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RACING SPECIAL

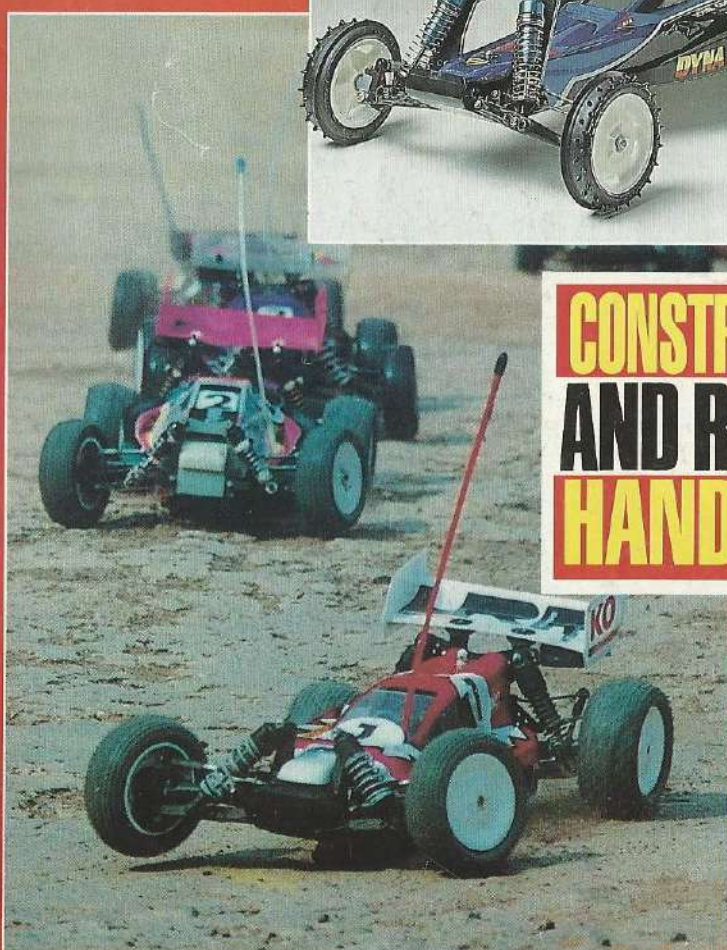
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INTRODUCTION

Racing Special has a specific task to complete. Every year we try to bring people interested in model cars something new to read, to look forward to receiving and hopefully at the same time pass on some advice and knowledge that may help you get more from your hobby. Over the past issues of Racing Special we have featured kit lists, motor lists and guides on buying RC Cars and equipment. This Racing Special (1993) is a little different.

New Format

This years reading is aimed at the beginners, club racers and semi experts. We feel that there is something for everyone in this years Racing Special. Our newcomers article explains what RC Car racing is all about, our construction and maintenance articles will aid those racing already and trying to gain knowledge of how the experts do it. And our set-up and drivers discussions with top drivers will give even the very best drivers something to think about.

This years Racing Special has been written and guided by people with years of RC Car racing experience and knowledge of the top competition and ground roots experience. Our thanks must go to the drivers who helped us: Jamie Bush, Kevin Moore, Craig Drescher, Ellis Stafford and David Spence who have tried to give an indication of what has made them so good.

So here it is... read and enjoy and hopefully learn. But most of all remember that car racing is all about having fun, making friends and healthy competition.

By the way don't forget RC Model Cars Magazine: in the next issue you can read all about the World Championships for 1/18 off road held in the UK - so don't miss it!

RACING SPECIAL

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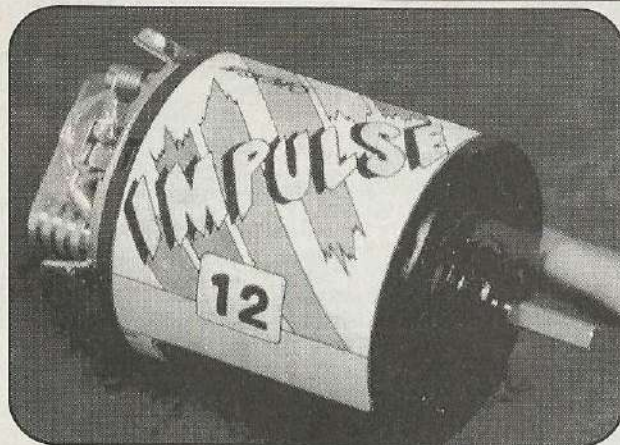
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ASSISTANT: Andrea Berridge
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ADVERTISING: Christine Contreras



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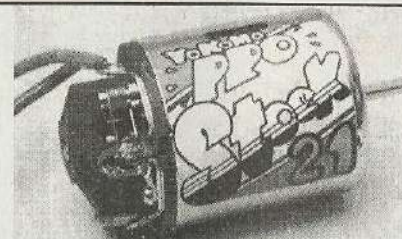
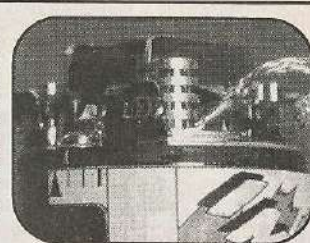
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STARTING OUT IN THE WORLD OF RC.





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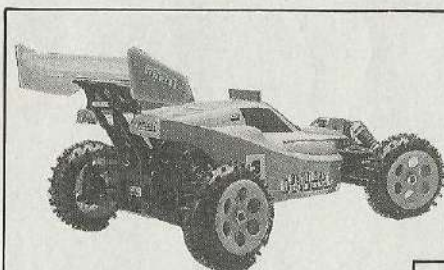
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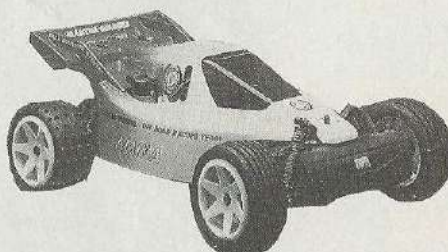
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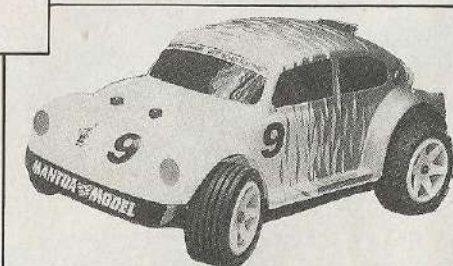
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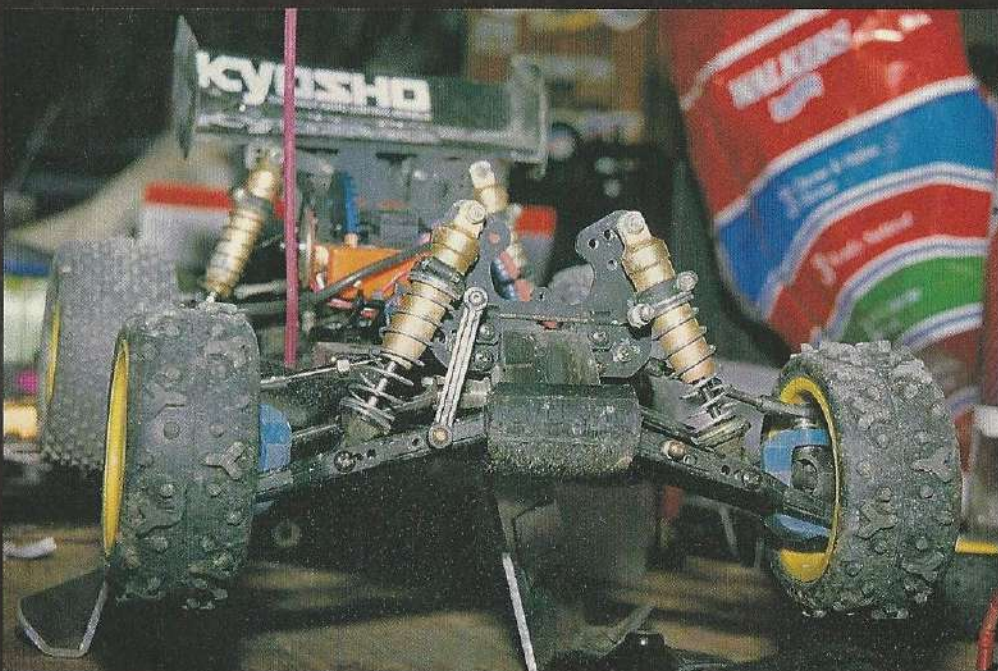
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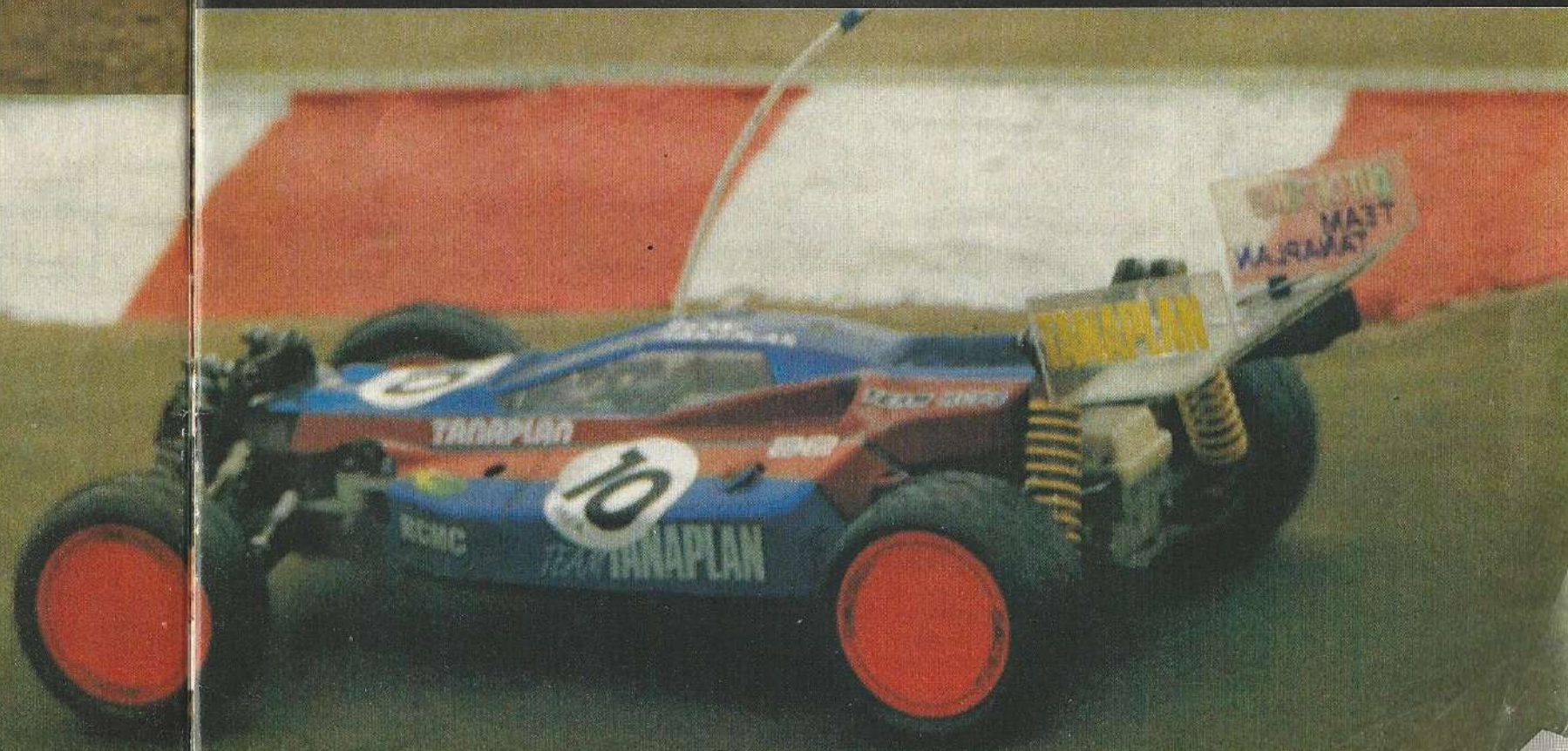
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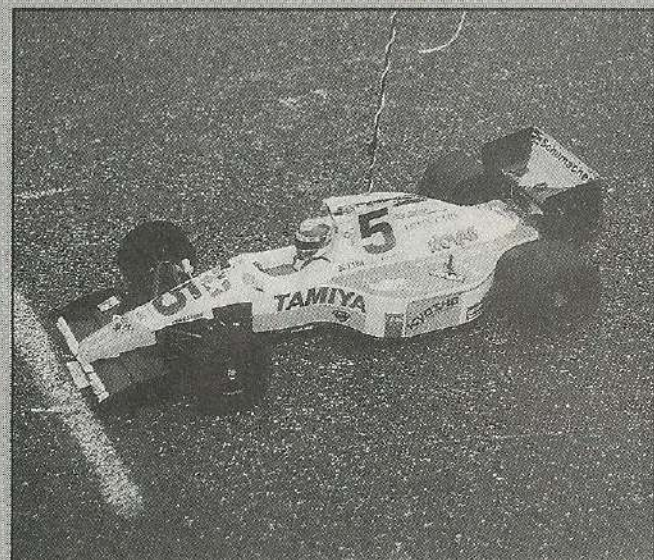
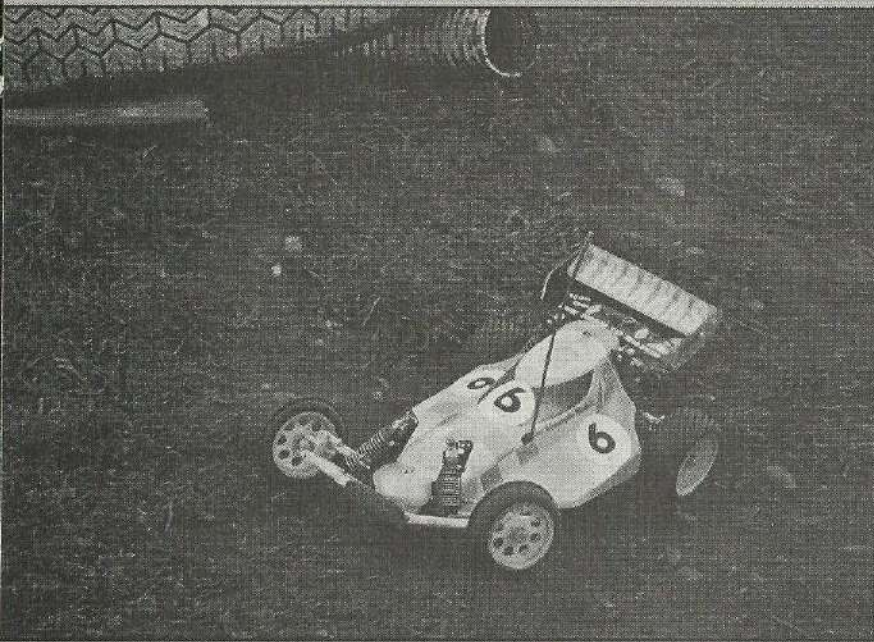
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GO RACING!

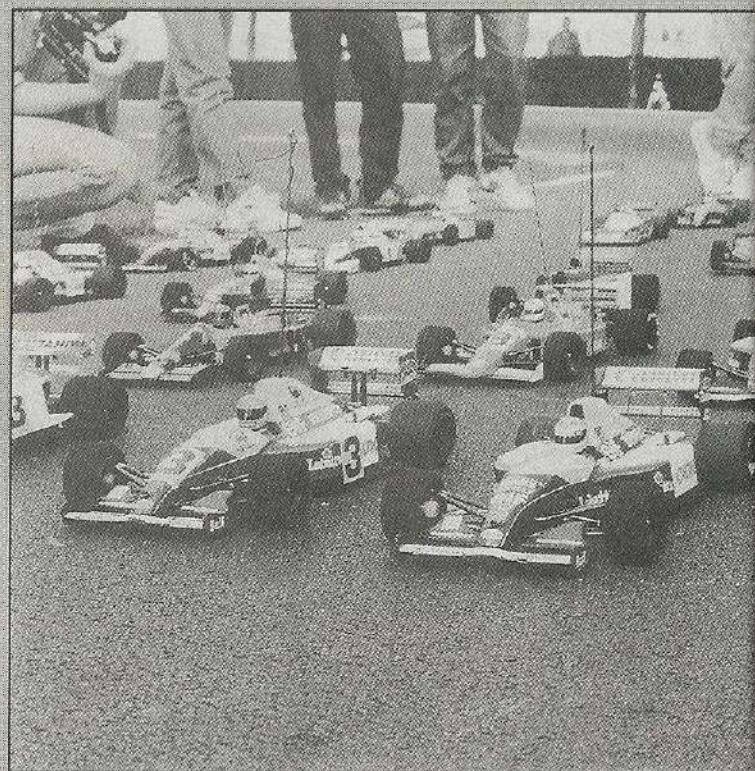
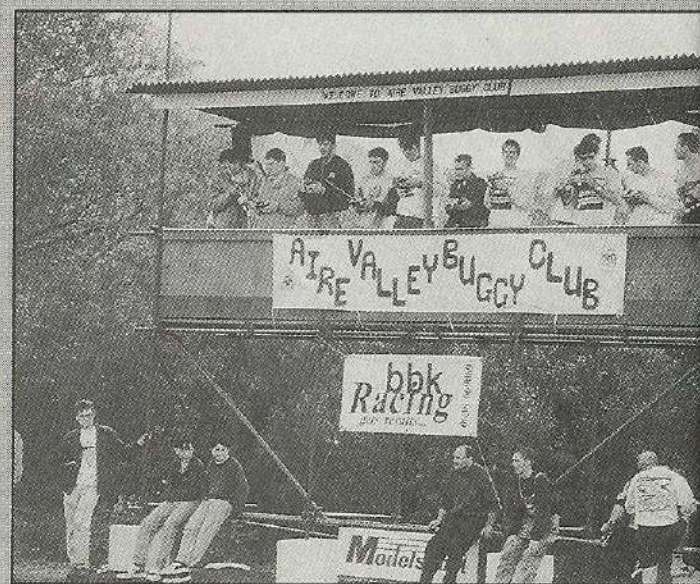
DON'T JUST
SIT THERE
GO RACING
AT CLUB
LEVEL -
PETE WINTON
EXPLAINS
WHY...





Racing radio control model cars instead of just enjoying them on your own brings a whole new dimension. Tamiya's F1 series has taken complete beginners with standard kits and made them regular racers competing even on the continent. Right; Eurocup Finals, Germany.

Radio Control (R/C) model cars come to our attention in many ways. People either see them at a club or a show, or look longingly into the model shop window. But the word we use all the time is racing. These are not model cars, this is model motor racing and here is how to go racing.



Racing is about competing against the clock (as in rallying) or directly against another competitor (as in circuit racing, F1 etc). The first thing to do is find a collection of like minded people who also want to race.

Every Day

These people are everywhere, they meet at

clubs all over the country on almost every day of the week. There is a list of clubs in this issue of Racing Special, and you can also ask at your local model shop for smaller clubs close to home.

It may seem like putting the cart before the horse, but often it is better to go to the club first and see what class of cars they race (see our list in this issue for the different classes available). Beginners should choose



mini-stocks, standard kits (Tamiya, Kyosho etc or 4WD Off Road. These are the easiest cars to learn to drive though in the case of 4WD Off Road, not the cheapest to buy and maintain.

You're Welcome

The club will welcome you, there will be plenty of people to give advice and help. Never be shy to ask if they

will put on races for the car you have or would like to buy. If you are not happy with what you see, try another club. It is better to travel a bit further and have some fun, than to keep local but not enjoy your racing. Visit the club two or three times to see how things run. Make sure you feel comfortable and that you have made a couple of friends. Find out what it costs to race, and that they will run a race for your class of car – now comes the first club night. Do not be nervous. However confident all the existing club members appear, they were feeling just as bad as you on the first night. You know how to charge the car batteries up, and how to switch it on and off. Remember to do all these things on time, and to be ready for your race. Club nights (like any meeting up to and including

the World Champs) start with booking in. Have your money ready, and know which frequency you are on. Tell them you are a beginner and ask for their guidance. Ask any questions you like, even if you need to borrow crystals. Of you get no help find another club. In the current recession every club needs every member it can get, they'll soon help you out! Once booked in, a list of the heats will go up on the wall. Look at it carefully, make sure you have the correct numbers on your car and you have been given the correct frequency. If it has not been made clear to you, ask what time the first heat starts.

Final Formally

You will normally race three or four times in qualifying and then in a final. Your lap times are posted every round for you to check. Don't worry too much about this now, but look at the times and see if your idea of a 'better' race is reflected in a faster lap time.

Make sure your batteries are on charge for your next race and check the car over so it is fully ready. Drive to the best of your ability, avoiding faster cars and hitting the track markers. There may well be crashes, but if you feel that there is no control of the idiots then find another club. Remember that every week you are only racing for 20 to 25 minutes. It takes a long time to build up skill at this rate, so don't expect too much too soon. It may take a year for you to feel in control and that is normal. As you get better you will want to enter bigger meetings, and you will inevitably join the BRCA to race in their organised Regional and National Series. Again, treat every bigger meeting like your first, being sure that you are well prepared and the car is reliable. Never, ever, worry about the cars or equipment other

drivers are using. Racing is all about driving skill. Whatever the rules are, or whatever equipment is available, the best drivers will always be at the top. your single goal in life is to drive an entire race without having an accident. Lots of cars, motors, batteries, etc do not mean that the driver is good, only rich! you must enjoy your racing and that can only happen if you get the best out of the car you have. When that car is being driven to your limit without accidents for a whole race, then is the time to buy better and faster parts. Remember the faster the car is the more difficult it is to control. Learn to drive slowly, and speed up later. Drive with your head, not your pocket.

Family Fortunes

The great thing about model motor racing is that it is a sport for the whole family. 1/10 Off Road has about 120 drivers at each meeting, but over 400 people. Mum's, Dad's, Sister's, Brother's all come to enjoy the atmosphere and the thrill of the race. The big meetings have camp sites, food, and occasionally some good weather! There are hundreds of families who see model motor racing as a day out, and who enjoy these days when the drivers are teenage or older. It is a great way to enjoy a family jaunt on a weekend, and far better than everyone going their separate ways as the younger drivers get older. Mum's and Dad's also race, and model motor racing is very addictive. So many people come back for more simply because they think, "I enjoyed that, and I can do better next time!" Don't drive it round the garden, go and race it – you'll never have more fun than doing well at a model motor race. Find your club, get you car and GO RACING!

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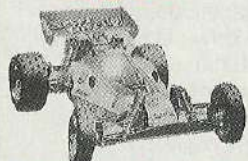
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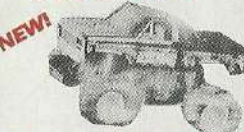
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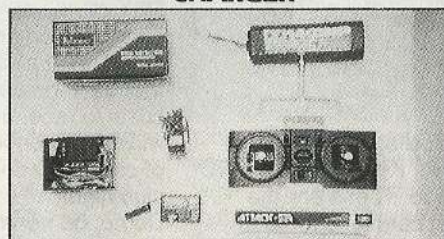
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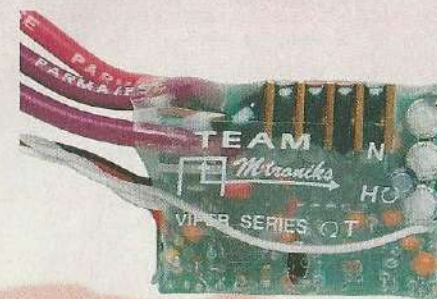
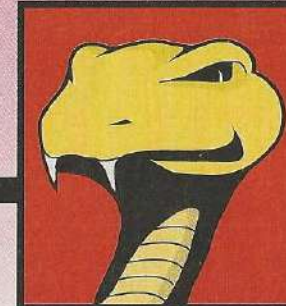
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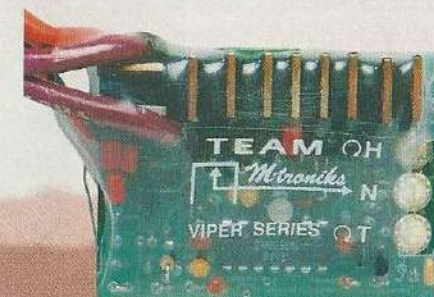
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The future of speed control



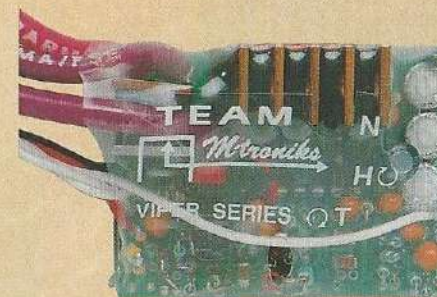
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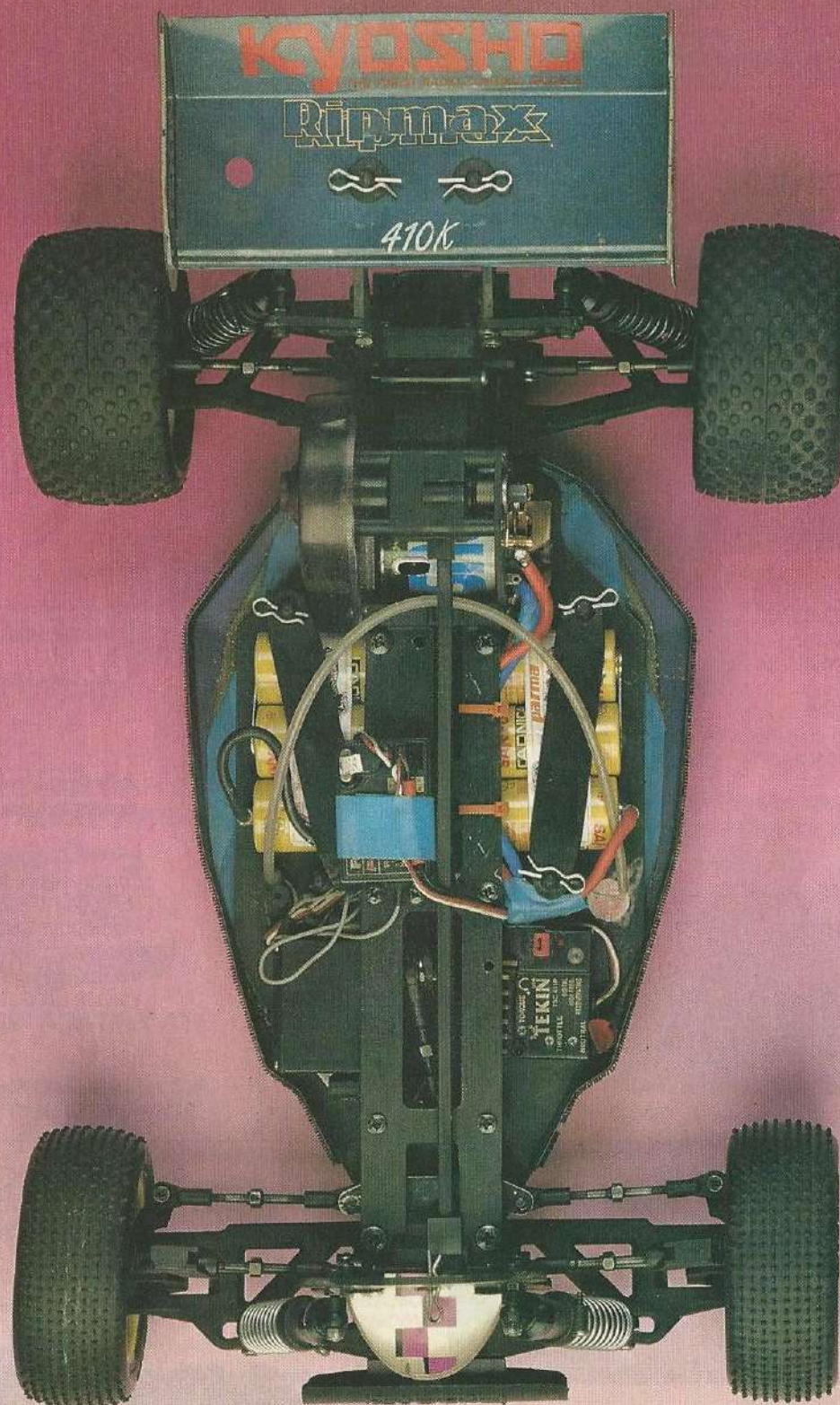
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BUILD TO WIN

PREPARATION IS THE NAME OF THE GAME. TIME SPENT ON BUILDING WILL BE REPAYED ON THE TRACK IN FULL...



Car preparation is as much a part of winning the race as good driving. It is obvious that if you car does not finish the race, you have no hope of winning, yet at every meeting the lower finals are littered with drivers who are let down by their cars. Just as we cannot improve your driving by merely writing words, we cannot improve your car preparation in the same way. What we can do is point out the simple rules that winners use to make their cars reliable - and here they are.

In order of occurrence the most common faults are:
1) Electrical failures, mostly radio gear and/or speed controllers.

