

101 R/C TIPS AND TRICKS



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I N T R O D U C T I O N

Everyone has some tips and tricks they have to share. This is a collection of 101 of the best from the net, club meetings and personal experience.

The document is broken into sections for easy reading and for finding the tip that best suits your problem.

101 Tips and Tricks

Batteries

1. *Wrap Them Saddles*

On saddle-pack batteries, the ends of each cell are exposed, and there is the possibility of the cells making contact with each other and shorting out the pack. To deal with this problem – especially when the packs are unattended in your toolbox or battery tray – wrap a regular rubber band around the two saddles so that they stack on top of each other. This will eliminate the possibility of the two saddles coming into contact with each other and causing a short.

2. *Give 'em a Break!*

Most of you know better. You know you're not supposed to leave your batteries on your discharger or connected to discharge lights too long. Extended discharge, or discharge below a safe voltage cut-off, can seriously damage your batteries. Yet many of us whether we're playing around in front of the house, or out at the track practising, will run our cars down until they can barely move. This is just as bad for your batteries, if not worse than leaving those batteries on your discharger. Once you see that your car has slowed down quite a bit, pull it over. That's it! Plug your battery in to your discharger. If you are using a light-bulb-style discharger, be sure to unplug it as soon as the lights dim sharply.

3. *Shrink Wrapping*

Don't have a heat gun to shrink your shrink-wraps? Place your solder gun under it for the same result.

Bearings

4. *Want To See Something Really Clean?*

Want to get bearings, and other parts, as clean as they'll ever get? At Wal-Mart, Kmart or any mart, pick up ultra-sonic jewellery cleaner — usually around \$20. Also pick up a bottle of Castrol Super Clean. Follow the steps that come with the jewellery cleaner and use the Super Clean as the cleaning solution. Clean your bearing or any other small items that need a deep cleaning. Five to ten minutes of this cleaning treatment should get out the dirt or grime that has worked its way into the item. Be sure to re-oil the bearings before reinstalling them.

5. *Cleaning the Ball Bearings!*

I know that this is a big pain in the ass and subsequently that most racers don't clean their bearings. They wait until they have a huge build-up of dirt and then just spray them with an air gun. It's no wonder then that bearings are the number one spares on sale.

Firstly, don't let your bearings get to the stage where they have a huge build-up of dirt. Gently hold the bearings by the sides and see if they can rotate freely (avoid touching the surface as this could result in the dirt infiltrating the seals). Depending on the result you get read the relevant section.

Rotate Freely:

Get hold of a very thin screwdriver, and gently, in a circular motion, scrape the dirt out from between the outer ring and the seal. Don't clean the dirt from the inner ring yet.

When most of the dirt is out, take a semi-hard thin brush and gently clean the bearing by brushing from the inside out. Avoid pressing down too hard as you could force the dirt on the inner ring into the bearing and damage the balls.

Finally, put a damp paper napkin or kitchen towel onto the surface of the bearing, while at the same time rotating the bearing. Next, gently push the towel onto the inner ring with your finger while still rotating the bearing. Do it gently!

It may seem like a long process, but believe me you can have a very clean bearing in about 2 minutes. Also, in this way, you don't get excessive dirt build-up so it can't infiltrate the bearing and ruin it.

Doesn't Rotate Freely:

Well you're screwed! Just joking. This means that unfortunately dirt has infiltrated inside the bearing and you will have to open it up. If you don't then dirt will rapidly wear off the balls and the bearing will fail. From there on you must replace it a.s.a.p. Not mentioning that a failed bearing will cause excessive wear on the axles, make your car behaving strangely and could even result in a more extensive damage.

So before you go out and buying new spares, replace your ball bearings or clean them properly. If your bearings are Teflon sealed, then you probably have to replace them anyway. There is not much we can do to clean them. If, however, your bearings are the standard sealed type, then we can hopefully restore them back to life.

Get hold of a small screwdriver or pin and gently remove the clip holding the seal in place and remove the seal. Do this on both sides of the bearing. Place the bearings in a cup with enough methanol, alcohol or fuel (not as effective) to cover the bearing and leave to soak for 2-4 minutes. Next, while keeping the bearing in the solution, rotate the bearing. If you still notice any resistance,

move the bearing back and forth in the solution and try again. Do this until the bearing offers no resistance to rotation.

Remove the bearing from the solution and place over a suitable drive shaft and rotate it quickly by spinning the outer ring. Dip it back into the solution and spin again. Repeat this process a few times until you notice that the bearing spins absolutely freely without the slightest resistance or any funny scratching noises. This is a great way of removing any dust from the bearing – the particles inside the bearing are “loosened” and “grabbed” by the methanol and then spun off by the centrifugal force generated by spinning the bearing.

Finally, put a little ball bearing grease (only use proper ball bearing grease) on the seals the seal the bearing. Don't use too much grease as it will leak out and surely attract any dirt when running.

The whole process should take you about 10-12 minutes. The next decision is for you to make; do you spend 10 minutes cleaning your bearings properly, or do you have the finances to go out and buy new bearings.

