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Ackermann

less Ackermann
more aggressive steering
harder to drive

more Ackermann
less aggressive steering
easier to drive

Ackermann is a term describing the effect of the inside front wheel turning tighter than the outside front wheel. More Ackermann means the inside wheel is turning in a tighter arc.

You change Ackermann settings in the RC10B4.1 buggy by moving the connection from the current holes (standard Ackermann) to the lower holes.
Anti-dive (onroad)

**lower angle**
- decreasing anti-dive
- adding anti-dive

**larger angle**
- increases corner entry steering
- increases caster at the wheel

This setting refers to the angle of the front arm mount when the rear arm mount is higher than the front arm mount. The "dive" refers to the tendency of the front end to dive, or lower, when braking.

Anti-roll bars can also help balance the pressure between the front and rear. If your car is oversteering, consider adding a front anti-roll bar only (or making the front bar thicker than the rear). If your car is understeering, consider adding a rear anti-roll bar only (or making the rear bar thicker than the front).
Anti-roll Bars, Sway Bars

**softer or thinner bars**  
*for low and med. bite tracks*

**stiffer or thicker bars**  
*for high traction tracks*

Anti-roll bars are used to stabilize a vehicle from excessive chassis roll (such as when a buggy leans through the turns by centrifugal force).

On a high-traction surface, a vehicle not using anti-roll bars will tend to have a lot of chassis roll, which results in the vehicle being less responsive.

Adding anti-roll bars (or making them thicker if you already have them on) will help minimize the chassis roll, making the vehicle more responsive in cornering, and at the same time making it more stable.

![Roll bar on the front of the #30106 Factory Team TC6 1:10 scale electric touring car.](image-url)
Anti-squat, off-road

less anti-squat
more side traction in corners
more rear traction for slick or bumpy surfaces

more anti-squat
less side traction in corners
more rear lift in jumps

Anti-squat denotes the angle of the rear arms relative to the chassis, when looked at from the side. 0 deg. anti-squat means that the rear arms are flat, parallel with the chassis. 2 deg. anti-squat means the front of the rear arms are creating a 2 deg. angle to the chassis.

This photo shows a 2 deg. anti-squat angle on the rear of an RC10B4.1 buggy. Change anti-squat by placing shims underneath the front of the rear arm mounts, angling them higher.
Anti-squat, onroad

**decreasing**

*less steering entering corner*

*improve acceleration over bumps*

**increasing**

*more steering entering corner*

*more traction exiting corner*

Anti-squat denotes the angle of the rear arms relative to the chassis, when looked at from the side. 0 deg. anti-squat means that the rear arms are flat, parallel with the chassis. 2 deg. anti-squat means the front of the rear arms are creating a 2 deg. angle to the chassis.
Axle Height, off-road

**lower**
more steering entering corners
less steering exiting corners

**higher**
less steering entering corners
more steering exiting corners

The front axle height on Team Associated 2WD off-road vehicles (such as the B4, T4, and SC10) can be raised or lowered to optimize handling for different track conditions.

![Axle Height Adjustment](image)

By moving both spacers to the top or bottom, you can change the axle height.
Bump Steer

**fewer washers**
* bumpsteer in
* less steering
* More stability

**more washers**
* bumpsteer out
* more aggressive
* less stable

Bump Steer takes its name from the fact that when the car goes over "bumps," it changes the "steering." Bump steer is the undesirable effect of extra toe-in or toe-out as your car goes over randomly-spaced hilly bumps closely spaced together in an area, making your steering unpredictable. Your car then bounces back and forth instead of going straight through the bumps.

You modify bump steer by adding or removing spacers on this ballstud.
Camber, front

**less (0 deg.)**
more straight-line acceleration
tyre is vertical

**more (2 deg.)**
more high-speed traction through turns
tyre leans inward

Camber describes the angle at which the tyre and wheel leans toward the car when looked at from the front or back.

Negative camber means that the tyre leans inward at the top.
Positive camber means that the tyre leans outward at the top. (Positive camber is not recommended.)
Camber is measured in degrees.
You can use Associated's #1719 camber gauge to set your camber.

The front camber of the B44.1 is being checked with the #1719 Factory Team Camber + Track Width Tool Camber Gauge. The number at the bottom corner of the gauge nearest the tyre indicates the angle of camber.
Camber Link, front

**shorter link**
*standard for high-grip tracks*
*more corner entry steering*
*less mid and exit corner steering*

**longer link**
*better for med.-grip loose tracks*
*less corner entry steering*
*more exit steering*

The front camber link is the turnbuckle link connecting the ballstud on the shock tower to the ballstud on the caster block.

Lengthening or shortening the camber links can affect traction, stability, and handling.

You lengthen or shorten the camber link by mounting the camber link turnbuckle in one of two holes in the tower (SC10 short-course truck shown).
Camber Link, rear

**shorter link**  
better for med.-grip loose tracks  
stiffer rear suspension  
accelerate better  
more turn-in steering  
less mid-to-exit corner steering  
decreases traction  
more side-to-side stability

**longer link**  
standard for high-grip tracks  
softer rear suspension (more chassis roll)  
less corner entry steering  
more exit corner steering  
more traction  
less side-to-side stability

The camber link is the turnbuckle that connects the ballstud on the shock tower to the ballstud on the rear hub.

Lengthening or shortening the camber link turnbuckles can affect traction, stability, and handling.

The camber link will affect how much the camber changes during suspension travel.  
The longer the link, the less camber change, and the more traction.  
The shorter the link, the more camber change, and the less traction.
Camber, rear

less (-2 deg.)
More high-speed traction through corners
tyre leans inward

more (2+ deg.)
removes straight-line acceleration
tyre leans outward

Camber describes the angle at which the tyre and wheel leans toward the car when looked at from the front or back.
Negative camber means that the tyre leans inward at the top.
Positive camber means that the tyre leans outward at the top.
At zero degrees, the tyre is vertical; benefit of zero camber is more straight-line acceleration than positive camber.
Camber is measured in degrees.

The rear camber of the B44.1 is being checked with the #1719 Factory Team Camber + Track Width Tool Camber Gauge. The number at the bottom corner of the gauge nearest the tyre indicates the angle of camber.
Caster, front

**less caster**
*less steering entering corners*
*more steering exiting corners*

**more caster**
*more steering entering corners*
*less steering exiting corners*

Caster describes the angle of the kingpin when it is leaning toward the rear of the vehicle. Positive caster means the kingpin leans rearward at the top. Negative caster (leaning the kingpin forward) is never used.