2) Gearbox failures, most commonly the differential and slipper clutch.

3) Suspension failures, usually from a ball joint or pivot pin coming loose or falling off.

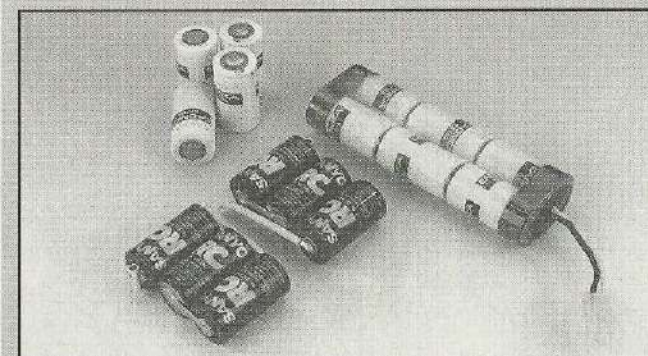
These problems are unrelated to accidents, for which the reverse order of failures above usually applies. Building the car from kit instructions gets the parts together in the right order. These tips will help you make them stay there race after race after race.

Batteries

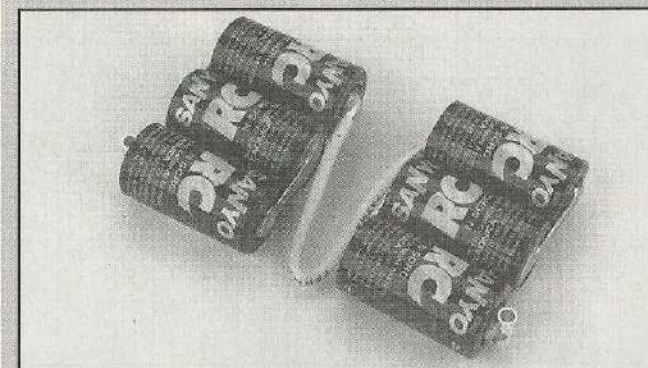
Cells must always be protected from the use, or abuse they receive. All cells come in individual shrink wrap, make sure it stays in one piece. Saddle packs must have rigid connections between each cell, and each cell must be glued to the one next to it - use Evostick.

Stick packs must be put together by experts, and be held together by glue (Evostick) between the sticks. There must be a stout piece of shrink wrap holding the two sticks together.

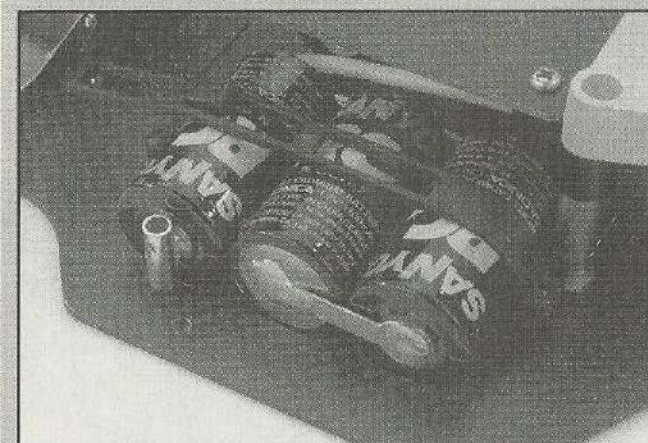
Cells sit easily in their retainers so that clamps merely hold them in place. Saddle packs often sit in slots in the chassis and are



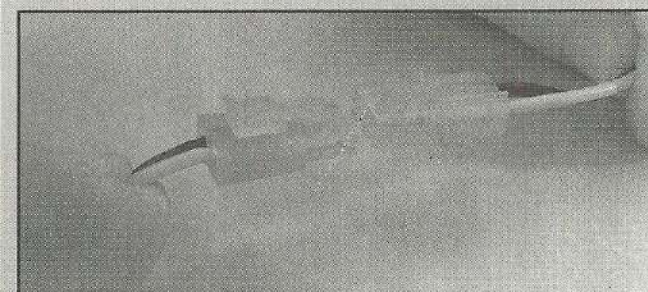
Batteries in single cell form and also in both saddle and stick packs.



Saddle packs need to be glued together and connected with a solid conductor.



Carbon chassis can conduct electricity so be careful. Batteries shown here held down with the excellent battery straps.



With the Tamiya style plugs reverse polarity connections are impossible.

held in with a strap. The strap must not be difficult to fasten since the extra force is distorting the chassis and will give a bad handling car. Stick packs can be held at each end or across the top with a strap. The cells must not be pushed down by the strap or rattle around. Glue a piece of foam to the strap to push the cells lightly down on the chassis and prevent them rattling. Carbon fibre chassis are lethal, they conduct electricity. The edges of any slots must be bevelled with a file and made smooth. If necessary, paint the edges of the slots with varnish to provide further insulation. Metal chassis should have a piece of tape stuck on them on which the cells can rest to prevent any possible electrical problems.

Speed Controllers

We have a full section on speedo's elsewhere in this issue, but two items are important for this article. Connections between the speedo and the cells must be foolproof. Always use Tamiya style connectors. Check and double check that new cells are correctly wired to the plug before connecting them to the speedo.

Users of the Corally Gold connectors must have a foolproof way of ensuring that one of the leads (say +ve) cannot reach the negative terminal, with a longer lead for the negative. Paint the positive terminal on all your packs red so that even if the pack goes into the car the wrong way round, you can instantly see something is wrong.

Off Road cars with full undertrays can use servo tape for mounting speedos. It is the simplest and safest providing, as it does some insulation for the speedo from the shocks it will receive. Make sure that any movement the speedo has does not cause the heatsinks or any other part

of the speedo to touch the chassis (if metal or carbon fibre) or the batteries. If you must use servo tape, use two layers to provide a 'cushion' for the speedo. All wires to and from the speedo must have proper insulation at any joints. Never allow any exposed bare wires anywhere in the car.

Steering Servo

Two rules here, nail it down and use a servo saver. Despite its name, servo tape is useless. Years ago servos could not lift a feather and had a 60 degree transit time measured with a calendar - not now!

All Tamiya cars belt their servos in, so should you. Use two posts to pick up on the servo flanges. Use the rubber bushes and screws from the servo 'kit' to fix the servo to the posts. Drill holes in the chassis to fix the posts. Make sure there is enough clearance under the servo saver to prevent it rubbing on the chassis. If this raises the servo up place a small piece (or pieces) of servo tape under the opposite end to support the servo.

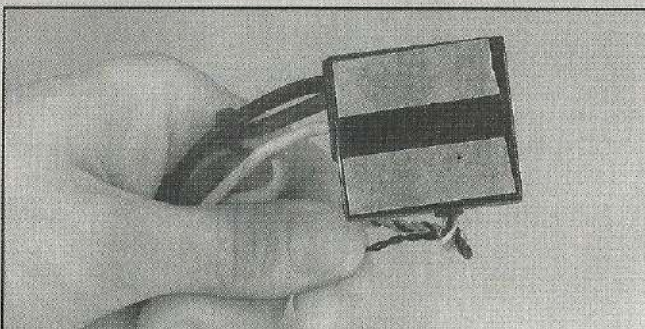
Servo savers are a must, they protect the servo and the steering arms, etc. Choose a good quality one (Schumacher, Kimborough) and make sure it is not touching the chassis or the servo body as it moves.

Springs and Dampers

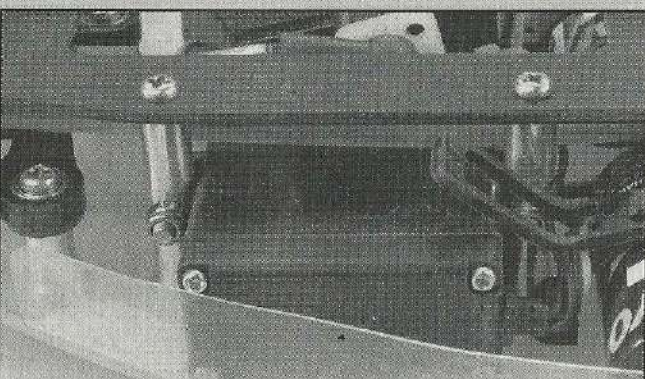
Springs must be properly seated at the top and bottom, and not rub on the damper body during movement. Check dampers regularly every race, for smooth action and correct filling of oil. Damper top mounting must be free moving, adjust them to ensure there is no binding. Bottom mountings must be secure if in doubt remove the steel ball and plastic cup



Corally connectors are an excellent method for R/C cars, but the emphasise is on the user to connect up correctly.



Stick speedos into your chassis with two pin strips of servo tape.



It is by far best to bolt servos in rather than stick them!



Servo savers, do just that so make sure you always fit one and keep connecting rods free at all times.

and replace with new ones. Building dampers needs a piece to itself, we are concerned here that you mount them properly and check them regularly. Once on the car move the suspension through its full travel to ensure the springs don't catch on roll bars, bodywork, or damper mounts. Move anything which interferes with the spring out of the way.

Suspension

Everything must move freely. If any of the pivots are stiff check that the pins are straight. Plastic ball joints must have threaded rods in at least 2/3rds of their length. The threaded parts must not go right to the bottom of the ball joint, nor be close to the end.

Chassis

Do not over tighten screws which fix plastic parts to the chassis. Make them as tight as you can using light pressure on the screwdriver, don't wrench them up with a clenched hand.

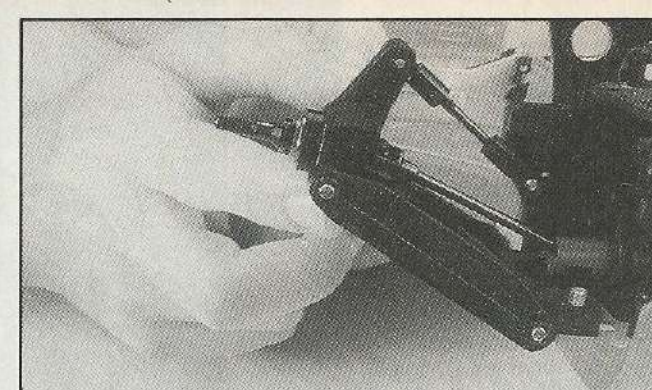
Self tapping screws will work slightly loose from time to time, re-tighten them as above. Machine screws and their nuts can more easily come undone so use a threadlock compounds on assembly. Do not use Superglue, but you can use Evostick instead of threadlock. Protect any exposed chassis parts with strong tape particularly carbon on glass fibre chassis. Most cars now have plastic undertrays to do this job for you.

Transmission

Differentials get better every year so the problems diminish in the same proportion. Check these points when assembling. Use silicon grease not a lubricating grease for the



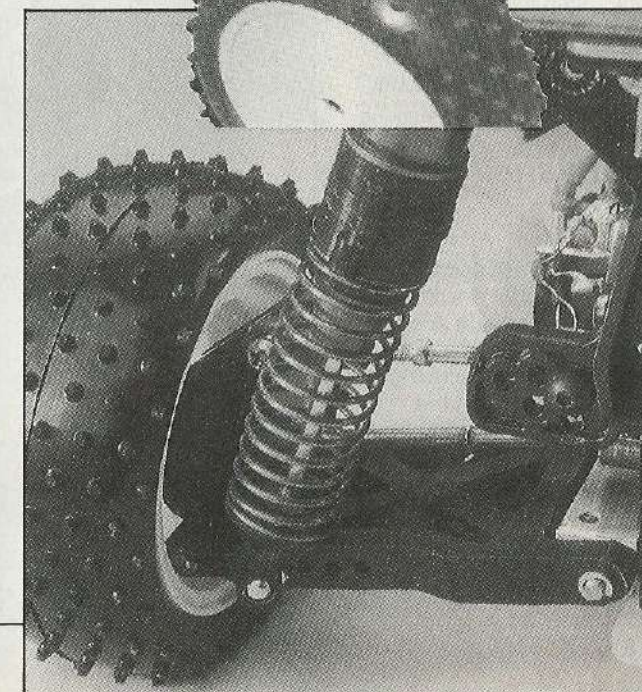
Neatly prepared Yokomo 4WD has neat wiring and uses Corally connectors on the speed controller and motors.



During building make sure that the car's suspension arms can drop freely under their own weight.



Left; Working on the car between heats is part of R/C car racing. Right; Make sure shock absorber springs are well seated.



diff balls. A small blob on each ball is sufficient. Too much grease makes the diff slip and it has to be tightened more to make it work. No other lubrication is required.

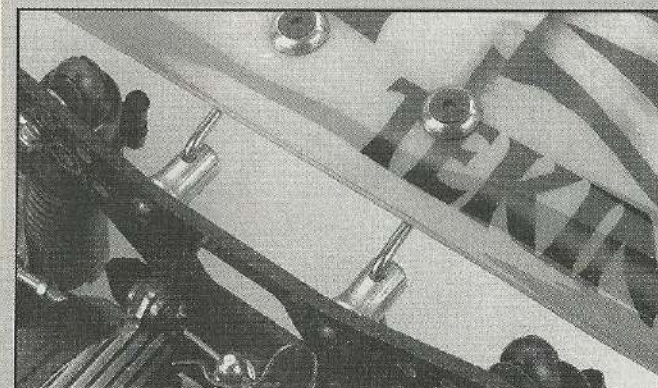
Do not over tighten the diff as this puts unnecessary strain on the parts leading to early failure. Use only the minimum pressure on the diff rings which gives no slip. Never over tighten the diff screw - if the diff slips no matter how tight the screw something is incorrectly assembled. Strip and start again.

When checking the diff in the car make sure the slipper clutch is screwed up tight. Once the diff is set unscrew the slipper to the required setting. On 4WD cars check that the long belt is correctly tensioned. The belt must not touch the chassis or the top plate. Wires passing between the belt should be securely fastened so they cannot move and become trapped in, or snag on the belt.

Transmission belts must not be too tight. Once set check that there is some slack all the time. Rotate the wheels and stop the belt in many positions to make sure there is no binding. If the belt goes tight in one position adjust the car to give it a little slack. Should this result in excess slack in another position find out why - strip the car and start again if necessary. Once this problem is resolved transmission problems will be a thing of the past.

Bodyshell and Wing

Most shells are secured with velcro, but even this can be inadequate in an accident. Try to fit a single body post with a screw-on nut somewhere on the chassis so it holds the body on. Correctly positioned this one post will ensure body and chassis never part company. Wire wing mounts are generally useless one shunt



A good strong wing mount needs washers under the bolts to stop the wing tearing.



Tamiya's plastic wing mount is ideal, keeping the wing level and firmly in place.

or crash and the wing goes awry. The Kyosho and Schumacher mounts are best even if they require a ready supply of clips or O rings. Adapt these mountings to your car and wings will always stay put.

Side dams on wings can touch the rear wheels on full travel, make sure yours do not especially when changing damper mounting positions. Stick side dams to wings with servo tape, and plenty of it.

Transponder

When used at a meeting it is best inside the car. If this is impossible or not allowed place it as close to the wing mounts as possible.

Transponders mounted out wide will damage the wing. If appropriate make a separate mounting of glass fibre screwed firmly to the car.

Practice your preparation as much as you practice your driving. Keep everything neat and tidy and securely fixed. Look for trouble after every race, eventually you will find some.

Get into a strict routine for preparing the car for the next race. Do everything in a set order and don't vary it. After a while it becomes second nature. For example, always clean and check the car before you remove the cells, then remove the cells, then check suspension then check screws etc. The order does not matter, but the routine does - make it second nature.

Once the car is 'stripped', place it on a flat surface. Check the camber angles - are they equal and the same on each side? Place the car on the roof of your road car and look at it from every angle - does it look right? Before fitting cells for the next race go through a set routine. Are the connectors OK?, is the motor secure?, is the pinion secure?, are the wheels tight?, etc. Again, the order is unimportant - you must choose one and stick to it rigidly until it becomes a habit.

If something does go wrong look at the problem. Fix it at once so it can't happen again, and put the check in your routine. Preparation can be summed up thus - if something goes wrong on the track you should not know what it is. If you do know then it was there before and should have been fixed before the race. Get into the assuming habit before the race by proper preparation.

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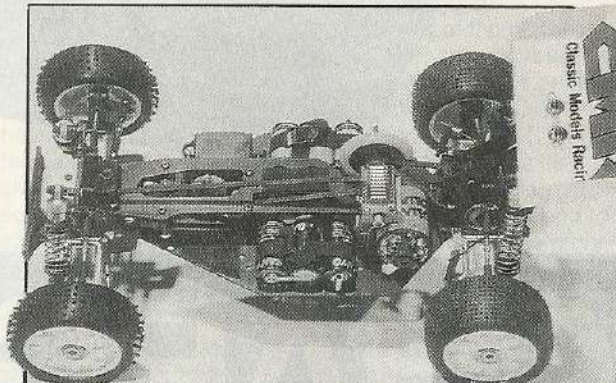
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CHARGED!

SCRC's HAVE CHANGED THE FACE OF RC CAR RACING, CHARGING IS STILL AS IMPORTANT AS EVER THOUGH...

The Challenger range of chargers find favour with both club racers and top drivers. Challenger chargers tend to be very neatly presented and reliable.



The Nicad pack is the life blood of R/C racing. Like all component parts of the hobby, nicads must be carefully selected and nurtured.

Over the years there has been a steady improvement in the performance of nicad cells. At each stage of development certain caveats were added to the specification, such as the way charging should be done and so on. What is interesting is that the nicads that allowed the hobby to flourish and become so popular some 15 plus years ago are still available to this day. This must surely say something for the

reliability and durability of those original cells. Nicads come in all sorts of shapes and sizes. However we will confine our interest to the pack type that is the power

source for R/C cars. The individual cell is known as the sub C size. Each cell will produce 1.2 volts (the same as all nicad cells), put six in series and we have produced a 7.2 volt battery pack. Configuration or layout of cells can be varied to whatever style you want. Most common are sticks where two rows of 3 cells lie alongside one another. The other configuration is saddle where virtually two separate packs are joined by a length of wire. This arrangement allows the pack to "saddle" the centre of the car. The major nickel cadmium cell manufacturers produce cells that have 1200mAh, 1400mAh and 1700mAh capacity. What this bit of information tells us is that the pack can produce 1.2, 1.4 or 1.7 amperes for one hour. As you might imagine increasing the capacity will, to a degree increase price.

As you might have guessed that is not the end of the story. R/C enthusiasts demand something extra from the batteries. Not a sedate 1.2 or 1.4 ampere for an hour but a hefty old current for around five minutes. Nine or ten ampere steady and up to 100 amperes on instantaneous demand. Can the batteries deliver. Well surprisingly the answer is yes. The nicads greatest asset the fact that it has very low internal resistance thus allowing it to deliver very high currents. Of course there is a penalty to pay for this instant power and that is a substantial generation of heat, this in turn leads to rapid deterioration of the battery pack.

Add to this another variable which is the way the battery will give up the stored energy and you have a choice on your hands. The main types of battery suitable



How you started? Most people start their charging careers with a simple timer based unit.

for R/C use are described as SC, SCE and SCR.

The variation occurs in the way the manufactures construct the cells. Fortunately we do not have to worry too much about that, it is a matter of how they perform which is important to us.

1. SC. These cells have been around the longest. They provide the mainstay of the R/C hobby. Others will out perform them, but for good, long life they take some beating. Available usually in 1200mAh form.

2. SCR accept a high charge and discharge rates repeatedly. They are more expensive but last longer if looked after. That means they should be allowed to cool down between each usage.

Available in 1200 and 1400. 3. SCE Not partial to very high charge rates and as such they do not have such an extensive duty cycle. Perform well.

Most common is 1700, thus a higher capacity is available.

4. SCRC is the latest to

come on the scene. These have now dominated the top racing events. Initially only available to a favoured few but now availability is wide. Repeated use and very high performance makes them, despite the cost a favoured battery. Finally just to add that final twist the designation of the SCRC has gone one step further with the SCRC (SP) being the very best of those available. These packs are usually covered in black shrink wrap. Available as a 1700mAh which is what makes them so attractive.

Charging.

There are different types of charging and charge condition detection. The system which is probably easiest to understand is the temperature sensing type. A temperature probe is placed in intimate contact with the case of a cell. When the temperature has reached a predetermined level (around 35 degrees C) the charger automatically switches from

a high current charge (5 or 6 amperes) to a low level trickle of a few hundred milliamperes. This system is reliable and is common in non R/C applications.

The peak detect system constantly monitors the applied voltage to the cell. As the voltage builds up a point is reached after which the voltage starts to drop. This peak is detected by the charger which automatically switches to a trickle charge avoiding overcharging. Nicads do have a tendency to give false peaks early in the charging cycle, and thus some of the more sophisticated chargers take this into account avoiding a false switch over.

The most sophisticated charger I have come across was not in the world of R/C but in industry. The machine initially completely discharged the nicad. Then the charging process was started. When charged, the battery was then automatically discharged. This was done a number of times, each time, the

"power in" was compared to the "power out". If something like a 80% energy transfer was achieved the battery was Ok. If this criteria was not achieved, an alarm was sounded and the battery was disposed of. All of this was carried out automatically. Mind you at around 1500 plus it is not the sort of equipment the average R/C driver will keep with him.

As a rule of thumb the SC/SCE cells are best charged using the peak detection system. Over heating an SC or SCE cell is not good for its health and will bring about a premature end to its life span. On the other hand the SCR and SCRC cells can handle temperature rise and to a limited extent they are forgiving with overcharging, so either temperature or peak detect charge detection is suitable. The fact that SCRC can handle overcharging allows them to deliver that extra punch if they are simply bursting with energy. What allows the SCRC to be so forgiving is the particularly low internal resistance

Many manufacturers produce dischargers. These are used to measure the amount of charge left in a battery pack after a race, this can aid the driver to gear his car for maximum speed.



they exhibit. Of course like everything there is a down side to all this energy cramming and that is cell life.

A lot has been written over the years about nicads adopting memory characteristics. The claim is that if a battery is not fully cycled, i.e. fully discharged and then fully charged it will adopt this "partial working" as its normal duty cycle. When it is called upon to deliver into that part of its charge that it normally does not reach, it can't or will not perform. Most industries recognise this and make sure that nicads are fully cycled. What is now coming to the fore according to some articles is that nicads not only develop memory for the amount of energy they are storing but they also memorise the way they are charged and discharged, that is, heavy hard charging will bring about a battery pack that can deliver punch by making masses of current available, almost a zero internal resistance battery, the dream of most electrical engineers. Of course this is only possible with cells that are capable of accepting this sort of treatment, namely SCRC (SP).

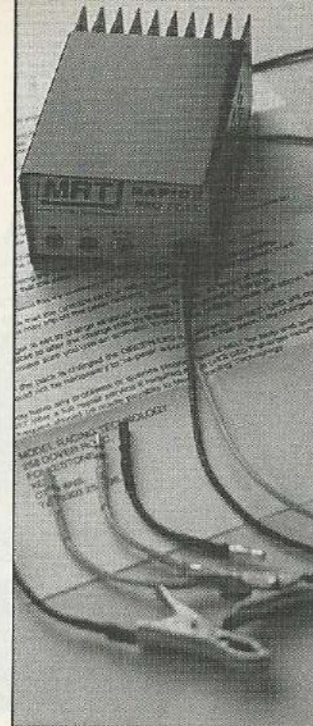
So the word is, that after a race or using the battery pack make sure it is fully discharged to ensure the duty cycle is complete. This can be done with a headlamp from a car and a few bits of wire, or to be more sophisticated with a discharger. This will measure just how much energy is left in the battery down to a predetermined level, usually switching off when the battery pack is registering less than one volt. Digital read-outs tell how much energy is left in the cell thus showing you that you could have geared the car to go faster by drawing more current in the race. I

suppose the perfectionist will aim for the battery to just run out of oomph as the car crosses the line. The power to charge the nicads can come from a 12 volt car battery or from the mains through a suitable transformer. If you are charging trackside from the family car, remember you can, during a day of racing do serious discharging to the family car battery. Many a time I have seen distraught parents looking for jump leads or a tow out of a car park and wishing terrible things on all R/C modelling.

What charger.

Like all electrical goods chargers can go wrong. Make sure that servicing is available before you spend your money. There is nothing wrong buying an imported charger as long as servicing arrangements exist in the U.K. This article is not a catalogue of chargers on the market so it is a matter of looking at the facilities offered and seeing what the pocket can stand. Thermal or peak, check the range of charging currents available. Digital read-outs, discharging

Charging your batteries in a box can help prevent any accidental connections. Here a Tekin charger is used to charge a pack of SCRC's.



Model Racing Technology of Kent produce this simple but effective charger. The appearance of these chargers is normally set by the size of the heatsink.

facilities some chargers can even charge at voltages higher than their own input voltage. Then there are the mains/battery combined type. As with most things the bottom line is what the pocket will stand, you are certainly spoilt for choice.

Charging.

Serious racers will only charge race cells once a week or sometimes even less. This means of course that they will carry vast quantities of packs around with them to big race meetings. At a less

serious level racers will only recharge battery packs once a meeting. When you are messing about in the garden you will want to recharge the battery as soon as it comes off the car. That's Ok as you may not have dozens of batteries available. All that should be pointed out is that heat build up in a battery pack can be cumulative and without realising it the heat could be building up to a seriously high level. Watch out on two counts. Firstly the most obvious, you could burn yourself, secondly the cells could vent. This means that as a safety precaution the cells have a simple valve in one end and if heat and pressure build up to unacceptable levels then some of the gas inside a cell will be discharged to avoid the case splitting open. This does not mean you battery pack is ruined, it does mean that it will never be as good again, but this is a lot better than having flying steel and noxious chemicals coming at you. So treat the batteries with respect, pressures inside the can may reach 90 PSI which is high enough. Treat them sensibly and you can expect in excess of 200 duty cycles from you packs, then you can still use them for running bicycle lamps.

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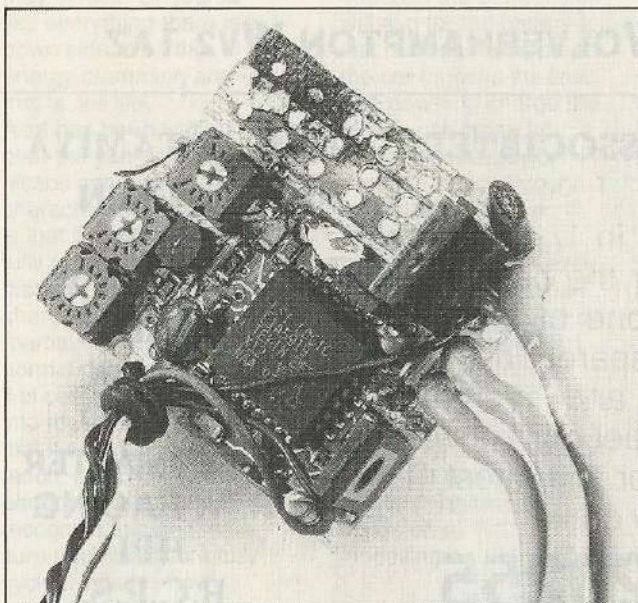
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Ouch! Bad wiring normally equals reverse polarity – and bang goes a £150 speed controller.