If following the above methods does not sort out your bearing, then replacing them is inevitable.

Body

6. Masking Tips

In order to cut different designs and patterns out of masking tape or masking material, you can use pinking shears (which are normally used for cutting fabric). The shears are available in different cut patterns like jagged edges, waves, etc. The designs can be used to quickly and easily customise any paint job. Use a high-quality masking tape or masking material for the best results.

7. Wing Tricks

On your off-road buggy, there is one tuning feature that is often overlooked. It is your spoiler; more often called a wing. The angle or position of your buggy's spoiler can have a big effect on how your car handles. Having a steeper angle on the spoiler will create more rear downforce. At medium to high speeds, your car will have more rear traction. If the car was oversteering, you might induce understeer, and vice-versa. Also, watch how your buggy is jumping. If it nosedives off the jumps, try putting a steeper angle on the spoiler. And last but not least, if your buggy lags a bit on the straight sections, try flattening the wing angle. With some patience and practice, your buggy's spoiler can be a great tuning aid.

8. Find Those Body Holes

When mounting a painted body, put grease on the body posts and set the body on. Lift the body up and grease marks the spot where the holes should be drilled.

9. Body Clip Storage

Take an old body mount and drill more holes in it to keep your spare body clips on.

10. Body Cushions

Make body cushions by drilling a hole through old foam earplugs and cutting them down to fit.

11. Applying Decals

To apply decals, spray the surface with Windex first, and then put the decal on. Now you can slide it around to find the perfect spot. After it is situated, apply pressure to push the Windex out from under the decal.

12. Broken Body Post

Have a broken body post? Glue it together and put a pen tube over it for support.

13. Body Cushions 2

Take old fuel line from a car, cut a 1/8th inch piece, and use it as a body cushion.

Chassis

14. Hard Driving Screws

Machine screws and cap screws that must be threaded into reinforced plastic or graphite are sometimes difficult to drive-in completely without stripping the head. Use a little diff lube on the screw threads before you start threading them into the plastic or graphite parts. The threads will cut cleaner and the grease will prevent the screw from sticking as the screw is removed and reinstalled the next time. Trinity now makes Assembly lube designed for just this purpose (#TK3070). This method is a must when using lightweight aluminium screws.

15. Sticky Screws

From time to time, every R/Cer has to install a screw that must be inserted horizontally or straight down. In these situations, more often than not, the place where the screw must go is in a nearly inaccessible spot. You can't even hold the screw in place with tweezers or pliers while trying to screw in the screw. To hold the screws on the screwdriver or hex-head wrench tip, apply a little diff grease, or any grease that is thick and sticky, to the end of the tool. Place the screw on the tool and carefully insert the tool and the screw into that hard-to-reach spot.

16. Screws

Never overtighten the screws. If you want the to stay in place, use lock thread glue.

17. Thread Glue

Usually most screws that connect metals are "suspicious" of failing. Use a VERY small amount of thread glue.

18. Nylon Nuts

When using nuts to secure screws, see if they're located in a vibrated place. If do then use a nylon nut instead of a standard.

19. Someone could say it's a waste of time. I say better waste of time than waste of money...

Cleaning your car is not something that you choose to do or not. You have to. It's compulsory like it is to charge your batteries. Maybe "on-roaders" don't have a problem with that. In off-road though things are different. Cleaning must take place in regular basis and must be done thoroughly. But, race after race such maintenance could start be annoying and boring. That is the down side of off-road racing. It is the most exciting of all kinds of racing but it requires some things from you also. A lot of people stay away from off-road due to maintenance.

Others just don't clean they car often and damages come up one after the other. This is a guide of maintenance that it focuses on a very good and fast cleansing. Although both fast and clean don't come together, you can lower time with a few tricks and still be effective. Let's take things one at a time.

20. KIT BUILDING - Chassis

Chassis - Put zap or another type of superglue around graphite or any layered part to keep it from splitting in a high impact crash.

21. Protect Lower Screws

Put electric tape over the rear chassis (the bottom) to protect the screws from filling with dirt and getting scratched.

22. Foam Battery Inserts

In a B3 or T3, cut the foam battery inserts in half for more adjustability.

23. Keeping the Chassis Clean

To keep the bottom of your chassis looking nice, buy a paper laminator sheet and stick it on the bottom,

24. Cleaning Nitro

If you have a gas car, use a pen cap stuffed with a tissue wad to wipe up oil that is hiding in the corners of the car.

25. Clean Chassis

Glue a screen in front of your front shock mount to keep dirt and gravel from getting in you chassis.

Driving Tips

26. Staying Smooth

Staying Smooth - Your overall finish will greatly depend on how much you crash. If you drive slowly without crashing, you will probably be faster than if you had driven at full speed, but crashed a few times.

27. Starts

Starts - When you race take notice of the starts in your class. If you're noticing a big pileup in the first turn quite often, wait a second after the start to go. You can then let everyone else crash while you navigate through the pileup and take the lead.