You can see the angle of caster on this SC10 short-course truck.
Chassis Length

**shorter**
more steering
quicker response in corners
quicker left-right turning

**longer**
more stability in high-speed corners
more rear traction
slower turn-in steering
better stability on rough tracks
slower turn-in steering
better jumping

Some vehicles have more than one chassis length available.
Diff Fluid, Centre Diff, off-road

lower weight, lower viscosity
thinner or lighter
smoother acceleration, better in bumps
for rough, low-traction conditions

higher weight, higher viscosity
thicker or heavier
accelerates harder, but worse in bumps
for smooth, high-traction conditions
Diff Fluid, Front Diff, off-road

**lower weight, lower viscosity**

*thinner or lighter*
*more steering, but less stability*
*for low-traction conditions*

**higher weight, higher viscosity**

*thicker or heavier*
*less steering, but more stability on power*
*for high-traction conditions*

Use the pro setup sheets online for reference and recommendations.
Diff Fluid, Front Diff, onroad

**lower weight, lower viscosity**

*thinner or lighter*

*more steering through the centre of the corner*

*for low-traction conditions*

**higher weight, higher viscosity**

*thicker or heavier*

*less steering into corner and smoother through centre of corner*

*for high-traction conditions*

A gear diff in the front requires a thick fluid somewhere in the neighbourhood of 300K or thicker. Using too thin of a fluid in the front diff will result in an inconsistent car through the corner, making the car very hard to drive.
Diff Fluid, Rear Diff, off-road

**lower weight, lower viscosity**
*thinner or lighter*
*more grip, but less stability on power*
*for low-traction conditions*

**higher weight, higher viscosity**
*thicker or heavier*
*less grip, but more stability on power*
*for high-traction conditions*

Use the pro setup sheets online for reference and recommendations.
Diff Fluid, Rear Diff, onroad

**lower weight, lower viscosity**
*thinner or lighter*
*more corner entry steering*
*for low-traction conditions*

**higher weight, higher viscosity**
*thicker or heavier*
*more on power steering and less steering into corner*
*for high-traction conditions*
Droop, onroad

**less droop**
*less shock travel*
*for smooth, high-traction tracks*
*larger number on Droop Gauge*

**more droop**
*more shock travel*
*for rougher, lower-traction tracks*
*lower number on Droop Gauge*

You can limit the amount of shock travel by increasing or decreasing an onroad car's suspension arm droop. One of its effects is to reduce "chassis roll."

Team Associated's #3987 Factory Team Droop Gauge helps measure droop.
Final Drive Ratio

**Lower number**
more top end speed possible
slower acceleration

**higher number**
less top end speed
quicker acceleration

Final Drive Ratio is: (Spur Gear divided by Pinion or Clutch Bell tooth count) times Transmission Ratio
No matter what vehicle you have, the equation is the same.
You'll get the transmission ratio from the instruction manual or the manufacturer. (This app supplies the transmission ratios for most Team Associated vehicles.)
Gear Pitch

**smaller pitch**
- best for onroad
- finer gearing adjustments possible
- more efficient
- quieter
- more easily damaged by rocks

**larger pitch**
- stronger teeth
- best for nitro
- best for off-road
- fewer gearing adjustments

In the RC hobby we use mostly 32-, 48-, and 64-pitch gears. The pitch has to do with the size of the teeth, not number of the teeth, on the gear. 32-pitch gears are the largest pitch with fewer teeth per inch. Fewer teeth per inch means the teeth are larger and therefore stronger.

The gear pitch distance from tooth to tooth.
Gear Ratio

**lower number**

"gear up"

more top end speed

**higher number**

"gear down"

faster acceleration

Gear ratio is Spur Gear divided by Pinion Gear. Example: 75-tooth spur gear divided by 15-tooth pinion gear = 5. This means the pinion gear must turn five times to make the spur gear turn one complete revolution. On large tracks, you might aim for more top end (using a pinion gear with more teeth). For small tracks or tracks with tighter turns, you might aim for more acceleration. So using a pinion with fewer teeth will help.
Kickup

less kickup
better turn-in and through a corner
fast weight transfer to front of car
best for high traction tracks

more kickup
turns into corner more
standard for most situations

Kickup refers to the angle, at which the on-road front suspension is mounted, measured from the horizontal, when looked at from the side of the vehicle.
0 deg. kickup means your front arms are level with the chassis.
20 deg. kickup means the front of the front arms are higher, creating a 20-deg. angle with the chassis.

Here's the kickup angle of an RC10B4.1 buggy.
Pinion Gear

**fewer teeth**
- more acceleration
- more run time
- gear ratio goes down

**more teeth**
- more top speed
- less run time
- gear ratio goes up

The pinion gear is attached directly to the electric motor shaft and drives the spur gear, which in turn interfaces with the transmission. Changing the pinion gear to more or fewer teeth will make big changes to your vehicle's run time and top speed.

#8255 18 Tooth, Precision Machined 48-Pitch Pinion Gear shown.
Ride Height, front

**lower**
creates more push
*onroad:* best for carpet
*onroad:* less chance of flipping in corners

**higher**
creates more steering
*onroad:* higher chassis means more chassis roll and better traction on bumpy tracks

The front ride height is the distance from the ground to the bottom of the chassis measured at the front (with the vehicle fully equipped). This adjustment helps to speed up or slow down how fast the car changes direction when cornering.

To set the standard front ride height for off road, lift up the entire car about six to eight inches off the bench and drop it.

When the suspension settles, the front edge of the A-arms should be level. If they are not in a straight line, then add or subtract preload spacers to the front shocks, or adjust the threaded shock collar up or down until it is level.

If you move the batteries forward or back, then recheck the ride height and adjust so it is level. You should always check the ride height after making all your other adjustments, just before you are ready to race.

You change the ride height of the B44.1 buggy by turning the shock collar on the threaded shock bodies.

You can measure the ride height with a tool, such as the #1449 Factory Team Off Road Ride Height Gauge.
Ride Height, rear

**lower**
*less rear end sliding in corners*

**higher**
*better acceleration in loose terrain*
*better lift off jumps*

The rear ride height is the distance from the ground to the bottom of the chassis measured at the rear (with the kit fully equipped).

Check the ride height by lifting up the entire car about six to eight inches off the bench and dropping it. After the suspension "settles" into place, then add or remove preload clips, or adjust threaded shock collars up or down so the dogbones are in a straight line.

If you decide to move the battery pack forward or back, then recheck the ride height and adjust so it is level.

The rear ride height setting you should use most often in off-road is with the outdrive, driveshaft, and axles all on the same imaginary horizontal line (referred to as "bones level").

Making large ride height adjustments up or down from this setting will tend to make the car feel unpredictable.

You should always check the ride height after making all your other adjustments, just before you are ready to race.

Ride height "bones level" is a starting point.

You change the rear ride height on the SC10 short-course truck by adding or removing preload spacers (arrow).
Roll Centre

**lowering roll centre**
more washers under ballstud
lower rear inner pin
for high-traction tracks
leans more when cornering

**raising roll centre**
fewer washers under ballstud
higher rear inner pin
for low-traction tracks

The roll centres for a chassis are defined by the suspensions' geometry. Roll centres are effectively positions in space (see drawing) that the suspension will "roll around." The roll centre height can be adjusted by changing the angle of the suspension arm, camber link, or both. Typically, this is done by changing the height of the inner positions of these members (the inner pin for suspension arm, and inner ballstud for camber link).

![Centerline of Chassis](image)

= Roll Center
= Center of Mass
Changing arm position. On some chassis, the inner pin position for the suspension arm can be adjusted up and down to change the angle of the suspension arm.

In this case, the roll centre will move in the same direction as the adjustment to the inner pin: if the inner pins are moved up, then the roll centre moves up as well.

**Lowering Roll Center, arms**

**Raising Roll Center, arms**
Changing ballstud height.
The angle of the camber link can be changed by changing the height of the inner ballstud.

This angle change has a much smaller effect on the height of the roll centre, so it is a finer adjustment and less noticeable on the track.