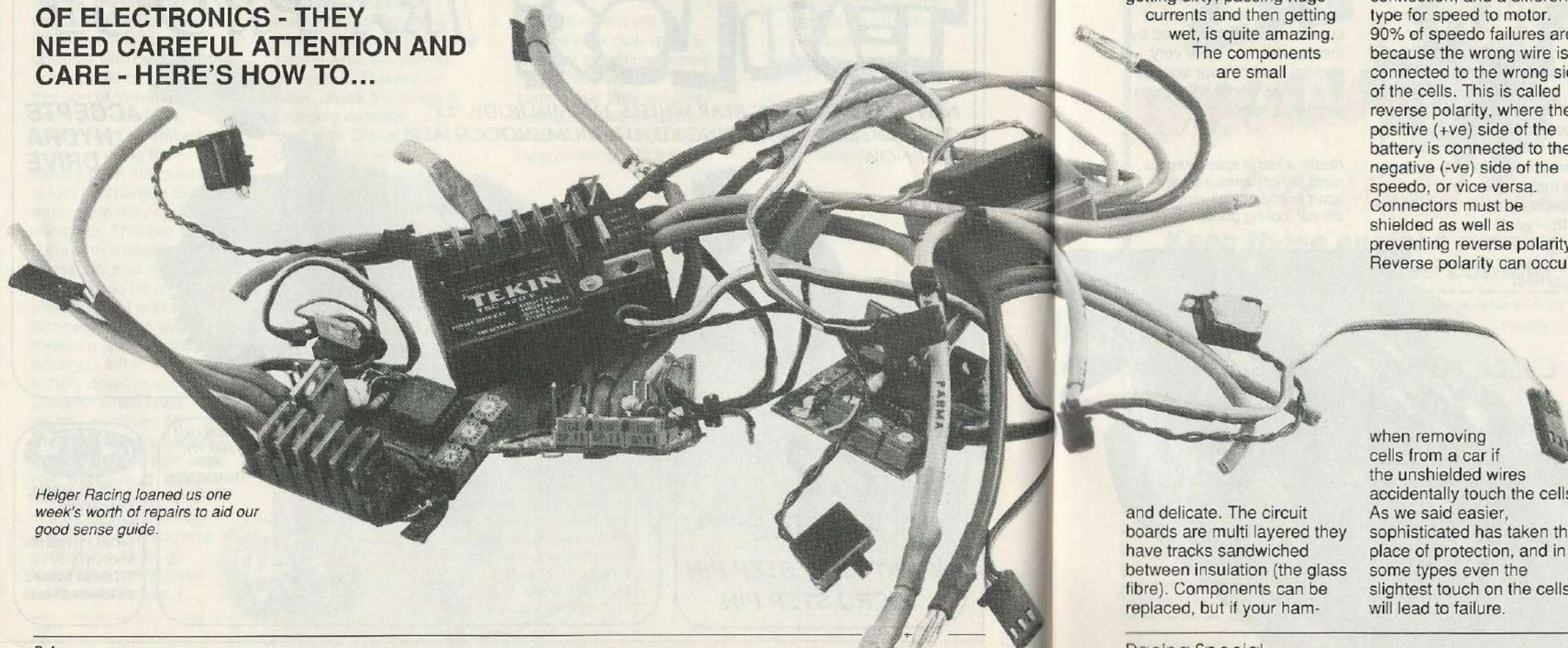
Speed Controllers - Rights & Wrongs

You need a new speed controller, and you've now got one. Sums of money large enough to cure the Third World debt have changed hands and we are now going to tell you how to look after it. Hold on don't turn the page, this is important and I need your attention. OK, open the packet, pick the speedo by the receiver wires, yes the little one's plaited together. Now, swing it around your head a few times, put it in a bowl of water, drag it across the garden, drop it on the

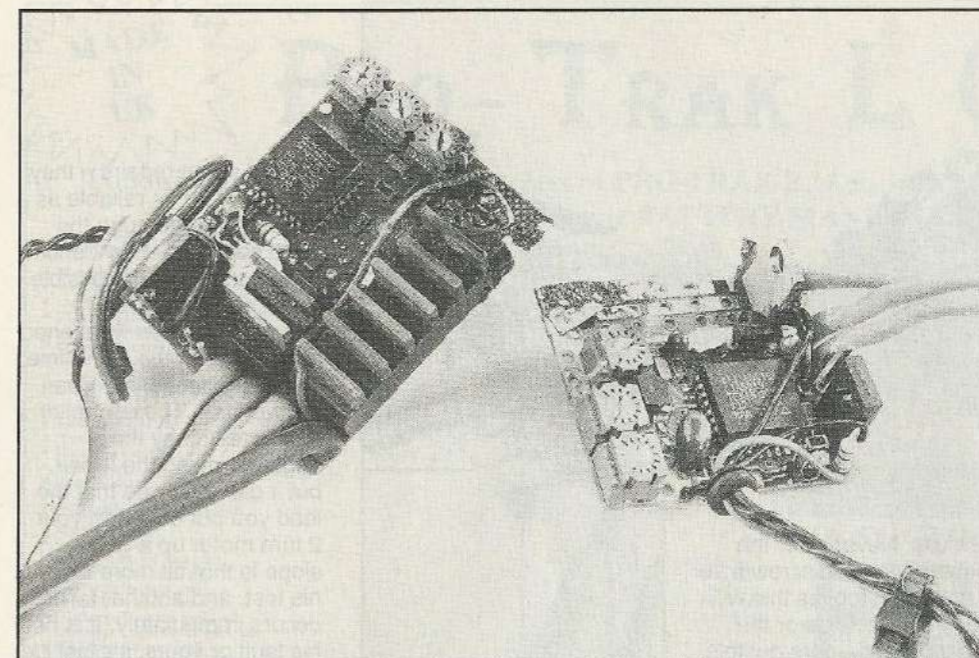
floor. Lastly, plug it into any cells in any position then hit it with a small screwdriver. Right – now do I have your attention?! Anyone who takes that seriously needs proper psychiatric help, and the rest of you who think I'm joking should talk to speedo repairers. Effectively, a large number of people treat speedo's exactly as described above, though to a lesser extent. Speed controllers (speedo's) are very complex pieces of electronics which have been developed over the years to be more and more efficient. Our demand for this improvement is limited by the amount we are prepared to pay, so manufacturers have given

SPEEDO SENSE

SPEED CONTROLLERS ARE AMAZING PIECES OF ELECTRONICS - THEY NEED CAREFUL ATTENTION AND CARE - HERE'S HOW TO...



Heiger Racing loaned us one week's worth of repairs to aid our good sense guide.



us more sophistication, but less protection – today's speedo's, are less rugged than their predecessors. Today's Tekin, Novak or Nosram (to name but three) is a miracle of modern electronics. Inside the box are hundreds of fragile components held together on a piece of glass fibre board not 2mm thick. That they work when sitting on your bench at home is clever enough, but when they carry on working when the car is racing, being bumped, getting dirty, passing huge currents and then getting wet, is quite amazing. The components are small

fisted approach causes the controller to overheat and break an internal track, the speedo is fit only for the dustbin.

Use only connectors which go together one way.

Use one type of connector for the battery to speedo connection, and a different type for speed to motor. 90% of speedo failures are because the wrong wire is connected to the wrong side of the cells. This is called reverse polarity, where the positive (+ve) side of the battery is connected to the negative (-ve) side of the speedo, or vice versa. Connectors must be shielded as well as preventing reverse polarity. Reverse polarity can occur

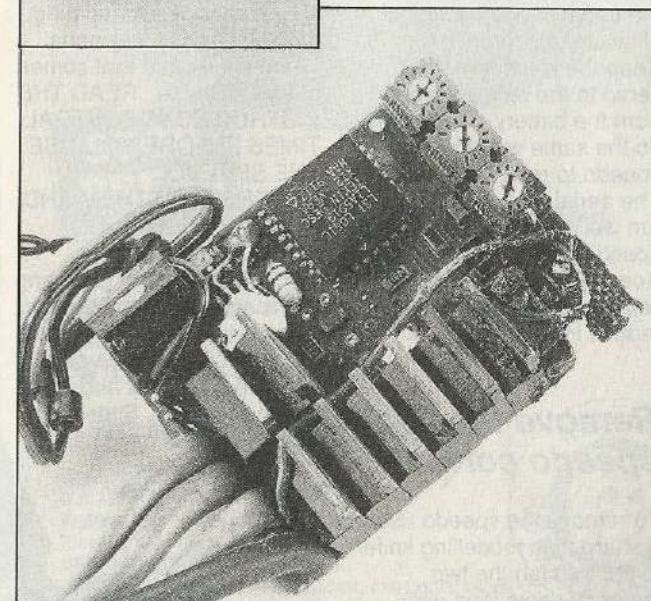
when removing cells from a car if the unshielded wires accidentally touch the cells. As we said earlier, sophisticated has taken the place of protection, and in some types even the slightest touch on the cells will lead to failure.

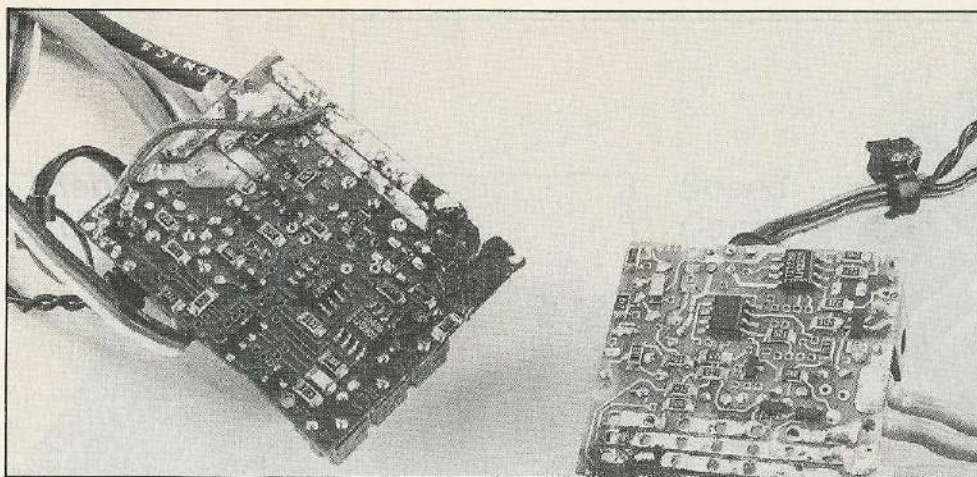
Always solder connectors to motor and battery leads.

Crimped connectors generate resistance and heat, they ruin any efficiency the speedo has which you paid good money for. Crimped connectors break or fracture causing lost power and radio interference. Always solder, never crimp. Do not use bullet type connectors used by car electricians, or any type of car connectors. They cannot carry the current required and will severely impair the performance and life of your speedo. Use Tamiya style connectors designed for model cars only. **ALWAYS INSULATE BARE WIRES.** No wires may be used which are not insulated. However unlikely it may appear to be that two bare wires could touch, or one bare wire touch a cell, you could make that connection



Left; Wiring like this causes shorts and therefore blow ups. Below; Holy crispy circuit boards Batman! a speedo well beyond repair.





accidentally whilst working on the car in a hurry. Insulated wires cannot give a problem so make sure by protecting any bare wires.

Mount the speedo correctly

Stick the speedo to the chassis with two strips of double-sided tape (servo tape) one on top of the other. The speedo must be firm, not wobbly. Never force the speedo between the top and bottom chassis plates. This pushes the components down on the circuit board and will make it crack or components to break. Speedo's must only be held in by the servo-tape and never be forced into any other position or left to move around in the car. Also, mount the speedo as far away from the receiver as you can to avoid interference. If you have this problem try mounting the receiver on its edge to alleviate interference. Keep the leads from the servo to the receiver away from the battery wires, and do the same with the speedo to receiver lead. The aerial wire must also run well away from the speedo and the battery. Keeping all these wires away from each other helps reduce interference.

Remove the speedo correctly

To remove the speedo use a sharp, thin modelling knife to cut through the two layers of servo tape very

carefully. Never lever the speedo up with a screwdriver or any other tool as this will break components or the circuit board – more dustbin fodder.

Keep the speedo controller cool

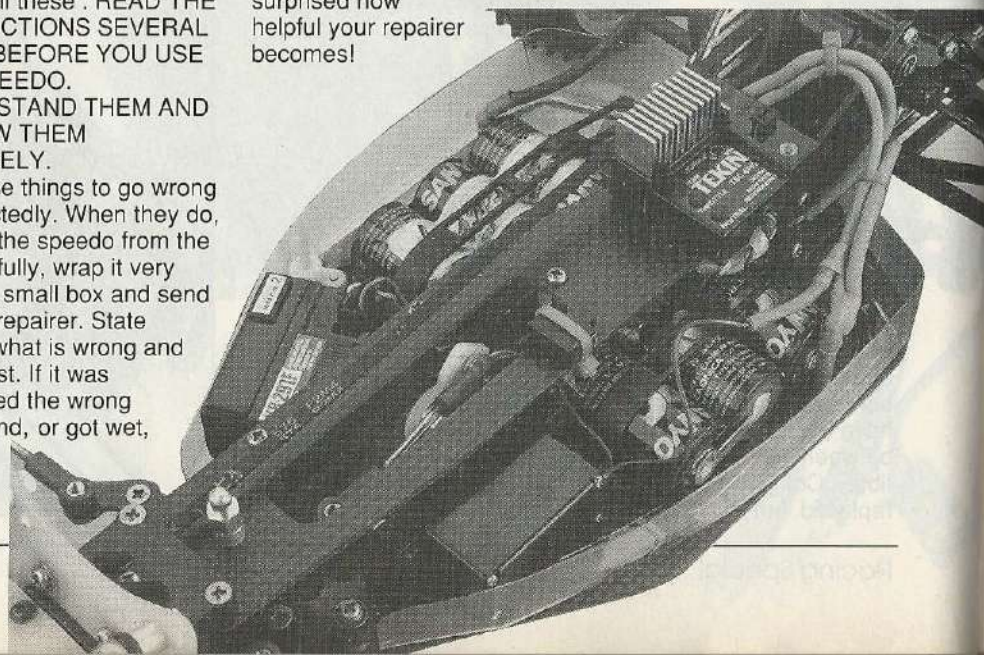
It is not very often that hot weather leads to speedo failure, but the cooler the speedo is the better it works. On hot days try to make some air pass over the speedo but not by cutting holes in the body to let in the dust. A hole in the back of the body to extract hot air can help. If something goes wrong with the car which causes it to slow down suddenly (apart from flat cells!) stop immediately. Many failures are caused by a faulty motor or seized gearbox being ignored, and the speed overheats quickly and then fails. If in doubt – stop. Follow these rules and you should reduce your speedo problems to virtually none. There is one rule that comes before all these: READ THE INSTRUCTIONS SEVERAL TIMES BEFORE YOU USE THE SPEEDO. UNDERSTAND THEM AND FOLLOW THEM PRECISELY. Of course things to go wrong unexpectedly. When they do, remove the speedo from the car carefully, wrap it very well in a small box and send it to the repairer. State exactly what is wrong and be honest. If it was connected the wrong way round, or got wet, or was

A word about repairs – they can never be as reliable as the original. Although the dead component can, and is, replaced, it is impossible to tell whether several others have been weakened or stressed in the short time the dead component was not working. The controller will be tested by the engineer doing the repair, but it can easily be that the load you put on it with your 2 turn motor up a grass slope is that bit more than his test, and another failure occurs immediately. It is not his fault or yours, it's just life and yes, it is frustrating. Speed controllers are delicate, they have lots of expensive sealed electronic parts in them which cannot be seen or properly tested individually. We demand sophisticated, small speedo's but what we get are less and less bullet-proof. The less sophisticated the speedo, the more rugged it will be, the ultimate proof of which is the resistor type in a model kit – they never go wrong, but they don't have much control. It may not be to your liking, but it is true that 95% of all speedo faults are caused by the user – you. Take very special care of your speedo at all times and it will not go wrong so easily.

Heat shrink tubing is probably far cheaper than miles of insulation tape – do it properly!

in accident do you honestly believe that the repairer, who see's hundreds every year, doesn't know? (If you do, see psychiatric help!). It is no good lying to the repairer or being aggressive. They know about speedo's than you will forget. Follow the instructions, treat the speedo carefully and tell the truth – you'll be surprised how helpful your repairer becomes!

Neatly wired in speedo keeps wires out of harms way and apart from anything else keeps the car looking good.



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B R C A - THE FACTS

**JUST WHAT IS THE BRCA?
WHY SHOULD YOU JOIN?
PETE WINTON OUTLINES
WHY ANYONE DRIVING AN RC
CAR SHOULD BE A MEMBER OF
THE NATIONAL ASSOCIATION**

Why join the BRCA?? The British Radio Association is the governing body for radio control cars in the United Kingdom. At some time or other, you will come across the British Radio Car Association (BRCA), probably when someone asks you to join. Why should you join the BRCA? The BRCA is a voluntary organisation whose objective is to promote the hobby of radio control car racing, to allow the interchange of information and ideas relating to the sport, and to coordinate National and International competition within a coordinated calendar of events. Membership of the BRCA is open to all and you can join through your club for £2.50 per year, or as an individual for slightly more. It is through the work of the BRCA that construction rules have been established which mean that wherever you go in the world, the cars you buy are all eligible to race. The BRCA works through various other associations throughout the world to maintain a stable and up to date set of construction rules which are followed by all the manufacturers. That enables any manufacturer in the world to produce a single car which can be raced in any country in the world. The BRCA maintains links with the European and

World Federations to ensure that at European and World Championship events, British drivers are guaranteed places to represent their country, and in turn the many British companies that sponsor them. Were it not for this work, some of the best known British manufacturers would not have won these prestigious events. With British drivers, giving them valuable publicity and earning sales for their products. For you, the racer, there are three main benefits from joining the BRCA. Most importantly, you get a vote in your hobby. Whether you exercise this vote as an individual by attending the Annual General Meeting, or through your club representative voting on your behalf at the AGM, you have the power to make changes to the way your hobby is run. In recent times, the votes of the club affiliated members have been a major factor in changing some of the BRCA's rules.

Licensed to Drive

Secondly, the BRCA racing licence means you have automatic third party insurance cover. Should you ever be involved in an accident where your model car causes someone injury,

the BRCA insurance is available to help you pay any damages which may be awarded against you. It is difficult to imagine how you would feel if at a meeting your car badly damaged someone's hand, and that someone turned out to be a top surgeon!! BRCA insurance covers you against damage your car or equipment may cause to other people or their property up to a maximum of £1,000,000. Thirdly, the BRCA gives you the opportunity to race at one of the many top National events which make up the National Championship in each class of radio controlled cars. In the case of Off-Road cars, the BRCA organises a Regional Championship, a Clubmans Championship aimed specifically at the newcomer,

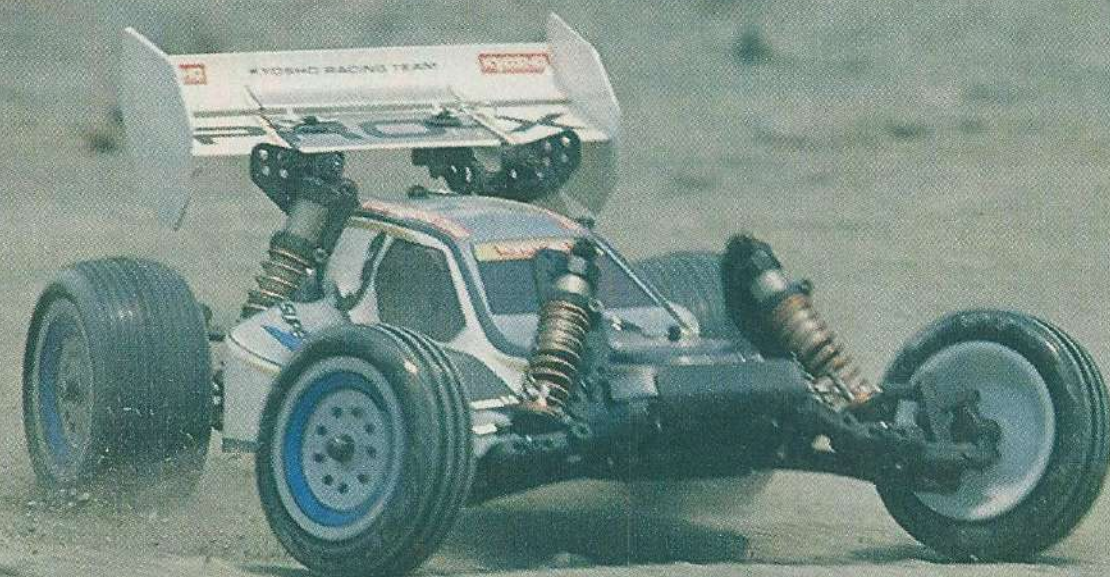
and from which the more experienced drivers are excluded, and a Junior Championship for up to 13's, and up to 16's. At whatever level, there is an event sanctioned by the BRCA which as a member you have the right to enter. And when you are ready to enter one of the European Grand Prix, the BRCA is there to provide you with your European licence and assist you in getting your entry to races any where in Europe. The BRCA is the gateway to International competition. It is excellent value for money. The next cheapest Accident Protection Policy costs £6.00 for the same cover, and you can get it by joining through your affiliated club for approximately half that! You should join the BRCA quite simply because there is no good reason not to, it is the organisation for the radio control car racer who cares about his hobby.



Joining the BRCA gives you access to its many publications throughout the year and the annual handbook.



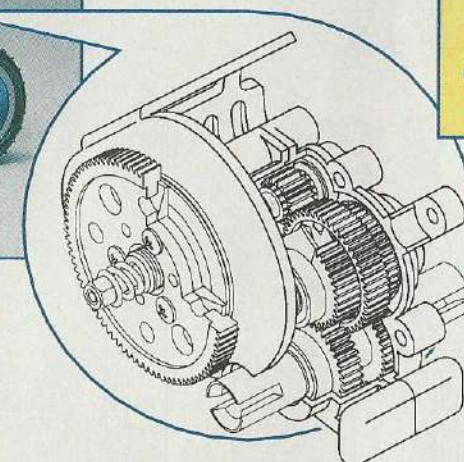
KYOSHO



PRO-X



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SST

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LAZER ZX-R

Designed to World Championship standard and winner of the 1992 Champs in Denmark, the Mark II Lazer ZX-R is supplied fully ballraced with adjustable ball diffs, metal bodied oil dampers and universal drive shafts at the front end. This belt driven 4WD car is the most race ready money can buy - straight out of the box!



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RICHARD DELVES SHOWS TWO EXAMPLES OF MODEL CAR BODY PAINTING. ONE WITH SPRAY CANS - THE OTHER USING AIRBRUSH TECHNIQUES

R/C car racing is going through the process of evolution. Buggy racing probably remains at this time the base core of the hobby but we are seeing more and more different formats of cars being raced. In the States it's oval NASCAR, over here with a little bit of assistance from Tamiya it's saloon Touring cars. Over the years attending race meetings it has become apparent that the item carrying the lowest priority is the bodyshell, empty a can of paint into it, try to remember to mask the windows and don't worry about any mistakes, the numbers will cover them up. It didn't notice too much with buggy shells but a saloon

shell is a bit bigger so now perhaps it will. Painting a bodyshell well is not difficult, it requires no special skills, just a little thought and patience, the right tools and a little instruction on how to use them... Ready? Normally this paragraph is tacked onto the end of these articles as an "oh by the way" so before you get totally bored with the rest of this article and resort to just looking at the pictures I'll say it now. The paint we use on bodyshells is nasty stuff, it etches onto polycarbonate, and will quite happily etch onto you. Something like just over half of the paint that comes out of an aerosol or airbrush ends up on whatever you

are painting, the rest ends up on the floor the furniture and inside you, if you happen to be breathing at the time you're painting. Wear a mask, or at least after you spray leave the room and give the dust a chance to settle. If you're going to spray a lot a cheap kitchen hood can be mounted in a box to make an extractor and your lungs will thank you for the rest of their life!

Lecture over back to the plot what type of paint? Polycarbonate is a wonderful material, easy to mould and very resilient but it needs a particular type of paint to cover it. Enamels won't work neither will Dulux emulsion, an acrylic based paint that will etch itself onto the plastic is what is needed, but it must be flexible too because as you slam your car into that

marshal at some incredible speed and the shell crumples and folds the paint must do the same otherwise the two will probably part company.



available in aerosol and liquid forms, the former needs thinning the latter comes already thinned. A question quite often asked is can different makes of paint be mixed? If they are of the same type ie. enamel, acrylic etc. the answer in theory is yes but theory in

this field does not always work and to be absolutely certain it is always worth trying out on a scrap piece of material. The last word on paint is what to do if it gets somewhere it shouldn't be. This is usually referring to overspray, mostly through body post holes and around the edge of the shell. Don't use thinners, they will mark the plastic, the best way is to use some methylated

spirits on a piece of kitchen roll, or in more restricted areas a cotton bud and firmly rub the paint off. The longer the paint is on the shell the harder it will become to get it off so keep an eye on the body as you're spraying it and clean any overspray off straight away.

Tools

The first tool to consider is a knife. The handle should be

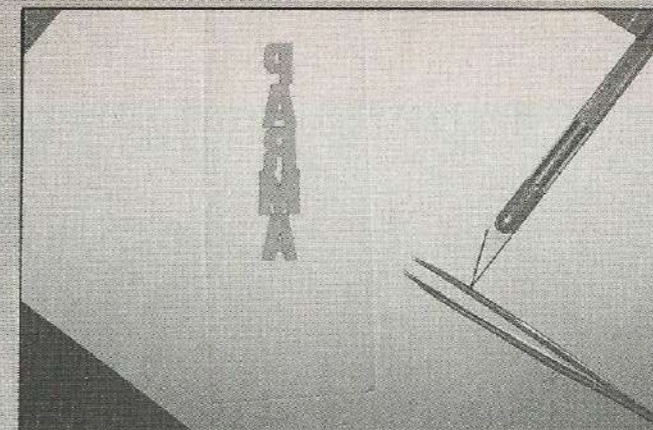
The most popular types of paint are Pactra and Custom Colour, both which are



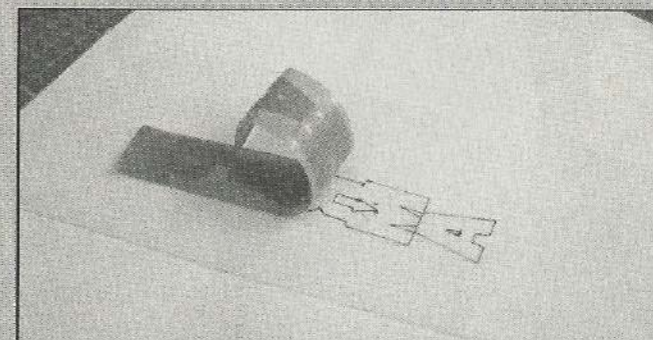
After the body has been washed and dried start masking the windows by outlining with 3mm wide tape cutting the radius of the corners, not too much pressure so as not to cut the body. Burnish the tape well down to stop paint creeping.



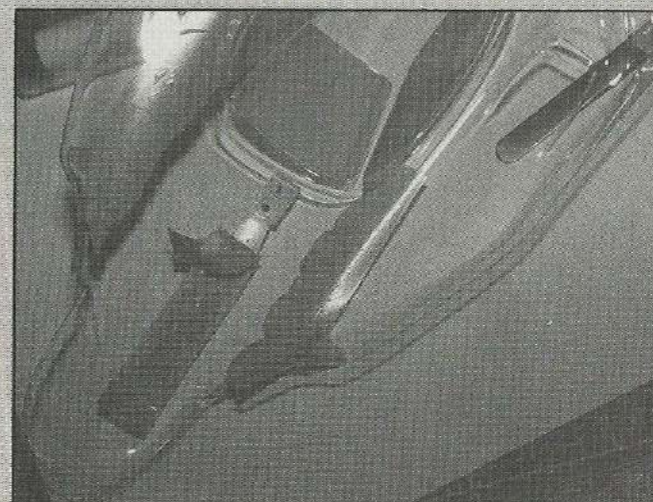
Next, fill in the windows carefully. Start to draw the peel back design with a Parma pen, this is easily removed later with meths.



Logo design: Draw logo onto tracing paper, turn over, cover in tape. Next carefully cut round to reveal logo.

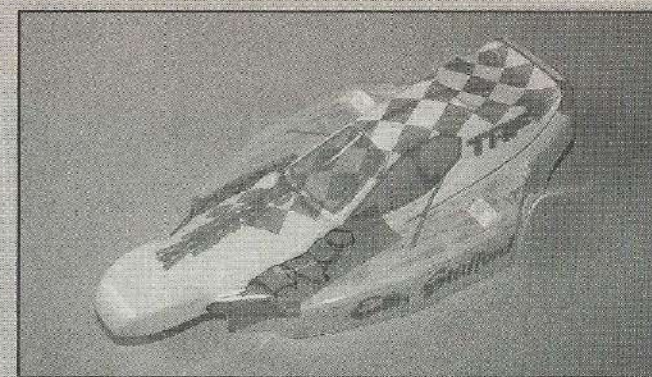
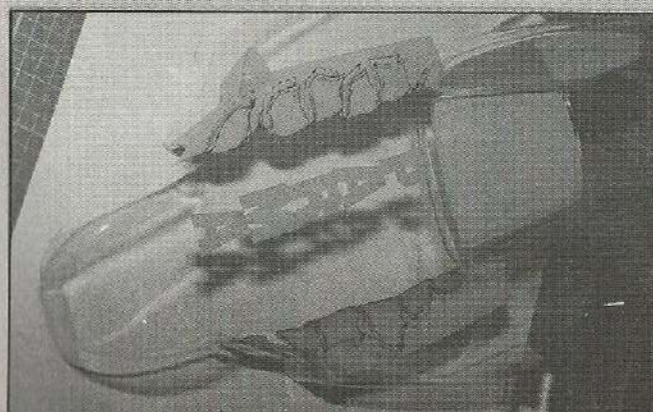


Lay another strip of tape over cut out logo, gently peel both logo and tape off of the tracing paper, ready for the body.

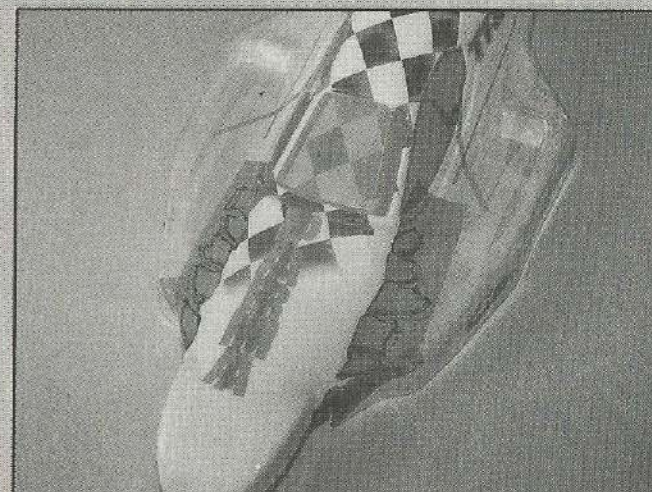


Apply the logo and remove the carrying tape. Now tape on the inside over the peel back drawn on design. Now start to cut the inside of the design to your drawing, not pushing too hard on the body...