28. Look Ahead

Look ahead - It is a good idea to look ahead on the track when you are racing. You can then see if any bumps or crashes are coming up. This takes practice, but can be very effective

29. Patience

Have patience during a race, and try not to do anything that will put you out of the race in a crash. Backing off and letting someone by is better than both of you crashing. Besides, it's easier to follow another car than it is to lead the other car - chances are, if someone does pass you, if you follow close enough and long enough, the other car will try to go even faster, and either mess up in a turn, or crash.

30. Starting the Race

Electric racers can ignore all the junk people tell you about how you have to walk your car over to the starting line, leave it "off" until just before the race starts, then have a buddy turn it on. If you've made it to the A-Main at a National, maybe that's true, but for a club race, forget it. What I do, is to walk over to the driver's stand, put the car on the track, then go up to the stand, then drive the car over to the starting line.

Electric's

31. Stay Soft

The next time you're cleaning your car pick up some Armor All® Vinyl Protectant. Spray the Armor All into a soft towel or rag and run it over your car's speed control, battery, motor, and radio wires. Not only will your wires be clean; they'll stay soft and pliable longer.

32. Threading Antenna Tubes

If you have trouble putting your antenna through the tube, put some black grease on the entrance of the tube to lube it.

33. Dry Receiver

Put your receiver in a balloon to prevent it getting dirty.

34. On-Off Switch

Position the on/off switch so that when the switch is ON, it is towards the back of the car. That way if a rock or something hits it as your driving, it won't turn off. Even better is to position it LAYING DOWN and FACING BACKWARDS in the chassis.

35. Spiral Leads

Make your car look like a Factory Car from the inside. Take the wires that go to the receiver and wrap them around an Allen wrench. This will make a "spiral" and look much neater.

36. Excess Antenna Wire?

Have too much antenna wire? Cut a pop-sicle stick and wrap the excess antenna around it before you put it into the tube.

37. Lost Antenna Cap

Lost your antenna tube cap? Put a piece of fuel tubing over the top instead.

38. Crystal Storage

Keep your spare crystals safe and organised by storing them in a seven-day pill container, each pair in a different day.

39. Crystal Storage 2

Store spare crystals in old X-Atco blade cases for protection.

General

40. Boy, What I Could Do With A Third Hand

Ever think to yourself, "boy, what I could do with a third hand"? Sure you have. Well wonder no longer. Turn any pair pliers into a vice with the use of a simple rubber band. Wrap the band a couple times around the handle of the pliers. You can then insert whatever it is you want to hold in the pliers grip. This tip comes in especially useful when solder plugs and things.

41. Unconventional Toolbox Essentials

These are just a few items you may not have thought would be a toolbox must.

- **Band-Aids:** Keep a couple of these handy. You never know when you'll have a hobby knife accident or gas car burn. This is an item that, when you need it, you really need it.
- **Handy Wipes:** Yup, you know, those little towels used to keep a baby's bottom clean. Well those little gems work great for cleaning bodies, hands, tires, or just about anything else that happens to get dirty or dusty.
- **Compressed Air:** You don't need a huge air compressor, just a small can of compressed air. Found at your local computer store, this essential can help keep things running smooth and quiet. As long as you don't go crazy with this stuff, one can will keep you satisfied for at least a few months of racing. Use it for cleaning out your ESC, receiver, connectors, diff, bearings, switches, radio, charger, etc. Be careful not spray when the can is on its side or upside down. The gas may come out in liquid form and can damage your components.
- **Your car's instruction manual:** Always keep a copy handy. You never know when you'll have a question about diff assembly or shock rebuilding. Also, since many instruction manuals list part numbers, finding the right part at the hobby shop will be much easier.

42. Removing Servo Tape

Don't get sore thumbs from trying to remove old servo tape by rubbing it off, or make a huge gooey mess by using motor cleaner. Instead, grab a heat gun or hair dryer and heat up the servo tape. Remove the servo, ESC, or receiver. Apply the heat to the tape residue. Be careful not to melt anything. Once the tape has softened, it should come off easily.

43. Tool Tune-up

Do you use a Dremel Motor-tool or something similar? If so, you've probably noticed its performance and speed wind down a bit the more you use it. You can breathe new life into your Dremel with a couple of quick tips. First, remove and clean the brushes. That's right, brushes. Just like the motor in your car, your Dremel tool uses brushes as well. Remove the brushes by unscrewing the brush caps.

- Clean the brushes with a smooth cloth or brush-cleaning tool.
- Spray the comm down with some good, plastic-safe motor cleaner.
- Using a comm cleaner, clean the comm of the tool through the brush holes.
- Last but not least, add a drop of a high quality comm drops to each brush face.
- Don't re-oil the bearings without first consulting your tool's owners' manual. Some Dremel tools use sealed bearings with high viscosity grease. Using a lighter weight bearing lubricant may dilute the grease in your tool's bearings and not provide proper lubrication.

