give a slower change in direction, more forgiving handling, tighter turning radius, safer bike to drive and overall more grip.
SERVO TRAVEL	Agile handling, fast response	Slower driving behavior and response to steering input.
STEERING DAMPER	Heavier oil prevents head shake. It gives the bike less grip in banking. Steering can be imprecise.	Lighter oil increases the grip in banking, gives more precise steering. Can cause headshake and a tendency to be more nervous.

STEERING PLAY	Some free play in the steering springs gives more grip and safer driving. Steering effect reduces around the zero position. The bike will stand up easily coming out of corners.	If the springs have no play, the bike will be agile and change direction easily. The bike will stay leaned over in corners. There is also less grip in banking.
CENTRE OF GRAVITY	High COG gives slower driving behavior, the bike will remain down through corners.	A lower COG, provides are more agile bike with a tendency to stand itself up out of the corners.
COG FORWARD / REARWARD	If the COG is more forward, the bike will have more front grip and less understeer.	If the COG is more reward, the bike will have more rear grip, but may have a tendency to understeer.
SUSPENSION DAMPING	Harder damping gives a stable bike in banking and through high speed turning. Offers safer braking, less weight transfer but can bring loss of traction on bumpy surfaces	Softer setups are safer for bumpy tracks, they increase weight transfer which can help with traction. Softer setups are less stable in fast corners and they increase brake dive.
DRIVE POWER	More power means higher top speed, acceleration but potentially less accurate driving, more wheel spin and risk of wheelie. More power brings more wear and tear	Less power gives a softer acceleration and top speed. The bike is easier to drive and will be more accurate to navigate around the track.

TYRE COMPOUND	Harder tyres are great for higher temps, they offer a more precise driving of the bike	Softer tyres a suitable for low temps, low traction situations. Risk of tyre moving around causing less precise steering.
TYRE MASS (weight)	Heavier tyres will slow the driving behavior, the bike will be more stable upright and in banking. Slower to change direction.	Light tyres give agile fast handling, fast direction changes and a neutral cornering behavior. Very precise driving.
DECCELERATION / BRAKING	High braking gives a shorter stopping distance but is dangerous in banking and will bring about higher tyre wear	Softer brakes increase the braking distance but can be used safely in corners. Offering a smoother overall behavior of the bike.

As you might have figured out reading the table above, each setting has a positive and negative effect on handling. All settings are related to each other and affect the bike differently depending on the combinations used. Use the table to explore the settings and find the right balance of bike setup for your preference and track conditions.

Setup is a game of give and take, fortunately providing you have a good base setup to begin with. If you prefer not to play with setup, most modern kits perform very well in a wide range of conditions with the box setup, providing you have the right tyre for the conditions. We recommend that before chasing setup and fine tuning, a good amount of time is spent learning the basics and building your skills before exploring the fine tuning and setup changes. Without this skill and experience you will find it difficult to feel how the changes affect the bike and may find yourself making changes that affect the bike handling negatively.

How to learn RC-biking?

While RC motorcycling takes a little longer to learn than driving an RC car, it makes it far more rewarding when it starts to come together, it's also a lot more fun and it never gets old (we find).

Bike Setup:

When starting out with your first bike, it is important to have a good natured and easy to control bike. Use a conservative lean angle to begin with (24-25 degrees). Reducing the EPA of the steering is also very helpful when first learning. Use a relatively under powered motor, soft compound tyres and sometimes wheel weights can also be helpful.

Find yourself a nice open space, asphalt preferably without obstacles. The surface should be reasonably clean, dust free and dry.

To launch the bike there are various options, the easiest is a second person to give the bike a push forward with enough speed the bike will self-balance and go forward. At this point the pilot can apply some gas to keep the bike going. Alternatively, if the bike is resting on its side on the scratch bar, it is possible to get the bike standing and take off. By applying some throttle input only with the bike on the bar it will begin to move in a circular motion, once the bike has picked up enough momentum and a certain speed the bike will stand up and can be accelerated straight ahead. Alternatively the bike can be set standing up against a wall/ curb or even a bike stand can be used to launch the bike from a stop.