...so that you don't cut it! When the design is cut - rub over the tape to check edges. Now peel away the tape where the white will appear.



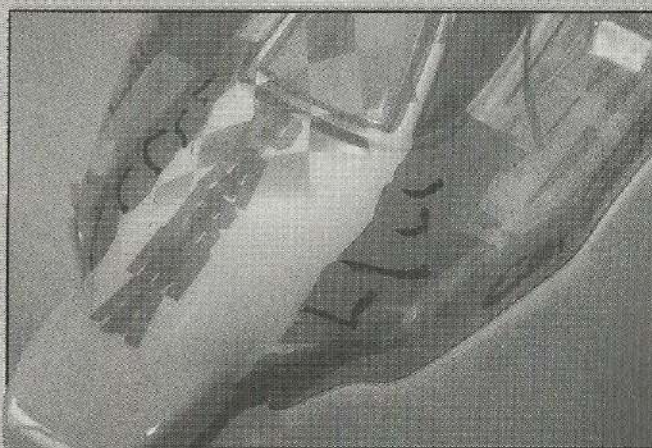
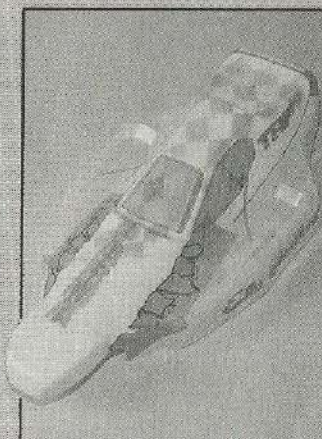
All areas other than what will be white are masked off and the other logos and designs are at this stage in place. The white paint is now applied.



Now the chequer design tape is removed and the white graduated 'fogging' is applied. The white and the silver areas are now painted, this will also help to prevent darker colours showing through the white.

Right: When spraying darker colours over the white, give the paint a good time to cure.

Peel off the shadow masking of the peel back and apply one fine coat of black.

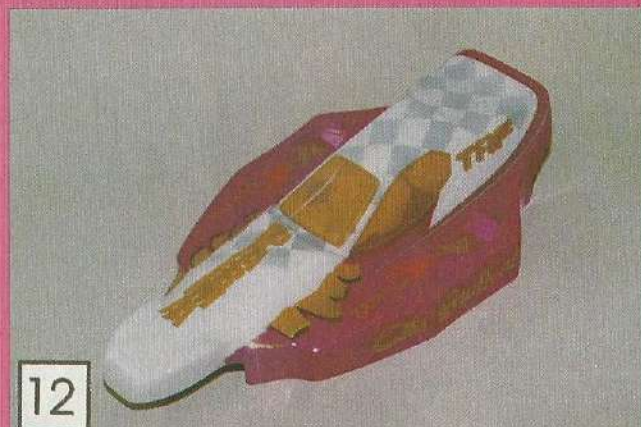




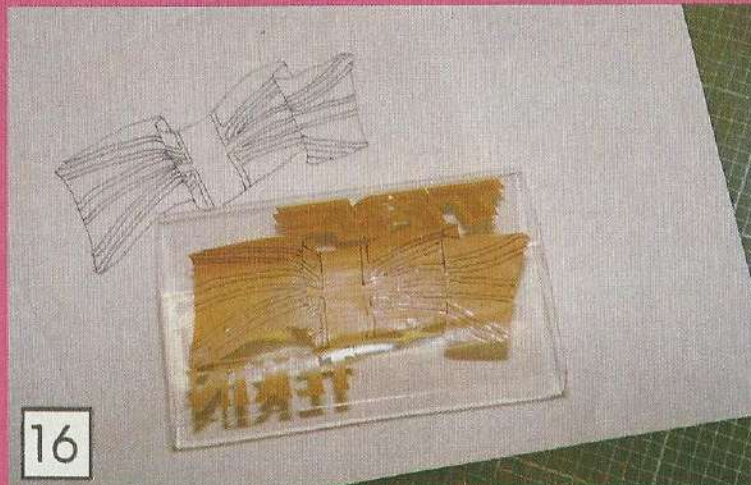
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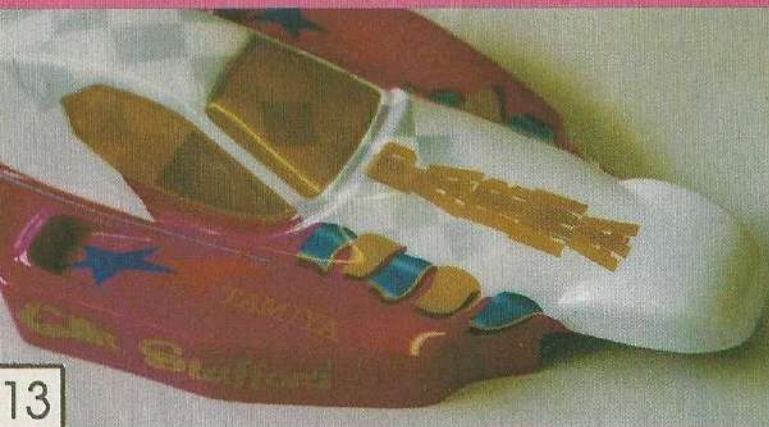
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12



16



13



17



14

11. Carefully unmask the areas to be painted purple, making sure not to pull off any tape that needs to remain in place... and apply the purple paint!
12. The purple paint on and work on the logos starts. First the red stars are unmasked and painted... then the blue.
13. Paint each peel back one at a time. Firstly pick out the highlights with a fine line of white, and then back with blue.
14. Continue to add the blue where required, one stage at a time.
15. The name logo here has had white areas applied and again backed with blue.
16. For the wing the logos are applied first to give the impression that the flag is behind them. The outer shape of the flag is cut on the tracing paper, the inner details drawn on with a Parma pen then applied to the wing.
17. Colours are applied one at a time, starting with the red, applying highlights where required as with the peel back. The blue is next followed by the white.



1

1. Trim the edge of the tape off – you cannot always rely on the tape's own edge to be straight and undamaged.



2

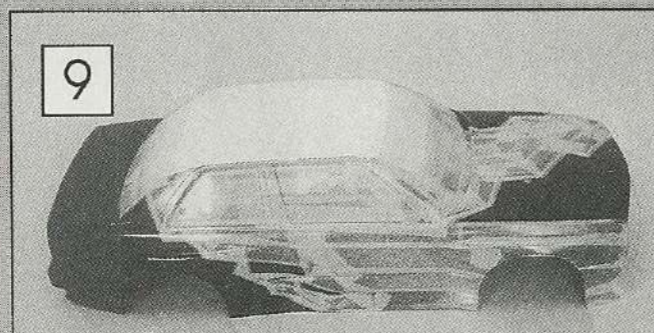
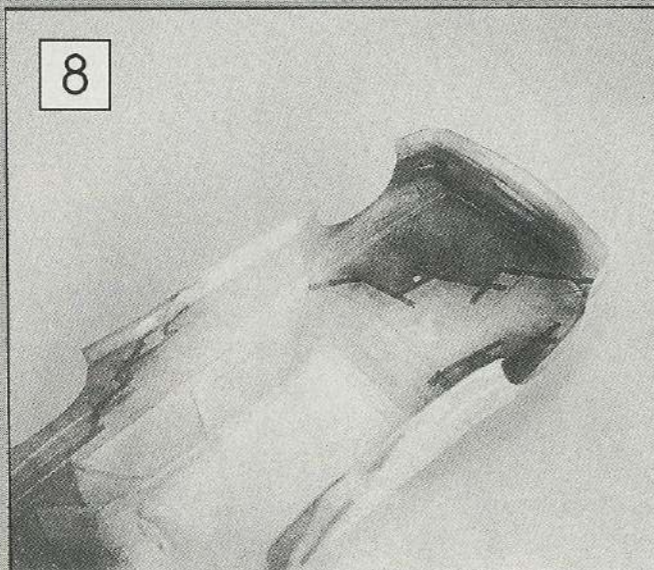
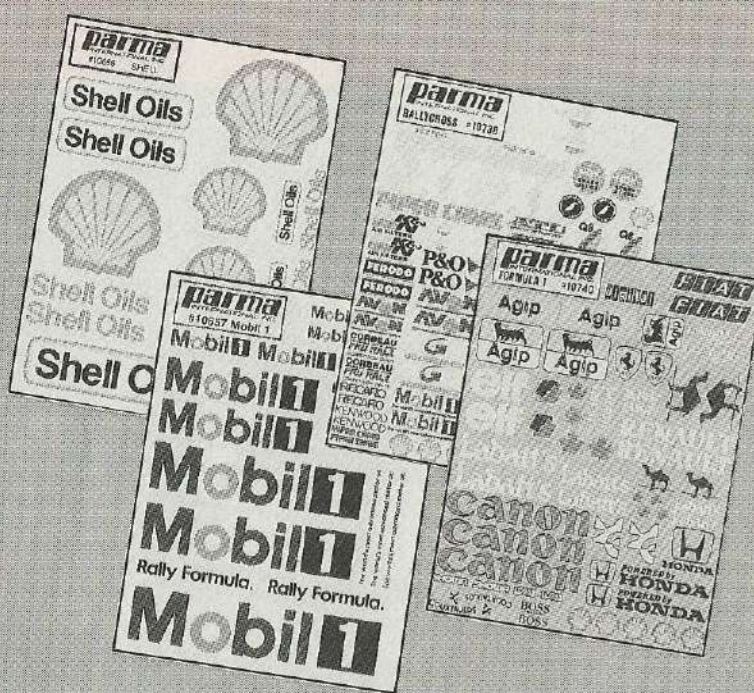
2. Lining the edge of the windows with the 3mm tape and cutting the corners.



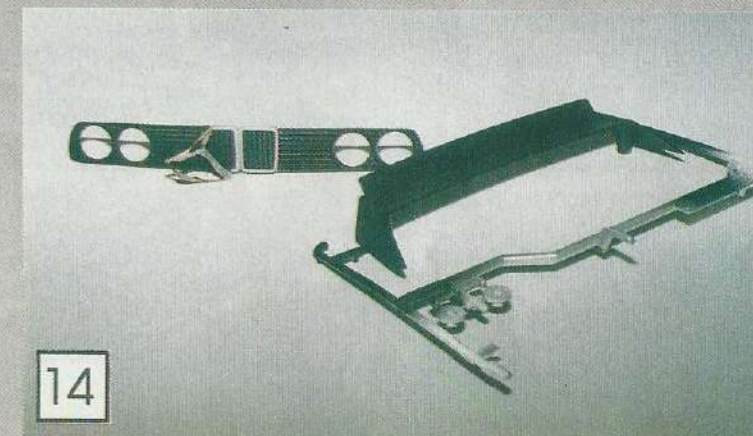
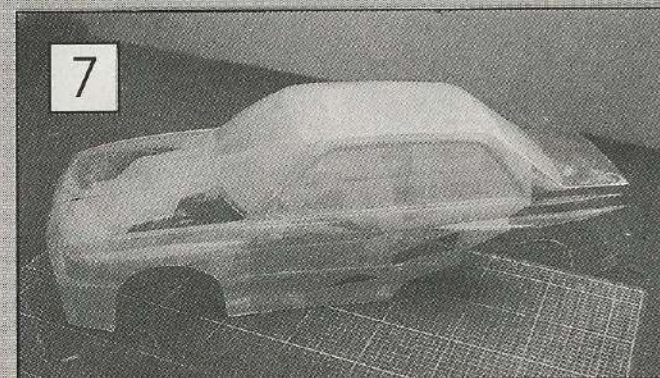
3

3. Filling in the windows – take time as small holes will allow the paint to get on clear areas.

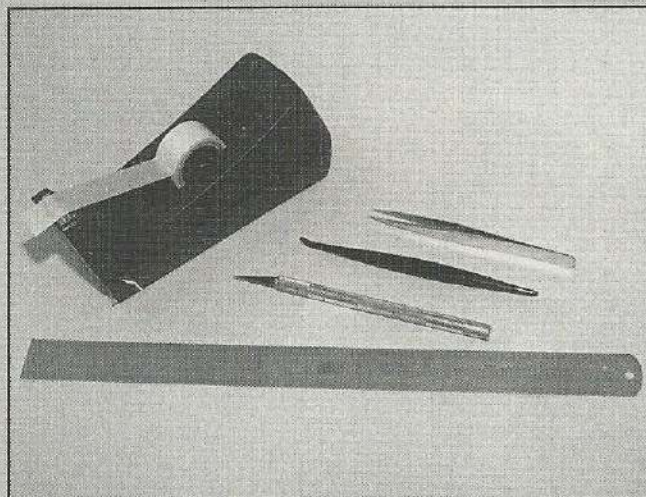
round in cross section so that it is comfortable to hold and can be rolled smoothly in between your fingers, a technique used when cutting tight curves. The blade determines how much control you have over the knife so you should look for a blade that has a shallow angle on its point and that is also ground to a shallow angle. There are several makes of blades available but the standard blade best used is a number 11. It is important to make sure that the edge of any masking is firmly pressed down onto the body, a fingernail can tear an edge, a finger is a little on the soft side and cannot guarantee a firm contact, the answer is to use a burnishing tool. Letraset make several types intended for use with their dry transfer lettering and most drawing office suppliers who stock their lettering if not actually stocking them can get them for you. A cheap alternative could be to find a teaspoon with a small rounded handle and use the tip of this. For laying down and removing masking tape, especially in awkward corners a pair of tweezers can be invaluable but don't get the type that have a broad flat top get a pair that come to a point. The edges of masking tape are by no means perfect, especially if the roll has been kicking around in a drawer somewhere. So to be sure of a perfect line whether it be masking a window or a pin line always use a fresh cut edge. A steel rule is best used as a guide and rather than re-shaping Mum's dining table use a self healing cutting mat. Most come with a grid marked on, and knife cuts are absorbed by the mat ensuring a smooth surface to work on.



4. To add a little variety we added a selection of Parma decals to the kit items, many are available and should be used as a tool.
5. Drawing the design as a rough guide with a Parma pen.
6. Following the design on the inside with 3mm tape.
7. In filling all the areas that are to be white – if possible darker colours should be panted before lighter ones.
8. Having masked the red trim lines, apply the black paint in light coats.
9. Build up the number of coats until viewed solid from the outside.



10. After the black is applied peel back the masking and apply the red.
11. Viewed from the outside the red paint is in place.
12. The body is now totally unmasked apart from the window, now apply light coats of the white to build up the main colour. As this is the last colour there is no need to apply silver.
13. In our case we painted the window surrounds rather than use the Tamiya items, this is more permanent and looks better!
14. Painting the plastic parts, just wash 'em and paint 'em!
15. All the parts in place and ready for decals...
16. Just visible is a light coat of glass cleaner (not polish), this allows the larger decals to be 'moved' into position and can be rubbed out from under the decal when the correct position is achieved.



you will in effect do is mix the first coat with the second. The most accessible way of painting for most people is the good old aerosol and although it has its limitations there's no reason why a perfectly acceptable job

Left: Tools of the 'trade' tape in a dispenser, tweezers, steel rule, burnisher and the correct type of knife.

Right: We used Badger airbrushes to complete our bodies and in their range there is an airbrush available to suit everybody's pocket.



produce them but despite their appearance they fall into one of two categories: single or double action. With single action guns the air is controlled by the trigger, when you let the air out the paint comes with it, the amount of paint on the cheaper versions is not adjustable but on the more expensive guns a screw at the tail can be altered to vary the amount of paint that comes out. With the double action gun the paint still comes out with the air but the amount of paint can be adjusted whilst spraying. This is achieved by the trigger acting in two directions, pressing down allows air out, pulling back changes the position of the needle in the nozzle and changes the amount of paint that can pass through. Double action airbrushes are more versatile, and can be used to create more complex effects but they are the most expensive type and are the most difficult to use. To drive the airbrush you will need a supply of

Masking Tape

Continuing on the point of masking tape it is very important that the correct type of tape is used. Ordinary automotive masking tape is not a lot of use to us, its adhesive layer is too thick, paint will creep under and its adhesive can tend to stay behind when you peel the tape off. Pactra make a masking tape for use on bodysells and Ripmax Models sell a paper tape called Betto tape that is very good. Some types of brown packing tape if cut down in width can be used but the tack of their adhesive can be quite strong and again certain types can leave their adhesive on the body when the tape is removed. Experimentation is the key and offcuts, wheel arches and surrounds from bodysells if kept can be very useful. If you want to find out if a tape is going to work lay a piece down onto a scrap and paint over it you'll know then for sure if it's going to work or not.

Air Brushes

Last but by no means least



Building up a range of colours in airbrush jars makes painting quicker, cleaner and more economical as the jars will screw straight onto the airbrush when you need them.

we need some method of getting the paint out of the can and onto the bodysell. Brushing paint on is feasible but the type of paint we use is what is known as a reversible paint, relying on a solvent component evaporating to make it dry. Put a second coat on and you will add solvent to the first coat making it revert to its original state - wet, so all

cannot be achieved using aerosols. Just make sure the masking is well rubbed down and apply light coats of paint building up the cover, if you try to cover the shell in one coat it will be so wet that it will soak under the masking and at worst even bridge it. Looking at airbrushes the selection seems endless, several manufacturers

compressed air and although large compressors are expensive the smaller ones designed just to drive airbrushes are more affordable. Should you not intend to do a lot of spraying compressed air can be bought in aerosols. So after acquiring this big pile of new toys how do you use them to actually paint the shell? Regardless of the

type of shell the procedure is the same. First cut out the body, this can be done either with a pair of scissors or by scoring the outline of the body with a knife and snapping it by bending it back on itself. Next mount the body, in the case of a buggy it will probably attach to an undertray with velcro but cut out the aerial hole and trim back to fit around the shock towers and shock absorbers. On saloons locate the mounting points and drill them but in both cases all of these jobs are much easier done while the body is still clear. Whilst a bodysell is being

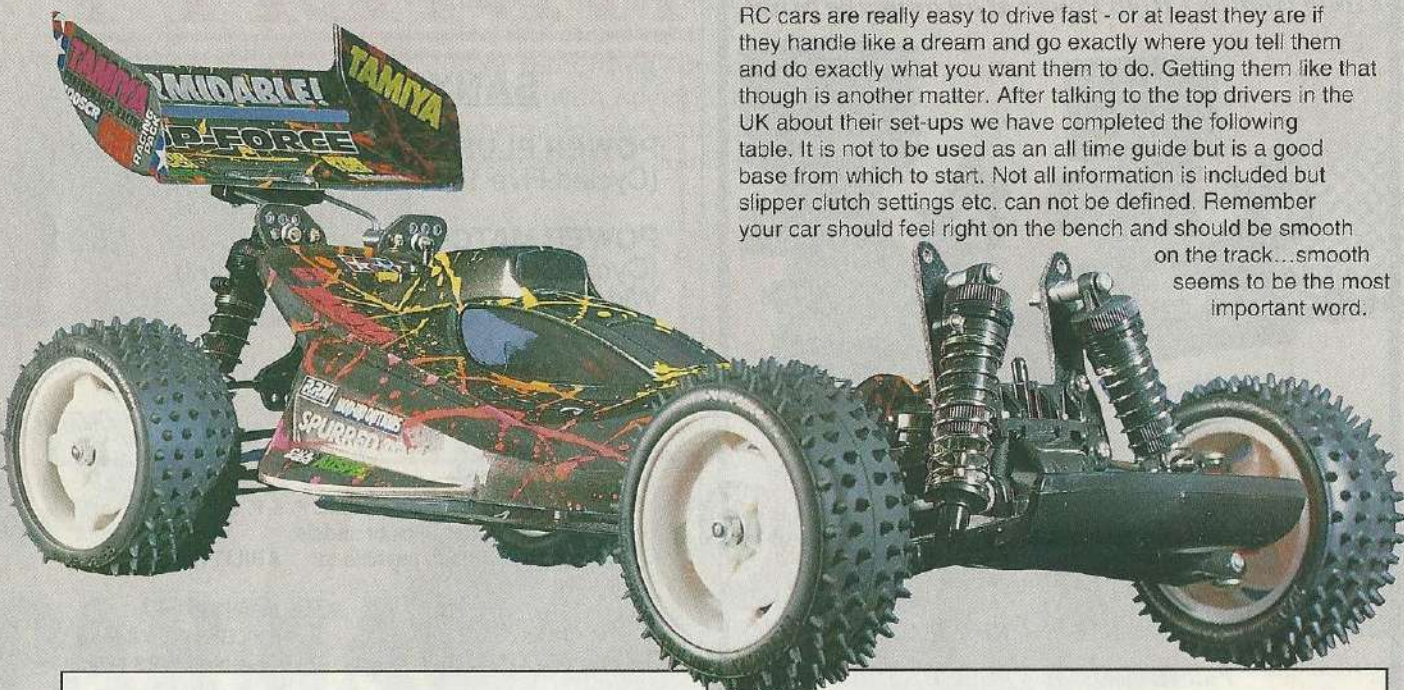
made most manufacturers use a release agent on the mould and if we paint the shell without removing this agent it could eventually come off, along with the paint so it is important we wash the body thoroughly in warm soapy water next and then dry it. Start the masking with the windows but don't just cover them with tape and try to cut around them, use a 3mm piece of masking tape along the edge and then infill. To do this lay a strip of tape down on the cutting mat, trim the edge away (this being on the outside of the roll it can be damaged) then cut a 3mm strip along the

length. Gentle curves on windows and the straight lines can be masked with this and for tight curves overlay with a slightly larger piece of tape and carefully trim down joining the straights with a gentle curve. Cutting these curves can be tricky but it is all a matter of controlling the knife. Firstly make sure the blade is sharp, if you have to apply any more than minimal pressure to the knife to get it to cut you will not have control of where it is going. The other point is to keep the blade as flat to the surface as you can, especially on longer curves

you want to almost be dragging the blade. Working inside bodysells it can prove to be very tight on space and it can be helpful to shorten the length of the handle of the knife. After masking the windows use the same method to mask the lights, grills and any other details. Deciding on a design can be helped by tracing a picture of your car and colouring ideas onto it or you can just make your design up as you go but the more complex effects like tearaway panels have to be thought out carefully and masked up in the correct order.



SET - UPS



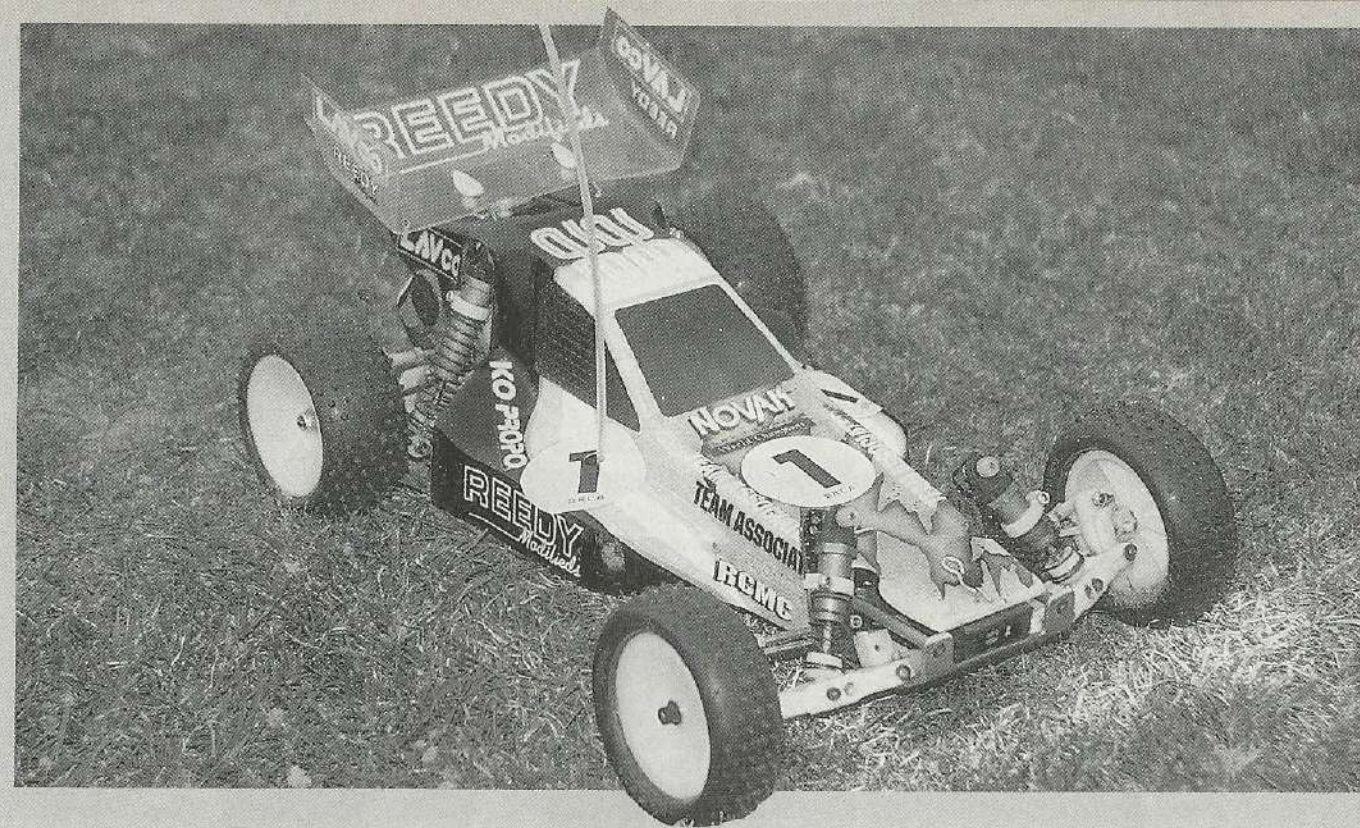
RC cars are really easy to drive fast - or at least they are if they handle like a dream and go exactly where you tell them and do exactly what you want them to do. Getting them like that though is another matter. After talking to the top drivers in the UK about their set-ups we have completed the following table. It is not to be used as an all time guide but is a good base from which to start. Not all information is included but slipper clutch settings etc. can not be defined. Remember your car should feel right on the bench and should be smooth on the track...smooth seems to be the most important word.

