A Beginner’s Guide to Buying and Racing Radio Control (RC) Cars
# Table of Contents

Introduction ................................................. 3
The Basics: Where to Begin if you’re a Beginner .......... 4
    Getting Started ......................................... 7
    Electric RC’s ........................................... 8
    Nitro RC’s ............................................... 10
    Ready to Run ............................................ 19
    Build Your Own ........................................... 20
    Now- Just What Type of RC? ......................... 23
    RC Car Sizes: Standard, Micro or Mini .............. 26
    But How Much? .......................................... 30
Running and Racing Your RC ................................. 31
    Where to Race RC Cars ................................. 33
    How RC Car Racing Works ............................ 35
    On Race Day ............................................. 45
Start Your Engines ........................................... 50
Introduction

Whether you’re nine or ninety, if you love cars and enjoy tinkering with things, you’ll get hours of enjoyment and excitement from RC cars. But there are a lot of things involved in getting to the race, and if you’re new to RC vehicles and RC racing, you’ve probably got a lot of questions.

*A Beginner’s Guide to Buying and Racing Radio Control (RC) Cars* has all the answers to these questions you might have, along with all the information you need to help you make decisions about just what to buy. There’s a lot to choose from when it come to RC’s, and if you’re a newcomer, you may need help choosing off and on-road, electric or nitro remote control cars. The more you know about RC cars, the better you’ll be able to choose the right vehicle for you.

Most people don’t realize just how exciting RC vehicles have become—the hobby quality RC cars made and raced today have can get up to speeds of 60 mph and feature suspension systems that can be tuned just like a real car. Perhaps the most exciting part is the wide variety of types of RC vehicles: you can drive a race car, run a monster truck on dirt tracks or even fly a plane!

Because of this, though, you should consider just what you plan to use your RC for before you decide to buy. On-road or racing cars are made for speed, while off-road vehicles like buggies are mean to take more rugged terrain. Plus, you can choose to buy your RC ready to run out of the box or as a kit to build it yourself. These and many other aspects are important to know before you buy your first RC.

There are RC cars and trucks for every kind of driver: nitro engines for the speed demon, reliable ready to run electric cars for touring, and for the advanced, even planes to fly. The electric cars run quietly and so are better suited to run right in your neighborhood, while the nitro motors give you the real feel of the racetrack.
What you buy should depend on your experience—choose your RC according to your experience to avoid frustration later on.

Something to keep in mind from the outset is that RC vehicles are a high-end hobby, and can get quite expensive. If you plan to race your car, there are additional costs that come with competition. But if you’re prepared for the cost, and if you make your purchases carefully, you’ll be rewarded with an amazing new hobby whose rewards certainly outweigh the cost. These are the decisions that need to be made before you buy:

• Do you want a ready to run car or do you want build your own?
• Do you want an on-road or an off-road RC vehicle?
• Which is right for you- a nitro or an electric RC?
• What type of RC vehicle do you want- and what size?

No matter what you decide, if you keep your own experience and commitment level in mind, you’ll be certain to get the car that’s right for you.

Whether you race them or just tinker with their engines, RC cars are a great hobby for kids of all ages. Though it might seem overwhelming at first, you’ll find that the most you work on your car and the more times you race, the more fun and exciting this hobby can be!

**The Race Is On!**
The Basics: Where to Begin If You’re a Beginner

For a beginner, the sheer amount of brands, varieties and specs of RC vehicles can be overwhelming. There are literally hundreds of types of RC cars and trucks, all with different engines, performance levels and completely customizable details. This puts hobby quality RC cars on a whole different level than toys and replicas, and is what makes them so much more interesting and exciting to play with.

While the actual mechanics of how each RC vehicle works can vary greatly from one to the next, the basic principles remain the same. Once you understand how RC cars work, you’ll have a better idea of just what’s involved, and which one would be right for you.

There are four main parts to an RC vehicle:

- **Transmitter:** This is the control you hold in your hand, usually powered by a 9-volt battery. Using radio frequencies, the transmitter relays the steering and control commands you give it to the receiver.

- **Receiver:** There are two parts to the receiver— an antenna and a circuit board inside the car. The radio frequencies sent by the transmitter are picked up by the receiver and relayed to the various appropriate parts of the vehicle.

- **Motor(s):** RC cars and trucks feature a variety of different types of engines, all with varying degrees of difficulty and output. The motor is often said to be the heart of the RC car and is the most intricate part of building your own RC.

- **Power Source:** Of course power is needed for acceleration, steering and overall engine output. Aside from the 9-volt battery in the transmitter, the power source depends on the type of car: electric cars
run on rechargeable, replaceable battery pack while nitro cars use a fuel mixture similar to what runs a real car.

What does RC Stand For?
If you’re new to RC it can often be confusing just what is meant- radio or remote control cars. Though the two are often used interchangeably, this is incorrect; they are not the same thing at all, since the way they transmit signals is completely different. You can spot a remote control car by the wire connecting the controller to the car itself. Radio control vehicles, on the other hand, use radio frequencies to send messages from the steering controls on the transmitter to the receiver in the car.

There are FCC regulations for all consumer electronics that use radio frequencies, in order to properly allocate the frequencies on the band without too much interference. Usually RC vehicles operate at 27MHz or 49MHz frequencies- the same as your walkie talkie or garage door opener. More advanced RC models like planes require a higher frequency, and are regulated to 72MHz or 75MHz. Always consult your manual to make sure you’re using the correct frequency, and for instructions on how to change frequency.

As long as you’re running your RC by yourself, all you need to do is follow the manufacturer’s instructions on how to choose the correct frequency for your vehicle. But when it comes to race time or even just practicing with friends, you’ll need to make sure every one has their own frequency or the signals will get crossed. If you’re at an official race, the organizers take care of this by providing each racer with a specific frequency and a flag with which to mark your car. In order to avoid crossed signals, you’ll need to make sure when practicing that you follow a similar process.
Getting Started

Just like buying a real car, deciding on an RC car takes research, price comparison and evaluation of your own needs. Though all RC’s have the same components—transmitter, receiver, motor, and power source—they vary widely in size, type, and degree of difficulty.

The first, most important decision to make is whether an electric or a nitro car is right for you. Nitro cars tend to be faster and more powerful, though their engines require a lot of maintenance and tuning. Electric cars, on the other hand, don’t run quite as fast, but they’re easier for beginners and run much quieter.

Secondly, once you’ve decided whether an electric or a nitro car is best for you, you need to choose between a car that is ready to run right out of the box and a kit that you build from scratch. Ready to run cars are easier for beginners anxious to get to the race, though the build your own kits give you a better understanding of how RC’s work since you build it from the insides out. If you’re not sure, keep in mind that most ready to run kits still include full instructions should you ever want to take apart your RC or replace some of its parts.

Next, you need to decide just where you’ll be driving the car. Just like you wouldn’t buy a gas guzzling SUV if you live downtown and have a long commute, you’ll want to make sure you buy the RC that suits the kind of driving you’ll be doing. On-road RC’s are built for speed, so if it’s racing and road running you have in mind, you’ll want to stick to these lighter, faster vehicles. If you want to practice on rugged terrain and with jumps, the more rugged off-road RC’s are probably best for you.

The last thing to choose is the size and type of RC vehicle you’d like. The most popular class of vehicles are 1/10th scale, but there are also larger 1/8 scale and smaller mini and micro sized cars. Plus, the best part is you get to decide just
what kind of RC vehicle you’d like best—there are cars, trucks, buggies, boats, planes and even helicopters to choose from.
Electric RC’s

Electric RC cars and trucks are generally considered best for beginners, since even if you choose to build your own car, they tend to be simpler and easier than nitro cars. They’re also a great deal quieter and run much cleaner, meaning you’re less restricted by where you can run them. In terms of speed and power, they do have a great deal of pickup, though not as much as the nitro cars.

Electric RC cars use rechargeable battery packs to power their motor and steering, which are usually recharged from a 12-volt car battery or wall socket. Batteries run for about 5-10 minutes, depending on the type of engine your car has, and charging the battery usually takes 15-30 minutes. Because of this, it is strongly recommended you have at least two battery packs, to allow for quick replacement of the battery. This means your car can keep running while the other battery is recharging, giving the car more overall running time.

At first glance, getting started with an electric RC car can be much less expensive than a nitro vehicle. But there are other costs to consider as well, such as additional battery packs, a battery charger and other accessories that will add to the cost, making it closer to the price of a nitro car in the long run. Of course, this cost also depends on what kind of car you end up purchasing and what kind of battery pack it requires, as well as how often you run the car and the quality of the batteries you get. Though the initial outlay of cash can be steep, but you’ll want to get quality battery packs and a good charger to save replacing cheaper batteries.

The main reason electric RC’s are said to be easier than nitro is in the amount of maintenance and tuning their engines require. Though the care, maintenance and cost of battery packs is steep, it is still less trouble for the new driver than the air filters, tuning, fueling and various other engine parts that require attention on a nitro car. Instead, careful conditioning and proper storage of your battery
packs will keep your electric RC running smoothly for years. Always consult your manufacturer’s instructions to make sure you’re getting the right battery packs for your car, and that you’re caring for them properly.