With this adjustment, the roll centre will move in the opposite direction than the adjustment to the inner ballstud: if the ballstud is raised, the roll centre is lowered.
High and low roll centre effects.

Changing the roll centre height will affect the stiffness of the suspension when the chassis is in roll (or leaning). This is due to how the inertial forces are applied to the chassis as it goes through a corner. As the car changes direction to transfer through a corner, these forces are applied at the centre of mass of the chassis.

The farther away that the roll centre is from the centre of mass (or, in other words, the lower the roll centre is), the more leverage the inertial forces will have to make the chassis roll. So in effect, as the roll centre is lowered, the chassis will be softer in roll, allowing it to lean more in the corner.

Suspension systems with lower roll centres are less responsive (or less "reactive"), and more forgiving than those using a higher roll centre.

Typically, lower roll centres are used on a smooth, high-traction surface and higher roll centres are used when the traction is low.

Keep in mind that the front and rear roll centres may not be the same, as it depends on the mounting position of the suspension arm and camber link. Staggering the roll centres front and rear can be an effective tool in helping to balance the car through the corner. You can raise or lower the ballstuds by inserting washers where the ballstuds are mounted to the tower.
Shock Mounting, front suspension arm

**inner hole**
- softer
- less stable

**outer hole**
- stiffer
- more stable

These holes on the front arm of the T4.1 truck give you two mounting options.
Shock Mounting, front tower

**inner hole**
*increases initial steering into corners*
*less lift off of jumps*

**outer hole**
*softer less steering entering corners*
*more front end lift off jumps*
*stiffer*

In this B44.1 4WD buggy, you change the top shock mounting with these two hole options.
Shock Mounting, rear suspension arm

**inner hole**
*softer*
*good for bumps and jumps*

**outer hole**
*stiffer*
*less responsive, more locked in*

These holes on the rear arm of the T4.1 truck give you two mounting options.
Shock Mounting, rear shock tower

**inner hole**
- more stability in entry and cornering traction
- less lift off jumps
- better in bumps
- onroad: more traction

**outer hole**
- softer less side bite (less cornering traction)
- more lift off jumps
- onroad: less traction
- stiffer

In this B44.1 buggy, you change the top shock mounting with these two hole options.
Shock Fluid

**lower weight, higher weight**
higher viscosity, thinner or lighter
faster rebound
for many small bumps

**lower viscosity**
thicker or heavier
less bottoming out
Shock Pistons

**smaller holes**
*improve jump lifts and landings*
*for smoother tracks*
*increases responsiveness*
*more damping*

**larger holes**
*for small bumps*
*less damping*

The shock piston has two or three holes through which the oil flows as the piston travels up and down in the shock. Pistons along with shock oil help determine shock damping.

A shock's damping is a measure of the resistance of the shock as it is compressed. Changing the piston hole size changes the damping characteristic of the shock.

Keeping the same oil, the smaller holes provide more damping, also known as more "pack," while the larger holes provide less damping, or less "pack."

Associated #6465 includes these 2-hole pistons: #1 (.055" hole diameter), #2 (.052"), and #3 (.047"). Four of each size are included.

When changing to the next smaller hole, it will have a similar feel of increasing shock oil by 5 wt. thicker.

A shock with a #1 piston and 30 wt. oil, when changed to a #2 piston with the same oil, will give the feel of thicker 35 wt. oil, because the #2 piston has smaller holes and moves with more resistance.

![Shock pistons](image)

Shock pistons #6465 (left), #6463 (centre), #89353 (right). #6463 are blank pistons, which means that you may drill your own size holes, as many or as few as you wish.
Shock Springs

**softer**
*lighter tension*
*great on rear for off-road*
*gives more traction*
*best for small bumps*

**stiffer**
*heavier tension*
*creates less traction*
*lifts higher off jumps*
*better suspension response*

The springs' purpose is to keep the vehicle level.

The shock spring controls the stiffness of the suspension.

This affects how the car corners and how it lifts off of jumps.

Several spring tensions are available to moderate these factors.

Shock spring on the Factory Team TC6 touring car.
Shock Travel Limiters

fewer limiters
for bumpy tracks

more limiters
used in side shocks when car leans too much in turns
in rear shocks they add traction when front end rises on acceleration

Limiters placed outside the body will limit the up-travel of the shock.

Limiters placed inside the shock limit shock down-travel.

These travel limiters will be placed on the inside of the shock body.
Slipper Clutch

tighter
for high bite tracks
more instant acceleration
smoother corner entry
looser corner exit
onroad: feeling of less steering

looser
for tracks with low traction
more traction exiting corner

By adjusting the clutch, you determine how much you will allow the wheels to slip.

On this Team Associated vehicle, adjust the slipper by turning this nut. (To help you remember which way to turn, think: "lefty loosen, righty tighty.")
Spur Gear

**fewer teeth**
*smaller gear ratio*

**more teeth**
*larger gear ratio*

*off-road: more traction because it pushes the motor back*

The spur gear is attached to the transmission. It interfaces between the motor's pinion gear and the transmission.

The spur gear.
Tyre Compound

*softer compound*

*for smoother surfaces*
*for higher temperatures*

*harder compound*

*for bumpier surfaces*
*for grass*
*for wet conditions*
Tyre Inserts, foam

**softer**
more traction
more drag

**harder**
less rolling resistance
better cornering

Tyres are typically thin and need support to retain their shape.

Tyre inserts give this support.
The foam insert's density is important.
The foam insert that comes with the tyres nine times out of ten is the insert you should use.
Too firm an insert will cause your car to bounce, resulting in loss of traction.
Too light a foam will cause the car to wander and to be very unstable.

You can see the white foam inserts that come standard with every pair of #21254 off road tyres.
Tyre Profile

**flatter**
_for flat and smooth surfaces_  
_higher contact patch gives better traction on smooth surfaces_  
_best for onroad and oval for_

**rounder**
_for bumpier surfaces_  
_for tracks with many turns_  
_best for off-road_
Tyre Sauce, Tyre Additive

no sauce
when surface is dusty or dirty

add sauce
for prepared surfaces
for rubber tyres
Toe-in, toe-out, front

0 deg. toe
standard for all conditions

toe-out
quicker corner turn-in
unstable in bumps and slippery straightaway

Front toe-out describes the angle of the wheels when viewed from above, the front of the wheel turning inward (toe-in) or outward (toe-out), or pointing straight ahead. It is measured in degrees.

Aftermarket gauges are available to help you measure it.

The 1 deg. toe-out angle is seen from the top of the vehicle.
Weight Distribution, adding weights

**front**
- more steering while accelerating
- changes direction slower
- more nose-down jumping

**rear**
- less steering
- more rear traction
- more stable under acceleration and braking

You can balance the chassis' weight by adding weights to the car, or by shifting your batteries forward or back.

The 87g #9776 Ballast Weight has been inserted into the Factory Team B44.1 buggy.
Wheelbase

**shorter**
*wheels closer together*
*more rear traction*
*weight shifted to back*

**longer**
*wheels farther apart*
*slightly more steering*
*better stability*
*weight shifted to front*

The wheelbase is the distance between the front and rear wheels at the axle centre lines.

You can make adjustments to your wheelbase. That is, you can shift the wheels forward or back to lengthen or shorten the wheelbase.