After you've performed these little tips you're ready to get back to work. This kind of maintenance may void the warranty of some tools. Be sure to check your warranty before performing any of these steps.

44. Stay Fresh

You get to the track and your on/off switch has come loose, so you dig into your toolbox only to find a dried out bottle of glue. Prevent your CA from drying out by putting it in a zip-tight baggy with a Silica keep-dry packet. This will help keep that bottle of glue nice and moist for those unexpected moments. This will also help keep it fresher longer which will save you money since you'll be able to buy the larger bottle of glue next time you're at the hobby shop. Novak sells Silica gel desiccant bags (part #5610).

45. KIT BUILDING - Mouldings

Mouldings - Make sure to trim any excess moulding off of any plastic piece. This will prevent bad fittings and bindings between parts

46. Stripped Screw Threads

If you stripped out a hole, place a small copper wire in it when you put the screw in. This will make the fit much tighter and the screw will stay in place. Make sure you use copper wire because it is softer than the screw. This way it won't strip the screw.

47. Worn Allen Wrench

If your stock allen wrench strips, put it in a vice and use the Dremel to chop the end off to get a fresh tip!

48. Stripped Screw Heads 1

If you strip out a screw end, solder a wrench to it to get it out.

49. Stripped Screw Heads 2

If you strip out a screw end, take a rotary tool (Dremel) and cut a slot in it. Then, take the screw out with a straight blade screwdriver.

50. Don't Throw It Away

NEVER THROW AWAY ANYTHING! You'll never know when an extra part could be salvaged from a broken one!

51. Removing E-Clips

Use a small flathead screwdriver to remove E-Clips.

52. Clean Pit Area

Keep your pit area neat and tidy. Take a foam block and stick your tools in it. To keep it from tipping, glue it to a wood block as a base.

53. Stripped Allen Head Screws

Take a Dremel and cut a slot in the top of stripped out allen head screws. Now you have straightblade screwdriver head screws.

54. Track Markers

If you need some cheap track markers go to the hardware store and buy some of those little orange flags for marking underground cables. They work great because your car won't break or stop if it hits them.

55. Small Storage

Use old fishing weight containers to hold small parts.

56. Pro Tip

This tip comes to us from Trinity's David Spashett.

Make a checklist of things to do between heats (e.g., apply traction compound, charge batteries, etc.) at a race and an order in which to do them. Tape the list to the inside of your pit box or to the top of your charger — somewhere you will see it often. This will help you make sure that you get everything done before each race and that you do them at the same time round after round.

Motors

57. Five Steps to Clean Motors

- The first thing you need to do is remove your motor from the vehicle. Now remove the brush springs and take the motor brushes out from under the brush hoods.
- Using a high-quality motor cleaner insert the spray tube into the endbell and spray for about 2 to 3 seconds or until the fluid coming out of the motor is clear. Be sure to spray both bushings or bearings at the ends of the motor. If the motor brushes are still attached to the motor be sure not to get any motor cleaner on the brushes.
- Install a pinion gear on to the motor shaft. Insert a comm stick into one of the brush hoods and turn the motor about 10 or 20 revolutions until the comm is nice and shiny. Now spray the motor again to get rid of any comm or comm stick material that might be in the motor.
- Determine whether or not you're going to replace your brushes or motor springs. Both springs should look identical when placed side by side. The brushes should be replaced if they look damaged, worn, or show signs of bad discoloration from heat. If you decide not to replace the brushes clean the brush faces with your comm stick.
- Reinstall the brushes and springs and add one drop of oil to each bushing or bearing at the ends of the motor. Be sure to use a bearing or bushing specific oil and use one drop only. Bearing oils are thinner than bushing oils. That's it. You're all done and your motor is back in shape.

58. Schottky Who?

If you use a plug connector between your speed control and the motor and you use Schottky diodes, then I've got a tip for you. Instead of installing the Schottky diode to the motor, attach it to the leads coming out of the speed control at the end on the plug. Schottky diodes have a positive and negative end, so be sure that you solder them correctly. For those hot modified motors, it's a good idea to solder another diode to the motor; that means you'll have two diodes working for you.

59. Comm Cutting

This is a tip I learned by watching Mike Reedy cut a comm one time. Once you have the comm ready to cut and spinning on the lathe, run a felt-tip marker over the comm. When the entire comm is covered by ink, you can begin cutting. The ink does two things; it acts as a lubricant for the bit and it helps you to see where you've already cut.

60. Pinion Setscrew

Use threadlock on the setscrew in the pinion. This way it won't come loose in the middle of a race.

61. Motor Storage

Store your motors in old pill bottles to help protect them.

62. Motor Springs

Remove your motor springs when not in use to keep them from wearing out.

63. Motor Protection

Glue a small screen over your motor's cooling holes to keep rocks and dirt out of it.

Set-up

64. Change Only One Thing at a Time

If you dial in an extra degree of camber, shorten the wheelbase and install stiffer front springs all during the same visit to the pits, you'll have no idea which adjustment has made your car handle better or worse. Take the car out for a few laps after each adjustment; if performance decreases, it's easy to "undo" the last adjustment.