Car: Tamiya Top Force

Front shock oil Tamiya 300
Front spring TF Kit Silver
Position Centre top outer bottom
Front camber Very slight at full height
Toe-in Parallel
Ride height Arms level at rest
Rear shock oil Tamiya 250
Rear Spring TF Kit Silver
Position Centre top outer bottom
Rear camber Upright
Toe-in As per kit
Ride height Arms level at rest
Wheelbase As kit
Tyres front Schumacher green 2.2 mini
Tyres rear Schumacher green 2.2 mini
Motor Parma 11 quad

Car: Tamiya Dyna Storm

Front shock oil Tamiya 200
Front spring Kit Silver
Position Centre top outer bottom
Front camber Quite a lot maybe 3 degrees
Toe-in Just a little toe-in 1 degree
Ride height Quite low arms slightly down at rest
Rear shock oil Tamiya 400
Rear Spring Kit Silver
Position Inner top outer bottom
Rear camber Quite a lot maybe 3 degrees
Toe-in As per kit - a lot essential
Ride height Arms level at rest
Wheelbase Short for dirt, long for grass
Tyres front Schumacher 2 row green
Tyres rear Proline 8081 XTR
Motor Parma 11 double



Car: Associated RC10

Front shock oil 25wt
Front spring Soft black or green
Position Centre top outer bottom
Front camber Just a little maybe 1 degree
Toe-in A little
Ride height Wishbones slightly down at rest
Rear shock oil 30wt
Rear Spring Green or Yokomo Copper
Position Inner top outer bottom
Rear camber A little (at rest)
Toe-in Standard kit
Ride height Arms level or just below at rest
Wheelbase Short for dirt long for grass
Tyres front Schumacher 2 row or new 2WD spike
Tyres rear TR31 or Schumacher Green 2.2 mini
Motor Reedy Mr S

Car: Yokomo Works 93

Front shock oil 30wt
Front spring Yokomo Copper or Associated Silver
Position Various - to suit conditions
Front camber Small amount at rest
Toe-in Parallel
Ride height Low! at the front
Rear shock oil 30wt
Rear Spring Associated Green or Yokomo Copper
Position Quite upright, outside hole on sus arm
Rear camber A little 1 degree or as kit
Toe-in As per kit
Ride height Quite high arms above level
Wheelbase Standard
Tyres front TR330 or Schumacher minispike 2.2
Tyres rear Schumacher Minispike 2.2 or TR31
Motor Approx 12 double



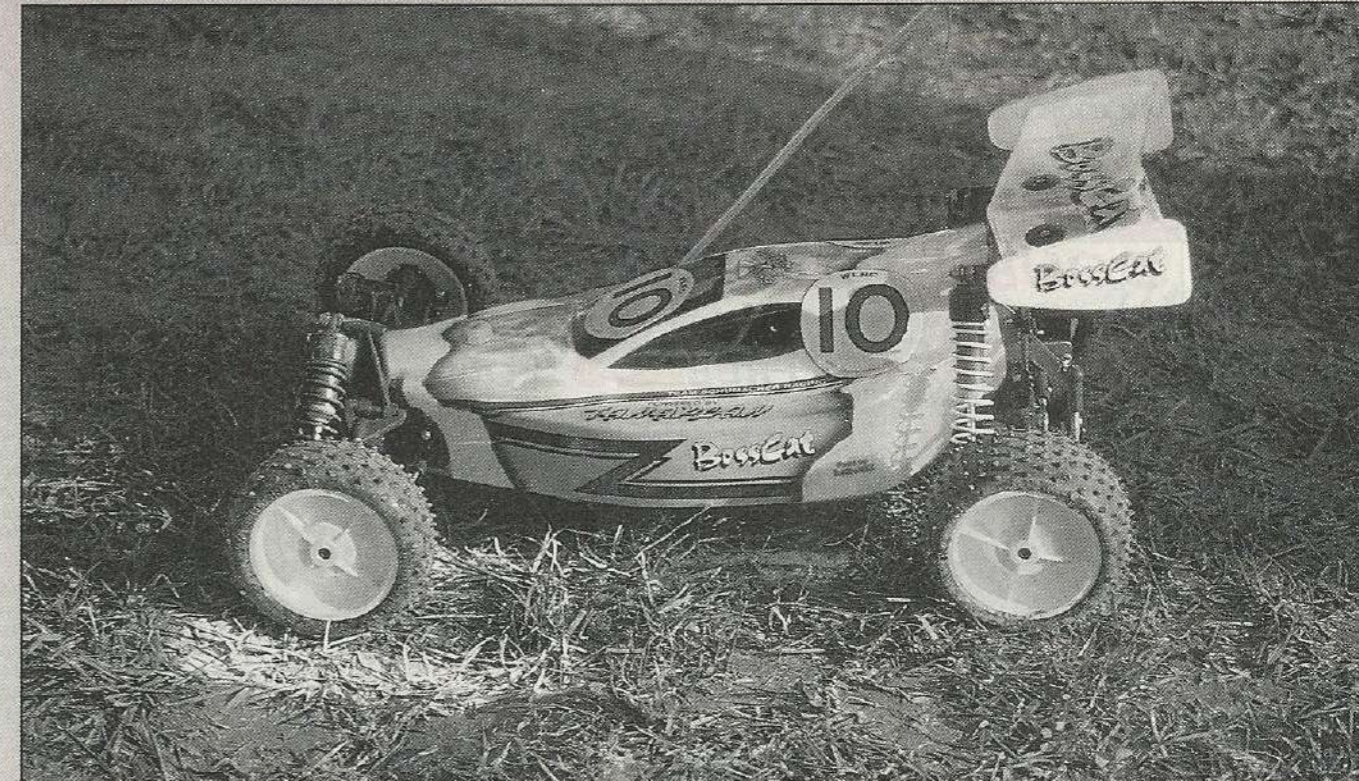
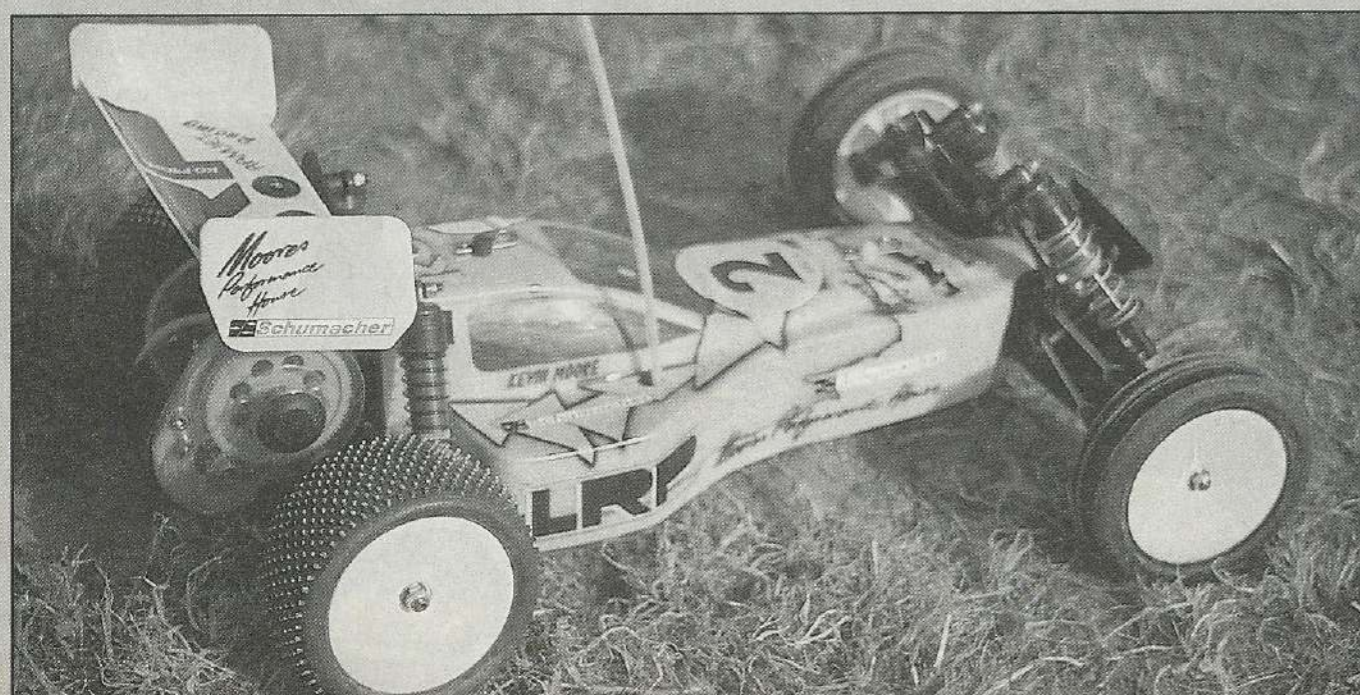


Car: Lazer ZXR

Front shock oil 40wt
 Front spring Kit silver
 Position Outside bottom middle top
 Front camber None but 5-7 castor
 Toe-in Parallel
 Ride height Arms level
 Rear shock oil 30wt
 Rear Spring Kit Kyosho Black
 Position Outer bottom middle top
 Rear camber A little 2 degress
 Toe-in 2 degrees from kit setting
 Ride height Arms level
 Wheelbase Standard
 Tyres front Kyosho H pattern
 Tyres rear Schumacher Minispikie Green 2.2
 Motor Corally 11 double

Car: Schumacher Cougar 2000

Front shock oil 30wt
 Front spring Yellow
 Position Top pos bottom middle outside wishbone
 Front camber Upright
 Toe-in Parallel
 Ride height level at rest
 Rear shock oil 40wt
 Rear Spring Yellow
 Position Bottom middle
 Rear camber A little 1 degree
 Toe-in 3 degrees
 Ride height Arms below level at rest
 Wheelbase Medium
 Tyres front 2 row stud green
 Tyres rear Green minispikie 2.2
 Motor LRP Bee D

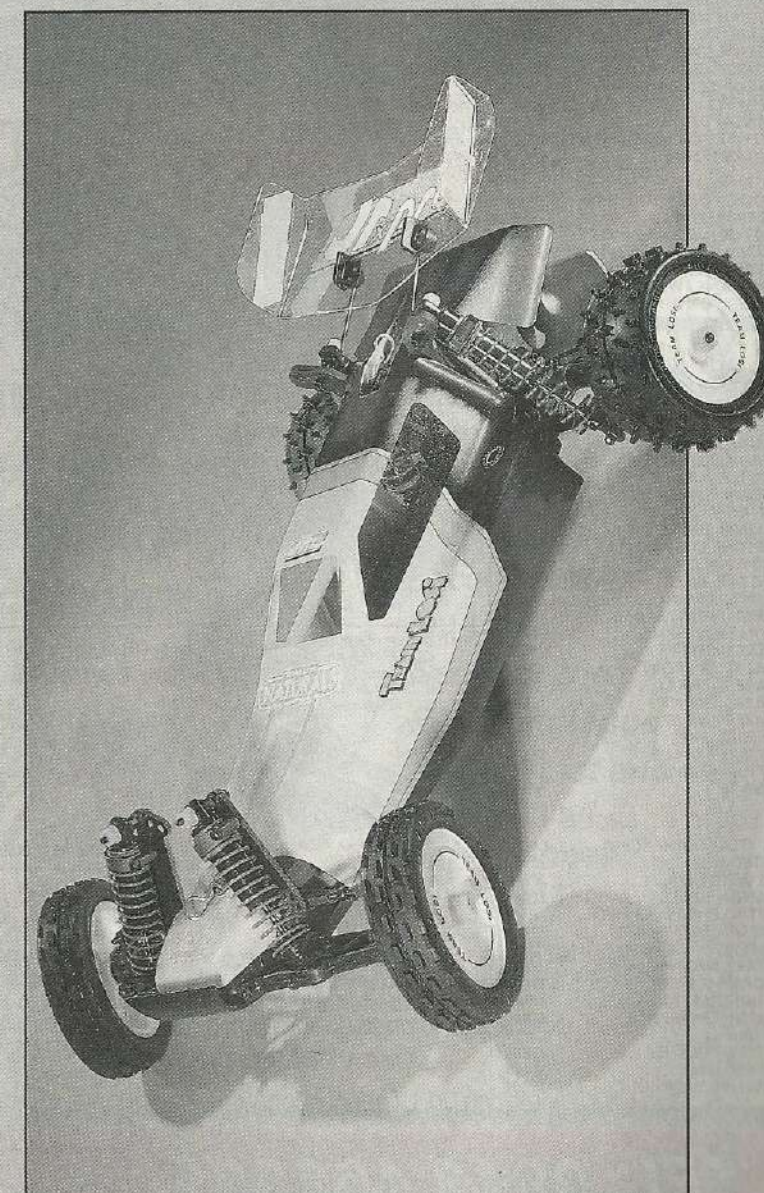


Car: Schumacher Bosscat

Front shock oil 30wt
 Front spring Grey
 Position Outside on wishbone
 Front camber A little at rest
 Toe-in Parallel
 Ride height Just below level at rest
 Rear shock oil 30wt
 Rear Spring White
 Position Top middle outside bottom
 Rear camber A little
 Toe-in Standard
 Ride height Parallel at rest
 Wheelbase standard
 Tyres front Green minispikie
 Tyres rear Green Minispikie
 Motor Bee D

Car: Losi JRX Pro SE

Front shock oil Silatech 35wt
 Front spring Losi Green
 Position Middle top outer bottom
 Front camber 1-2 degrees
 Toe-in Parallel
 Ride height level at rest
 Rear shock oil 25wt
 Rear Spring Red
 Position Middle upper lower outer
 Rear camber A little 1-2 degrees
 Toe-in Grass track 3 degrees Dirt track 6 degrees
 Ride height Drive shafts level at rest
 Wheelbase Generally short (kit)
 Tyres front TF240
 Tyres rear TR32 or Jammin' Step pin
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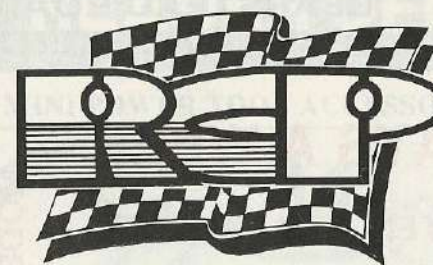
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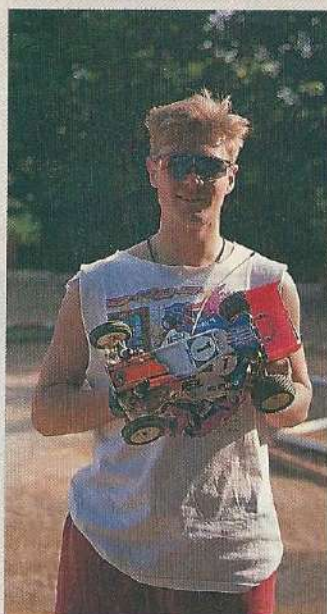
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Racing Special



Craig Drescher is currently double British Champion, European Champion and a thoroughly nice guy.

RACING SPECIAL TALKS TO THE UK'S TOP DRIVERS WHO REVEAL INFORMATION TO HELP YOU ON THE TRACK

What makes a champion driver?

Is it what he eats or drinks, the after-shave he uses or even the sun-glasses he wears. I think not. Perhaps it is his ability, his skill, his single-mindedness.

Are champions born or do champions make themselves? Perhaps it the equipment they use. Or are they ordinary human beings who have recognised their own ability and then develop and perfect that skill to the highest level. We thought it would be a good idea to ask some of the countries finest drivers (Ok ed. you will get your chance) and see what they think and do to get themselves to the top. Problem number one was who to ask. (later ed.) We chose a selection of off and on road drivers who hold or have held national and international awards. We asked the same questions of each driver and because of limited space we have reduced the answers to a few lines.

(you will get your turn ed.)

Craig Drescher	CD.
Ellis Stafford	ES
Jamie Booth	JB
Kevin Moore	KM
David Spashett	DS
RC Model Cars Ed.	ED

1. Why do you think you are as good at R/C cars as you are?

CD. I was naff when I started. Mum and Dad encouraged me, but without pressure. It was my choice. I enjoy R/C and I know what I want.

ES. Practice, sticking at it and wanting to be better and best! Years of driving cars at home, working on them, trying different things and breaking them. Mainly attitude and the help of people around you.

JB. I'm interested and always thinking about what is happening to the cars on the track, and not listening to everyone else. The ability not to be psyched.

KM. Practice and racing everyday and more practice. Encouragement from parents without pressure and being dedicated.

DS. Practice, practice, practice and being in the right place for sponsorship. Dad's influence. Practice and dedication.

ED. Ummmm.

2. What are the main things about your car set up that you know work well?

CD. I always start with the same set up. Strip down and preparation, no slop, everything free. Start with the same oil, springs, shock positions I always start with a safe set up.

ES. Nothing special,

usually start with the kit set up and start from there. Try to get a set up that works regularly, once done it hardly needs changing, just oil. Common sense on toe in and camber.

JB. Lots of caster. It smooths the car out and makes it predictable, more accurate. I'm known locally as Jamie "caster" Booth. Apart from that average set up but overdamped rather than underdamped.

KM. If it is a new car start from a basic set of specs. from an older car, caster, oils etc. It is the feel of the car on the bench - a good feel for balance.

DS. In 1/12 it is a little difficult. I go to meetings with the car as it is and work on the tyres. We have plenty of grip, therefore set up is less important than in off road.

ED. Well...

Kevin Moore is known as "Mr Cool & Preparation" and as you read this he could well be a World Champion.



3. What are you aiming to achieve in pre race practice?

CD. For the car to feel good, enough steering, not necessarily learning the track. I concentrate on the car. Look at others, does anyone else look good.

ES. Learn the track. Experiment on certain corners, see how fast the car can go. Go flat out to see what the cars limits are. Watch carefully.

JB. Looking at the track for bumps etc. Checking the motor and looking at the car for handling and duration. Whether the tyres are good and are they helping the suspension.

KM. Watching the car. Trying to get it as good as possible. Use the same motor for practice. Concentrate on car set up. Motors and batteries are sorted later.

DS. Mainly learning the circuit. Knowing the circuit is where time can be gained. That's why Phil Davies is so good, he is fast at learning the lines.

ED. Oh,

Ellis Stafford quickly rose to fame in 1992 when he took the British GP and European 4WD titles.



4. In words how do you want the car to feel on the track?

CD. Varies with each track. Always safe never over or under steer. Smooth is the word.

ES. A bit of understeer, so I can put the rear end out if needed but still in control. Good on bumps and jumps but that's obvious.

JB. Precise but not nervous. Forgiving if you get over excited, in other words not spinning easily, I hate understeer. That's what I try to avoid at all costs, it limits the speed you can go, whereas oversteer is controllable - up to a point.

KM. Safe but a bit of oversteer. Understeer is bad, not quick. A car with oversteer is quick for me.

DS. In 1/12 I want smooth and precise. For the tightest corners you need full lock, if it is Ok the car is Ok. My Corally is always safe, unlike some other makes. That's one thing about my car it is always safe.

ED. Yes.

5. It's your first heat, your car is on the line, what are you thinking?

CD. Same every race, push hard, drive smooth, go for a good time.

ES. Not about anyone else, steady for first few laps then go for a good time.

JB. Have a smooth run, no mistakes. You need a clean basic score.

KM. Not to push too hard, safe and steady.

DS. Get a good clean run, try not to dump.

ED. Win.

6. Do you have any method of thought for a start.

CD. Don't concentrate at the 10 sec. signal, wait, then concentrate, look and listen hard.

ES. Hit the power, if there is a good chance of leading go for it.

JB. Try to avoid a crash at all costs. Just concentrate and whack the throttle.

KM. Don't go into the first corner too fast. Just concentrate.

DS. I always wipe my hands and don't look at the cars, superstition really. Then hit the power.

ED. Try to remember which is my car.

7. Let's say your leading, what are you thinking while on a TQ run?

CD. Back markers, maybe just scaring them into moving over.

ES. Keeping smooth

JB. Keep the laps quick but no mistakes, don't throw away an A place going for a TQ.

KM. Try not to crash, push hard.

DS. Not to use too much power, ease back and keep it smooth.

ED. What does TQ mean?

8. What do you say to yourself if you crash? How do you keep your concentration and keep going for a good run?

CD. Don't try to make up for the crash. Push later not immediately after the crash, don't try to make it



Probably the best rawest talent of them all - Jamie Booth is still a World favourite.

all up at once.

ES. Think why! Try not to panic, not to do it again; everyone crashes

JB. If I crash because it's something I've done, then it's Ok. If it's not my fault then it is hard to concentrate.

KM. For the next corners take it steady, don't try to get back to racing speed immediately, play yourself back in.

DS. Don't try and make up for the mistake, just try and learn from it.

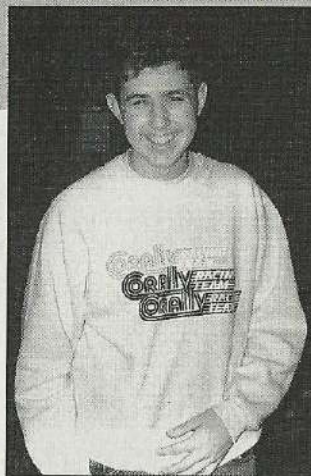
ED. Sulk

9. How do you drive? A lot of braking, no braking, do you use the throttle hard or smoothly?

CD. Smooth, my style has changed. I'm more aggressive, I push to the safe limit.

ES. I think I'm smooth, but I'm told otherwise. Smooth on steering braking if necessary.

JB. Enough steering so that I don't need brakes. At most tracks I don't use brakes it unsettles the car.



So young and yet so good, David Spashett is growing in confidence and has the title of European Champion to his name.

KM. As smooth as possible. At most tracks no brakes it unsettles the car.

DS. No brakes. I'm generally smooth on the sticks, not even full throttle or lock only in mistakes.

ED. Yeah I'm smooth, cool hair, flash motor with the megawatt stereo.

10. Do you feel the way you think in a race can make a big difference i.e. telling yourself not to crash and keep tight etc.

CD. Yes, I don't always know what I'm thinking. Sometimes it helps to say "that was silly".

ES. Yes it can help telling yourself to concentrate. Think before a manoeuvre.

JB. Yes, definitely, but don't think too much, you can pressure yourself. Must keep calm.

KM. No not really, just concentrate.

DS. Yes. I keep thinking about what I'm doing and how to be faster, looking at different lines.

ED. Yes, some of my most interesting conversations have been with myself.

11. Why do you think you're the best, if you do?

CD. Good people around me. Concentration and watching the car so closely, looking for that little bit extra, always knowing I can go faster.

ES. Because of practice years ago. I take it seriously, but not that it upsets me if I don't win.

JB. Just because I'm good with the sticks, I think I can drive as good as any.

KM. My ambition is to win the worlds, before doing that I haven't finished. Just ambition.

DS. Difficult, don't know. Good reactions and good judgement.

ED. Pardon?

12. Do you feel preparation is the main part of winning or driver skill?

CD. 80% preparation, 20% driver skill. If the car is working it is easy to drive.

ES. Yes it is a big part of it, maybe 50/50 split. The car needs to be good, go to a track with a set up you know works.

JB. More important is car set up. I don't care as long as the car works. Set up and preparation is maybe 80% important.

KM. 70% prep, 30% driving. Preparation is a big part of it, if nothing is going to fall off, its just a question of driving.

DS. Preparation has to be the best, or at least the best you can do. 65% it's important.

ED. Oh yes, very important. Always Simonize the body

between races.

13. Why do feel Masami is so good?

CD. He's brilliant, one of the best to watch, he's so aggressive. Practice and preparation. All his hours at the track helps, although you can overdo it.

ES. Don't know. Practice maybe and a good attitude.

JB. Testing and practising. When I practice very hard and long I get better. His dad is also very good, he knows a lot.

KM. Yes he is good. He puts in more effort than anyone else. He drives a lot and his job helps.

DS. Perfect preparation, he has everything ready, and he is a brilliant driver. Not smooth but fast. He is good all-round.

ED. Sounds like a nice name.

14. What secrets do you have that helped you to win?

CD. I have the same equipment as others. It's down to car set up and working with a team.

ES. None!

JB. None, try to relax and have fun.

KM. Maybe 100% dedication

DS. No real secret apart from nicking all my dad's stuff. Nothing anyone else couldn't do.

ED. If I told you it wouldn't be a secret

15. What would be the biggest tip to someone who goes well but isn't quite there?

CD. No single thing. For some it's driving for others preparation.

ES. Don't give up. Work out the problem and work on it.

JB. Just drive at big races, as if at your local club. The difference between top drivers and club drivers is attitude and bottle.

KM. Try to do as many big meetings as possible. Get a feel for bigger competition. Go to as many tracks as possible.

DS. Keep the car smooth and concentrate, enjoy yourself you can get it in the end.

ED. Buy R/C Model Cars.

It may be possible to spot some common areas in the answers from the racers we interviewed but the only certainty as far as I can see is that there is NO formula, no secret solution, no instant answer. The best advice we can give is, don't listen to the ED.

RCMC editor can offer if nothing else more years of racing experience than most...



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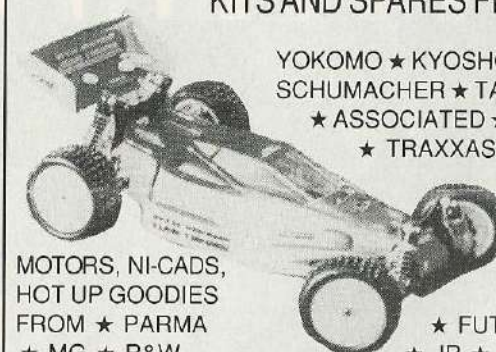
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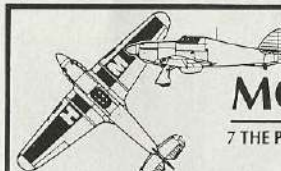
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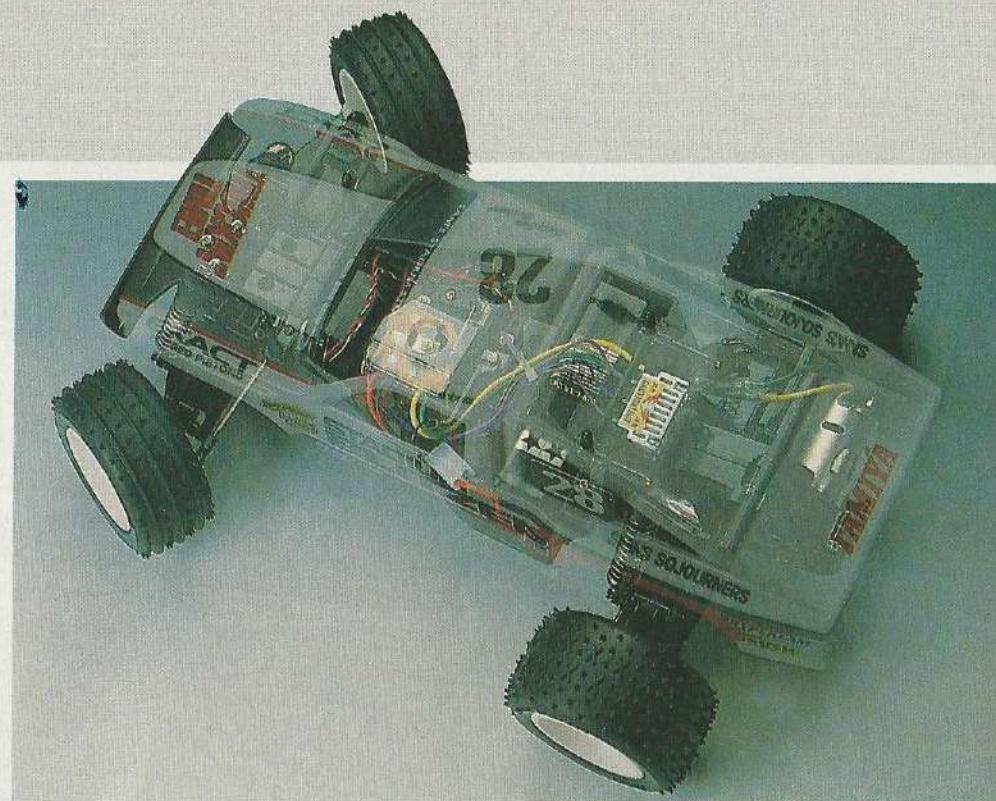
Electric powered cars come in many shapes and sizes, you need to choose one that suits your desires, and your pocket.

1/12th Mini-Stocks

The 1/12th bit (or 1/10th later on) refers to the scale of the car. 1/12 is 1/12 of full size. Like all fractions the smaller the number below the line, the bigger the car. Mini-stocks are made by Mardave of Leicester. They have Mini (as in the car) bodies and are replicas of the stock cars used on oval tracks. This is the cheapest form of racing, usually takes place indoors, and is great fun. The cars are simple, very rugged, and very cheap to buy and run.

1/12th Stock Cars

Big brothers of, and natural progression from the Mini-Stocks. Stock cars are replicas of the full size BRISCA F1 stock cars as raced by Derek Warwick. Like Mini-stocks oval tracks indoors are used. Racing is more skilled and the cars require more knowledge to set-up, but the same simple durable construction remains. Tight cost controls



are applied to 1/12 stock cars so racing is very competitively priced. If you enjoy a bit of contact in your racing, this is for you.

1/12th Circuit Cars

This is the pinnacle of indoor electric car racing. Their apparently simple chassis design hides sophisticated features which are used to tune the chassis to particular tracks. Powerful motors push the cars up to actual speeds of 35mph (or 420mph scale speed!) and sophisticated electronics are used to control speed and steering. These cars are very fast and once tamed by the novice driver provide huge enjoyment. Racing is fast, reactions are quick and



Top; Truck racing started in the US and is now popular in the UK although organised race events are rare. Tamiya's scale like 1/10 cars are popular. Corally's 1/10 on road car comes pre-built and beautifully machined. Left; Mini-stock racing – inexpensive and great fun.



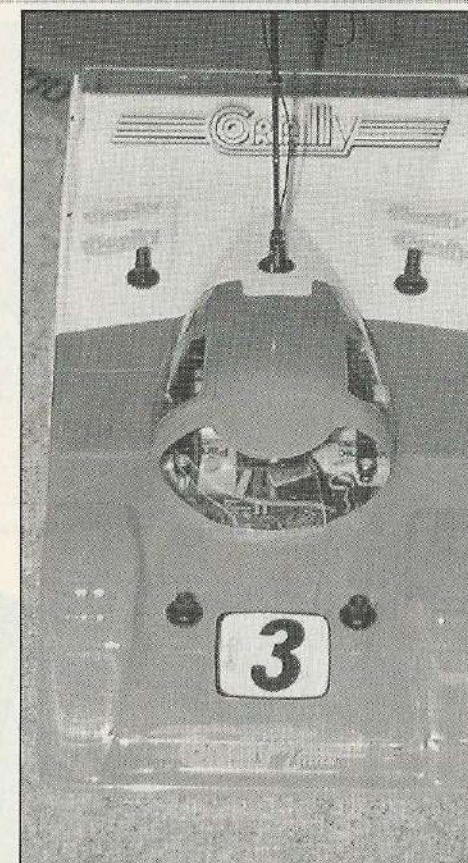
there is the added bonus of an 8 minute race time (all other classes are five minute races) in which to learn your class. Not for the faint hearted, a must for the real enthusiast.

1/10th Circuit Cars

Larger versions of the 1/12 Circuit cars using the same closed cockpit Le Mans bodysells (Jaguar, Nissan, Peugeot, etc.) Races are only five minutes, but the real changed is the venue – purpose built outdoor tarmac tracks. Speeds are even higher, up to 45mph, but with slightly slower cornering speeds. Cars can be tricky to drive if the grip is low, but there is nothing like a 1/10 circuit car flat out on a long straight on a warm summers day. Quite an expensive class but avidly followed by loyal drivers for whom happiness is a big track and a fast car.