Easier and cleaner, electric RC cars and trucks offer the genuine racing experience to the beginner on an easy learning curve. Proper conditioning and maintenance of the car and its battery packs are still easier than the many parts and problems often associated with nitro RC’s. If you’re a beginner, or if you just want to get to the races, an electric RC can offer you the speed and fun you’re after for less work.

Also keep in mind that if you think you’d prefer an electric RC, but still want the experience of building your own car, that you can also purchase electric kits. These include complete instructions to build your own car from scratch, and because their systems are less complex than the nitro cars, they are a little easier to build yourself.

Electric RC Car Motors

In order to prevent unnecessary wear and tear on your electric motor, it is important to always break in your motor, before you drive it for the first time, and every time after you change its brushes. One easy method is to run the vehicle with the wheels off of the ground at about 1/4 power for about 5 minutes. This will slowly get the brushes fully seated to the commutator without causing wear and tear on the engine, and will allow your motor to run at its full potential.

Your electric car will come with instructions on how to change the brushes on the motor, as well guidelines for how often. Remember, if you change the brushes on your motor, be sure to break it in again. How often you replace the brushes—and the motor, for that matter—depends on where and how much you’re running or racing your car. Generally, a motor should be replaced after it has gone through
five or more pairs of brushes, but it will always depend on the individual car, its motor and how well they’re running.
Nitro RC’s

Nitro RC cars are named for the special type of fuel that gives them and their motors such kick. Though not the best choice for beginners, they are the choice if speed and power are what you want from your RC. The great popularity of nitro RC cars and trucks is due not only to their speed, but is also because of the realism they offer—sights (smoke), sounds (tuned pipe) and smells (exhaust) just like the real thing! Over the last several years, the quality of nitro RC's has been greatly improved, making them safer and more reliable than in the past.

There are four defining features of a nitro RC car:

- special nitro fuel
- high horsepower nitro engine
- tuned exhaust pipe
- Realistic, replaceable air filter.

Two different power sources are required for a nitro RC car, starting with battery packs for the transmitter and receiver. The car itself, as the name suggests, really does use gasoline as its fuel: an oil and gasoline mixture, much like a real car. There are two kinds of nitro motors: the 2-stroke and the 4 stroke engine. The more 2-stroke engine is similar to the kind of engine found inside motocross motorcycles, chain saws and weed whackers. This type of engine has no separate oil reservoirs, so the oil that lubricates it is included in the fuel mixture. Conversely, the less popular 4-stroke engine does have an oil reservoir and therefore depends less on a gasoline/oil fuel mixture for lubrication. When running or racing, the car’s fuel tank will need refilling every 5 to 10 minutes.

The engine seen most frequently in nitro RC cars today is a 23cc (cubic centimeter) displacement, 2-stroke engine. Its popularity stems from the fact that it’s among the most powerful engines available for nitro RC cars, putting out approximately 2.5 HP from its 23cc displacement (23cc means that the engine
has about 1.4 cubic inches of engine displacement). This engine would be certainly powerful enough to impress you with its speed.

You'll also need a starter for the engine, of which there are two types:

- a pull-start nitro engine (these use a process like your lawnmower to start)
- Or a non-pull nitro engine (these fire up with a starter box).

The pull start nitro engines cost a little more, but you don't have to buy a starter box and it's less you have to carry around to run your vehicle. Just take it out, pull on the starter, and you're ready to go! Be sure to check your instructions to choose a starter that's right for your car.

To keep your nitro RC running at its best, constant maintenance is necessary. This includes keeping the engine clean and well-tuned, setting it up correctly and using good clean fuel. As well, if you're running your RC off-road, you'll need to make certain it is properly cleaned after you run it, otherwise dirt and grit can slow down or even ruin your engine. Any special procedures particular to your car will be outlined in your owner's manual. Remember that your engine will only run as well as you treat it—so take great care of it, and you'll never have trouble on race day.

**Fuelling Your Nitro RC Car**

Nitro RC cars run on a blended fuel easily available at local hobby shops or online. It is made up of a blend of methyl alcohol (methanol), nitro-methane (nitro), and oil. In order to understand how nitro fuel work, you need to know what each of these three components does for the car:

- Methanol provides the main power to the engine and is the main ingredient in model fuel. It has an ignition point that allows it to be ignited with the kinds of platinum-element glow plugs used in RC engines, and it releases more energy per pound of air than gasoline. Because it's
easy to get, it's not expensive—you'll find model fuel much more reasonably priced than regular gas.

- Nitro-methane is added to assist the idle and acceleration and to enhance power output. Nitro is referred to as a “hot fuel,” and is only used in small amounts in model fuels. It can be explosive if not handled correctly, so take care to read the fuel tips offered here, and always follow the manufacturer’s instructions when filling up your RC.

- Oil is needed as a source of lubricant for all the moving parts in the engine. Here 2-stroke and 4-stroke engines will require different fuels, since 2-stroke engines have no separate oil reservoir, and need oil mixed in with their fuel. There are two types of oil found in model fuels—castor oil and synthetic oil. These can be used by themselves or in a blend, with synthetics being far more common these days. This is mainly because synthetics are cheaper and less gummy than castor oil, which used to be the only used. For some engines, a blend with a large percentage of castor oil may work best, since it is actually a better lubricant at higher temperatures. The synthetics are far less messy, however, and leave less gum on your engine. You’ll be able to choose from blends of synthetic and castor oil that vary in their percentages—try out a few to find one that runs your engine best.

Fuel blends are expressed in percentages based on the amount of each component ingredient used, and of course the one right for you will depend greatly on your car and engine. Most model fuels contain mainly methanol, to which about 20-22% oil and 10-15% nitro is added. Be sure to check your owner’s manual for suggestions and guidelines about which blend is correct. Bear in mind that you may have to try out a couple of different types and blends before you find the one that’s right for the way your engine is tuned. And if your engine isn’t running properly, one of the first things you should do is change the fuel.
Taking proper care of your nitro car’s fuel is extremely important. Not only will it help your car run better and make for less wear on the engine, model fuels are flammable and could be dangerous if not properly stored.

- Nitro fuel should not be stored in unsealed containers. Because methanol mixes easily with water, the container you store it in should be completely air tight. Otherwise, air could get in and evaporation or condensation could occur, ruining the fuel. It will cause your engine to run too hot and be quite damaging to your car’s fuel and exhaust systems.
- Store your fuel at room temperature, and at a constant temperature. Again, you want to avoid any air in your container or in the fuel, which temperature swings can cause to condense. Do not store your model fuel in a room that varies widely from hot to cold or vice versa.
- Keep model fuel away from light. Nitro methane degrades in light, which means you need to store your model fuel in a cool, dark place. If you leave it exposed to sunlight or store it in a brightly lit place, the nitro will degrade completely, as though it hadn’t even been added to the fuel in the first place. This will cause your engine to run very poorly, or cause poor starts or stalling.
- Do not store fuel more than a year. In addition to following all these steps, you must also replace your model fuel frequently. Though proper storage will keep your fuel fresh and running clean, it cannot be stored for years and years. Most manufacturers offer some guarantees on their fuel, but these will not apply if you have stored it for an extended period of time. Most importantly, old fuel can be dangerous, so don’t leave it stored indefinitely.

**Nitro Engines: 2-Stroke**

The 2-stroke is the engine most commonly found in nitro RC’s. “Stroke” is meant by the number of times the piston travels through the engine sleeve in the combustion chamber. 2-stroke engines produce power in one cycle, which is divided into the two “strokes.” The piston has two positions: top dead center
where the cycle begins and ends, and bottom dead center, which is the middle point of the power cycle. Combustion causes increased pressure in the chamber and forces the piston down. As this occurs, the exhaust ports are opened so gases can escape through the manifold. The second stroke begins when the piston reaches bottom dead center and the crankcase and then moves back up the engine sleeve. This causes the pressure to build up again as the piston approaches TDC once again, completing the power cycle. The next stroke occurs as soon as combustion from the glow plug sparks it again.

*Nitro Engines: 4-Stroke*

Less common but more powerful, 4-stroke engines are more like what you'll find under the hood of your real car or your lawnmower. Though similar to a 2-stroke, a 4-stroke engine has 2 full cycles with 2 strokes of the piston each (for a total of 4 strokes). Unlike the simpler glow-plug ignition that a 2-stroke uses, a 4-stroke regulates the air and fuel in the chamber with a geared cam mechanism. Intake timing is how much and when this air/fuel mixture enters the cylinder, while exhaust timing refers to the escape of hot gas from the cylinder.

The easiest way to understand what happens in the 4-stroke power cycle is imagine the 2-stroke cycle simply stretched out to get the most out of each segment of the piston’s movement. The piston begins at TDC and as it travels down the cylinder the geared cam allows fuel and air into the combustion chamber.

The intake valve closes when the piston reaches the bottom of the cylinder, which is then forced back up by the flywheel and drive train components. This compresses the air and fuel, and the pressure causes combustion as the piston reaches the top of the cylinder again, completing what is referred to as the compression stroke.

As the fuel mixture ignites it initiate the so-called combustion-stroke, during which the piston travels back down the cylinder and up again. In the final
“power” stroke the gases are forced out to the exhaust systems—just as in the 2-stroke engine. The cycle is then repeated.