Moving these spacers to the other side will shift the front wheel back, shortening the wheelbase.
Wing

**steeper angle**
*more rear traction*

**more horizontal**
*standard traction*

Wings are a vital part of the car's stability. The angle at which you place the wing and how much of the wing you cut will cause the car to handle differently.

Wing angle aids in rear traction.

You can adjust the amount of traction by changing the wing angle.

On road: You can slide the wing back for more rear traction. Some aftermarket wings allow more adjustments.

The canards, which are sides of the wings, can change the handling based on how tall and long they are. Use side dams when you need more stability in the straights and high speed corners.

The wing angle of the B44.1 buggy (as seen from this underside view) is changed by the use of tapered wing shims.
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Battery "C" Rating, LiPo

**lower rating**
*lower discharge load*

**higher rating**
*higher discharge load*
*more punch when accelerating*

The #629 Reedy LiPo battery has a C rating of 60C.
Battery mAh Capacity

**lower number**
lower capacity
shorter run time
less cost

**higher number**
higher capacity
longer run time
more cost

Your battery's capacity is rated in milliamp-hours, abbreviated mAh.

The #629 Reedy LiPo battery has a capacity of 5500mAh.
Battery Cell Count

fewer cells
lower voltage
less speed

more cells
higher voltage
more speed

Six cells are in this Factory Team TC5R.
Battery Label (NiCd and NiMH)

Battery resellers enhance the performance of their cells and provide certain cell characteristics on their labels. The cells are machine-tested and labelled. Compare these numbers on the NiCd and NiMH battery labels to get the best cells. You’ll find this information on matched packs, not your regular stick packs.

**A/V (Average Voltage).**
*Higher number means more voltage.*
*Higher number = better.*

**A I/R (Actual Internal Resistance in Milliohms).**
*Lower number means better power output because less loss through resistance.*
*Lower number = better.*

**SEC (Cell Runtime).**
*Higher number means more run time.*
*Higher number = better.*
Battery Placement

**forward**
*more steering*
*less rear traction*

**rearward**
*less steering*
*more rear traction*

You can slide the batteries forward or back. Its weight bearing down on the front or rear will emphasize that area’s unique suspension aspects.

(Off road: on extremely high or low traction tracks, moving batteries forward may balance the car and give better rear traction.)

This foam bar at the rear of the Team Associated SC10 short-course truck pushes the batteries forward. The foam can be cut, moving the batteries back incrementally, placing the cut pieces at the front.
Battery Voltage

**lower voltage**
- slower acceleration
- runs cooler

**higher voltage**
- faster acceleration
- runs hotter

The #629 Reedy LiPo battery is 3.7 volts.
Drag Brake

less drag brake
free-wheel to a stop

more drag brake
faster brake engagement

The amount of braking achieved when the throttle is returned to neutral.
A setting of 0 per cent means the car will free wheel to a stop while higher settings will stop the car faster.
Change this setting by adjusting your radio transmitters brake EPA setting.
Some high-end transmitters can adjust this setting. Otherwise, it’s set through a electronic speed controls (ESCs).
Dual Rate (D/R)

**lower percentage**
- turns down the amount of steering you have from full left to full right
- use when you keep over-compensating for your steering mistakes on the road
- for larger tracks
- for a softer steering feel

**higher percentage**
- gives more steering left to right
- use when you have smooth control over your car
- good for tighter tracks
- for a more responsive (aggressive) steering feel
- to make tighter turns

The dual rate refers to setting your steering servo's maximum angle of rotation, or "throw," to two different limits.
The steering servo has a maximum throw to its travel left and right. Those points are the "end points."
First you set the end point adjustment of the steering servo; the dual rate setting for left and right will be a percentage of that value.
This transfer from one rate to the other is achieved by a control on the transmitter. It affects your turning radius.
You adjust the dual rate amount so that you can make the turns most efficiently. Since the control is located near your thumb on the transmitter, you can adjust the rate at will for different parts of the track.

![Diagram of dual rate settings](Image)

Picture #2 shows the angle change when you set the dual rate to 85% of the setting in picture #1.
Expo/Exponential, steering servo

**negative percentage**

*decreases (softens) the steering rate at initial wheel turn and accelerates rate at end*

**positive percentage**

*accelerates the steering rate at initial wheel turn and decelerates (softens) rate at end*

Without an expo setting, if you turn your transmitter wheel left or right, the servo turns left or right at the same linear rate of speed.

But with a negative expo percentage applied, one adjusts this rate of change so that at the initial turn of the transmitter wheel, the steering response is minor or softened; but as you continue turning the wheel, the steering response is accelerated exponentially (hence the name, "exponential.")

A greater negative percentage will accentuate the rate.

A positive percentage will reverse these rates.

A linear rate is set at expo 0%, which is a comfortable and predictable rate for beginners. (The Team Associated XP3D radio manual calls this feature the ARC/ST, Adjust Rate Control, steering servo.)

Expo can also be applied to the brakes and the throttle.

For instance, a more negative percentage will soften the rate at the initial control movement (braking or acceleration) and accelerate the rate at the end of the movement.
EPA/End Point Adjustment, steering servo

lower percentage  
*makes wider turns*  
*shorter throw*

higher percentage  
*makes tighter turns*  
*longer throw*

The steering servo has a limit or maximum "throw" to its travel left and right. Those points are called the "end points."

You adjust the end points to achieve an equal amount of steering left and right, then you adjust the "dual rate" to fine tune the adjustment. To this end, the EPA for left and right steering are adjusted individually.

You can set the steering servo throw end points for the left and right individually.

![Steering Servo Adjustment](image)

Here, the left is set at 100% of the throw while the right is limited to 95% of the throw.
EPA/ATV/End Point Adjustment, throttle/brake

**lower percentage**
*shorter throw*

**higher percentage**
*longer throw*

The throttle/brake servo on nitro vehicles has a maximum throw to its travel left and right. Those points are the "end points."

You adjust the end points to achieve maximum throw or less throw when setting up your throttle and brake.

**Throttle/brake setup**
The same servo controls the throttle and brakes, and depends on their corresponding linkage setup to work together properly.

Set the throttle servo linkage so that when you apply full throttle, the barrel of the carburettor is open all the way. Then you fine-tune the EPA for that thrown so it stops just short of fully open.

Set the brake linkage so that when you push the trigger outward for braking, the brakes are fully applied. Then fine-tune the EPA for that throw so the plates stop just short of full pressure on the brakes.

When the throttle trigger is in its centre or neutral state, you want the carb to be at its idle position with little to no brakes are applied.

If you want to have a measure of drag brake at neutral, then set it with the brake linkage or EPA. (Drag brake means that the brakes being slightly applied at neutral.)

It’s important to adjust the linkage in concert with the EPA settings so that the linkage will not be jammed or strained at full left or right throw, but is just right.

The throw has been set for throttle and brake linkages in this RC8B 1:8 nitro buggy.
Brushless Motor Speed, KV

**lower KV**

 slower acceleration

**higher KV**

 faster acceleration

The #917 Reedy 540R Brushless Motor is 3900kV.
Motor Springs, brushed motors

less tension
more RPM

more tension
more torque

You can change the tension of the spring by changing the angle of its two ends (by squeezing them closer together or pushing them farther apart). The tension of the spring affects the pressure of the brush against the armature.