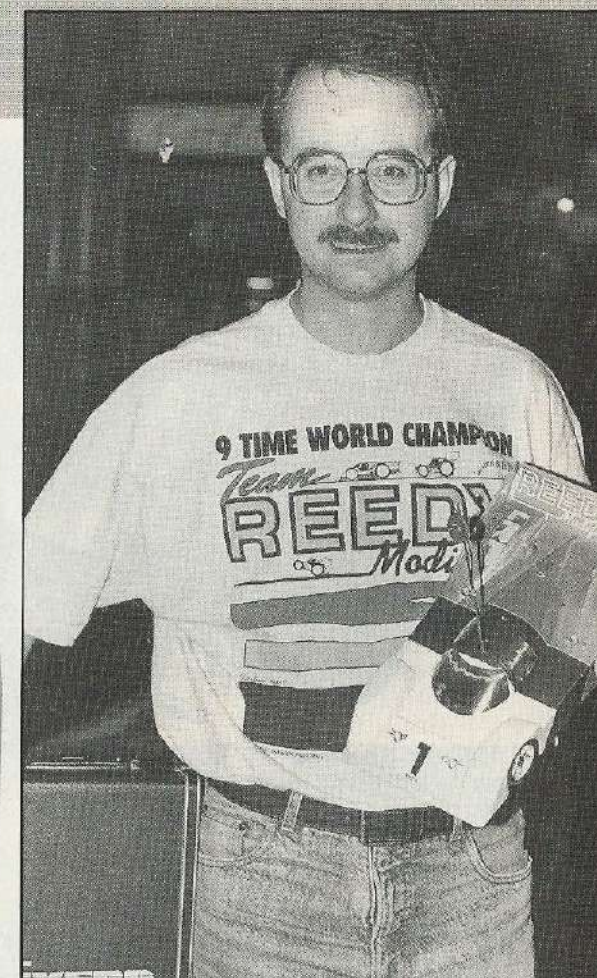
1/10 Off-Road

The grand-daddy of them all, simply the most popular electric class in the world. Open wheeled cars, racing on grass, dirt, or clay tracks, designed to rake the ups and downs of a rallycross style track in their stride. There are two classes, one for two wheel drive and one for four wheel drive cars. 2WD is the lower cost formula with a premium on driver skill not cost. Cars are not simple, but rugged and easy to maintain. There are many different cars available and all have a range of adjustments to tune them to different tracks. 4WD cars cost more and take more maintenance but they are easier to drive. Again, adjustments are available to tune the cars, and getting a good performance from the chassis is within reach for beginners despite the extra complication of the 4WD transmission.



There is such a wide range of cars available that anyone can get started in 1/10 Off-Road at a price to suit their pocket. As long as you realise the limitations of the cheaper cars, racing is terrific fun. Hundreds of clubs up and down the country organise meetings every weekend where families gather to watch Mum, Dad, Sister or Brother (or all of them!) race. Cars can even be driven in the garden to scare the cat! All these classes have rules policed by the British Radio Car Association. Their rules mean you buy cars which are suitable to be raced at any club. The BRCA organise Regional, National and International meetings in all these classes, so as you skill improves you can

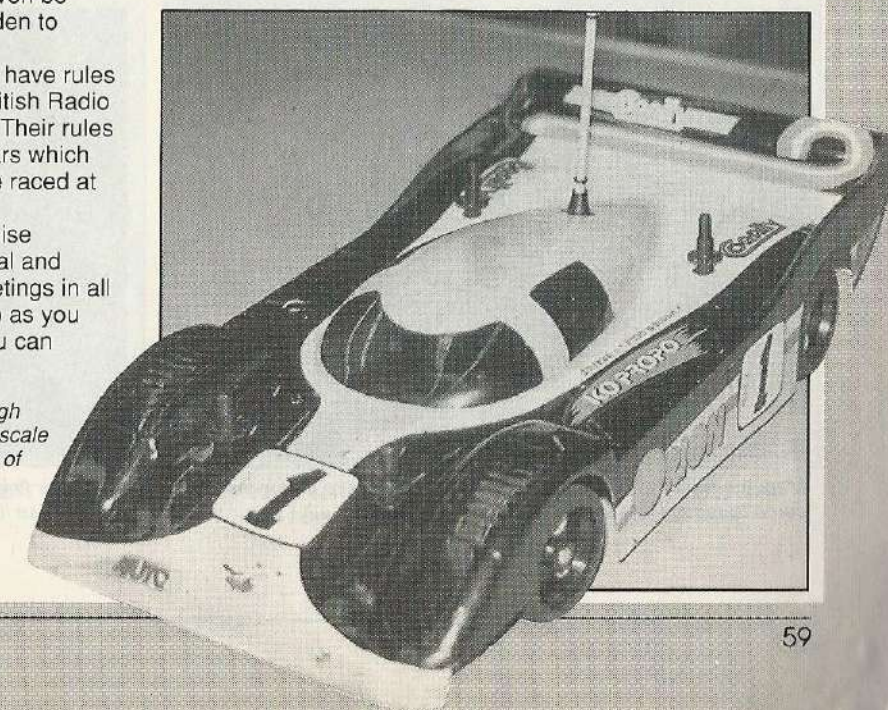
Light weight and high power makes 1/12 scale racing the pinnacle of indoor R/C cars.



Drivers are good drivers whatever class they race in. Phil Davies has proved this point being both 1/10 off road and 1/12 on road European Champion in the past.

compete at whatever level you choose – up to and including the 1993 European Champions Craig

Drescher and Ellis Stafford. These may be models, but the racing is real – go out and enjoy it!



Electric motors in R/C cars are used and abused unmercifully and yet they seem to go on working without complaint. It is quite probable that you might not even notice the drop in performance, but you can bet your bottom dollar that over a period of time your motor will not be



regularly, buy brushes every now and again what more can I do? Just look at what that motor is doing for you. It is drawing, say 10 amperes at say 7.2 volts, conservatively consuming 70 watts of power. Assuming at worst a 50% efficiency (more likely to be around 65%) and it is delivering at least 35 watts of power. Not bad from a unit that measures around 36mm x 50mm. It is subjected to knocks and bangs, heat, dirt and reverse currents being

delivering the sort of performance it was when you bought it.

What has caused this deterioration?

How do feel about neglect. No I hear you cry out. I clean the can

MOTORS TAKE AN AMAZING AMOUNT OF ABUSE. WITH OUR GUIDE YOU CAN BRING THEM BACK TO TIP-TOP CONDITION

applied on and off all the time and then to cap it all you expect it to do this for five minutes continuously without even taking a breath.

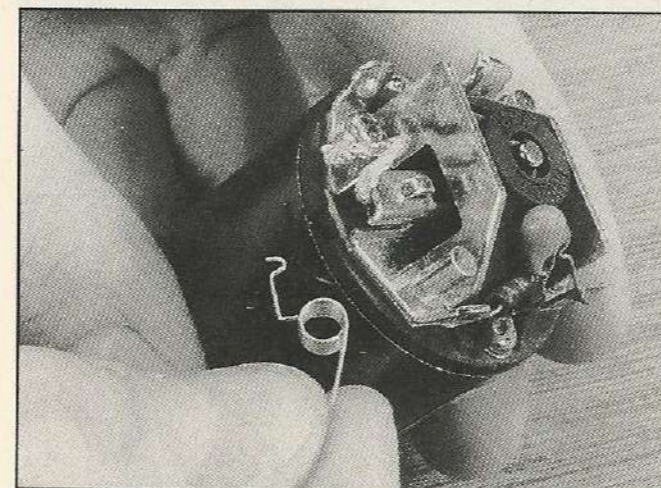
SECRETS FOR SPEED



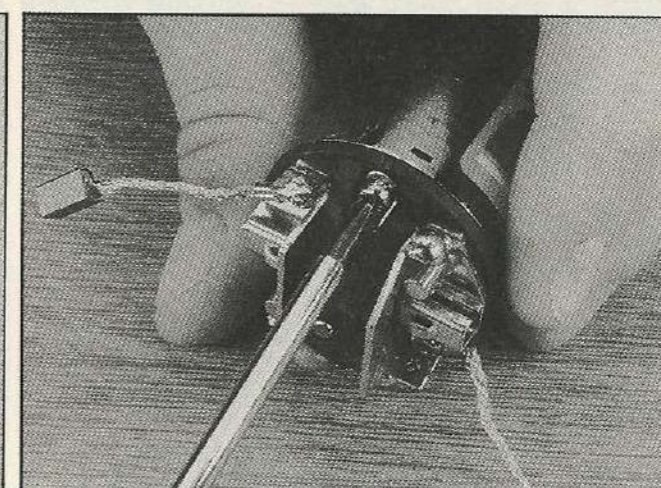
Mark the motor with a scalpel or paint to make sure that when you come to rebuild it you get it back as it should be.



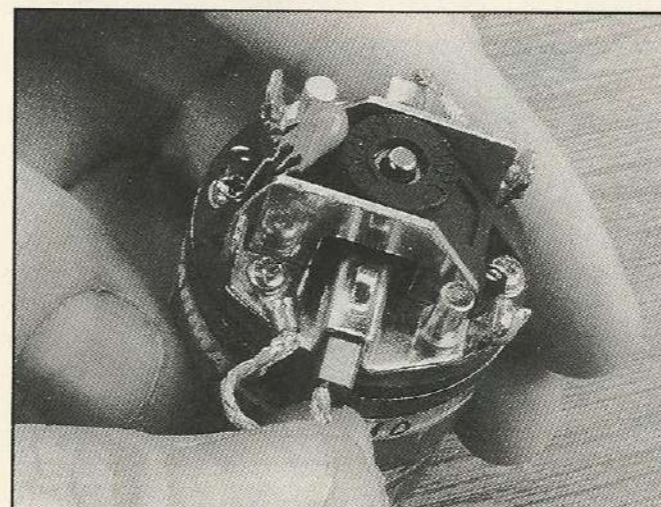
With your finger, unhook the spring and gently release it. Be careful not to loose it.



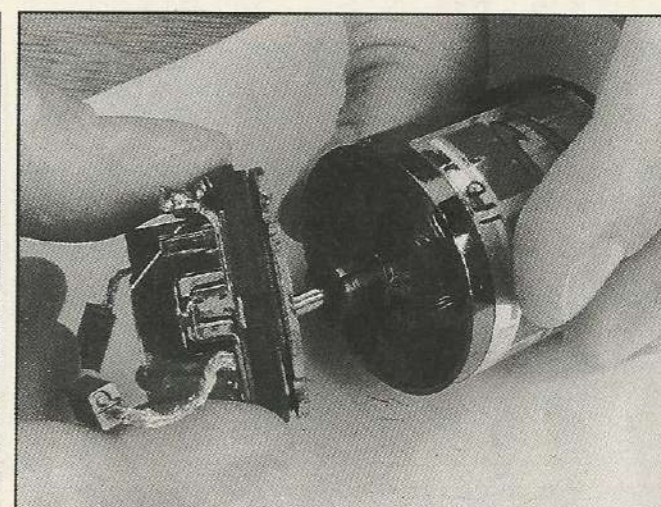
Gently remove the spring and place it somewhere safe and repeat it for the other side.



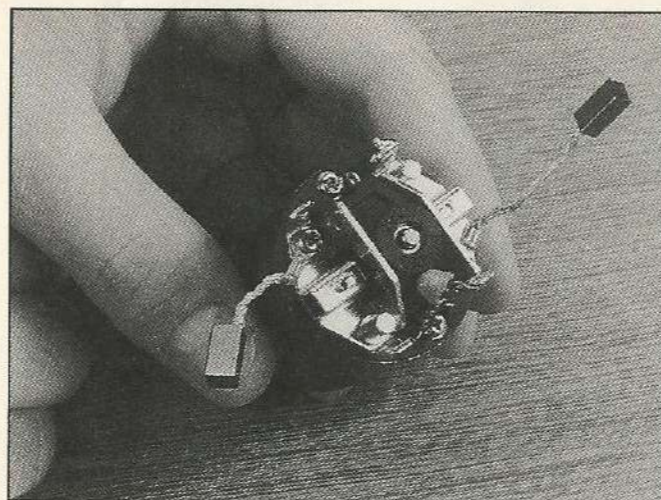
Undo the two motor screws opposite each other approximately 4 turns. Then grab hold of the whole endbell and twist slightly...



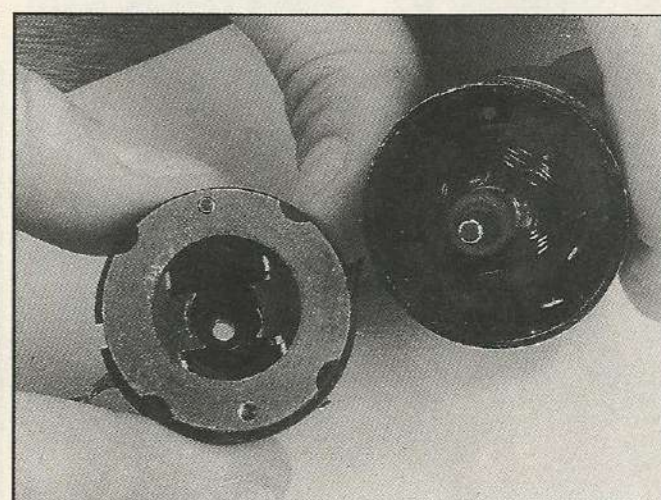
Pull out the brushes from the brush holders being careful not to chip them or to stretch the braiding.



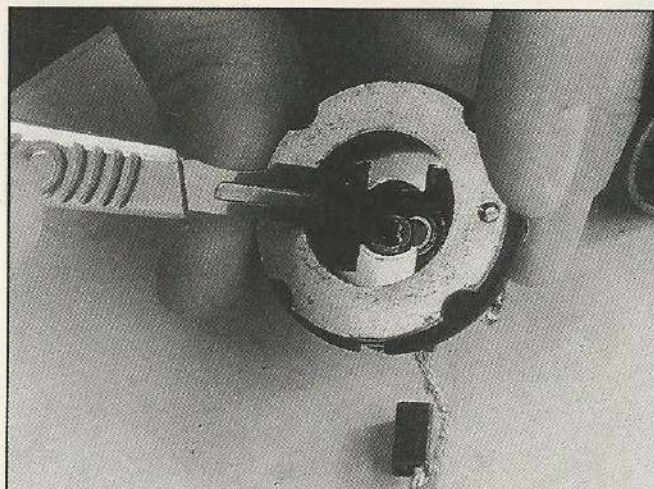
...The endbell should now come away from the can. It is at this point that you must be very careful to...



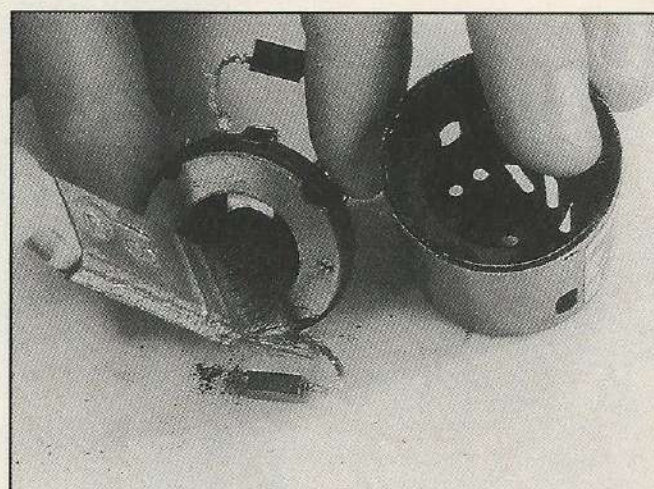
After removing both brushes the end of your motor should look like this. Remove the brushes well clear of the endbell.



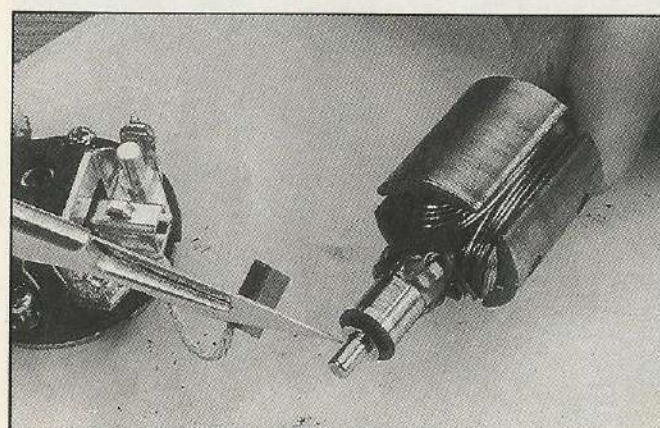
...Keep a very careful eye for the motor shims. They tend to hide down by the bearing in the endbell. You must not loose them.



One of the small motor shims can be seen here clinging to the bearing. Remove it carefully and keep it safe. At this point the bearing can be checked to see if needs replacement.



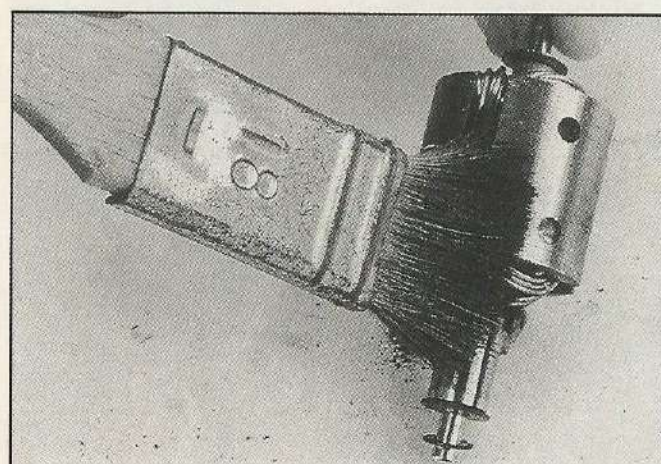
You will need to properly clean out the endbell, as this is where most of the dirt will gather.



You can either place the shims back onto the armature as shown or place them somewhere safe. Remember as you pull the armature out of the can to keep an eye on the motor shims at the other end.



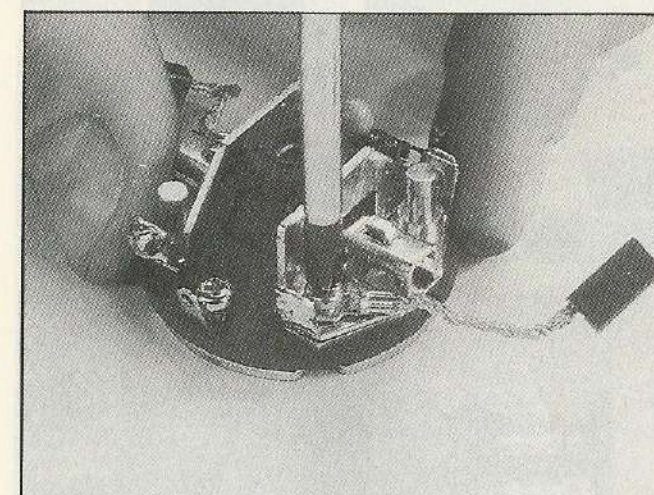
Clean the copper of the armature with a clean tissue and a spray of motor cleaner. Be careful and treat the armature gently as it is made from relatively soft material.



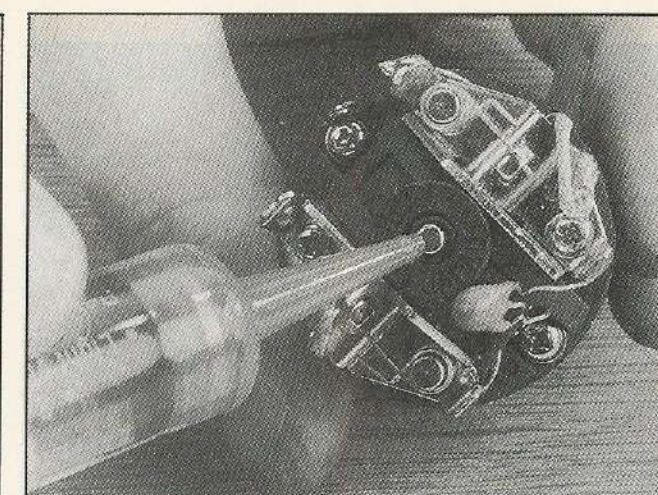
Cleaning the armature requires a soft brush and care. The windings can be easily damaged so don't drop it!



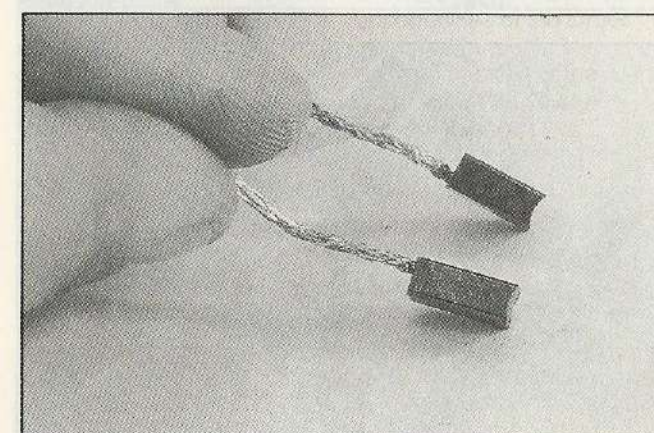
The can will also have collected a lot of dirt remove this first by brushing and then by spraying motor cleaner.



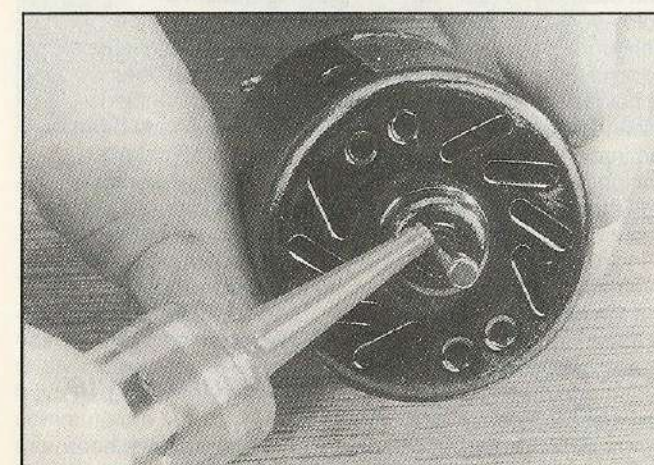
To remove the brushes simple remove the screw and the brush will come free. Brushes need changing when...



The endbell bearing will also require a small amount of oil, again just a little so that none will reach the brushes.



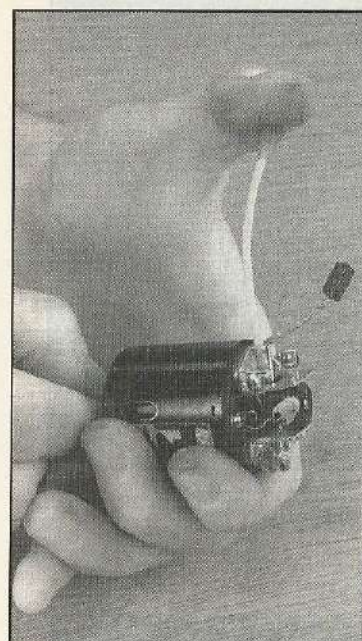
...They are either worn excessively, overheated or broken. Two brushes are shown, a slightly worn brush (top). And a new one below. The used brush in this instance is still quite usable.



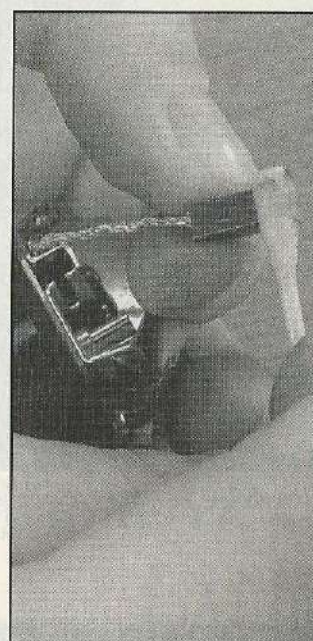
When you have cleaned the bearing thoroughly they will require oiling. Don't over oil the bearings just a small drop will suffice.



The tools required. A motor cleaner, light oil, scalpel, Phillips screwdriver, soft brush and cotton bud.



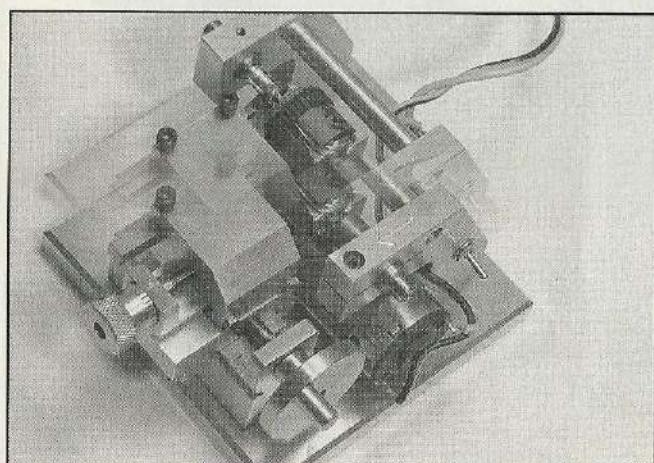
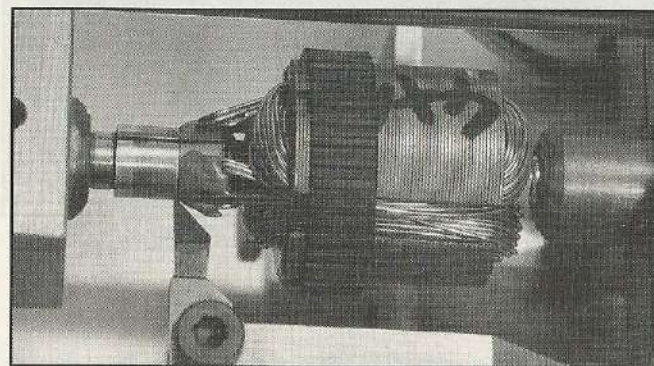
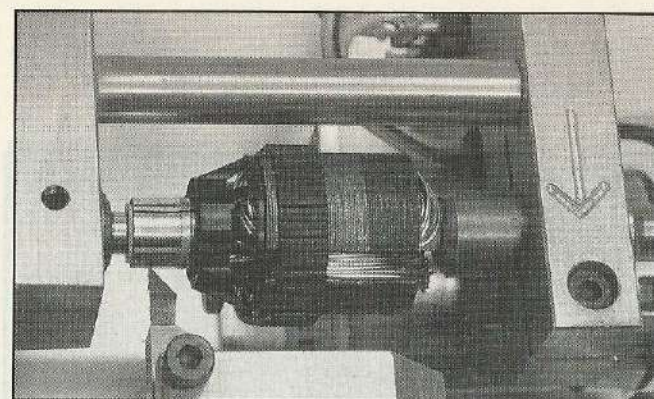
A quick clean of a motor can be achieved by removing the brushes and cleaning the comm with a cotton bud soaked in motor cleaner. Use the cotton bud also to clean the face of the brushes.



How about a thought or two for the motor.

In every Racing Special issue we have talked about motor maintenance. Every year the hobby sees more enthusiasts joining the ranks of the dedicated racer, so it is right and proper that we devote a few pages to one of the most important components in the R/C car, the power plant. The part of the motor that does most of the work is the bit that rotates, the armature. The armature is basically three coils of wire wound around three blocks of metal known as the poles of the armature. The purpose of each pole is to concentrate the magnetic flux which is produced when an electric current passes through each of the coils in turn. The magnetised section of the armature is now attracted to one of the two permanent

magnets set inside the can of the motor. As the magnets set inside the can of the motor. As the armature rotates a switch turns off the current to one coil and on to the next coil, so causing it in turn to be attracted to the magnet and so on. The current reaches the coils of wire by means of blocks of sintered copper which slide over the surface of the commutator (the switch). The commutator is divided into three sections, each section connecting to a coil. The variables in R/C car electric motor design (excluding choice of materials) are the size of armature, size of commutator, number of windings and size of wire, strength and size of magnet and can. 1. For the most part the diameter of armatures of R/C model cars has always been around the 23mm. Some variations do occur however in armature design and make up. The basic armature is made up from a series of silicon iron laminations that have been clamped together



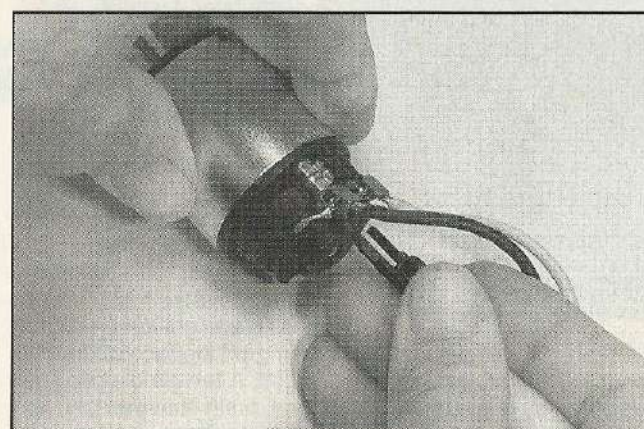
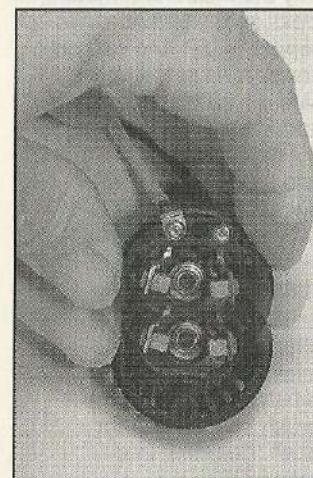
If the armature in your motor is beyond cleaning you will require a motor skim. A number of manufacturers will do this for you or you can use a motor lathe as shown.

and coated in a resin to hold everything in place. Although not widely advertised it is possible to have different thicknesses of laminations. Typically the laminations range from 0.35mm up to 0.5mm in thickness. The basic principle is that the more laminations the better, but the higher the cost. Some manufacturers have gone for slotted armatures and taken out great sections of armature in the centre of the stack. This gives a much lighter armature providing quicker acceleration, but on the down side the

concentration of magnetic flux will be reduced resulting in less output torque. Other methods of lightening the armature have been to machine off chunks from the outside edge of the laminations. Sort of a halfway house between the slotted armature and a standard version.