4-stroke engines rely on intake and exhaust valves to complete their power cycle. This is combined with a number of other features—a moving crankshaft, several valve-train components, camshaft, rod and pistons and the geared cam mechanism—to make a more powerful, but more advanced engine. The improved management of fuel and air flow in and out of the engine makes the 4-stroke more efficient, though their advanced mechanisms mean they require meticulous attention and maintenance.

**Nitro Maintenance and Tuning**

So now that you know what’s under the hood of your RC, there are few more tips that will help your car run better:

- Improve your acceleration by proper preparation of your clutch.

  Over time, a glaze can form on the clutch and the clutch bell, which causes the car’s acceleration to noticeably decrease. Scuffing both the clutch shoes and the clutch bell with fine-grit sandpaper or steel wool and a good cleaning with motor-spray will remove this glaze, and prevent the clutch from slipping again the clutch bell.

- Extend the life of your car’s differential by breaking your motor in gently.

  Your car’s differential filled with small, complicated gears that make them both complicated and expensive. This is not a part you want to replace frequently, but carefully breaking in your car before racing or running it full out can greatly extend the differential’s lifespan. To break in your engine, run it at ¼ power a few inches off the ground, and then run some slow, steadily powered figure-8’s. This should set the gears in the differential and you can run it full out without damaging the engine.
• Make sure you keep your header in position.

Your car’s header is attached with a tiny spring, meaning it comes off very easily if you hit something or if your car gets hit by something. If you’re racing, this can be a huge problem to put back on in a hurry, so be sure to attach your header to the engine block more firmly using a small piece of safety wire. Make sure you twist the wire firmly around the header and be sure to cut off any excess.

• Brace your air filter to prevent losing or damaging it.

The small piece of the same safety wire that secures your header should also be used brace your filter. Again, twist it tightly to prevent the filter from becoming loose and remove any excess.

• Protect your pull-start cord from fraying and breaking.

Over time, the cord of a pull-start engine can often become worn and frayed. This can be prevented by covering the edges of the opening- try duct tape or cutting up a small section of fuel tubing. Make sure not to obstruct the opening, but rather create a smoother edge to the opening for the cord get in and out of with out fraying. Never leave your pull start cord pulled all the way out- if this happens, it could get stiff or be impossible to reinsert.

• Follow your manufacturer’s instructions for the best results.

Your car will come with complete instructions and owner’s manual, which you should read carefully for all specifications and any technical issues you have with your RC. Should you run into something you can’t fix or an engine that simply won’t run properly (or at all!), it’s best to consult your local hobby shop for some expert advice and help.
There’s nothing like the realistic roar and smoke of a nitro RC, which are fast powerful enough to make for some exciting races. Bear in mind however, that nitro cars and the engines that power them are very complex, and as such require frequent tuning and meticulous care—much more so than an electric RC. Because of greater complexity, you will also find they tend to be more expensive, as well. What this means to you as a driver is that you need to decide in advance what your budget is and just how experienced you are with engines and RC racing.

If you’re beginner but you still have your heart set on a nitro car, they can be purchased in ready to run versions that will get you in the race as soon as you open the box. Although these still require the same ongoing attention and maintenance, you will be saved the initial trouble of building the car from scratch.

Ready to run nitro cars and trucks are more expensive than the ones you build yourself, but they’re far easier if you’re still unsure about your mechanic ability. Also, since even ready to run kits contain complete instructions on how they go together, you can rest assured you’ll be able repair, maintain and add on to your car for a long time to come.

The main attraction of nitro RC cars is their realism and their power—they’re fast, they roar and they smoke—just like real cars! They can be tuned to reach speeds up to 60 mph and they can race as long as you keep filling the gas tank. Though not recommended for complete newcomers to RC racing, nitro RC’s are by far the most popular.
**Ready to Run**

If you are a complete newcomer to RC cars and racing, this is definitely something you should consider for your first RC vehicle. Ready to run RC’s are a little more expensive, but they require little or no assembly. For younger drivers not quite ready for the building portion of RC’s, or for drivers who simply want to get to the race, there are a wide variety of nitro and electric RC vehicles from which to choose.

Some manufacturers ship their ready to run kits without the receiver installed. If this is the case, they will provide complete instructions on just how to position the circuit board inside the car. This, in addition to slowly breaking in the engine, are the only things ready to run kits ever need before they’re race-able.

Ready to run RC’s usually come with complete instructions, so if you need to tear down your car at any point to replace parts, you can. They simply save you the initial work of putting them together, which for beginners is often overwhelming. If you're completely new to RC vehicles and unsure about your mechanic ability, you'll definitely want to make your first RC something that comes ready to run.
**Build Your Own**

If you don’t mind getting dirty and like to tinker with things, you’ll definitely want to consider building your own RC vehicle. Build your own kits are complex and time consuming, but when it comes time for maintenance and repairs, nothing compares to knowing your RC car from the inside out. Though it is initially more difficult, you’ll find the experience comes in handy down the road when you want to change engines, or change the air filter.

Also, if you want to save money, you’ll definitely want a build your own kit. This is ideal if you’re on a limited budget: by building it yourself you can often get a better model. Other costs, such as batteries and fuel, are the same whether you build your own RC or choose a ready to run kit.

The length of time it takes to build your RC and just how difficult it is depends on the car, the manufacturer and your experience. Build your own kits feature complete, step-by-step, illustrated instructions that walk you through the process. Follow these instructions carefully, and do not expect to build your car in one sitting. Breaks will help you concentrate better and make fewer mistakes—remember even the pros take their time!

Before you begin, consult the following checklist to make sure you’ve got everything you need to get your RC up and running:

- **Your car’s instruction manual**
  Read it over first! Before you begin assembling your RC, you should read through the instructions in order to anticipate difficult steps and head off potential disaster or wasted time later on. Take care not to get ahead or skip steps, as this could result in needing to start over again.

- **A notepad and pencil**
In addition to making important notes in your instruction manual, you will also want to keep track of screw positions and settings. Pay special attention to lefts and rights, fronts and rears. Though these are usually marked on the parts themselves, you may need to make additional notes to make sure you get them right.

- **A well-lit, uncluttered building area**
  This should include a clean dry towel to prevent parts from bouncing and rolling, it will protect your bench (or the kitchen table), and it will absorb any liquid you spill. Be careful not to set up your “pit” in a place that could be disturbed, such as in reach of younger brothers and sisters. Cover your work with a cloth or towel when you’re not there to prevent any lost pieces. Finally, make sure there is ample light—a desk lamp will help a great deal—for you to see the inside of your car and its tiny parts.

- **Hardware trays**
  It is recommended to keep your small parts in a container of some sort, use take-out container lids, fishing-tackle boxes, and muffin tins are all suggestions to keep things organized. When you’re building, be sure to keep everything sorted and separate.

- **A small but select set of tools.**
  You’ll need a basic but good set of tools, including:
  - Screwdriver: Nos. 1 and 2 Phillips-head drivers, a 1¼4-inch flat-blade screwdriver and a set of jeweler’s screwdrivers are considered sufficient.
  - Pliers: Pairs of slip-joint and needle-nose pliers are necessary, and nitro models may require channel-lock pliers for holding flywheels.
  - Flush cutters: These are best for the fuel lines and other parts that require a close, clean cut.
  - Hobby knife, no. 11 blades: Blades should be replaced often and the knife should always be used carefully and with supervision for younger drivers.

- **Soap, extra fuel tubing**
A bar of soap can be used as a clean, dry lubricant for pieces that fit tightly or which fit through tight spots. Extra fuel tubing is useful for a number of things, like on the end of your screw driver to hold the screw in place while you get it into position.

- Patience
  More than anything, this is the biggest challenge; especially if this is your first build your own RC car. Following the illustrations closely and making sure you don’t rush or skip steps is the best way to ensure success. Above all, be patient—building an RC car from the ground up is tricky time-consuming business that will only result in error and frustration if you rush it.

If you choose to build your own RC car or truck, it can be very rewarding, but bear in mind that it is quite difficult. Though electric RC cars are slightly easier to build than their nitro counterparts, it is still strongly recommended that new drivers gain experience running and maintaining a ready to run RC before they attempt to build one from scratch.
Now- Just What Type of RC?

So you’ve decided you like the simplicity of the electric RC’s, or the realistic sights and sounds of the nitro class. Now the next decision is just what type of RC vehicle is best for you. Choose according to what you plan to do with your RC, and your level of experience.

**On-Road**

On-road cars are the most popular type of RC cars. The standard for on-road cars is 1/10 scale cars, though 1/8th scale RC’s are not uncommon. The recent increase in micro and mini RC’s means there are hobby quality on-road cars made as small as 1/18 scale.

Both nitro and electric RC’s come in on-road versions, and are available ready to run or as build your own kits. Built and geared for speed, an on-road RC should be your choice if you plan to race your car. Touring cars need a smooth, paved surface on which to run though even running up and down the street you’ll be amazed by their speed.

**Off-Road**

If you want to be able to run your RC just about anywhere, you’ll definitely need the rugged construction of an off-road vehicle. These sturdy cars and trucks will handle jumps, uneven terrain, and hills, even sand. They come in two- or four-wheel drive versions, and are perfectly capable of driving in your back yard, a vacant lot—just about anywhere.