The #780 Motor Spring has a 9 oz. rate. Thicker and thinner wires change the rate.
Timing, brushed motor

clockwise
more RPM
less torque
"advancing"

counter-clockwise
less RPM
more torque

Brushed motor timing is accomplished by loosening (but not removing) the top screws of the endbell (not the brush hood screws) and turning the endbell slightly. Then the screws are tightened again.

Timing marks are found on the hood (top of the motor), marked on the side of the can (see photo below), or on a label.

There is usually a mark on the hood that would line up with the timing marks. Each vertical line of timing marks off 4-6 degree increments.

It’s best not to go below the 0-degree mark, for it retards the time and could create efficiency problems. Too much timing will have a similar effect; even though you can hear the motor has a lot more RPM, advancing the time takes away efficiency and could cause the motor to overheat or burn off the armature wire's coating - ruining the motor.

You can see the notches in the endbell hood for lining up with the small timing indicator stamped into the can.

![Timing marker image](image_url)

The far left vertical line marks 0 degrees.
Motor Turns, brushed

**fewer turns**
- higher RPM
- higher top end
- more battery draw
- less run time

**more turns**
- lower RPM
- more acceleration
- less battery draw
- more run time

Turns refers to the number of times the wire was wound around each armature arm.
Sintered Rotor, brushless motors

smaller diameter
more RPM

larger diameter
more torque

The #LRP50638 LRP Works X-12 Sintered Rotor is 13.0mm in diameter.
Steering Servo

more torque
best for large vehicles

more speed
best for on road

Off-road needs more torque because of the larger wheels and rougher ground. Monster trucks need the most torque because of the power needed to turn the heavier wheels.

This T4.1 truck is using an XP digital servo available from Team Associated.
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Carb Restrictor

**smaller hole**

- less acceleration
- better control
- lessens wheelspin (better traction)
- better fuel economy

**larger hole**

- more speed
- harder to control
- reduced fuel economy

Carb restrictors "restrict" the amount of air entering the carburettor. Carb restrictors can be used to help control the amount of wheel spin coming out of corners, resulting in a vehicle that's easier to drive, but top speed will be reduced.

Reedy's carb restrictors for the 121 engine range from 6.5mm to 9mm. Shown from left: #28028 (6.5mm), #28029 (7.5mm), #28030 (8.5mm).
Carb: High-speed Needle

**clockwise**
smaller opening
leaner
less fuel
more air
compensates for higher elevation
increases temperature

**counter-clockwise**
larger opening
richer
more fuel
less air
lowers temperature

The high-speed needle adjusts the quantity of fuel when the throttle is fully open. The high-speed needle setting is determined by driving your vehicle at maximum speed on the longest straight. After each full speed run, close the high-speed needle 1/16 of a turn at a time, noting the difference in speed. The goal is to achieve the highest straight-line speed while maintaining a visible trail of smoke from the exhaust.

A poorly performing clutch assembly (bad bearings, weak or broken springs, worn clutch shoes, interference with engine or chassis components, etc.) may trick you into making adjustments that are not necessary or incorrect.

Be sure your clutch assembly is in perfect running order at all times. (From the Reedy #800 engine manual.)

Here are the screw locations for the carb settings for a rotary carb (top) and slide carb.
Carb: Idle Adjustment Screw

*clockwise*
*increases idle RPM*

*counter-clockwise*
*reduces idle RPM*

Adjusts the engine idle speed at neutral throttle. The idle adjustment screw should be set so that the engine will keep running, but not so that the vehicle will be running on its own.

Here are the screw locations for the carb settings for a rotary carb (top) and slide carb.
Carb: Low-speed Needle

clockwise
smaller opening
leaner
less fuel
more air

counter-clockwise
larger opening
richer
more fuel
less air
compensates for overheating
compensates for hot outdoor temp
more acceleration from standstill or low RPM

This setting adjusts the quantity of fuel for best acceleration from standstill or low RPM. Bring the vehicle to a complete stop and let it idle for 5-6 seconds, then give 100% throttle. If the vehicle emits excessive smoke and does not accelerate smoothly and quickly, the mixture is too rich. Turn the needle in 1/16 of a turn increments until the vehicle accelerates quickly and smoothly. However, if the engine speeds up momentarily and then cuts out abruptly when 100% throttle is applied, the mixture is too lean. So turn the low-speed needle counter clockwise and test.

A poorly performing clutch assembly (bad bearings, weak or broken springs, worn clutch shoes, interference with engine or chassis components, etc.) may trick you into making adjustments that are not necessary or incorrect. Be sure your clutch assembly is in perfect running order at all times.

Here are the screw locations for the carb settings for a rotary carb (top) and slide carb.
Clutch Bell

**more teeth**
more top end
less acceleration

**fewer teeth**
less top end
more acceleration

The clutch bell teeth transfers engine power to the spur gear to drive your rear wheels. The ratio between your clutch bell teeth and spur gear teeth (its "gearing") will affect how fast your vehicle goes (its top speed) and the rate your vehicle accelerates.

Like a see-saw effect, changing the top end will adjust the acceleration in the opposite direction. (Higher top end will result in slower acceleration.) You can adjust your top end and acceleration by changing your clutch bell to one with a different number of teeth.

Clutch bell on the MGT monster truck.
Clutch Shoes

**shorter shoes**
*use when less traction*
*slower engagement*

**longer shoes**
*use when good traction*
*quicker engagement*
*creates quicker acceleration*

When the engine revs increase, the clutch shoes, attached to the engine shaft within the clutch bell, are flung outward by centrifugal force. The shoes engage the inside of the clutch bell to turn the bell and accelerate your vehicle.

The shorter the clutch shoes, the longer the engine must rev before the shoes engage (a shorter contact patch contributes to this too).

A clutch shoe at stock length engages the clutch bell more quickly than short ones do.

To adjust when your clutch engages, you change the number of clutch shoes used, or alter their length.

Nowadays, racers adjust the clutch spring rate rather than the shoes.

right: #7601 clutch shoes, PTFE material which you can cut, used on the RC10GT truck.
left: #25720 clutch shoes, aluminium.
Clutch Springs

**softer**
*softer spring rates*
*engages the clutch earlier in the engine RPM range*
*can cause the engine to "bog" if the load is too great for the low RPM*

**stiffer**
*stiffer spring rates*
*engages the clutch later in the engine RPM range*
*makes the power delivery more abrupt and can cause wheel spin (low traction)*

Generally, three spring settings are given for a vehicle.
The standard setting is using the middle value.
On low traction, use a softer clutch to limit wheel spin or to make the power "softer."
On tracks needing heavy acceleration out of corners, use a stiffer clutch to engage the power more violently. This is helpful in stringing jump combinations together.
Additionally, if there is a heavy load on the car due to mud or sand, a stiffer clutch is desired to not "bog" the engine.

Clutch spring stiffness also effects the coasting of a vehicle.
A softer clutch will stay engaged when power is removed and can cause a "run-on" effect.
A stiffer clutch disengages more quickly and allows the car to freewheel sooner.

Clutch springs (coloured blue for this photo) being installed into the RC8B nitro buggy.