65. Make Only Small Adjustments

Touring-car set-up isn't a game of inches; it's a game of TENTHS of inches. Make small adjustments, or you may overshoot the perfect setting. Test the car frequently as you dial it in.

66. Know When to Say "ENOUGH"

Question: How long does it take to get the perfect set-up? Answer: How much time you got? It's easy to fall into the trap of chasing set-up all day, all week, or all season. Though you should always be looking for ways to go faster, you should not be altering your car so often that you never get used to one set-up. It's more important to be able to drive your car at 100% of your ability, even if it's only 80% dialled in.

67. Keep Notes

You'll notice that the fast guys all have greasy little notebooks on which they jot all their set-up info. You should follow suit; write down all the set-up info you can stand - even the stuff that didn't work! It doesn't take long to acquire a lot of useful data, and you'll save a lot of practice laps when you need to tune your car for conditions you've encountered previously.

68. Ride Height

The ride height of your car is basically the distance between the surface of the track and the bottom of your car's chassis. The best time (really the only time) to measure this is when you have EVERYTHING INSIDE YOUR CAR including electronics and batteries. By not having everything in your car, the weight drastically changes and therefore your ride height changes when you get all the necessary items into your car.

It is best to set-up your ride height in similar conditions as the track you will be running on, if not on the track you are running on. This particular setting can be adjusted in many different ways, but the easiest and best way to do this is by using preload spacers (which are basically collars and spacers that snap onto the shock to raise and lower the pressure the shock exhibits) or threaded shock bodies. If you race on carpet, the conditions might enable you to go as low as a 3mm ride height. The lower your ride height is, the better your car can corner. Having your car lower to the ground allows the car to corner "flatter" by having a lower centre of gravity. Right height can also affect how much traction you have; the end of the car that is lower will have more traction than the other. Another way to lower ride height (if you use foam tires) is to cut them down. For more tips on tires, go the TIRE TIPS section on this page.

69. Shock Travel

The title is pretty self-explanatory; it is the shock's full range of motion from full compression to full extension.

If you are running on a fairly smooth track, then you don't need as much shock travel as if you were running on a bumpy track. The less shock travel you have the better the overall performance of your car. I recommend having the least possible shock travel you can get away with at your track. Shock travel is adjusted by placing shock limiter/ internal spacers/ O-ring/ shock piston (whatever you wish to call them) on the shock shaft. Just make sure that when you put these spacers into your shock that they are PLASTIC, not metal. Some cars have suspension arms that allow them to adjust shock travel by adjusting the threaded inserts. These threaded inserts may be handy for quick shock travel tuning; they aren't good because they put a lot of strain on the chassis of the vehicle. Threaded inserts may be used to figure out the best shock travel distance, but final adjustments should be made by the spacers that go inside the shock body. To limit the upward travel of a shock, place any number of spacers onto the shock shaft between the spring perch and the shock body. Make sure you don't put too many in or the shock will be too short and you will have major problems. You should be able to adjust your shock travel before you hit your local track, unless of course you have no idea what the track you are going to is like. Carpet racing can allow you to lower your shock around 3-5mm lower than the stock setting. Paved road racing may need more shock travel or even possible less; it all depends on how bumpy the track surface is. One important thing to know about touring car shock travel is that touring cars usually work best when there is no "sag" (when the suspension compresses at rest). The shocks should be fully extended when the car has all of the required electronics and parts/accessories in it and a ride height that is proper for conditions. A little bit of "sag" might help you if the track is really bumpy, but it usually is not recommended or required.

70. Spring Rate

This one isn't an adjustment; it's a choice. Contrary to popular belief, cranking down on a spring's preload does not affect its rate. Just about every touring car maker offers an optional set of tuning springs (usually "soft", "medium" and "hard"). Buy two sets so that you can have duplicate springs on all corners if necessary.

Spring rate must be matched to the car's need to resist roll in the turns and to its need to absorb bumps. Softer is better for bumps; stiffer is better for turns. If your track is bumpy and has lots of sweepers, you can go soft; if it's smooth and there are lots of sharp turns, go hard - especially if there's plenty of traction. Spring rate can also be used to tailor front and rear grip: use a softer spring on the end of the car where you need more traction. Note: spring rate and damping go hand in hand, so be prepared to make some shock-fluid/piston changes if you make a radical change to your spring rate.

71. Shock Angle

The name states it all. Most TCs have a selection of holes on the shock towers and on the suspension arms that can be used to alter the angle of the shocks

The shock position suggested by the vehicle's manual is typically the best set-up for most tracks, but it pays to experiment. Shock angle is easy to change by mounting the shock arm in different holes, so it's not tragedy if your car changes don't help the car; just remount the shock in the hole you started with, and you're back to square one.