Like their on-road counterparts, off-road RC’s can be purchased ready to run or as build your own kits. There is a wide variety of both electric and nitro cars and trucks from which to choose. Off-road RC’s, though not the fastest cars available, are durable, rugged and can be run practically anywhere.
**Cars**
The touring and racing cars are perhaps the most common type of RC's. The wide variety of styles and cars in both electric and nitro kits makes them an easy choice for the beginner, and the higher end build your own models can be great for advanced hobbyists.

Lightweight and fast, these are the ideal racers.

**Trucks**
If off-roading and rugged, sturdy vehicles were what you had in mind, then a truck is likely to be the RC for you. Both electric and nitro monster trucks are fast, tough RC's for running off-road courses. The ready to run RC trucks would be suitable for beginners.

**Buggies**
These durable little RC's are powerful enough to handle on- and off-road terrains with speeds up to 60 mph. Usually only available in nitro kits, they are a lot to handle for a beginner.

**Airplanes**
RC flyers are one of the most popular and exciting types of all RC vehicles. Electric and ready to run versions are the most accessible for the beginner, though of course there are nitro and build your own versions to allow for growth and customization.

RC airplanes are extremely light weight, and can be made to fly and very low speeds. The electric versions are also quiet enough to be run in a school yard. This makes them a great option for someone new to the RC scene, though there are fewer competitions for this type of RC vehicle than the trucks and racing cars.
**Helicopters**
Though a little too complicated the beginner, RC helicopters are exciting and challenging to fly. They are usually run on gas, and can be great fun for the experienced flyer.

**Boats and Watercraft**
Available in both electric and nitro powered versions, RC boats are not usually ready to run. The need for waterproofing adds an additional level of difficulty, and though they are not recommended for beginners, those familiar with the workings of RC vehicles will find boats and other watercraft the most fun of all to build and race.
RC Car Sizes: Standard, Micro or Mini

Next, now what you know what type of RC you want, you need to decide what scale it will be in. Hobby quality RC cars come in a few different sizes: as small as 1/18 scale and as large as 1/8 scale. Nitro and electric cars are usually made at the industry standard 1/10 scale. This can be confusing for a newcomer, but if you’re in any doubt about the size of the RC you’re interested, just as at a local hobby shop and make sure it’s what you want before you buy.

To give you an idea of the amount of variety available when it comes to scale, this is a brief rundown of the sizes of nitro RC’s on the market today, as given by a prominent web retailer (http://www.shipshewanatoys.com):

- **1/10 scale touring cars:**
  Engine powered touring cars can be extremely fast, reaching speeds up to 55mph. As with electric touring cars, nitro vehicles feature 4WD and realistic body lines, and are only meant for on-road use.

- **1/10 scale stadium trucks:**
  Nitro stadium trucks are identical to electric stadium trucks, except for the engine power. They’re suitable for racing or recreation, on or off road, averaging a peak speed of about 30mph.

- **1/8 scale monster trucks:**
  These monsters are equipped with major horsepower. Consequently, they can travel on-road and off-road up to 40 mph, tearing through and over anything in its path!

- **1/8 scale buggies:**
  Similar to other 1/8 scale vehicles, they have the power to traverse rough terrain on-road and off-road, are very durable, and travel up to 60mph.

- **1/8 scale on-road cars:**
  The revolution of RC performance, these vehicles reach speeds of close to 80mph, coming standard with shifting 2- or 3-speed transmission.
Intended for experienced enthusiasts, their foam tires provide tremendous grip, and they are suitable for smooth on-road courses only.

**RC Micro and Mini Cars**

The most recent development in RC in the last decade or so has been the introduction of micro and mini-sized RC from Japan and throughout Asia. These tiny but powerful little RC's offer the same racing excitement as the big boys for only a fraction of the cost.

Only recently introduced to the North American market from Asia by companies like Radio Shack, micro RC's offer an extremely low price-point for out-of-the-box racing fun. Priced at $50 or less, these are a great choice for a driver not ready for a full-sized RC or a newcomer to RC racing who wants to see what all the fuss is about.

Measuring only 2 ½” inches long, micro RC's feature the same kind of motor that makes your cell phone vibrate. Best of all, these little engines are interchangeable, so you can tweak your micro RC with a different motor for more speed. Specialty tires and hubcaps can be added to customize the look of your micro RC, as well as enhancements to the torsion and steering controls.

Mini and micro RC’s are always ready to run, right out of the box. Your little RC will come with the following:

- rubber non-stick tires
- micro scale working engine
- realistic, running chassis
- receiver and circuit board
- transmitter
- customizable body
The greatest advantage these little cars offer is their versatility. Unlike the noisy, smoky nitro cars, or the load hum of an electric race, micro RC’s are clean and quiet. They can be run indoors or out, even in your garage or basement. This means you don’t have to wait until the next race to run your car—these are small enough you can drive them anywhere.

Mini RC’s, like their standard-sized electric cousins, run on rechargeable battery packs. When your car is out of juice, it usually pops into the controller itself, which is then plugged into the wall. With your transmitter doubling as your charger, your car will be ready to race again in under a minute. If you want to race longer, the fast recharge time for these tiny RC’s is a great selling point.

Overall, though they are not as customizable and intricate as the larger 1/10 and 1/8 scale cars and trucks, micro and mini RC’s have the same acceleration, controls and feel. Their tiny size makes it possible to run them anywhere from your garage to the kitchen floor so you can race any time you like—down the hall or up the street!

For about a quarter of the cost of a regular RC, you get a car with responsive controls, tunable suspension and customizable exterior. But, like their larger counterparts, you can still get the kind of car you’re after: mini and micro versions of all the most popular vehicles are available. They’re the ideal option if you’re on a limited budget, but are still eager to get to the race.
But How Much?

In comparison with some other hobbies, RC cars can get somewhat expensive, depending on your level of commitment to it. Even if you build your own RC car or truck and save the cost of the ready to run kits, additional parts and fuel and battery packs can add up, not to mention the entry fees for races if you plan to compete. But beware of the widely-available cheaper versions which claim to be good quality RC vehicles. These break easily and cannot be repaired like hobby-quality RC’s, which can be maintained to run smoothly for years and fixed properly if anything ever goes wrong. Expect to spend at least $200.00 per vehicle initially, with a more complete beginner setup costing about $400.
Running and Racing Your RC

Proper maintenance of your RC vehicle is the key to achieving the best possible results. While the car may still perform while not in its best form, you can be assured that keeping it up will make certain even better results. By keeping your car clean, well-tuned and properly maintained, you can be sure you’ll get the top performance out of your RC.

Before you head out to the track, there are a few suggestions you should follow to make sure everything goes smoothly on race day:

- Mark your initials on all your car’s parts.
  It’s frenetic and exciting in the pit, which means in the haste of repair, refueling and racing, it can be very difficult to tell which parts belong to which racer. This difficulty is compounded by the fact that a lot of parts from different makes and models look remarkably similar. Avoid confusion by marking all your car’s parts with your initials and take care to keep track of those parts on race day.

- Mark your initials on all your tools and equipment.
  Use a marker to write your initials on all your tools and equipment to avoid mix ups and losses. Over time you’ll spend a great deal of time and energy completing the set of tools and gear you need for your car—so be careful with your equipment. Marking your name on your tools makes it more likely you’ll get them back if you lose them, and prevents confusion in the event that several racers are using the same tools.

- If you have a nitro RC—always use fresh fuel and bring plenty extra.
  Model fuel should not be stored for extended periods of time since the nitro methane it contains can degrade over time if exposed to air or water. Old fuel should be disposed of properly, and you should always race with fresh, clean fuel. Make sure you use a brand you are familiar with in
competition: a race is not the place to test a new type of fuel. You’ll want to know how much running time the fuel you’re using produces and bring plenty extra to re-fill your car’s tank.

• If you have an electric RC—your batteries are the most important thing on race day.
  How your electric car does on race day depends entirely on your battery packs. Be sure to follow your manufacturer’s instructions on how to properly condition your batteries to extend their life and get maximum performance from them. When you’re racing, you’ll want to have several battery packs so that when one runs out, you don’t have to wait to recharge it. You need to know your car’s running time per battery pack in advance so you can count on how many battery packs you need to bring, and whether your charger can charge them up quickly enough between races.

• Develop a race-day checklist for your car’s systems and your tools.
  Well-prepared racers go through the same list of checks on their car and all its systems every time they race. Develop this list at home when you prepare your car for race day and include important reminders like securing fuel lines, checking gaskets, testing the glow plug, making sure the gas tank isn’t rattling. Test runs will help you know what to look for, and what to double check on the day of the race. Remember to add any equipment you need to fix these day to day problems to your tool box on race day, just in case you need them.

• Be respectful of other racers in the pit and on the track.
  There is nothing like the roar of an RC race—but excitement and exhilaration are no excuse for poor sportsmanship. Always be respectful of other racers and their equipment. In the event of an accident, remove your car from the track as quickly as possible. If you have complaints or disputes they should be brought to the race officials immediately and all judges decisions should be accepted as final. In the pit be courteous to other racers by keeping track of all your tools and equipment. Labeling your gear and keeping track of all of your belongings while you’re racing
and marshaling will ensure that there are no problems with other drivers and their equipment. Remember space is limited!
Where to Race RC Cars

RC cars generally need a paved surface to run on, so open parking lots of schools, churches, and office areas provide plenty of space to play on. If you're racing or practicing on someone else's property, it is extremely important to ask their permission first. And, if there are younger children out running their cars or watching, make sure there is proper supervision.