Three Segment Style

Commutators have been the three segment type now for around fifteen or more years. Five segments (to go with five windings) were tried



Tamiya's Gold motor has a different style of motor brushes. These need to be removed with a tool supplied and cleaned individually with a cotton bud. The brushes can also be replaced as per a normal motor.

many years ago, but the gain verses cost never really showed up. We have had skewed commutators but they never really took off and now perhaps the only significant change to come in a decade is a modification to the commutator diameter.

Previously commutators were around 7.5mm, the latest range of commutators is up to 10mm diameter allowing a bigger area of brush contact to be made. This in turn allows greater current to flow, contact pressure can be reduced in turn reducing commutator and brush wear and finally the reduction in contact resistance will mean that the motor will run cooler. To go with the large diameter commutator some manufacturers have simply turned existing rectangular brushes through 90 degrees others have seized on the opportunities of the larger commutator and in fact doubled the size of the brush making it square in cross section, so a significant increase in motor performance can be expected. Keeping motors cool has always been a problem. Many years ago small fans were included at the

a single lamination bent to act as a fan or a completely separate plastic cage fan that is positioned near the brushes causing air to pass over the brush gear and out through holes cut in the can. The advantage with the latter system is that if you prefer not to have the fan it can easily be cut off without affecting the rest of the motor. Magnets have gone through a steady evolution and now the so called wet magnets are pretty standard on all motors. It is still possible to get Cobalt magnets but these are quite expensive and are outlawed by some racing organisations, mind you it is pretty difficult to spot when a motor has cobalt magnets fitted. Another development is the introduction of different thickness magnets. The larger the magnet, the smaller the air gap and in theory the more efficient the motor. Of course the magnetic circuit is only as good as its point of greatest magnetic reluctance and that is determined by the thickness of the motor can, yet another variable, but cans are usually around 1.0mm to 1.5mm thick. The thicker the can and the thicker the magnets the greater the weight so it becomes the inevitable balance between weight and power.

It's a Wind Up

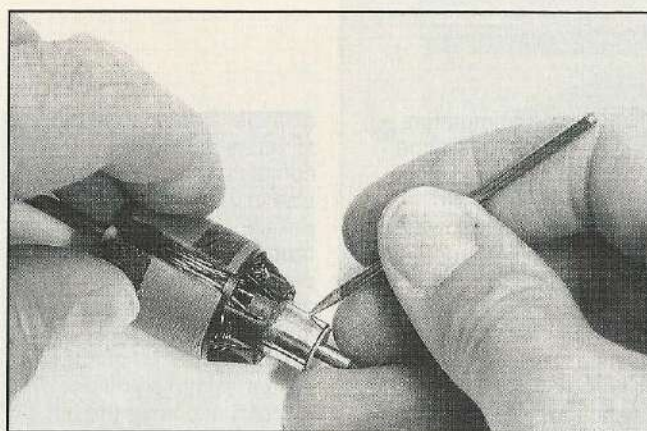
Then we come to the windings themselves. Copper wire specially formulated to withstand heat, with high melting point varnish is now the norm. The windings must be wound neatly and tightly around the iron core. No movement of the windings on the core can be tolerated, in the worst case a badly wound

armature can throw the windings right off the armature with catastrophic results. Some makers whip cord around the wire where the windings meet the commutator. This helps to keep everything together. An alternative is to coat the windings in an epoxy resin to lock everything together in a solid mass. We can have a single piece of wire wound around each pole of the armature or two pieces of wire wound together (a double), three pieces of wire wound together (a triple) and so on. The idea is to get as much copper around the iron core as possible. So the specification of a motor will say 16 x 2, that is sixteen turns of two pieces of wire wound together. The less turns, the thicker the wire that can be used. So the lower the resistance. The lower the resistance the greater the current, which would normally mean an increase in revs and torque as there is a direct correlation between energy in and energy out. However, electric motor speed is more determined by voltage than by current, and as our applied voltage is set at 7.2 volts the current available tends to affect torque and power output more than R.P.M. R.P.M. is going to be controlled by applied load and the ability to overcome load resistance will be by controlling current. Not that we need worry to much about this when it comes to motor maintenance. Despite all of these improvements in motors we still have the same old problems of cleaning and maintaining the motors. Let's start at the beginning. The two basic motor types are the ones you can take to pieces, often

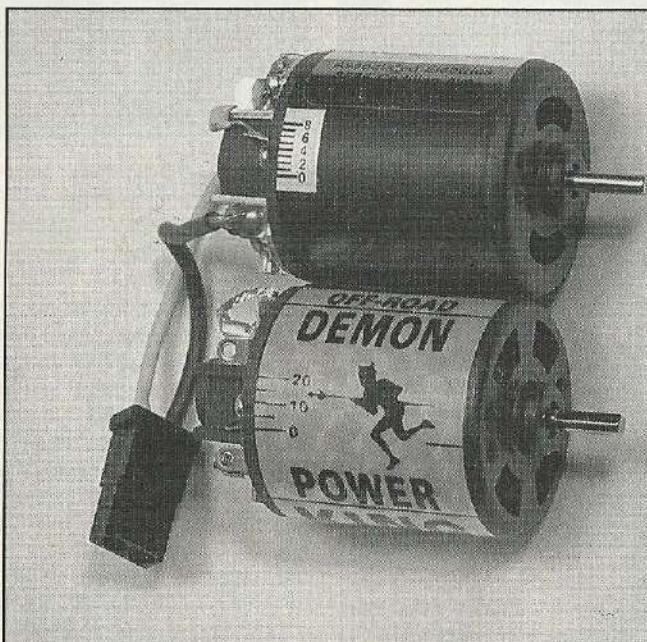
the basis of modified motors and the standard motors which cannot easily be taken apart. The standard type of motor can only be cleaned and overhauled to a limited degree and brushes are not replaceable (if it is a kit motor). Having said that it will certainly be a good idea to clean out as much as possible with a motor cleaner either in liquid form or from an aerosol spray. It is possible to buy tools that allow some amount of commutator reworking. However check how much it will cost to replace the motor before investing in expensive commutator truers for standard motors.

Take 'em to Pieces

Moving to the motors that can be taken to pieces. Assuming that the motor has been removed from the car (after of course removing the batteries). The first job is to check to see if the small capacitors that are soldered to the brush gear have the other end soldered to the motor can. If they are you will have to unsolder the capacitors from the can. Be prepared to replace these as they may not take kindly to being manhandled. It is a good idea to have a few spare sets available just in case, they are not that expensive. However it is more common these days to have the capacitors soldered to a tag which is under an endbell fixing screw (no unsoldering necessary). Next remove the brush springs by unhooking them from the brush holder and then lift the springs off the spring post. A good look at the



After skimming the motor or for general cleaning purposes the slots between the copper sections should be cleaned using a pointed object. At all costs do not mark the copper surface.



Setting the timing on the motor will change its characteristics. The motors above have the timing of the motor shown via a small sticker. 2-3 degrees is often a good starting point.

spring will give you some idea if it needs to be replaced. The only really satisfactory way to check a brush spring is to compare it to a new one. Springs are at the hot end of a motor and do deteriorate in time. They lose their springiness, sometimes you can even see bluing on the surface of the spring, this is a good sign that a replacement may be necessary. Once again a spare set is not that expensive to keep in the tool box. It is possible to get different brush

springs. They are described by angle, that is, a 120 degree brush will exert a higher brush pressure than a 100 degree spring. Brushes are next on the list. Assuming that you may want to use the same brushes again, mark them and the holders they come from as you remove the brushes, so you can replace them the same way and on the same side from which they came. If you wish to look at the brushes a little more closely you can

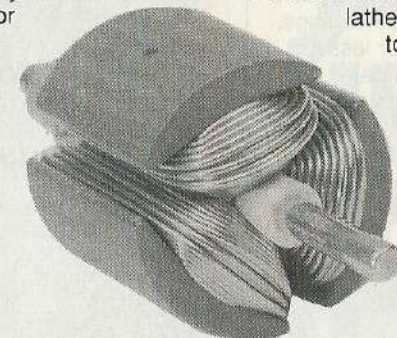
undo the small screw that holds the brush braids (sometimes called shunts) to the brush holder. Brushes are manufactured usually by sintering (moulding under heat and pressure) a mixture of copper and carbon, perhaps silver and a few other compounds for good measure. As the motor runs the brushes gradually wear away, they effectively breakdown to their constituent parts, that is why the inside of a motor looks an awful mess. It is copper, silver and carbon powder. All of this mess plus the oil that you have added from time to time not to mention all the grit and rubbish from the track will need to be washed out. While you have the brushes out check the length. The minimum length for a brush will be when the brush springs cannot push the brush into contact with the commutator, I would recommend changing well before you get to this point as the brushes would have deteriorated anyway. Look at the face of the brushes, if they have taken on a bluish hue they are probably past their best and a motor failure could be on the cards. Also it is possible to get lumps falling off the face of the brush. A few problems here, firstly the area in contact with commutator is now reduced resulting in reduced current flow, secondly you have a lump of copper rattling around inside the motor potentially causing all sorts of chaos and finally the brush face is quite likely to be a bit lumpy and rough. The result will be scoring of the commutator, not good! So, it is important that if you spot damage to the brush face then change the brushes as soon as you can.

Ding Dong Bell

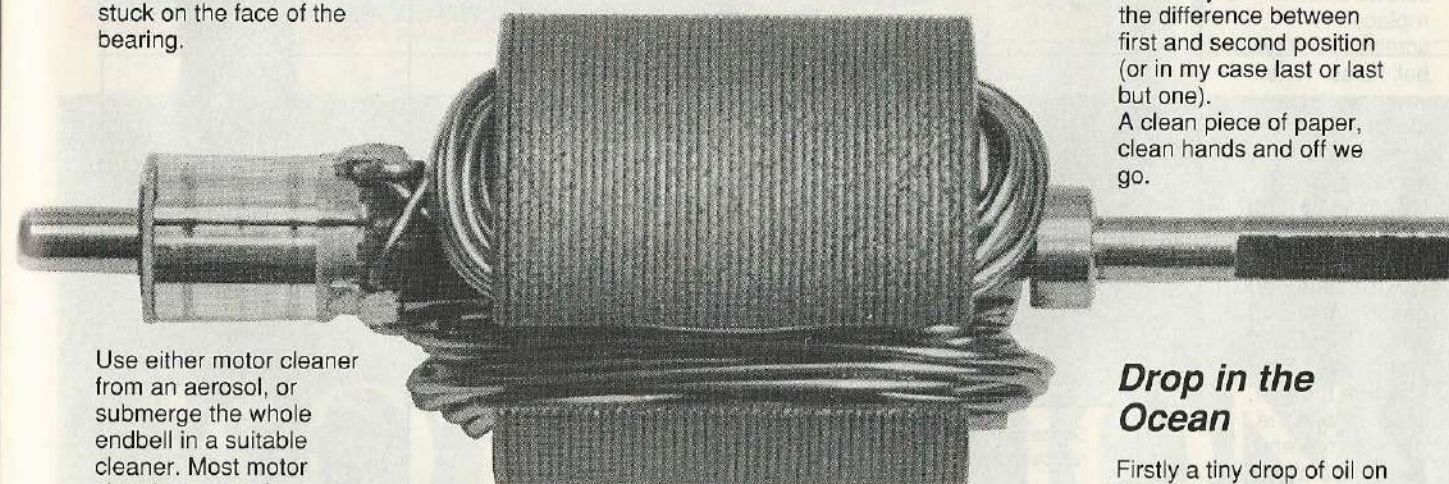
Time to remove the end bell. Before you do this mark the can and end bell with a knife or blob of paint so that you can put it together in the same relative positions as it came apart. Loosen the two main securing screws, there is no need to remove them completely. With the endbell loose it can now be twisted around. Twist the end bell by approximately 90 degrees and the whole assembly can be lifted clear of the motor can. Cleaning the endbell can be a messy business. It might be a good idea to remove the ball race from the endbell housing, it will just push out. Be careful to collect any washers that may be stuck on the face of the bearing.

the commutator. Use a piece of wire, ball point pen or a very fine spike to clean the space between the commutator segments. Take great care not to run your cleaning implement across the commutator surface as it could do some irreparable damage. If your commutator has some

like it is covered in moon craters it will require some drastic action. A skim could be the only answer, but remember that the copper on a comm. is pretty thin. You will need to remove only the very smallest of layers. Specialised comm truers are nothing more than miniature lathes designed to do



Very neat wire installation on this Corally armature shows just how a good R/C model car motor should be.



Use either motor cleaner from an aerosol, or submerge the whole endbell in a suitable cleaner. Most motor cleaning aerosols use a product called Genclean or a product close to it. It is a solvent based on trichloroethane and is safe if common sense precautions are used. There are numerous other cleaners on the market that work equally as well. Cleaning the armature. Remove as much debris as possible from the windings, commutator and pole pieces with a stiff brush. Now down to the real business. Use a cotton bud or cloth soaked in motor cleaner to clean

scratches it may not be the end of the world. Marks can be removed with an eraser, if there are grooves then it may be possible to use very fine abrasive sticks that fit in the brush holders to grind a few thousands of an inch from the comm. surface. Some enthusiasts have had a limited success with very fine abrasive paper, say around 1000 grit. Take care, a false move with this could spell disaster, it depends how bad things have become. If the commutator looks

just one job, namely skim a comm. If you have access to a small lathe then this will do equally as well as long as you go for a pretty fast speed and use a diamond tool to get the best results. Having put the commutator into pristine condition is there anything else that can be done? Although it will need some specialised equipment it is possible to get the can and magnets remagnetised. This is sometimes called zapping and requires putting the can inside an

incredibly high magnetic field to remagnetise the magnets. A few of the motor specialist offer this service and it usually costs only a few pounds, but the results can be astounding. You will probably finish up with magnets that are better than they were in the original condition. Well, that's about it. All you have to do is rebuild. Have all your new parts to hand, including brushes, brush springs and if necessary your skimmed armature, magnetised can, even new bearings if the originals sound or feel just the tiniest bit doggy. It is unlikely that the armature will crash into the magnets as the bearing will have all but decomposed to allow this to happen, but additional friction means less efficiency and that can be the difference between first and second position (or in my case last or last but one). A clean piece of paper, clean hands and off we go.

Drop in the Ocean

Firstly a tiny drop of oil on the front bearing. Replace the washers on the armature and carefully place the armature into the can. Although the magnets will virtually pull the armature out of your hands it is an easy matter to position the shaft into the front bearing. Try, if possible to use brass washers at the front end of the armature as steel ones will be whisked off the shaft and stick to the magnet, these will almost certainly jamb the armature when you start the motor for the first time. Now the end bell assembly. If you have

taken the end bell screws right out the end bell securing ring will have to be replaced first. End bell rings can be made from aluminium, brass or steel. If they are made of aluminium you will need to take care when the securing screws are tightened, it is very easy to strip the threads in the aluminium. Most of the motor producers will keep spare parts should you need any. Turn the securing ring around so the can indents are holding it in place. With the end bell bearing replaced and lightly lubricated make sure the brushes are either removed or withdrawn, place the end bell in position. Put the tags on the end bell securing screws and replace the screws in the end bell holes. When you have located the threaded holes in the securing ring tighten the screws, but still make sure you can rotate the end bell. Put the end bell so the mark (you made at the start) on the can, lines up with the mark on the end bell and finally tighten the securing screws. Replace the brushes or use new ones, then put the brush spring in place. It is a good idea to bed the brushes in before giving them a lot of work to do. So a few minutes at 3 or 4 volts should be sufficient. Brushes are preshaped to fit the commutator, so it is not that lengthy a job. There are a fair number of specially cut brushes that claim all sorts of extra performance for different conditions. They cost quite a bit and because they all have a lower contact area on the comm. the wear rate will be

higher, so make sure you know what you are letting yourself in for if you try some of these. Having put the motor into tip top order, remember it will very quickly deteriorate again. Interim cleans after every meeting with brush and spring inspections followed by full overhauls every 10 to 15 meetings. That is more or less it. There is one final adjustment that can be done and that is to adjust the timing of the motor. Advancing the timing will up to a point increase the R.P.M. of the motor, the

down side is that the torque will reduce. So if you have a track where there is sustained high speed, then maybe higher R.P.M. is the answer. If however the track includes gradients and lots of corners where you will need torque, then keep the advance closer to the zero point.

Buy a Motor that suits your needs

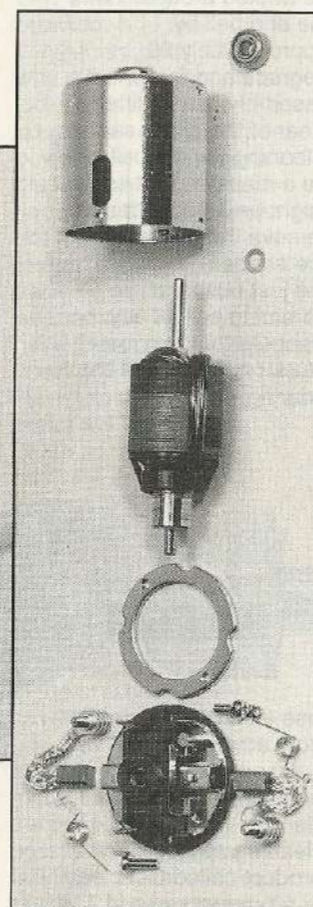
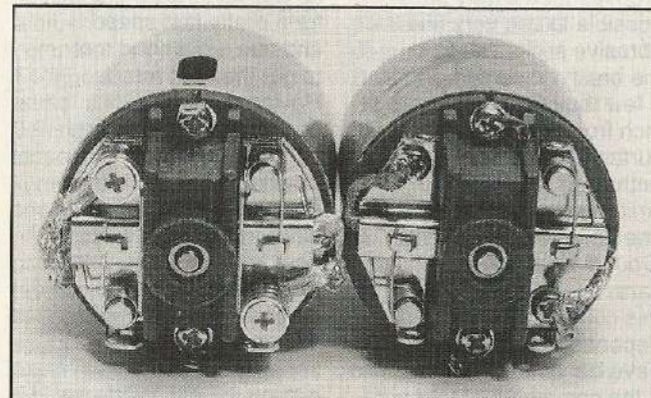
When you choose a motor wind, buy

something that you can handle and something that suits the sort of racing you are going for. If you intend to be the next world champion then the fastest, torquiest most powerful motor such as a triple or quad 10 might be appropriate. If your greatest success is completing a lap in the right direction then perhaps a single or double 17 or 18 would suit you better. Right now



Some manufacturers offer a specialised motor cleaning fluid that will remove dirt without damaging the armature.

As mentioned in the text the latest form of armature and brush set up can be seen on the left when compared to the regular set up on the right.



All the parts of the motor laid out to show the order in which they need to be re-assembled.

I'm off the clean up my 27 turn single.

Our Thanks

Racing Special would like to thank Pete Winton, George Land, Traxxas Corally and Nick Adams for their help in compiling this article.

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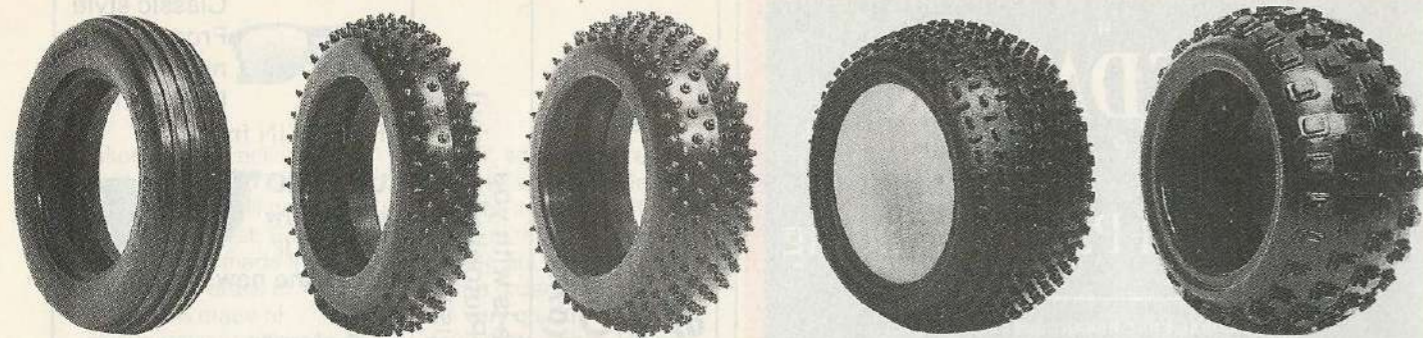
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TYRE TECH

EASILY OVERLOOKED, TYRES MAY NEED MORE PREPARATION THAN YOU THINK...

It is probably fair to say that there is one piece of R/C car equipment that will have a greater effect on car handling than all other equipment put together. Tyres, in truth should really be described as consumables not as equipment. In fact they are so consumable that at the very top level, tyres will only last for a single race, indeed if the races

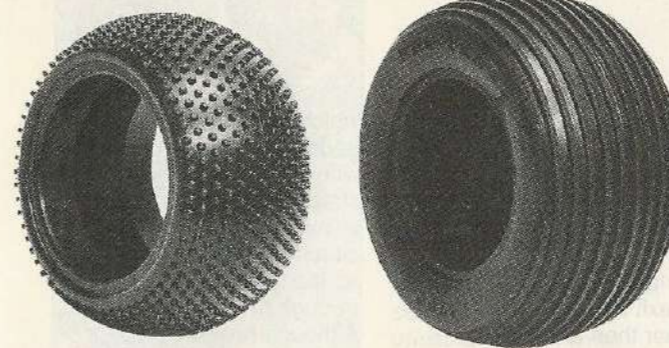
were long enough I expect a few drivers would be happy to go for a tyre change during a race. At less intense meetings tyres will be expected to last for the whole meeting and more often than not to last for a number of meetings. Perhaps one of the most significant factors in successful racing is choosing the correct tyre for any particular race. A pretty obvious statement

when you think about it but so many racers just go for the cheapest or the most stylish or most famous tyre without thinking about where and when they will use it. You only need to go to a decent size club meeting and see the cartons of tyres being selected like apples off a fruit stall to realise the importance of tyre choice. I suspect that R/C drivers have a greater choice of tyre compounds, tread pattern and manufacturer than in most full size racing, and

certainly a lot more choice than formula one racing. Sometimes even the choice of tyres from all the manufacturers shelves still do not give exactly what the expert driver needs. So he must "tune" his tyre to do exactly what he wants and what suits his driving style best. Of course, you are now entering an area of really understanding and knowing what can and cannot be achieved from a specific tyre design. What are the variables in tyre design and construction?

Tread pattern.

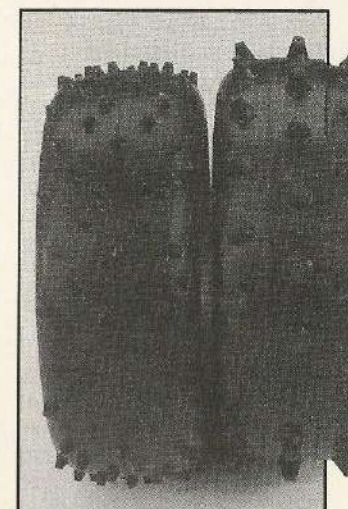
Spike tyres are far the most common style of tread pattern used today. These are usually Spike tyres are far the most common style of tread pattern used today. These are usually specified in rows. To a certain extent the number of rows determines the size of spike used in a tyre. The larger the spike the fewer the rows of spikes that can be



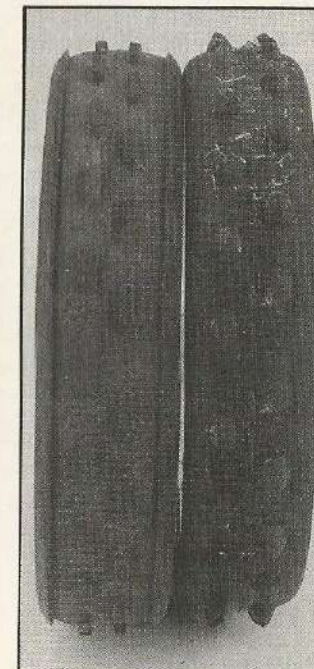
moulded in. The other variable in spike tyres are the length of spikes. Certainly, only a few years ago there were a limited number of types available, but recently spike tyres have increased in popularity with the most recent innovation being a very large quantity of very small pins. Developed by Pro-line these have become known as fuzzies. It is not difficult to imagine the effect of spike tyres on a track surface. They will try to tear into the surface. The very general principle is that large spikes are best on loose surfaces or grass, the smaller the spike (and usually more of them) are better on dusty or packed surfaces. Try using large spikes on hard tracks and the pins will bend and buckle. This will give at best, wobbly acceleration and cornering, at worst the car will be totally unpredictable. The mini spike and "fuzzies" are often referred to as high bite tyres will, on the other hand grab and hold on to a hard surface like a limpet. The problem of course is that any track will have a range of surfaces and a different design of tyre would, in theory be needed on different parts of the track. For this

reason there are a mass of different tyre treads to choose and in the end it will be experimentation that gives the best compromise, because compromise it definitely is. As far as front tyres on 2WD cars are concerned it is usual to run small or mini spikes on loose surfaces, ribbed are often favoured on harder and packed surfaces. Of course it is not all spikes and some manufacturers have a good selection of alternative patterns available. Blocks, square and rectangular are still pretty popular at many race meetings whilst where the surface is likely to be almost smooth such as asphalt and indoors then treads that lay more rubber on the road will be favoured such as diamond, ribbed or zig zag patterns. Tyres have to deal with a whole range of surface and driving problems. The first and perhaps the most obvious are the forces that act on the tyre. There are the straight line forces where you are striving for grip away from the start line. Then there are the cornering forces which are complex in that the car is still travelling forward yet there is lateral acceleration to deal with. So if you make a tyre that is good in straight line

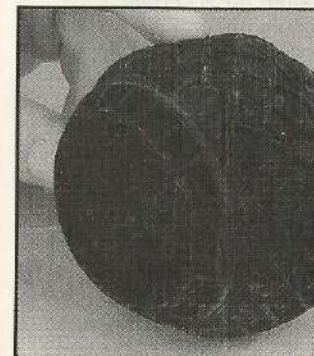
performance it may be pretty useless trying to go around a corner or vice versa. I suppose the most obvious example of this is the ribbed tyre which will offer good grip with lateral or cornering forces applied to it. With only a few thin strips of rubber trying to get to grips with the surface under straight line acceleration the ribbed tyre tends to be best on the front non driving wheels of 2WD cars. Overall, spike tyres of one style or another offer a pretty good grip characteristics all round. Set against this is the wear factor with perhaps just the tips of the spikes tearing at the track surface and it is plain to see that the spike tyre will not last very long on a hard surface. There are square and rectangular blocks with sharp edges, good for cutting into a track surface but of course the edge will go off pretty quickly. The stepped pin tries to offer the benefits of a piercing tyre with the edge will go off pretty quickly. The stepped pin tries to offer the benefits of a piercing tyre with load spreading of the wider part of the pin. Some very narrow block tyres look as though they have thin strips of rubber stuck onto the tyre surface. Although straight ahead grip may not be so high as the spike, the cornering grip will be excellent. You can see from the range of driving tyres available that manufacturers are really being inventive and inspirational. Remember however that it is not always a matter of simply having as much grip as possible that is always the criteria. When it



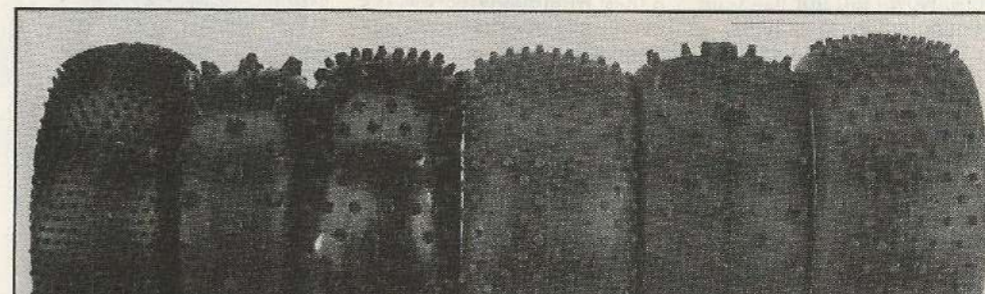
Above left: Line up of Amark and Traxxas rubber. Above: Schumacher 2" tyres include their popular minispikes and 3 x 20 which is very trimable.