You can see the difference in thickness between these two clutch springs for the RC8B nitro buggy, softer on left, stiffer on right. (left: #89157, 0.9mm. right: #89158, 1.1mm.)
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Active Strut Upper Arm Mount

**lower angle**
*more consistent through the corner in high-bite conditions*

**higher angle**
*more entry steering*  
*less mid-corner steering*

The active strut system dynamically controls caster through suspension travel. The active strut upper arm mount adds an angle to the upper arm hinge pin, pointing the front of the pin down. This angle removes caster as the suspension is compressed.

Here is the caster angle for the active strut front suspension.
Battery Placement, oval

**inward**
*for high-bank cornering*
*for large tracks*

**outward**
*improves cornering on tight, low-bank (or flat) oval tracks*

Sliding the batteries in or out will change the cornering performance.
Centre Damping

**lower weight, lower viscosity**
thinner or lighter
more rear grip on high-bite tracks

**higher weight, higher viscosity**
thicker or heavier
stiffens rear of car
increases mid-corner steering

Centre damping is based on shock fluid viscosity in the middle shock. The damping controls the speed at which the chassis ride height changes when going over the bumpy sections of an asphalt track, and as it accelerates and decelerates.

Change shock fluid in the centre shock to change the damping.
Centre Spring

**softer**  
*slower rebound*

**stiffer**  
*faster rebound*

The centre spring controls how much the chassis ride height changes when going over the bumpy sections of a track, and as it accelerates and decelerates.

Change the spring on the centre shock to adjust rear stiffness.
Inline/Trailing Axle

**inline**
- standard setting
- more aggressive steering

**trailing**
- easier to drive
- less aggressive steering

RC10R5 Oval with inline axles.
Kingpin Damping

**lower weight fluid**

*standard setting*

**higher weight**

*more consistent through the corner in high-bite conditions*

You affect the damping of the kingpin by applying shock fluid to the outside of the kingpin where the kingpin slides through the lower pivot ball.

This lubrication affects the damping. With slower spec motors and high-bite conditions, thicker fluid can make the car more consistent in the corners.

Apply shock fluid to the outside of the kingpin.
Kingpin Springs

**softer**
*increase steering*

**stiffer**
*decrease steering*

This spring sets the stiffness of the Active Strut front end. Oval racers sometimes use a different rate spring on each side. With a softer spring on the left, the tyre grabs harder. A stiffer spring on the right helps to free up the car coming out of the corner.

This spring compresses when the tyre goes over bumps. A softer spring helps make the car more consistent on bumpy surfaces.
Rear Pod, oval

**centred**
*for substantial banking*
*for large tracks*

**offset**
*improve cornering performance on tight, low-banked (or flat) oval tracks*
Side Damping, rear

lower weight
lower viscosity shock fluid
side-to-side transition is quicker

heavier weight

higher (thicker, heavier) viscosity shock fluid
side-to-side transition is slower
more consistent through corners in high bite conditions

Side damping is based on shock fluid viscosity in the side shocks. This damping controls the speed at which the chassis rolls through the corners.

This photo shows the chassis rolling motion around the yellow centreline.

Change the shock oil in the side shocks to change the damping.

Change the spring to change the damping in the RC12R5.1 pan car.
Side Springs, rear

**softer**

*more consistent in low bite and bumpy conditions like asphalt*

**stiffer**

*better for smooth surfaces*

The side springs control the change in ride height as the chassis rolls through the corners. Softer springs allow one side to lift (or both sides to "roll"), more.

This photo shows the chassis rolling motion around the centreline of the chassis.

You may use different springs on either side shock for finer adjustments.

Change this spring in the RC12R5.1 pan car.
T-Bar Flex, oval

2 holes
standard setting
very active (soft) front-to-rear

3 holes
more rear traction
accelerate through bumps better
best for smooth, high-traction conditions

Mounting the T-bar at two or three locations will change the relationship of the rear end to the rest of the car.
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Maintenance Checklist

*Your vehicle will give you many hours of trouble-free operation when you regularly check for wear and tear. You should periodically check all the moving parts of the car, especially before a big race. Here is a sample checklist in alphabetical order.*

**A-arms, front and rear**
Check for cracks from crashes.
Make sure arms move smoothly; remove dirt build-up.
Make sure hinge pins are still straight.

**Air filter**
Clean and reapply filter treatment #7719; replace filter if needed.

**Ball cups**
Check for cracks to see if they need replacing.
Clear the ballstuds of dirt.
Apply ballstud dust covers to minimize dirt.

**Batteries**
Check that battery is fully charged, and connections and mounting are secure.

**Body**
Check that body clips are not missing, and body is not touching tyres.

**Brake parts**
Check for worn brake disc and proper adjustment.

**Bushings and bearings**
Clean and lube; replaced if needed.

**2-speed clutch**
Check for proper shift point and that shoes are not worn.

**Receiver and servos**
Check for firm mounting.

**Receiver battery pack**
(Nitro vehicles) Check that battery is fully charged and secure in vehicle.

**Shocks**
Check for consistent dampening all around.
Refill with new oil.
At that time, check and replace worn inner shock seal parts.

**Steering blocks and hub carriers**
Check for cracks from crashes.
Make sure they move smoothly.
Remove dirt build-up.

**Transmitter**
Check batteries are fully charged.

**Wires**
Check for any frayed wires or loose connections.
NITRO

**Clutch shoes**
Check that engine clutch shoes are clean and springs are working properly.

**Glow plug**
Check that it's heating up properly, replace if some coils are not heating up.
If engine will not start, replace glow plug.

**Fuel tank**
Check for leaks and dirt, good seal around O-rings.

**Fuel tubing**
Check for cracks and possible air leaks.
Be sure that the fuel line is not rubbing on any component that could cause damage or a leak.

**Screws**
Because of the vibration of nitro engines, check that all screws are tight before each run. (Racer Tip: Apply locking compound #1596 for all screws that are metal to metal.)
Clean out the screw head opening before inserting your driver to minimize wear.
Use quality drivers to keep from stripping out screw heads.
RC Toolbox, electric

*These items are good to have on hand near your workbench or at the track.*

**Electrical**
- Battery charger (peak detection charger recommended)
- Extra battery packs
- Battery Discharger for NiMH or NiCad type batteries
- Extra AA batteries (for transmitter)
- LiPo balancer, for LiPo batteries
- Fireproof bag, for LiPo batteries

**Fluids**
- Tyre adhesive (to glue tyres to wheels)
- CA glue
- Paint for body
- Thread-locking compound
- Performance Plus 3 or similar for cleaning car
- Performance Plus 3 or similar for cleaning bearings
- Tyre Sauce (onroad)
- Body cleaner

**Tools**
- Phillips screwdriver
- Flat blade screwdriver
- Needle nose pliers
- Shock wrench or multitool
- Hex driver set
- Socket driver set
- Wire or diagonal cutters
- Turnbuckle wrench
- Camber gauge
- Droop gauge (onroad)
- Ride height gauge
- Pencil-type soldering iron with Rosin core solder to solder motor wires
- Hobby knife
- Precision ruler
- Body scissors
- Body reamer
- Body cleaner

**Parts and Accessories**
- Wire ties
- Motor brushes
- Motor springs
- Extra suspension arms and bumpers and whatever parts you seem to break the most
- Extra nuts and locknuts of a variety of sizes
- Extra screws and set screws of a variety of sizes and types
- Extra washers of a variety of sizes and types
- Extra E-clips and similar clips
- Extra body clips
- Extra diff balls
- Extra glow plugs
- Extra ball cups
- Extra tyres and tyre types
Extra crystals with different frequencies
Extra servo gears
Extra shock internal parts
Extra belts, for belt-drive vehicles