With RC trucks, the type of surface doesn't matter as much, since they can be driven on pavement, dirt, gravel and all types of ground. Even long grass can be tackled- though only for short periods of time. Open fields, vacant lots, and construction yards are perfect places to run or race, as long as it's safe and you have permission.

Though many people enjoy simply running their car by themselves up the street, this can be made infinitely more fun by practicing and racing with others. Setting up pylons easily turns an empty parking lot into a racetrack, while a vacant lot can be host to a tug-of-war.

If you prefer off-roading or a more rugged challenge for your vehicle, you can construct your own jumps in a field, yard or lot. Scraps of wood or cardboard can be used to make ramps and jumps or challenging obstacle courses. Off-road RC vehicles have a lot of power, but don't overestimate their torque when you construct your track. Make sure that if there are younger children playing you have proper supervision.

But if you prefer official races, they're held often enough that you can be racing every few months. For some hobbyists there's nothing else that compares to RC car racing. Most race areas are on-road (paved) tracks, usually in unused parking lots. Other locations are off-road, featuring all-dirt surfaces with lanes separated by boards or plastic pipe. Most metropolitan areas have a race track nearby. To find the racetrack nearest you, start with the internet and the yellow pages.
**RC Truck Pull**

One of the most fun things you can do with RC trucks especially is to participate in a truck pull. For the best performance possible, it’s best to become part of a team, not only for the social factor, but also because team associated RC trucks are known for their durability, power, race-ability and reliability as they combine experience, knowledge and parts to make the best possible vehicles out there.

If you’re looking to participate in an RC truck pull, you should begin looking into a truck that runs on a nitro engine, as they are by far the most powerful and long-running. Electric versions of truck-pull calibre trucks do exist, but for those interested in serious competition, nitro engines provide the right amount of power. Since nitro gas powered trucks have been on the market for over 15 years, they have had ample time for perfection and adaptation to the unique requirements of a truck pull.

If you become a part of a team, the odds are that you will be using kits to design your vehicle. This takes patience, especially for beginners, but with enough practice, it becomes easy to alter and add to your RC truck. Once your vehicle is complete, don’t for a moment think that it is finished, as you will be continuously upgrading and updating your truck to keep it competitive with the other RC truck pull participants; adding new parts all the time to an older kit can give it a new life at a much lower cost.

RC truck pulls can be extremely challenging. They come in different levels, terrains and courses, depending on the organization that has assembled the track. They are usually organized by weight that can be pulled and maneuverability while pulling, and categorized between different types of engines, i.e. gas, electric and nitro. When there is no difference made between engine types, tend to win, but the outcome of any race is always depends as much
on the car as it does on the driver. as a little extra know-how can sometimes make all the difference.
How RC Car Racing Works

Governing Bodies: ROAR
(http://www.roarracing.com/core.htm)
ROAR (Remotely Operated Auto Racers) has been the official North American sanctioning body for racing RC cars since 1967. ROAR is responsible for producing and maintaining fair rules and for organizing race teams that represent the US and Canada at the International Federation of Model Car Racing (IFMAR) World Championships.

Made up of 19 regions in the US and Canada and their representatives, ROAR has been making the rules for RC car racing for more than 35 years. These rules are designed to promote fair competition and define the equipment allowed in ROAR races.

Though ROAR does not run races, it does sanction races from the club level to the National Championships. It is important to note that if international racing is your interest, ROAR is the only organization authorized to qualify and send drivers to the IFMAR World Championships.

The strength of ROAR lies in local clubs spread throughout all 19 regions. Clubs pay $35 to be sanctioned and to be covered by the member accident and liability insurance. Weekly competition in the local clubs provides racers with ample time to practice, and prepares competitors for the State, Region and National Championships.

Individual annual membership in ROAR is $30, which includes a copy of the rule book and the ability to vote on important rule changes, as well as insurance coverage for ROAR sanctioned events.
ROAR also provides extremely detailed specifications for engines—if you’re planning on racing seriously, it is best to build your RC along these guidelines, to prevent having to make difficult changes later. Size outlines for both nitro and electric cars and all the regulations governing official races are also given.

COMPETITION RULES

5.1 GENERAL COMPETITION RULES

5.1.1 ROAR aims to promote family-oriented racing. Unruly or unsportsmanlike conduct will therefore not be tolerated. Individuals judged by the Designated ROAR Official or Race Director to be in violation of the spirit of this rule will be disqualified and requested to leave the race area.

5.1.2 For Level 3 and 4 sanctioned events, any deviation from ROAR rules must have been applied for in writing and approved by the ROAR Executive Committee (by signature of the Competition Director) in advance of the event, and must be prominent on entry forms and all advertisements. Deviations at Level 1 and 2 events must be prominent on all entry forms and advertisements but do not need written ROAR Executive Committee approval.

5.1.3 The race lengths specified for each class are mandatory for Level 3 and 4 events. At lower level races, race length is optional, but must be announced in advance.

5.1.4 Race lengths are:

<table>
<thead>
<tr>
<th>Scale/Class</th>
<th>Qualifiers</th>
<th>A Main Race Length</th>
<th>Other Mains Race Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/12 Electric On-road</td>
<td>8 minutes</td>
<td>8 minutes</td>
<td>8 minutes</td>
</tr>
<tr>
<td>1/12 Electric Oval</td>
<td>4 minutes</td>
<td>4 minutes</td>
<td>4 minutes</td>
</tr>
<tr>
<td>1/10 Electric Oval</td>
<td>5 minutes</td>
<td>5 minutes</td>
<td>5 minutes</td>
</tr>
<tr>
<td>1/10 Electric Off-road</td>
<td>5 minutes</td>
<td>5 minutes</td>
<td>5 minutes</td>
</tr>
<tr>
<td>1/10 Gas On-road</td>
<td>5 minutes</td>
<td>45-60 minutes</td>
<td>15-30 minutes</td>
</tr>
<tr>
<td>1/10 Gas Off-road</td>
<td>5 minutes</td>
<td>45-60 minutes</td>
<td>15-30 minutes</td>
</tr>
<tr>
<td>1/8 Gas On-road</td>
<td>5 minutes</td>
<td>45-60 minutes</td>
<td>15-30 minutes</td>
</tr>
<tr>
<td>1/8 Gas Off-road</td>
<td>5 minutes</td>
<td>45-60 minutes</td>
<td>15-30 minutes</td>
</tr>
<tr>
<td>1/5 Gas On-road</td>
<td>5-10 minutes</td>
<td>30 minutes</td>
<td>15-30 minutes</td>
</tr>
</tbody>
</table>

5.2 GENERAL VEHICLE RULES
5.2.1 All vehicles entered for a ROAR-sanctioned event must comply with the dimensional requirements contained in this rulebook for the relevant class.

5.2.2 Vehicle batteries must be securely mounted. ROAR recommends limiting the radio receiver battery pack in all vehicles to 6 volts. This is usually accomplished by the use of five (5) NiCad or NiMh cells or four alkaline cells. Slightly higher voltages (Maximum 6 NiCad/NiMh cells) may be used for direct receiver power but this can result in an increased risk of receiver failure by over voltage. Receiver and servo power for electric vehicles may come from an electronic speed controller equipped with Battery Elimination Circuitry (BEC) or from a separate battery pack used for this purpose only. (See rule 1.5.18)

5.2.3 The use of traction control sensing devices, active suspension devices, and steering control devices aided by gyroscopes or accelerometers (G-force sensors) of any kind is strictly prohibited. Sensors may be used for the purpose of passive data recording but not for adjusting the performance of the vehicle while in motion.

5.2.4 No roll-over antennas are allowed unless noted in the class rules. Roll-over antennas are defined as any vertical antenna strong or stiff enough to support the weight of the vehicle when resting on the tip of the antenna and one side of the vehicle.

5.2.5 Multiple speed transmissions are not allowed unless noted in the class rules.

5.2.6 Any material used to add weight to a vehicle in order to comply with the minimum weight requirements for the class must be securely attached to the vehicle chassis. If such ballast falls off the vehicle during a race for any reason, and the vehicle is under weight at the post race technical inspection, the vehicle will be disqualified for that run. For all fuel classes, chassis weights must be securely mounted with solid mechanical fasteners such as bolts or screws.

5.2.7 No hazardous bumpers, nerf bars, chassis extensions, or other objects protruding from the vehicle are allowed.

5.3 CLASSES

5.3.1 Vehicle class definitions:
5.3.1.1 For the purpose of establishing specific rules, vehicles used in ROAR competition are divided into various classes according to the following criteria:
• Scale
• Drive configuration
• Type of power
• Track surface and configuration
• Body style

5.3.1.2 Scale Definition:
• 1/12 scale
• 1/10 scale
• 1/8 scale
• 1/5 scale

5.3.1.3 Drive configurations definition:
• Two wheel drive (2WD), where power is transmitted to the rear wheels only, and
• Four wheel drive (4WD), where power transmitted to all four wheels. Vehicles that are
  driven by the front wheels only are classified as four wheel drive.