Lower mount: as you move the shock to the outer holes in the suspension arm, the arm has less leverage to activate the shock, and its action becomes "stiffer". This is useful to counter body roll. If you use holes that are farther inboard, the arm has more leverage, and suspension action is "softer".

Upper mount: changes here do not affect the suspension arm's leverage, but they do affect the shock's compression rate. If you move the upper mount farther outboard, the angle formed by the suspension arm and the shock will change less as the arm moves through its travel range. This means that the shock's compression rate is more consistent from full extension to full compression. If the top of the shock is moved inboard, the suspension action will feel progressively "stiffer" because

the angle formed by the suspension arm and the shock becomes closer to 90 degrees as the suspension is compressed. The effects described here are quite subtle but are worth experimenting with. Be sure to check ride height when you change shock angle.

72. Damping

What most racers call "shock absorbers" are actually dampers; all "shock absorbing" on TCs is done by springs. Dampers keep the springs in check by controlling the release of the energy stored in the spring after it has been compressed; without dampers, the car would go "pogo" all around the track. The dampers used on all but the least expensive TCs control spring action with the resistance generated when silicone "oil" is forced through the holes in a piston.

There are two ways to adjust damping: change the viscosity of the damping fluid, or change the size of the openings in the damper piston. Most shocks use holes of various diameters to control the flow of fluid through the piston. Smaller holes offer more resistance as the piston is pushed and pulled through the oil; larger holes allow the fluid to pass more easily. Likewise, "thicker" fluids pass through a piston hole of a given diameter with great difficulty than "thinner" fluids. Assuming you selected the appropriate springs for your car, less damping will allow the suspension to compress and extend more quickly, and this will result in increased control on bumpy tracks; however, the car is likely to show more body roll when cornering. Stiffer damping will increase smooth-surface traction but will inhibit traction and control on bumpy tracks.

73. Anti-Squat

Anti-squat is known as the angle of the plane formed by the arms' inboard pivots as viewed from the side of the chassis. When you have the hinge pins angled further up, the less the car will sink the rear of the car at acceleration. When the hinge pins are parallel with the chassis the car is considered to have zero anti-squat.

Almost every sedan has their rear arms mounted on fixed bulkheads so anti-squat is not adjustable. The SHUMACHER SST '99 PRO is one car that uses independent rear arm mounts in which spacers may be added under the front mounting screw so that the hinge-pin angle may be altered. It is not recommended to adjust the anti-squat from the stock setting, but experimenting might lead to better performance. If you lose a lot of traction while accelerating or feel that the car is wiggling when you are accelerating, you might want to try and adjust the anti-squat (add a degree of anti-squat).

74. Camber

Whenever you look at your sedan directly from the front or the rear, the wheels should lean slightly inward toward the chassis centre-line. This is known as camber. When the wheels are perfectly vertical, the car is said to have zero camber. If the wheels lean outward (away from the chassis centre-line) the car is said to have positive camber; if they lean inward, the car is said to have negative camber. Camber is used to compensate for chassis roll while cornering. Basically, as the chassis "leans" in the corners, so do the wheels; this reduces the contact patch between the tire and the roadway surface. Giving your sedan negative makes the tires flatten out in the corners and therefore increasing the contact patch. This will also increase cornering ability, better handling, and more even tire wear.

The camber may be adjusted by way of a turnbuckle upper linkage, by adjusting a threaded-rod camber link (one end of the camber needs to be popped off), or by threading a pivot ball into or out of the suspension arm (this is quite rare). Touring cars usually don't need more than 1 or 2 degrees of negative camber thanks to the fact that TC's have such short-travel suspension systems and do not need to compensate for excessive chassis roll. Higher camber angles can be used to reduce the wheels' contact area as a way to dial out traction, but that is hack tuning. Adjust your camber if you want even tire wear and try and stick to angles between 0 and 3 degrees negative camber. You can accurately measure this number with a gauge from RPM or RACEtech.

75. Caster

This is the angle of the steering hub's kingpin, or the angle of the plane formed by the hub's pivots. Like camber, caster is measured in degrees and may be "positive" and "negative". If the kingpin is perpendicular to the chassis, it has zero caster. If it leans toward the front of the chassis, it has negative caster; if it leans toward the rear, that is known as positive caster. Caster and camber work together to control the tires' contact patches as the car turns. When set at zero, caster has no effect on camber. Add positive caster, however, and it's easy to visualise how camber and caster interact. The Tamiya TA03 has a 10-degree positive caster. The tyre's contact patch moves to the outside of the tread when the hub is turned toward the rear of the chassis. Correspondingly, the contact patch moves to the inside of the tread when the hub is turned to the front of the car. Now, imagine the TA03 is taking a turn: the inside hub swings the wheels towards the rear of the chassis, and the caster setting helps move the tyre's contact patch from the inside of the tread toward the outside (decreasing camber). Meanwhile, the outside hub swings its wheel toward the front of the car, and the caster setting moves the tyre's contact patch farther inward (increased camber) You may have heard that greater positive caster angles increase turn-in steering but decrease steering when exiting a turn. How discernible this is to the average racer is debatable, but it does make sense that the sudden change in camber could cause the car to react quickly to steering input but then "settle down" as chassis lean counters the effects of the camber change.