**Other**
Servo tape
Masking tape for body designs
Portable desktop light source
Rag for wiping and cleaning
Hand cleaner
Shrink Tubing, various diameters, and flame lighter or heater to shrink it
Towel for workbench (keeps area clean and prevents bearings and other parts from rolling)
Small paint brush (1 inch wide) to clean
Stopwatch
Pit bag
Toolbox and parts trays
Pen and pad of paper for notes
Blank setup sheets
Instruction manuals and catalogues
First aid kit
Safety eyewear
Safety gloves (for handling hot items like engines or heated motors)
Strapping tape (for batteries)
Favourite RC magazine
RC Toolbox, nitro

*These items are good to have on hand near your workbench or at the track.*

**Electrical**
- Extra AA batteries (for transmitter)
- Starter box extra battery
- Receiver battery pack
- Battery charger

**Fluids**
- Foam Prefilter Treatment
- Fuel
- Tyre adhesive (to glue tyres to wheels)
- CA glue
- Paint for body
- Thread-locking compound
- Performance Plus 3 or similar for cleaning car
- Performance Plus 3 or similar for cleaning bearings
- Tyre Sauce (onroad)
- Body cleaner

**Tools**
- Glow plug wrench
- Phillips screwdriver
- Flat blade screwdriver
- Needle nose pliers
- Shock wrench or multitool
- Hex driver set
- Socket driver set
- Wire or diagonal cutters
- Turnbuckle wrench
- Camber gauge
- Droop gauge (onroad)
- Ride height gauge
- Pencil-type soldering iron with Rosin core solder to solder motor wires
- Hobby knife
- Precision ruler
- Body scissors
- Body reamer
- Temp gauge for engine

**Parts and Accessories**
- Wire ties
- Extra suspension arms and bumpers, whatever parts you seem to break the most
- Extra nuts and locknuts of a variety of sizes
- Extra screws and set screws of a variety of sizes and types
- Extra washers of a variety of sizes and types
- Extra E-clips and similar clips
- Extra body clips
- Extra diff balls
- Extra glow plugs
- Extra ball cups
- Extra tyres and tyre types
- Extra crystals with different frequencies
Extra servo gears
Extra shock internal parts
Extra belts, for belt-drive vehicles
Extra clutch springs

Other
Air filter elements
Glow plugs
Glow starter/igniter
Starter box, or hand-held starter
Fuel tubing
Shrink Tube, various diameters
Servo tape
Masking tape for body designs
Portable desktop light source
Rag for wiping and cleaning
Hand cleaner
Towel for workbench (keeps area clean and prevents bearings and other parts from rolling)
Small paint brush (1 inch wide) to clean
Stopwatch
Pit bag
Toolbox and parts trays
Pen and pad of paper for notes
Blank setup sheets
Instruction manuals and catalogues
First aid kit
Safety eyewear
Safety gloves (for handling hot items like engines or heated motors)
Favourite RC magazine
Checklist: How to Go Faster
Here is a checklist of areas to consider that may be "scrubbing" speed. Don't overlook these if you want faster lap times.

Driving
This is the place where the biggest improvements will come, but it's usually the last place we look.
Learn how to control your car.
Learn how to clear obstacles and jumps.
Learn when to go slow is to go fast. You lose time when you go fast and crash a lot. Slower and steady is best.
Practice driving repeatable laps without crashing.
Start to drive tighter lines around the course, making smooth arcs around corners.

Maintenance
A poorly maintained and worn-out car will not handle properly. Here are some general guidelines to be used after every 2-3 days on the track:
Clean all of the dirt off. Remove the shocks and check that all of the components move freely without binding.
Your shocks may have dirt inside that is causing them to stick. Consider installing new oil and new red O-rings if shock action isn't smooth.
Carefully look over all of the components on your car to see if anything is bent, worn, or broken that you may not have noticed at the track.

Equipment
Some good equipment upgrades:
Change bushings to bearings. Bearings reduce drag for more power and runtime.
Get Matched batteries. Matched packs are grouped by cells with similar output. These provide more power and runtime and are usually sold in different rating levels of runtime and voltage.
Upgrade speed control. Upgrade to a race-level speed control for maximum efficiency and smooth throttle feel.
Titanium turnbuckles should replace the kit turnbuckles for more strength and less weight.

Tyres
Make sure you are running the appropriate tyre for your track. Ask a more experienced racer for advice. Tyres are 90% of how well a car handles.

Setups
We recommend using:
Kit setup.
A setup from a more experienced racer at your track. Use those setups as a starting point and then make adjustments.
Make sure to change only one setting at a time so you can see the effect, whether better or worse. It also helps to switch the settings back to where it originally was and compare lap times to confirm whether the change improved the car.
Most Common Beginner Mistakes on the Track

**On the track**
Gearing too high and going too fast for their skill level.
Not slowing down enough; poor throttle control.
Not taking the curves right; braking late or going in too fast.
Not practicing enough.
Thinking that pro equipment will make up for practice.
Not remembering that having fun is key.
Too nervous.
Forgetting to turn off reverse.

**With others**
Poor track etiquette when losing.
Not asking for help, or not appreciative of help given.
Having too little patience.

**On the bench**
Not learning how to set up the car for the track and driving style.
Finding it hard to fix their vehicle.
Not learning proper engine tuning.
Not learning proper battery care.
Forgetting to charge batteries.
Wiring the electronics wrong.
COMPARISONS

- 2WD vs. 4WD Vehicles
- Brushed vs. Brushless Motors
- Bushings vs. Bearings
- Electric vs. Nitro Vehicle
- Kit vs. Ready-to-Run Vehicle
- Onroad vs. Off-road Vehicle
- Pullstart vs. Non-pullstart Engines
- Racing vs. Bashing
- Graphite vs. Standard Material
- Truck vs. Buggy
- Choosing your rc car

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2WD vs. 4WD Vehicles

2WD
- less expensive
- faster to build
- less complicated

4WD
- more expensive
- better all-around traction

2WD RC10B4.1 (left) and 4WD B44.1 buggies.
Brushed vs. Brushless Motors

**brushed**

*great for budget drivers*

*motor will require maintenance to keep up performance*

**brushless**

*requires little to no maintenance*

*more consistent performance*

#9626 Reedy Radon brushed motor (left), and #917 Reedy brushless motor.
Bushings vs. Bearings

bushing
lower cost
adequate performance
less maintenance

bearing
more expensive
better performance
more maintenance

#3656 bearing (left), and #3907 bushing.
Electric vs. Nitro Vehicle

**electric**
- cleaner
- quieter
- can run indoors
- no messy fuels and oil
- cheaper than nitro
- motors easier to maintain than engines
- easier for beginners

**nitro**
- roar of a real engine
- no charging/discharging of batteries
- no battery matching
- no battery disposal
- messier than electric

Nitro RC8T-RS (left), and electric RC10T4.1 trucks.
Kit vs. Ready-to-Run Vehicle

**kit**
requirements: assembly
requires electronics (motor, speed control, servo, transmitter/receiver)
fun to build
gives the builder a better understanding of the vehicle
can include hopups during build
can paint your own body design