5.3.1.4 Type of power: Vehicles may be powered by electric motors or by fuel engines. Electric
motors are further classified as stock or modified. Fuel engines are classified primarily by
fuel type, and then by engine displacement.

5.3.1.5 Track surface and configuration: Authorized surfaces include carpet, dirt, and pavement.
Configurations include ovals and road courses. Surface and configuration can be
combined in many ways to provide a variety of racing venues.

5.3.1.6 Body style: A wide variety of bodies are authorized for use in ROAR competition. These
are covered in detail in the Body Rules section.

5.3.1.7 ROAR reserves the right to specify what classes of drive, power, and body style can be
used on the various track surfaces and configurations.

5.3.1.8 Provisional or Demonstration classes are those being raced where the level of interest or
participation does not warrant National Championship status. Rules may be provided for
these classes, and they may be run at all levels, unless specifically prohibited. Cost
controlled classes are authorized and encouraged. See Cost Control Rules.

5.3.2 Driver categories:
5.3.2.1 Drivers may also be categorized according to various criteria. Juniors and Masters categories are encouraged, as well as Novice and Beginner’s categories. Any driver category may be linked with any vehicle class. Drivers not qualifying for these categories compete in an open category.

5.3.2.2 When Juniors and Masters categories are run, the following rules will apply:
- Juniors must be 15 years old or younger on the final day of the event
- Masters must be at least 40 years old on the first day of qualifying.
- At level 4 events, proof of age is required for entry in the Juniors or Masters categories. Proof of age for Juniors is provided by means of a Birth Certificate, and for Masters by means of a government-issued ID or Driver’s License.
- At Level 4 events, Juniors and Masters may enter other classes in the open category, but not in the same vehicle type.

5.3.2.3 When Novice or Beginner categories are run, the following rules will apply:
- The definitions used to determine Beginner and Novice must be clearly stated on the event entry form or otherwise publicized before the event.
- Beginner and Novice categories may be offered at events up to and including level 3 only.
- Drivers entered in a novice or beginner category may not enter other classes in other categories, but may enter multiple classes within their category, if available.

5.4 TECHNICAL INSPECTION

5.4.1 Each vehicle should satisfactorily pass a pre-event technical inspection before being allowed to compete.

5.4.2 All rules must be strictly adhered to. No vehicle will be allowed to race until it has been cleared to do so by the Technical Director. Any violation must be corrected before the vehicle is raced.

5.4.3 All vehicles must pass technical inspection prior to or after every race, or both. For A Mains both pre and post race inspections are required. Any vehicle found to be illegal during a pre-race inspection will not be allowed to race in that condition. Vehicles found to be illegal during a post-race inspection will be disqualified from that race.

5.4.4 Technical inspections include but are not limited to checking the vehicles height, length,
width, and minimum weight (with personal or handout transponder installed).

5.4.5 Except in the case of 2.4GHz DSM/DSS systems, the technical inspectors will ensure that the driver’s radio is on the proper frequency.

5.4.6 During width measurements, vehicles must roll freely in the tech box at ride height. This will be verified by lifting the rear of the box to 45 degrees above horizontal, and the car must roll forward under its own weight.

5.4.7 All dimensions or other specifications quoted as “maximum” include all manufacturing or other tolerances. No further tolerance is allowed above any maximum specification.

5.4.8 Bodies must remain as originally approved. Flaring front fenders or making any other aerodynamic modification is not permitted.

5.4.9 The minimum vehicle weights listed in the Class specifications include transponders. No distinction is made between personal and “handout” transponders.

5.4.10 All vehicles must have the correct numbers.

5.4.11 The Designated ROAR Official, Technical Inspectors and the Race Director have the right to subject any vehicle to mechanical or visual inspection or impound at any time. It is the driver’s responsibility to tear down a vehicle for inspection if required to do so.

5.4.12 The Race Director has the right to limit admission to any area in which inspections are being made.

5.4.13 During post race inspection, the effects of normal wear and race distortion or damage should be taken into consideration. For post-race inspections, a “cooling-off” period of no more than 10 minutes may be allowed to eliminate any temperature effects on sizes, capacities, etc.

*Governing Bodies: NORRCA*
(http://www.norrca.com)

Also, if you live in the US, another governing body for RC racing is the National Organization for Racing Radio Control Autos (NORRCA). Established in 1987,
NORRCA's purpose is to help clubs and tracks promote their existing facilities and develop current and future endeavors in order to better meet the needs of the racers. NORRCA is a full-time organization whose paid officials help organize, plan and run events, as well as provide a host of services to all sanctioned tracks and clubs.

Membership in NORRCA costs $25.00 and includes the official rule book and access to all NORRCA-sanctioned events. Additional family members can join for $5.00 each. Racers not wishing to become members may also enter a race by paying a "per event" fee, but NORRCA requires a full year's membership in order to participate in any National Event. Only members can vote on rule changes.

NORRCA lays out the rules of qualifying and code of sportsmanship, and it is also worth having a close look at the General Technical Rules, to get an idea of the strict and specific guidelines used at an official race. If you are going to compete, it is very important to know the requirements of the races you are entering. Also included here are the General Rules NORRCA uses to govern their races.

**QUALIFYING**

**GR.3** A driver can qualify himself or herself with any car as long as it meets Class requirements. Each car used for qualifying must be technically inspected or "teched" by a race official prior to each Heat/Main. If for any reason, a driver fails to make a lap in a qualifying heat, and if they choose to run their Main, they must use their own vehicle. The driver must be entered or pre-entered prior to the event before the first qualifier begins to be allowed to run any Main. For the Main events, a driver must race the car that has been teched and qualified with. If a driver destroys their car during qualifying, NORRCA reserves the right to allow the racer to use another driver car. **UNDER NO CIRCUMSTANCES** can one driver qualify or run a Main for another driver.

**GR.4** For all Main events, drivers have the right to choose their position on the Drivers Stand, based on their qualifying position. All cars will "grid" by their qualifying position in all Mains.

**GR.5** NORRCA reserves the right to call the race "official" and award trophies as per a completed
Qualifier if weather conditions, acts of God, etc. prohibit or hamper the efforts to complete the scheduled event. All races are considered official after one round of qualifying has been completed. If a second round of qualifying has begun, and the race must be called, all classes that have completed their qualifying will have the second round included for awards/points. Only complete rounds count.

SPORTSMANSHIP

GR.6 A “Black Flag” (which means a driver must immediately remove his/her car from the race) will be given to the driver whose driving or operation constitutes a hazard to other cars in the race. Ignoring the Black Flag is cause for disqualification.

GR.7 All cars must cross the finish line under their own power. All cars must finish the race intact. All cars must have its body and all wheels and tires still attached to the car. Any car losing a tire or tires or body must be removed from the track.

GR.8 Unsportsmanlike driving and behavior (i.e., intentional hitting of other cars, short coursing, corner cutting) is not allowed. A person threatening to intentionally hit another car is not allowed. Anyone doing so will be disqualified at the judgment of the Race Director. Abusive language by a driver to a turn marshal or any Official will not be tolerated and immediate disqualification will result.

GR.9 Any driver who deliberately takes out another driver and/or threatens another driver will be suspended and placed on probation for 6 months. If, during that 6 month probation period, the offending driver has any contact with the driver that was threatened and this conduct was viewed by an Official to be deliberate, the offending driver will be suspended for 6 months from all forms of NORRCA events.

GR.10 Jumped starts before the tone will result in a restart of the race. The driver that caused the restart will be placed at the rear of the field. The driver that caused the restart will be disqualified if he causes a second restart.

GR.10.1 All Tracks must have a clearly marked Start-Finish line. Scoring area should be at or near finish line.

GENERAL TECHNICAL RULES: ALL CLASSES
GT.1 TECH INSPECTION: Will be explained at each event prior to the start of the first Qualifier. The Race Director or Tech Official may also inspect cars immediately after the race.

GT.2 TECHNICAL RESPONSIBILITY: All tech rules must be strictly adhered to. No cars will be allowed to race if they are found to be in violation of the rules. Any violation must be corrected BEFORE the car is raced. It is the responsibility of the racer to insure the car meets all technical requirements. If a car passes through “Tech Inspection” and a technical illegality is overlooked, the car is STILL ILLEGAL.

GT.3 1st-2nd-3rd PLACE CARS: in all classes may be etched immediately after their respective Mains. At National, Divisional or State events, the top 5 cars in the “A” Main must return for technical re-inspection. If the driver or their designated appointee takes the car back to the pit area before returning to tech inspection, the car will be disqualified. These cars will be held in Tech for a period of 15 minutes following its Main event.

GT.4 BUMPERS/GEAR COVERS: Non-shock absorbing front bumpers are not allowed. No metal front bumpers. Most stock bumpers are acceptable as well as many aftermarket bumpers. All Off Road cars and Oval Sprint cars require a bumper. All Off Road and Dirt Oval Sportsman Gear classes require a gear cover. No sharp or protruding objects allowed on cars. This includes nerf bars. See specific Class rules.

GT.5 BODIES: All cars must have a readily removable body. A car cannot compete unless its body is properly secured. If a body falls off, the car must pull off the track and have the body refastened before resuming the race. No car shall be counted or allowed to cross the finish line without a body secured. It is the driver’s responsibility to have a NORRCA legal body on his/her car prior to inspection. No body may be reformed from its original configuration that was previously submitted and approved. A complete approved body list is available from NORRCA upon request.