Once you have the bike moving forward, the most common mistake is that too much throttle and too much brake input, or too late on the brakes ends in the bike leaving the ground. Another effect that is initially underestimated by beginners is the fact the steering corrections on a bike, especially at higher speeds are slower than a car.

An excellent training exercise is in the carpark is controlled stops, use an obstacle you put down on the road, practice stopping the bike as close to the object and then taking off again without letting the bike fall over.

At some point after every straight line we have curve to negotiate. Taking corners and moving the bike around a circuit or open area is surely the most fascinating and exciting part of RC biking. In contrast to an RC car, to make a turn on the bike the steering input is a short pulse in the direction you want to turn.

The turning radius of the bike and corner is controlled by the speed you carry into the corner and also by how much lean angle the bike is set with. Unlike steering a car, where you hold the steering input on through the corner the **same action** with a bike results in a very large turning radius and the bike will move straight instead of making the turn. In summary you can consider the steering input of a bike as indirect or suggestive.

For a typical corner, the pilot applies the brakes for the bike in the upright position while at the same moment or slightly delayed, a steering input in the direction you want to go is made. Depending on the speed of the bike and the steering setup the bike will react to the input accordingly and begin to lean over, when the desired angle of lean is reached the input of the steering is returned to neutral, release the brakes and you will see your bike ride stable and make the desired turn. At about 2/3 of the turn (Apex) you start to accelerate gently, the bike will begin to stand up, if required a second steering input can be made to help the stand itself up quicker.

Some great training exercises in the park lot are driving in circles and figure eights or weaving between and around obstacles training tight cornering. Once you have gained some skill and confidence, driving on the track is basically the same as in the parking lot. Only here everything has to fit, otherwise you end up in the grass.

When selecting a track, the scale of the bike (for example, 1: 5) should fit the scale of the track. On smaller tracks controlling a 1:5 bike is much more difficult because of the lower track width found for example with many 1:10 size tracks (here a 1:8 scale is better suited).

Find yourself a local club and get to know the track and club members. Ideally a club that already has some RC bikers but if not you can always be the first of many to enjoy the fun of RC biking. All clubs and tracks will have their own rules and regulations, below are some of the basics which apply to all tracks and clubs.

Basic track rules:

- Never drive against the direction of travel
- If the bike is on the track (especially on the straights) call a loud warning to the drivers on the track.
- Start from the ground rather than the driver's stand, or use someone to help you marshal the bike when you go off track
- Take care when recovering the bike. Do not run on the track, risk of accidents.

The top 10 sources of error "Why will not my bike"

PROBLEM	CAUSE	SOLUTION
Hi speed noise and or tyre wobble.	Tyre has come unglued or torn from rim	Re-glue or replace tyre
Steering stability after cornering is bad. Steering feels sluggish and spongey. The bike does not run straight.	Forks may be twisted, steering damper oil is too hard. Or to little damping due to lack of oil	Align forks, check bearings, service damper and refresh oils.
On lean the bike is not stable (pumping) not precise.	Head stem bearing failure, or head stem is bent.	Renew and replace.
Bike falls in one direction	Twisted or tweaked forks.	Loosen off the axle and triple clamps, align and tighten.
Drive train noise	Worn gears, stone or dirt stuck in them.	Check, clean and replace if required.
Bike has increased rolling resistance	Rubber in belt and teeth or belt tension too tight	Check, clean and renew.
Bike makes noise on accerlation or acceleration is weak.	Belt is slipping on teeth.	Check belt tension and replace worn belts.
Bike loses control under braking. The rear of the bike steps out sideways. The bike lifts the rear wheel under braking causing big crash, or the front of the bike washes away in the corner	Incorrect brake balance. Too much rear brake and too much front brake.	Take some clicks out of each until the bike runs well and brakes safely,
Bike doesn’t stand up on corner exit. The front folds into the corner.	Lack of front adhesion or too much lean angle.	Change or replace tyre and or reduce lean angle.
Bike will not stand up from the bars, going into a corner the rear of the bike slides away.	Lack of rear grip or too much lean angle.	Change or replace tyre and or reduce lean angle.