Most cars use separate steering hubs and hub carriers that do not allow caster to be adjusted (optional hub carriers with different caster settings are available for some kits however). Also be aware that caster always refers to kingpin angle, not hinge pin angle. Some kits, such as the Team Losi Street Weapon, do use optional bulkheads to alter the angle of the front suspension arms' hinge pins as a means of changing the angle of the kingpins, but caster angle refers ONLY to the kingpins. Kits that have adjustable caster usually use a turnbuckle to adjust it (GHI Xpress series), or they have variable-position upper-arm spacers (Traxxas 4-Tec). If you are pleased with your car's handling but find it turns too hard (or not hard enough), try altering the caster setting; increasing positive caster will increase turn-in and vice versa.

76. Ackermann

Ackermann refers to the difference in front wheel angles required for a touring car to steer more effectively. When cornering, a car's inside wheels describe a smaller circle than the outside wheels; therefore, the inside and outside front wheels must turn at different angles to negotiate a turn without encountering "scrub" - the friction caused by a tire that is not correctly aligned with the arc of the turn. Ideally, a car's steering geometry will cause the front wheels to maintain an angle that is perpendicular to the radius of the turn, regardless of how sharp or sweeping the corner is. Associated claims the TC3 has "perfect Ackermann" as described above.

Ackermann is usually "selectable" rather than "adjustable". In the case of the Team Losi Street Weapon, two bellcrank pivot locations allow the car to be set for more Ackermann (greater difference between left and right wheel turn angle) or less Ackermann (less difference). Some cars have an adjustable drag link between the bellcranks; changing the length of the drag link will alter Ackermann. If your track has lots of tight turns, more Ackermann might suit your car; conversely, less will work well on tracks that have sweeping turns.

77. Track

This is often confused with width, as any change in width also changes track. But to be precise, track is the distance between the right and left tires, measured from the centre of each tyre's tread. This is important because two cars with the same total width may have different track measurements because of the width of their tires.

To alter track, some cars offer a choice of hub mounting holes in the suspension arm, and on a few pivot-ball-supported hub designs; track can be adjusted by threading the balls into and out of the arms. But on most cars, the only way to alter track is to put spacers between the wheels and hubs or mount wheels with more or less offset (which is the distance from the centre of the rim to the face of

the mounting hex). Kawada and HPI both offer a line of rims with different offsets. Go with the widest track you can (190mm is usually the maximum width allowed for electric TCs), as width promotes stability. If your local track allows you to run a 200mm car, go for it.

78. Wheelbase

The distance from the centre of the front axle to the centre of the rear axle represents the car's wheelbase. Be sure the front axles are perpendicular to the chassis' centreline for accurate measurements!

The longer the wheelbase, the more straight-line stability a car has, but long-wheelbase cars do not corner as tightly as short-wheelbase cars - imagine a limo on a slalom course. If your track has sweeping turns and long straights, try a long-wheelbase set-up; for tight, twisting tracks, shorter is better. On most cars, wheelbase can be adjusted by changing the locations of the spacers on the rear of the hubs' hinge pins. Some cars have rear suspension arms that can be flipped to match the chassis to short-wheelbase body sets, but this is too dramatic a change in wheelbase for tuning purposes.

79. Toe Angle

This refers to the angle of the wheels as viewed from above. The wheels have toe-in if the front wheels point inward toward the front of the car; and if their fronts point outward...you guessed it: toe-out.

Front toe is fully adjustable on all but the least expensive cars, and it's adjusted by altering the length of the steering tie rods by twisting a turnbuckle or by adjusting a threaded link. Rear toe is rarely adjustable, but optional hubs with various degrees of toe-in may be available. Most cars benefit from a degree or two of front toe-in to help stability on the straights. Toe-out can be used if you need extremely aggressive turn-in. For most cars on most tracks, the stock setting for rear toe is fine, but running zero rear toe can help efficiency and straightaway speed - but at expense of some stability. Rear toe-out is never used. Avoid extreme toe-in settings (4 degrees or more) at either end of the car, as this will cause the tires to "scrub", and that limits speed and increases tire wear. If stability on the straights is an issue, toe angle should be your first adjustment.

Suspension

80. Hold the Shaft Gently

You've seen different methods of holding shock shafts while attaching rod ends. We've got a great method for you that are better than any you've ever seen. Place a small piece – about half an inch is all you need – of silicone fuel tubing over both noses of your needle-nose pliers. Once the tubing is in place, use the pliers to hold the shock shaft firmly while screwing on the rod end.