GT.6 WINDOWS: All vehicle windows must be “Transparent”. Windows may be tinted on the upper portion of the windshield (Sun shield).

GT.7 WINGS AND SPOILERS: A spoiler is an air deflector mounted on the front or rear deck of a race vehicle to reduce the tendency to lift off the road at high speeds. A wing is an airfoil used for down force, usually mounted on the front or rear deck of the vehicle. Wings cannot be made of metal material. See Class rules for Wing/Spoiler specifications.

GT.8 COMPOUNDS: Tire cleaners or traction compounds applied to vehicle tires that can coat the track surface are not allowed. Use of tire cleaners or traction compounds is at the discretion of
the Race Organizer.

GT.9 ROLLOVER ANTENNA: If the rollover antenna is made of wire, it should be made from .078 or smaller wire. Fiberglass or Graphite may be used. The rollover must end with a closed loop or have a blunt tip for safety reasons. Rollover antennas are not legal in oval racing.

GT.10 APPEARANCE REQUIREMENTS: The sport of R/C competition is racing between realistic models of racing automobiles. All cars must be painted. Absolutely no clear bodies will be permitted.

GT.11 MISCELLANEOUS: No portion of the chassis, nerf bars, bumpers, wheels or tires should extend beyond the body. Exception: When Indy Formula 1 or Modified classes of bodies are used. Servos, receivers, batteries and servo savers are not allowed to protrude through the original body shell.

GT.12 BODY DETAILS: Wheel wells must be cut out if the original car ran that way. When entered in a race, the body must be neatly finished and complete. Grille and air vents may be cut to original size. Bodies may not be modified in any way that changes the NORRCA-approved shape. Bodies may not be mounted so as to change the NORRCA-approved shape.

GT.13 WHEEL NUT OR AXLES: No portion of the axle or wheel nuts may protrude beyond the wheels.

GT.14 MOTOR CLAIMING RULE: A motor claiming rule for STOCK CLASS ONLY is in effect at all NORRCA State, Divisional and National Events. The motor used in 1st-2nd-3rd place cars in the “A” Mains will be available to be purchased by the first racer to claim the motor after the event has finished. Only the driver in the same Class and Main can claim a motor. The owner of the motor will be paid $50.00 in cash and must sell his/her motor. After a motor has been claimed the race is final. A racer that refuses to sell his/her motor will be disqualified from the event and all NORRCA events for one year.

GT.15 MOTOR TEAR DOWN: The motors used in 1st-2nd-3rd place cars in all Classes may be torn down to be certain of legality. Other motors may be torn down at the discretion of the Race Director or Tech Official. Any motor found to be illegal will not be replaced and the driver will be disqualified. The drivers assume the risk of having their motors torn down and therefore motors will not be replaced by NORRCA.

GT.16 STOCK MOTOR PROTEST: Stock motors can be protested by filling out a Motor Protest
Form and submitting it with $50.00 in cash, within 10 minutes of the heat that the motor in question raced. A racer can only file the protest from the Class in which the motor was raced. If the motor is found to be illegal, the protestor will receive back the $50.00 and the racer using the illegal motor will be disqualified. If the motor is found to be legal, the protestor will forfeit the $50.00 to the owner of the protested motor.

GT.17 DRIVE TRAIN: All two-wheel drive vehicles must be rear wheel driven. Front wheel drive cars are only allowed in 1/10th Off Road racing and Touring Class. 2WD cars cannot compete in a 4WD class and 4WD cars cannot compete in a 2WD class, with the exception of NOVICE CLASS. Front Wheel Drive Off Road cars cannot compete with Rear Wheel Drive cars. Front Wheel Drive cars will compete under the same rules as 2WD Rear Driven cars, with the exception of the drive train being in the front. Multiple speed transmissions are not allowed in any class.

GT.18 WEIGHT: The weights are outlined in each Scale and Class. Weight is measured prior to the placement of the transponder. All weights will be based on the scale in use in the Technical Inspection Area. It is the responsibility of the racer to make sure his/her vehicle is within weight on that scale. Weights from scales other than the designated scale in the Tech Area are null and void. Drivers should check their weight often, changing tires, or other components can cause a weight change.

GENERAL RULES

GR1.1 RACE STARTS: A two minute warm up will be announced, followed by a 30 second call to the starting line. At the 30-second call, the cars will move to the line or be placed in position by their pit crew. The cars may be fueled at this time, providing it does not impede the start of the race. At the 5 second time, the pit crew will leave the starting grid and the Starting Director will motion with their hand that 5 seconds remain. The race will be started with a flag or over the PA system.

GR1.2 QUALIFYING: Qualifying heats will be five minutes in length. Main event race times will be determined prior to each event.

GR1.3 FLAMEOUTS: If a vehicle flames out during Qualifying and must be removed from the track surface to be restarted, it cannot be returned to the racing surface during that Qualifier. Vehicles may be restarted during the Main Events, however, under no circumstances are the pit crew allowed onto the racing surface to retrieve a vehicle, nor are turn marshals allowed to assist in restarting or repairing any vehicle. If a vehicle is restarted during the Main Event, it must be placed back onto the surface past the transponder line/scoring area.
GR1.4 PIT STOPS: All classes must pit a minimum of one time during a race exceeding 10 minutes. The number of required pit stops for each event exceeding 11 minutes will be announced at the event.

GR1.5 TRACK REQUIREMENTS: Tracks shall be fully surrounded with a minimum barrier of 8” above the highest portion of the track surface. Barrier should be anchored to the ground or have the outside braced with a heavy weight such as a hay bail.

GR1.6 PIT LANE: A portion of the non-race surface will be designated as "Pit Lane" and must be separated by a barrier from the race surface. Pit Lane will only be used for re-fueling and minor repairs. The vehicles must be removed from the track surface and placed behind the barrier for re-fueling and repair. Drivers are to exercise caution when exiting Pit Lane. Any vehicle exiting Pit Lane that interferes with a vehicle on the racecourse is subject to a penalty. The Race Director will assess penalties.

GR1.7 PIT CREW: Pit crews may not exceed 2 persons.

GR1.8 MUFFLERS: All vehicles must have an exhaust system that directs the exhaust parallel to the ground or directly at the ground. Mufflers must be intact while the vehicle is running. The muffler can be no louder than 77db when measured from 30 feet.

GR1.9 TRANSMISSION: See Individual Class Rules.

GR1.10 ENGINE TIMING: No variable timing engines are allowed.

GR1.11 ENGINE COOLING: No liquid cooled engines are allowed.

GR1.12 AIR INDUCTION: No forced or ram type air induction systems are allowed.

GR1.13 ENGINE TECH: At National, State and Divisional Events, 1st, 2nd, and 3rd place engines may be disassembled to insure proper compliance with all specifications.

GR1.14 CLUTCH: All vehicles must have a clutch between the engine flywheel and vehicle drive gear. See Individual Class Rules for clutch specifications.

GR1.15 SUPPLEMENTAL THROTTLE RETURN: In case of servo failure, vehicles must incorporate a positive action return spring attached directly to the carburetor throttle arm.
GR1.16 FUELS: Fuels will contain only 20% Nitromethane. No other additives will be allowed. At NORRCA-Sanctioned events, the Track/Promoter may supply fuel for a nominal fee. This shall not exceed the ounce per gallon price. Racers must supply a fuel bottle.

GR1.17 FUEL TANK, FILTERS & LINES: The maximum fuel allowed in the tank and fuel lines is 75cc. 1 filter allowed in the carburetor line. Maximum of 8” of fuel line on the carburetor side. No reserve tanks allowed.

GR1.18 BRAKES: All cars must have a braking system capable of slowing the vehicle to a complete stop.

GR1.19 TECHNICAL INSPECTIONS: Engine, fuel tank capacity, carburetor bore, exhaust bore, and/or any other scale specifications may be checked at any time by the Race Director.

GR1.20 SAFETY: The Track Owner and/or Club President are required to provide gloves to be worn by the Turn Marshals. It is highly recommended that pit crews also wear protective gloves. DISCLAIMER: Any Pit Crew or Turn Marshall that receives a burn and is not wearing protective gloves will not be covered by NORRCA insurance.

GR1.22 QUICK CHANGE PARTS: No Quick-change parts are allowed.

In addition to the rules it provides, NORRCA also has a full club and track listing, as well as a list of endorsed brands.

Though it is not necessary to purchase membership in either of these or any other organizations, if you plan to race your RC you must be aware of all of the rules governing the sport. ROAR and NORRCA exist to make it easier for numerous small clubs to consult just one set of rules. This makes races, championships and other events more consistent and better for the racers.

Whether your RC car will be racing at the Nationals or just up and down the street, these organizations can be great resources for finding out about local clubs and events. They also provide excellent technical information so you can be sure your RC vehicle is up to specifications.
On Race Day

Make sure you’re ready for a long day, since there are usually long practice
sessions before the racing begins. During this time you should sign up for the
race and prepare your car. When you register, the race official will give you the
frequency on which your car will run, and a frequency clip, pin or flag for your
car’s antenna. This will make sure you don’t accidentally run on someone else’s
frequency and prevents people from using your frequency.