**ready-to-run**
vehicle is preassembled with electronics
great for the beginner
great for person who doesn't have time to build
body comes pre-painted
Onroad vs. Off-road Vehicle

**onroad**

faster speeds possible  
easier to relate to real cars  
more technical and challenging  
quieter

**off-road**

can drive on more surfaces  
takes higher jumps  
see dirt fly  
drive on unpredictable and challenging tracks with jumps, bumps, and wet surfaces

Off-road SC10 truck (left), and onroad TC6 touring car.
Pullstart vs. Non-pullstart Engines

**pullstart**
- start anywhere
- adds more weight

**non-pullstart**
- needs starter box
- less engine weight
- lower centre of gravity

Nitro engines are started by several methods. By pulling the handle of a pull start, which engages a one-way bearing that causes the crankshaft to turn, which drives the piston up and down. Or when one pushes the flywheel against the starter box rubber drive wheel, which spins the flywheel and in turn spins the crankshaft and moves the piston. Or by using a drill drive or onboard starting system which spins the crankshaft, which drives the piston and pulls fuel up towards the heated glow plug.

When the piston cycles, it draws fuel into the combustion chamber, then the piston cycles up and drives the fuel into contact with the heated coil of the glow plug. Then the coil ignites the fuel and causes the engine to run.

Each subsequent cycle of the piston pulls more fuel in and again contacts the coil in the glow plug. The fuel ignites, and reheats the coil, and that continues the process and keeps the engine running, even with the glow igniter removed from the glow plug.

#25354 AE PRO 4.60 pullstart engine (left), #25480 AE Pro 8.0 non-pullstart engine.
Racing vs. Bashing

**racing**
*can test skills against others*
*for those who love the competitive environment*
*make friends around the track*
*win prizes*
*possible sponsorships*
*must pay fees for club membership and/or event*

**bashing**
*make up your own rules*
*run when you want*
*no waiting your turn*
*run anywhere you want*
*make up your own track*
*no fees to pay*
Graphite vs. Standard Material

**graphite**
- lighter
- more rigid
- more responsive
- more expensive
- less impact-resistant

**standard**
- heavier
- more flex
- less responsive
- budget-friendly
- more impact-resistant

Stock plastic part versions are more impact-resistant. Stock plastic parts are more flexible than carbon or graphite, allowing more flex in a crash. Experienced racers prize carbon parts, not for their strength in a crash, but for their "responsiveness:" without the minute delay of flexing, rigid interconnected parts will respond to the driver's control immediately.
Truck vs. Buggy

**truck**
*more stable*
*easier to drive on rougher tracks*

**buggy**
*more agile*
*faster on smoother tracks*

1:18 scale RC18T2 truck (left), and RC18B2 buggy.
Choosing Your R/C Car

Kits and RTRs
Radio-controlled cars come as kits that need to be assembled and as factory-assembled RTRs (Ready-To-Run).

Kits are great for the person who enjoys building and wants to choose the additional components that will go into the car.

RTRs are great for people who want to hit the road fast and who may not have the time or the desire to build a kit.

Electric and Nitro Power
Electric-powered cars are generally easier to run and maintain. They are quiet and comparatively simpler to operate than nitro-powered cars. Electric cars can be run indoors and run times can be around 6-12 minutes depending on the motor and battery. The batteries in an electric car take about 45 minutes to charge and speeds in excess of 30-40 mph are not uncommon.

Nitro-powered cars have a real working internal combustion engine that runs on nitro methane fuel. Nitro cars generally have more moving parts than electric cars. Its inherent engine vibrations require a little more vigilance to maintain. Nitro engines must be tuned according to the day's weather for maximum power and performance!
Nitro cars are very fast. Speed, power, and realism are the main attractions to running nitro!

Onroad and Off-road
Onroad and off-road R/C cars have distinct advantages. Both onroad and off-road cars may be powered by electric or nitro, depending on the model. Four-wheel drive (4WD) and two-wheel drive (2WD) models are available for onroad and off-road, and with working independent suspension systems.

Onroad cars offer the ultimate in speed and handling, but are sensitive to the surfaces on which they run.

Off-road cars are not as fast but can be run on many surfaces that an onroad car can't travel. Not to mention that off-road cars can jump and run in the dirt!
Soldering Tips

**Soldering** is one of those tasks that you either really enjoy or greatly despise; RC maintenance is often like that. Even if you are a nitro guy, soldering comes up more than you’d think, and if you run electric, soldering is a vital necessity. Most beginners—and some veterans—are intimidated by soldering jobs, but if you keep a few important tips in mind, soldering can be easy and will become something you look forward to, instead of cringe over.

**Use a hot iron**

Soldering is a lot easier when you start with a hot iron. Avoid using an iron that is less than 40W. Low wattage irons can put your equipment at risk, because holding the iron in place too long, waiting for the solder to melt, can easily damage your components by overheating.

**Pick the right tip**

There are a number of different soldering iron tips on the market, and they can be used for specific tasks. In general, however, stick with a broad-faced, chisel tip. The extra surface area on the tip will improve the contact surface, allowing for more efficient heat transfer. Unless you are forced to solder in a confined space, avoid fine-tipped irons.

**Wipe the tip often**

Before you start a new job, dampen a sponge and keep it handy. You should wipe the iron tip with the sponge before you tin a new surface, and wipe it off in between steps. Iron tips accumulate flux, oxidation and old solder quickly, and wiping them off allows for more efficient heat transfer.

**Use an iron stand**

Even if you don’t have a complete soldering station, you should at least purchase a coiled-wire iron stand. This gives you a place to keep a hot iron handy and will prevent you from burning your work bench and even yourself. Lying a hot iron on its side is dangerous and makes it difficult to use.

**Score surfaces**

Especially if you are soldering on flat surfaces, it is always useful to rough-up (score) the surface with fine-grip sandpaper. Scoring the surface cleans it and increases surface area—both of which aid in making a strong bond and prevent the solder bead from running.
Pre-tin surfaces
Any time you solder one surface to another, “pre-tin” both surfaces with a small amount of solder. When you move-on to binding the surfaces, the tinned areas will melt together much more easily than if one or both of the surfaces are naked.

Use a soldering jig
Although they may look ridiculous, investing in a soldering jig that uses alligator clips and a magnifying lens is a big help, especially when soldering connectors or wires to each other. The jig works as your third and forth hands—an invaluable resource considering that your first and second hands are full of the iron and solder itself.

Flux helps the flow
Most hobby-grade solder is infused with flux—as substance that improves the flow of melting solder. But for heavy-duty jobs with wide-gauged wires, brushing a little extra flux paste onto the surface before starting can help the melted solder flow and its heat remain homogenous.

Do the tug-test when done
When you are done with a job and the surfaces are sufficiently cooled, give the wire a quick, moderate tug. Solder isn’t bullet-proof, but a good connection should sustain a few pounds of pressure. If your connection breaks with a slight tug, the bond is bad, and it was just a matter of time before it came loose on its own.

…Wrap-up
Soldering is an acquired skill, much like trimming a body or gluing tires. The more you practice an acquired skill, the more tips and tricks you will learn by experience. If you are nervous about soldering, try practicing on an old wire, motor or battery first.