81. Graphite What?

Want your suspension to work a little bit smoother? Who doesn't? The next time you build or rebuild your vehicle's suspension, pick up some powdered graphite dry lube from your local hobby shop. It's used for many things including pine wood derby cars. Put a small amount of dry lube between your hinge pins and the parts they are going through. You can also put a small amount inside your ball cups before you snap them in place. Unlike oil or grease, the dry graphite doesn't attract dirt or dust and will keep your suspension working smoothly. Graphite lube is available through Pinecar and is called Hob-E-Lube (P358). If your local hobby shop doesn't carry it, ask them to order it for you. If you can't find powdered graphite in your area, you can also try using baby powder.

82. Work Those Shocks

Before a race, it's important to pump your vehicle's shocks. This will help to release any air that may be in the shocks. If you listen closely when you do this, you can hear the shock oil smooth out as you pump the shocks. You will notice that your vehicle's suspension is more consistent through the first few laps of the race.

83. Shock Piston

Before inserting oil into the shock, always check if the piston moves smoothly.

84. Shock Stopper

To use as a stopper, cut a small piece of silicone tube and insert it in the piston. (on the outside portion!)

85. Shock Bubbles

Always overfill the shocks with oil. Then move up and down the piston to remove air bubbles. Be patient! Wait until all bubbles are removed.

86. Clean Shocks

ALWAYS clean your shocks before each refill and ALWAYS check again if the piston moves freely.

87. KIT BUILDING - Suspension

Suspension - When you are threading the plastic pivot joint onto a shock shaft put a piece of silicon fuel tubing over the pliers so you don't scratch the shock shafts.

Transmission

88. Clean Your Diff Correctly

The next time you rebuild your diff and you've removed the old diff balls, spray some plastic-safe motor cleaner on the diff gear to clean it off. After that, use a pipe cleaner and run it through the diff ball holes. Inspect each hole to make sure that you've cleaned them thoroughly before you begin to install the new balls. This will ensure that you've gotten all the dirt and grime out of the diff ball holes.

89. Filling Diffs

Always fill the differentials with grease/oil until the gears are covered, or even lower. Don't overfill! You'll have oil leakage.

90. Diff OutDrives

Apply a small amount of grease into the axle of the diff outdrive to ensure smooth turning.

91. Diff Gears

Check if the differential engages smoothly before filling with the grease/oil.

92. Diff Sealing

If the diffs have inadequate sealing and oil leaks, apply a small amount of silicone in the contact of the two-diff housing parts (after you build it of course!)

93. KIT BUILDING - Transmission Assembly

Transmission Assembly - Apply a thin bead of Black Grease between your transmission cases with you assemble the transmission. This helps to keep the dirt out.

Wheels & Tyres

94. Checking Tires

Those simple things that we take for granted can often come back to bite us on the butt. Whether you're a sedan racer or an off-roader, the next time you put your car or truck down on the dirt or asphalt be sure to check that your tires are still glued on. That's right. Often times the CA glue we use to mount tires can break or come loose. You might not notice this until your rear tire passes your car on the straightaway. Even if only a small area has come loose, it can have an adverse effect on your car's performance. If you see that the glue on your tire has come undone, place a small drop of CA between the tire and rim. You can wrap some heavy-duty rubber bands around the tire to hold it in place until the glue dries.

95. You're Soaking in it

Have you ever bought a new kit that used three-piece wheels? Remember what a hassle it was to get the tires on those wheels? Any one who has had to perform this task knows it can be tough. To make your life easier try assembling those wheels and tires over a sink or bucket of soapy water. That's right, just as if you were about to do the dishes. Rinse the tires and wheels in the soapy water and assemble them just like the instructions tell you. The soap acts as a lubricant and dries easily without leaving a residue or mess.

96. Tire Compound Tip

If you use a traction compound like Trinity's Buggy Grip or Team Associated's Traction Action, then you know how much of the compound gets wasted every time you spray it on your tires. Usually, only half of the spray gets on your tires. The other half gets on your car's body or, even worse, in your lungs. Instead of using the spray bottle, get a soft-bristled toothbrush. When you are ready to apply the compound, simply dip the brush in the compound and brush it on your tires. When you're done, shake the excess compound that is still left on the brush into the bottle. This method will help you to conserve compound, to keep your body free of stains, to distribute the compound more evenly over the tire, and to cut down on fumes.

97. KIT BUILDING - Tyres

Tires - When gluing tires on to rims be very careful not to screw up. Keeping your tires balanced is very important. Use only the necessary amount of glue. Also, before you glue them on to the rims, take the time to clean the plastic rims off with something like non-acetone finger nail polish remover. This is very important because there is an oil like substance that the factories put on the rims to take them out of the mould. If this stuff isn't removed, the glue will not stick as strongly.

98. Extra Traction

Shoe Goo can be used on bald tires to get some extra traction; you can make you own tread!

99. Tyre Balancing

When balancing tires, try using hot glue instead of tape. This way it can't fly off in a race. If you apply too much, it will still be warm enough to take a little off. It can also be applied in spots where tape cannot be.

100. Tyre Venting

Instead of cutting a hole in the tire for venting, drill a small hole in the wheel itself so you don't ruin the tires.

And Finally...

101. The Final and Most Important

HAVE FUN!