When you are practicing, use the first run to get used to the track layout and
slowly work your way to full speed as you get used to the track. Using the rest of
your practice time to improve your time from there is one of the best ways to
learn the track and your car.

Also try and be aware of the other racers—keeping up to someone faster than you
can be a great learning experience. Often the pre-race track will be crowded and
unorganized, so take care while practicing not to run into others and risk
wrecking your or someone else’s car before the race even begins.

When it’s time, the race director will announce that the qualifying heats are
available for racers to see their car numbers and race numbers. These are very
important! Get your car number decals and with a pen or marker mark your race
number on one of the car numbers. This will make sure you remember when your
race is coming up, you won’t miss one of your races.

A 'round' of races is one complete set of races, from race number one to the last
race. Each round of races can last 30-45 minutes for a small track with just a few
races, to an hour and a half or more at busy tracks. Most tracks will have at least
two and sometimes three rounds of qualifying.

Qualifying is your chance to make your best run on the track, in preparation for
the 'mains,' or the final races. Usually the top ten fastest racers in each class will
be grouped in what is called the A Main or A Final, and the next ten fastest racers are in the B Main, and so on. Sometimes a class will have ten or less racers in it, so there is only an A Main and no B Main.

The novice class is usually the first class to race, so if this is your first race, make sure your batteries are charged up. If the track uses transponders, ensure you have the correct one installed. There will usually be a track employee at the transponder area with whom you should register. Watch the race numbers coming up and select the right transponder with the correct color.

When you get ready for racing, be as relaxed as possible and just try to make it to the end of the race without hitting any barriers or other cars - that is what will slow you down the most. Don't worry about winning, going faster than other cars or making any passes—simply run your car as consistently and quickly as you can. After the race is over, make sure you follow any directions the race director gave everyone before the racing started. Sometimes your car and radio must be left on a table, sometimes you are able to take your car back to your pit area.

Either way, make sure you get back out to the track to do your turn marshaling duties. Every racer has to turn marshal the race immediately after theirs, this is the best way to make sure everyone does their marshal duty and everyone has an equal chance to get going the right way if they crash or make a mistake during their race. Turn marshaling is basically watching a specific part of the track and turning over any cars that crash in that area. Failure to complete your marshalling duties could result in penalties to your score or disqualification from the round.

To give you an idea of what the rules are like, here's the way ROAR lays out the guidelines for turn marshalling:

5.5 TURN MARSHALING
5.5.5  Drivers must marshal for their designated race. Another qualified ROAR member may substitute with the approval of the Race Director. It is the driver’s responsibility to find a substitute marshal. The original marshal is responsible for the actions of the substitute.

5.5.6  Turn marshals are not permitted to repair vehicles. Marshals will take disabled vehicles to the closest outer edge of the racetrack as soon as possible.

5.5.7  A vehicle running on the track has the right-of-way over a vehicle that has gone off the track, turned over, or otherwise had problems.

5.5.8  When marshaling a vehicle, it should be returned to the point where it left the racing surface. Care must be exercised not to interfere with on-coming vehicles.

5.5.9  Only the designated marshals are permitted to handle vehicles on the racetrack during a race. No one else may enter the racetrack to repair or retrieve a vehicle.

5.5.10 Marshals for 1/5 scale classes can be a pit crew member. No one, Marshal or otherwise may enter the race track area until a Yellow Flag condition is called and all vehicles have slowed to a controlled pace.

Once you are done turn marshaling you can head back to your pit area to work on your car, get your next battery started charging, or whatever you need to do to get ready for your next race. When the qualifying races are over, the mains begin, normally after a short break in the schedule. Your car number may change, and also your race number may be different, so be sure to pay attention to the main event listing.

The main event is run just like the qualifying races, except that this time there’s usually a real prize at stake! The top ten fastest drivers in each class are put in the A main for that class, the next fastest group in the B, the next ten fastest in the C, etc. If you didn’t make the final group you wanted, take time out to watch those who ranked ahead of you. Observing their steering and racing techniques may help you get better results next race.
Tackling a New Track

A new track is always exciting, but seeing it for the first time can often be overwhelming and intimidating. It is important to calmly evaluate the track in its every aspect, and try to anticipate potential trouble spots. Each track has its strengths, weaknesses and quirks—the better grasp you have of them before the race begins the better you'll do.

When you first set eyes on a new track, look for the tricky or tight spots: boards that may snag your car, a fast entry going past a corner dot, off-camber turns, etc. Some turns have a real sweep to them that can be dangerous if you enter or exit too soon. Long, stretched out turns—sometimes called lazy S’s—are often tight against the boards; take these with caution to avoid trouble: these are the types of corners that cause crashes and flameouts.

It is important to know how to spot these corners and carefully navigate your car through them without incident. Use your practice rounds to get a feel for the whole track to map out difficult parts of the track. One of the biggest mistakes beginners make is over-driving the turns during their practice times. Once you've identified any tricky turns, look for the easier turns and sections that can improve your lap times.

Spotting the pivotal and dangerous points in a new track is not always easy. Your practice time is limited, and it can be hard to know without running it a few times how to take a certain turn properly. The transition from straights to tight turns is where a lot of drivers lose time—pay close attention to slacker parts of the track that allow you to make up time. Watch for hairpins and sweeping turns so you can anticipate how quickly they can be taken. Experienced drivers make the most of their practice runs and heats by mapping out the dangerous parts of the track they must keep slowly and the part in which time can be gained.

Many tracks feature large sets of looping S curves. These sweeping curves in rapid succession can spell trouble for inexperienced drivers. Take care to control
the inertia of the inner loops, and do not over steer. Use your practice runs to test how fast you can take S’s, as they are one of the trickiest parts of most RC tracks. Remember for more dangerous parts of the track, slow and steady is preferable to crashing and burning.

When evaluating the track, be sure and spot the shorter straights that can be rounded off between curves save time. Negotiating your way through these sections properly can significantly lower lap times. The easiest way to negotiate such a turn is to straighten it out before you make the second turn. This usually makes the car look as though it’s slowly doing a slight S-bend in the straight section. The fast way to do these types of turns is to turn the short straight into a nice radius by tightening up the curves as much as possible. But take care that you do not cut any of the corners too short or you’ll run the risk of a crash. The key lies in acceleration through the small straight between the opposite curves—time it right and you won’t have to straighten out your car entirely. This creates the shortest distance between the two turns and allows you to carry the most speed into the next section.

Make-or-break sections are named with good reason: master them, and you’ll always find yourself in the A final; fail to get a knack for them and they’ll cost you precious time. With practice you’ll be able not only to spot these pivotal sections, but to navigate them successfully. Especially when you consider you’ll be racing against others and there is always a possibility of disaster, you’ll want to master course navigation.

**How do I Pass?**

There are a number of factors affecting how successfully you pass. Proper evaluation of the sections and hazards of the track, as well as of the drivers around you, is key to making safe, effective passes. Every driver is different, but there are universally accepted ideas about when you should and shouldn’t pass. More then anything, passing is about opportunity, and the driver’s ability to anticipate his speed and the speed of the surrounding vehicles. Of course, this
also has a great deal to do with the track—you’ll find some race tracks have numerous safe passing zones while in other it is next to impossible to get a clear pass. Watch for breaks especially when entering and exiting straight-aways, since these tends to be the time when racers are changing position and speed. Patience and awareness are as important in pulling off good passes and speed and reflexes. When you’ve decided you want to pass, be sure to analyze the person’s position, acceleration and the track around you before you move. Avoid passing in hairpin turns and on the track’s fast sections, and be sure that your pass doesn’t put you in poor position for the next turns.

And the Most Important Rule of All...
When you’re racing (or even just practicing) keep fair play and good sportsmanship in mind at all times. Every competitor puts equal amounts of painstaking time and energy into their models, so respect the parts and competition space of others at all times. Crashes and flameouts can be harrowing and awful—but in the event of such an accident, it is important to try and minimize damage to other cars. Any disputes over times, technical requirements or race rules should be brought to the race officials’ attention immediately. Decisions made by race organizers are usually final, and should be respected.

Just remember everyone is there to have fun- so treat the other drivers fairly and don’t forget to enjoy the race!
Start Your Engines

From the smoke of the nitro car to the speed of the electric RC, there are few hobbies as interesting and rewarding as the world of RC vehicles. By choosing your first few models carefully and appropriately according to your experience, you ensure your own success and continuation.

Suitable for kids of all ages, RC’s are a particularly great hobby for children who love to tinker with things, who have an interest in cars or who enjoy good competition. They’re great building projects for rainy days, and an absolute blast to race and run outside in the sunshine.

If you’re prepared in advance for the cost and commitment it takes to run and race an RC, it will mean less frustration later on. Bear in mind if you’re entirely new to this, you’ll probably want to cut your teeth on a ready to run electric RC. Getting used to the small, meticulous attention RC maintenance involves early on will make you a pro in no time.

Numerous reputable internet retailers make RC cars and parts of all kinds widely available for reasonable prices. It is also a very good idea to become acquainted with your local hobby shop, since they can help you fix any problems that you can’t tackle on your own. Since inventories change so often, many of these smaller companies don’t list all their stock online—but they are usually more than happy to help you find the special parts you need.

So get ready- it’s almost race time: start your engines!