Pro-line produce a number of 2WD front tyres including many variations on the ribbed theme.



Losi 'X' pattern tyres have an intricate cushion carcass which can be seen here.



comes to cornering it is the ability to control the car around a corner that is all important. In this respect it is sometimes necessary to have a tyre that will slip. What is important here is that the level of slippage is controllable. What a lot of the top drivers appear to go for is a very high grip tyre which they then tune to allow them the percentage of slip that suits their driving style. It is not unusual to see top drivers sitting in the pits nipping off rows of pins or spikes from tyres to reduce the tyres cornering performance. This is perhaps more likely to be found with 2WD cars. Front wheels on 2WD cars need to provide lateral grip not in line grip. Ribs tend to be the popular for this or perhaps very fine fuzzy tyres. It is all a matter of how much oversteer you can handle. Of course with 4WD the choice will be quite different with the desire to get the front wheels pulling out of a corner. So good grip with spikes or blocks are likely to be favoured.

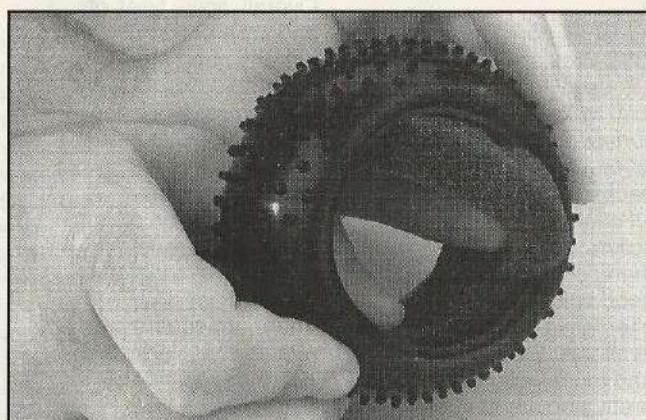
Tyre shape.

There are two basic shapes available. Easily identified as either a curved tread surface or a flat tread surface. The round contour tyre will flatten out a certain extent under acceleration. Even so there will be less track contact in straight line driving, but walls will flex under cornering loads, allowing the spikes on the edges of the tyre to come into play and hold onto the track surface. Flat tyres will have a greater tyre patch on the track in straight line driving but will be less forgiving when you encounter track holes. When cornering the tyre will depend on the face

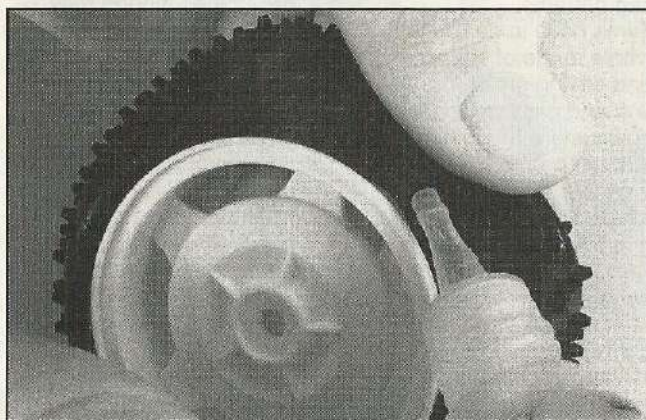
developing sufficient grip to keep the car on line.

This is not the whole story.

I very much doubt that even model tyre makers take into account the forces that act on a tyre when it is moving over bumps. It is worth noting that the forces acting on a full size racing car tyre when the suspension moves up and down can



Today's grippy tyres have super soft rubber that collapses easily. The tyre needs to be kept in place but the addition of a foam inner. Below; Gluing the tyres to the rim is very important, make sure that the tyre is glued firmly and correctly into the slot.



be as high as 6G or more. Now I am not claiming anything as high for R/C car tyres but there must be a force, and that force will bring about tyre deformation especially when objects are struck. It may be a very small effect but the speed of tyre shape recovery will

certainly help with getting to grips with the track surface again. The recovery speed will be helped by having holes punched in the tyre surface. This will allow air to exit and enter the tyre other than around the rim. Use a tyre punch to make small holes in the surface of the tyre. You could of course do the same thing to the wheel rims but this will permanently affect the rim and you may at some

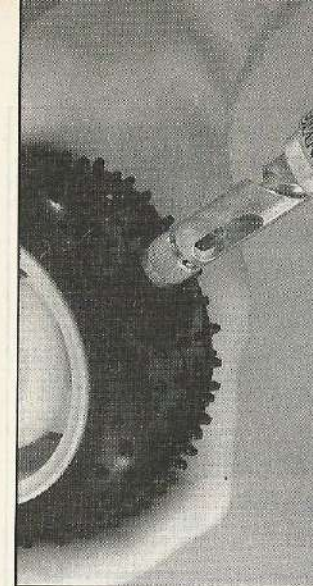
Compounds

So much for tread patterns. Compounds or in simple terms the softness of the material (I will call the material rubber but it is unlikely that the tyre material is a virgin natural rubber) is perhaps next on the selection chart. I suppose the easiest way to consider softness is that for a given tread pattern the softer the rubber the greater the grip. The down side is that the softer the rubber the greater the wear rate. From the manufacturers viewpoint the softer the rubber the less strength there is for the tyre to keep its profile, also soft rubbers tend to mould themselves to whatever they are resting against. In effect they have limited ability to recover their shape. The easiest way to notice this is to leave a car with soft tyres on a start line in hot weather for five minutes and then look at the points of the tyre that were in contact with the road and the chances are you will see significant flat spots. Some cars that come pre-built will have the tyres kept clear of the box to prevent flattening of the tyres. So, use soft rubber tyres if you need grip and you are prepared for a high rate of wear but treat the

Specials.

In the speciality departments there are tyres for ice and snow

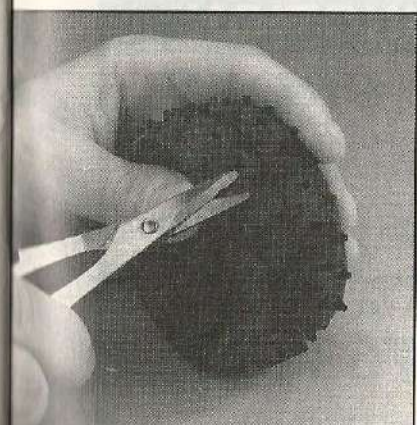
which are more like paddles. Tyres for mud where the tread is in the shape of chevrons or arrowheads designed to clear mud from the tread as the tyres are churned through the mire. Although not accepted for racing some keen drivers use talcum powder on the tyres or even spray WD40 to aid keeping the tyres clear. There are truck pulling tyres and for smooth surfaces there are slicks or treads that shift water on wet surfaces.



Yokomo produce a tyre punch that allows trapped air inside the tyre to escape.

tyres with respect and care. It is also worth mentioning that soft tyres may need some help to keep their shape. Tyre makers will probably be reluctant to increase the thickness of the tyre walls to make tyre more rigid and keep their shape, as this will increase the weight of the tyre and thus the unsprung weight of the vehicle which is undesirable. The solution which is widely used is to put lightweight foam inserts inside the tyre. This will keep the tyre in shape and not add significantly to the weight. A satisfactory all round solution. You may notice on the inside of some tyres some reinforcing ribs that have been moulded into the tyre carcass to further help keep a tyre in shape.

Trimming tyres is simple and can aid final set up and handling of a car.



This was definitely a development brought about by experience. Early tyres tended to be smooth on their inside and they had limited strength across the tread surface. It was not unusual to have tyres coming to pieces or breaking up under the stresses of racing long before they had worn out. So it shows that tyre producers do listen and learn from track performance.

Fitting tyres.

Simple job. Just pull the tyre over the rim and that is that. Until of course you hurtle around the first bend and whoops off comes the tyre and bang goes the race. So what went wrong? Some simple precautions. Make sure you have the correct size tyre for the rim. The two most common rear wheel sizes for buggies are 2.2 inch and 2.0 inch, in between this you will come across 2.15 inch, but that is unlikely to give a serious problem as 2.2 tyres will usually fit a 2.15 rim well enough. If you think it will be a good idea to fit 2.0 tyre onto a 2.2 inch rim, I should forget it. Firstly you are likely to cause severe soreness to the tips of your fingers, secondly you are quite likely to damage the tyre and finally the tyre is not going to take up a very sensible shape on the rim, with flat spots, stretched walls and total distortion. Fitting a 2.2 tyre on a 2.0 rim you will need to build up the diameter of the 2.0 rim to something close to the 2.2 diameter. Yokomo used to include rubber bands in the early Wonder Dog kits that would do just that. It may not be that easy to get hold of these bands nowadays, but not too worry. It should not be

difficult to get hold of thick, wide rubber bands that can, if necessary be layered onto a 2.0 rim to increase its diameter.

To glue or not to glue.

If your racing is serious then gluing is probably a good idea. No need to smoothen the tyre and rim in every adhesive you can get hold of from the hardware store, just a few drops of cyanoacrylate adhesive in the bead should do the trick. Take proper precautions with the glue as you feel such a fool walking around with a wheel and tyre permanently fixed to your hand, not only that it becomes difficult to hold the transmitter. Some drivers prefer to allow particularly thin glue to run all around the edge of the rim. This will seal the tyre well and truly to the wheel. An excellent joint but you may have a bit of a problem removing the tyre afterwards. Don't worry too much about taking the tyre off when it eventually needs replacing. A few deft strokes with a modelling knife and the rim will soon clean up. If the bits of glue and tyre stubbornly refuse to part company from the rim then dunking the wheel into very hot water will loosen things up. But be careful if you use this method as bits of rock hard glue and tyre can cause irreparable damage to eyes. Recently an alternative to gluing the tyre to the rim has become available. Amark Tyres have introduced something they call "Bead Loc". The principle is to have a very deep bead around the inside rim of the tyre. This bead fits into a deep groove that is moulded into the wheel. The system looks pretty good and initial reports say that it

works well. It is possible to fit bead loc tyres onto other rims, but the deep bead will probably need to be cut off. It may even be possible to fit ordinary tyres to bead loc rims but it will necessary to glue the tyres in place.

Balancing

It is often thought that only foam tyres need truing when in place. Well it may not be possible to true an off road tyre but it is certainly possible to do something about the balance. Firstly the obvious. Make sure the tyre is properly seated on the rim. Then place the tyre on a free running bearing and wait until it has stopped rotating. Mark the part of the tyre that has come to rest at the bottom of its rotation. This will be the heaviest point. Check to make sure there is no tyre flash or other lumps of plastic or debris causing this to happen. The choice you now have is to either remove material from a non critical area of the wheel or add weight to the opposite point, spots of glue may be satisfactory. The aim is to have the tyre and wheel so perfectly balanced that when you turn the tyre to any position it just stays there. It may take some time to achieve perfection, but little time to achieve an improvement. It may be difficult to notice significant performance in the short term but all the small improvements do add up.

Tyre manufacturers.

Pro-line
Yokomo
Tamiya
Kyosho
Traxxas
Amark
Schumacher
Mardave

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Welwyn Garden City
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Capel RCCC
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Dartford
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The Stocks
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BEGINNERS PLEASE

STARTING OUT IN RC IS EASY. BUT SO IS MAKING MISTAKES. HERE'S OUR GUIDE TO YOUR FIRST STEPS...

O.K. so you have decided that you want to have a go with radio controlled cars. What should you do next. Well, there is one thing that you should not do, and that is go out and buy a car, or at least not straight away. Which ever car you choose it will be a substantial investment, so better to get it right first time.

Now, if I was young and had money left over from Christmas or a promise of a special present then this is not the sort of stupid advice I would want to hear. The money would be burning a hole in my pocket, and what I need is a car not advise. So OK, go ahead, buy in haste and repent at leisure. If you have managed to

control the urge and read on, plus exercise supreme self control by waiting just a day or so before spending, not only could you save yourself money, you could possibly make a much wiser choice.

So what to do first.

Let's make sure we understand what we mean by radio controlled cars. Simple enough, an electric powered car has a small electric motor powered by a nickel

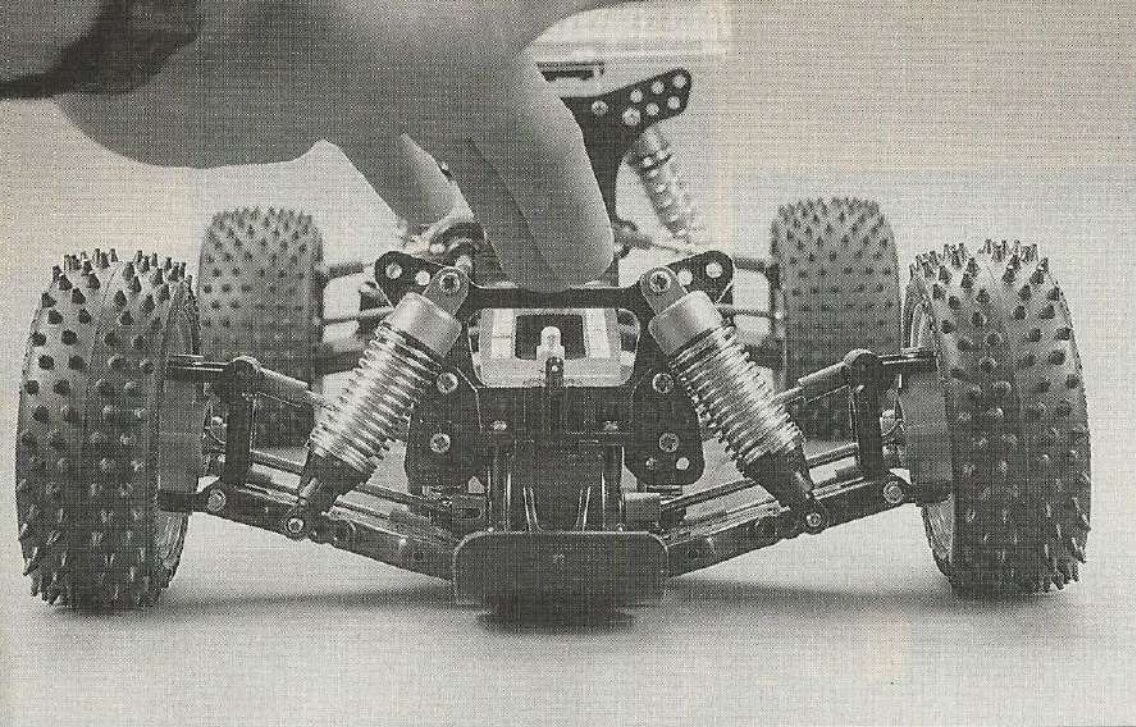
cadmium battery of usually 7.2 volts (or sometimes internal combustion engine). For "off road" the scale is 1/10, for "indoor" and most circuit racing the scale is 1/12. There are of course exceptions but to keep it simple we will stick with these scales.

The usual way you control the car is to have a transmitter which you hold in your hand which gives you control of steering and motion. The transmitter runs on batteries (usually 8 AA size, some smaller scale RC cars have a 9 volt battery in the transmitter).

The signal leaves the transmitter via a telescopic aerial. The radio signal reaches the car and is received through a wire aerial which then passes into a small radio receiver. The information received will be converted into a form that can be used to control speed and direction of the car. The most common method of doing this is to use a servo which responds to the signal leaving the receiver. The servo is housed in a box which has a small motor (controlled by electronics) which when run through a series of gears produces

a very powerful output shaft. This output is used to steer the front wheels or in the case of motion, to control a forward or reverse control speed control switch. The really clever bit is that the more you move the steering control on the transmitter, the more the car will turn, or the more you operate the speed control the faster the car will travel. Servo movement varies in proportion to your controller movement, this is proportional control, the Japanese call these RC sets "Propo's". There are normally two servo's with the radio gear, one for steering and





Tamiya's Top Force offers a competitive car that is easy to build and is an ideal start into 1/10 electric off road racing.

one for speed control. Right, we now know what we are doing. At this stage I guess you are still not too sure how keen you are to get into this hobby. So let's see what else we can find out. Number one job, go out and buy an RC magazine, well you got that right, you certainly choose the best magazine. How about some books on the subject. An excellent intro to RC cars is published by ASP. Some manufacturers also have some first class publications on how to get started (even though they do try to persuade you to buy their product.)

We now need to look at:

1. The cars
2. The radio control equipment
3. Tools
4. Spares
5. Where to drive the car
6. Clubs
7. Additional equipment
8. What help is available

The Cars – Type Off Road
– Propulsion electric –
The scale 1/10

There are two wheel drive (2WD) and four wheel drive (4WD) cars.

It is my opinion that if you can drive a 2WD car well then you will have very few problems driving a 4WD car. It does not follow however that if you can drive a 4WD car then you will automatically be good at 2WD. 4WD cars are more complicated, take longer to build and for the most part are more difficult to maintain. A quick run down of the car, starting from the front. The front steerable wheels run on either plastic, bronze or ball bearings. The best are ball bearings but are more expensive. Most cars can be upgraded to run on ball bearings. Tyres are hollow on off road cars, and solid foam on circuit cars and they will eventually wear out and be a ongoing cost, this will be the case whether you race at a club or just have a lot of fun in your garden. There are tyres for dry and hard surfaces, soft, mud, grass, dust just about any conditions you can think of. Of course you do not have to buy that many sets of tyres as there are some good all season tyres and the ones provided with the kit are probably good all

rounders. Remember also that not all kits have the same diameter wheels, this means that some tyres with a tread pattern that you might fancy just would not fit your wheels.

Suspension.

All 1/10 cars have independent front suspension, be they 2WD or 4WD. The wishbones pivot on the chassis and have all sorts of linkages to ensure the correct steering geometry of the wheels. This is vitally important to make sure the car not only goes in the direction you point it but also it handles properly over bumps and around corners. The more expensive the car the greater the range of adjustments. Probably the most important component on the suspension (both front and rear) are the shock absorbers or more accurately, the dampers. Each manufacturer has his own design with this or that feature. At this stage make sure that your choice of car either comes with oil filled dampers or that they can be fitted at a later stage. This will have the most

significant effect on how well the car goes over the bumps.

The Chassis.

Not much to worry about here. Manufacturers have this well sorted any of the follow will be quite satisfactory: Injection moulded plastic. Strong, fairly light, cheap as they must be made in thousands, tendency to twist a little. May fracture in cold weather. Glass reinforced plastic. Very strong, light, can twist unless special designs are incorporated, expensive, can be made in small quantities, easy to modify. Aluminium. Not that light unless thin gauge, then it must be formed into shape to make a very rigid structure. Can be drilled. Cheapish if in flat plate, but can distort. Easy for manufacturers to produce in small quantities as long as complex shapes are not required. Graphite. Very strong, difficult to modify (hard to drill), very expensive, very rigid chassis, minimal flexing.

Rear Suspension

The same basic principles apply to the rear suspension as applied to the front. Good oil filled dampers and a range of adjustments.

Transmission.

2WD. Nowadays 2WD off road cars power the rear wheels. A few attempts have been made with front wheel drive but it never came to much. The motor powers a series of gears to get a primary reduction. Some cars incorporate a slipper

clutch at this stage. The purpose of the slipper clutch is to absorb some of the power and avoid spinning the drive wheels. Spinning wheels just wear tyres and slow you down.

The drive then passes into a sealed gearbox, through a few more gears and into a differential. The differential takes care of the outside wheel on a corner travelling further than the inside wheel. If you try to corner without a differential then life gets very difficult for the car as it tries to keep in a straight line. The are numerous types of differential all have the same effect. You may come across different descriptions of gears within the gearbox. They may be described as 32, 48, or 64 DP sometimes 0.6 modulus. All of this refers to the diametrical pitch, which if we keep it simple describes how big the gear teeth are. 32 being larger than 48 and so on. 0.6 modulus is very close to 48 DP but not exactly the same, so watch out. Most cars are opting for 48 (U.S made) and 0.6 module (Japan), make sure you know the type of gears are used on your car as you may want to buy alternative motor pinion gears to provide different ratios. Motor pinion are easily changed and cost just a few pounds.

The final stage of the transmission are the drive shafts. All sorts are used. Steel with dog bone ends to allow up and down movement of the suspension. Steel with proper machine universal joints. Plastic with sliding tubes to allow the up and down movement and aluminium, a sophisticated version of the plastic. I have concentrated on gear drive, but some manufacturers choose a toothed belt drive. The

features within the gearbox such as differential and slipper clutch will be just the same.

4WD

The powering of the front wheels means that either a shaft or a toothed belt must take the drive to a front differential. The complications of getting the power down to front wheels plus keeping good steering have made manufacturers come up with all sorts of interesting and innovated designs. Having all this mechanism running to the front of the car has meant a few juggling acts to get batteries and servos into place. It is worth remembering that the complication of a 4WD car does not end at that point. The handling characteristics of 4x4 are quite different to a 4x2. Weight distribution must be altered. In addition the front wheels travel in a different path and a different distance to the rear wheels, so another centre differential may be needed or perhaps a torque splitter, so you can see that 4WD cars can be complex.

The Schumacher Cougar 2000 is already gaining a good reputation with both regular racers and first time buyers.



The Radio Control Equipment.

Electric cars require a two channel radio controller. The main frequency bands allocated by the department of Trade and Industry are 27mHz AM and 49mHz FM for model cars. There are many different frequencies used around the world, most of which are illegal to use in the U.K. Power output of the transmitters is around 500 milliwatts which is quite adequate for car use, when the car goes out of range it will be pretty difficult to see anyway. Within the allocated band width spot frequencies are chosen allowing a number of cars to be operated in close proximity without interference. With 27mHz band there are 12 spot frequencies usually identified by colours, or mixes of colours. Plug in crystals allow you to choose the frequency. The receiver must have a similar coloured crystal. 49mHz crystals will not work in 27mHz sets and vice versa. Transmitters come as stick controllers or as pistol grip controllers. The pistol grip type have a trigger for the speed and a steering wheel for direction. There are a few other adjustments on the most transmitters in the form of trims. These allow you to set up the

zero points. For example the steering may not be pointing dead ahead after you have finished building the car, so the trim allows you to make minor corrections without affecting the overall steering performance. Either dry cells or nicads can be used to power the transmitter, and the receiver will be powered by either 4 x AA cells or more often than not, an output will be taken from the main drive battery through a voltage reducer. The receiver usually operated on 6 volts.

Tools.

Most kits come with a few of the basic tools needed to build the car. You will certainly need a few other items, but no need to overdo it as the more tools you have, the heavier the load to carry. Screwdrivers. Both cross head and slot head types. A couple of the smaller sizes should suffice. Pliers. Pointed nose pliers will be essential. The best makes are not cheap, but a few pounds should provide a good serviceable pair. Hexagon wrenches. You may have a couple of wrenches in the kit. An additional set would be very handy. If you can afford it the ball ended type are nice as you can use them at any angle. Wire Cutters. Perhaps

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not essential, but useful for cutting and stripping insulation from wire. Spanners. Once again not essential but useful. Small open end spanners are probably the best, but like everything you will always find a use for a more comprehensive set. Good spanners do not come cheap, but they will last you a lifetime. Knife. Modelling knife. There are many types to choose from. Most have interchangeable blades or the snap off type are cheaper and very good.

Luxuries.

Multimeter. If you are starting out, not really necessary, if you stick with the hobby then I suspect you will eventually finish up with a meter. Soldering Iron. If you are offered a useful present go for a gas soldering iron. As well as soldering you can use them as a hot knife for effortless cutting plus a hot blow for things like shrink wrap. Gas makes you independent of your 12 volt supply, which you could easily discharge with a powerful 12 volt iron. Don't forget to buy a gas cylinder. If you are young then an adult may need to buy this for you. Pit box. Everything can be used from a cardboard box to a sophisticated tool chest. Many types available, but why not make your own. Good project for craft workshop classes. Small battery drill/screwdriver. Certainly speed up the dismantling and assembly of kits. Also useful for making emergency holes on bodies and chassis and loads of other things. Saw and files. Small hacksaw (junior type) and a set of warding files.

Spares.

Ideally of course you should not need spares, as in a perfect world you would not damage the car. As we, and the world are not perfect then spares must be considered. There are two reasons for spares. 1. Some parts will wear out, just because of normal use. 2. Some parts will break due to crashes and collisions.

What will wear out? Eventually everything, but in the short term you will need to think about the following: Tyres. Plain wheel bearings. Some transmission gears (motor pinion if it is made from aluminium alloy. Toothed belts (if fitted) Drive shafts (although they will last a considerable time before failing)

Suspension damper bushes (also the oil will become contaminated) Ball joints. If a slipper clutch is fitted the friction pads will wear (they are intended to be sacrificial)

What will break in a collision. That is impossible to guess, because I have seen just about every component on a car at one time or another break up under impact. It is perhaps worth thinking about:

Suspension wishbones
Damper shafts
Bumper
Body
Steering uprights plus stub axles.

So what should you buy to begin with. My advice is nothing, but make sure you know where you can get the parts in a hurry. Make a list of names, addresses and phone numbers of all likely sources. If your local model shop does not hold spares for your particular model then mail order may be the answer. There are some first class dealers holding extensive reserves of spares. Even if these dealers are out of stock then do not give up. Some manufacturers offer emergency hot line spares supplies direct. There is even a step beyond the manufacturer and that is the specialist after market producer.

There are a substantial number of alternative products designed to fit your car made by small specialist companies, the main disadvantage with these products is that they tend to be a little more expensive than original equipment, but at least they might keep you on the road.

Where to drive and Clubs.

In a way these go together. The easiest option and the best fun will be had by joining a club. Around the country there are literally hundreds of clubs. Many clubs are associated to the BRCA, the controlling body for model car racing in the U.K. There are some other club associations, but probably with less influence than the BRCA and there are many clubs who are not affiliated to any organisation. The place to find out about your local club is: 1. Contact the BRCA and ask them for a local club or get hold of the RC Model Cars Racing Special.

2. Call at your local model shop. If there is no local club, have a go at starting one. Advertise in local schools, model shops and if there is a free local newspaper place an advertisement in that. Better still get the local newspaper to write an article on the need for a local RC club. Contact the local model aircraft club and find out what they know about cars and racers. Of course you will need a track. That may not be as difficult as you might think. Check out with you local Parks and Park Managements and see if they could let you have a small corner. Maybe the local school might

turned down, there is bound to be something else just round the corner.

Additional Equipment.

If you are racing away from a mains power supply (and that is quite likely) then you will need a 12 volt car or caravan battery. Nice to have a new one, but you may be able to get hold of something cheaper from a scrap yard, make sure, if you can that it is serviceable. You will need a charger to charge the nicad battery

discussion about chargers at this point as there are numerous publications that will provide the detail you may need. Other than some sort of transport to get to and from the track I guess that should be about it. Carrying the car and tools is not so difficult, but lugging around a car battery can be something of a problem. If you fancy using the family car battery (with the family car still surrounding it), remember that continual charging and discharging will take the car battery capacity down to a point where you may not be able to restart the car, watch out!

What help is available.

This is perhaps one of the best reasons for joining a club. There are bound to be old hands who will be willing to help you sort out problems and give you all sorts of advice. Shops can be a good place to go for help, but remember if you decided to ignore your local model shop and send to some mail order company on the other side of the country to save a pound or two, then it is not really fair to expect your local shopkeeper to sort out your problems. The manufacturer of your car or radio gear will sometimes be able to provide you with information and sort out problems over the phone and of course the magazines offer support in the form of either readers pages or perhaps they will have access to an RC car expert. If you are really stuck and can't get the problem sorted, don't panic. There will always be someone somewhere who can give you some support and help, all you have to do is find him. So, do you still fancy having a go at RC cars. If I were you I would go for it. You will get hours of enjoyment, meet new friends. Oh yes you will encounter problems, get frustrated and annoyed and things will go wrong, but then again sometimes things will go right and it will all seem worth the trouble.



The next thing that you will almost certainly crave will be more power and speed. High performance motors are going to be looming high on list of desirable items. I am sure this will fall on deaf ears but driving skill will always count for more than simple out and out speed and power. You might be the fastest man down the straight, but do not forget about the corner at the end of the straight. Given a list of hot up items, I would put ball races at the top of my go faster bits, in front of mega motors and super gripper tyres. Finally, to get the best out of your car, keep it maintained in tip top condition. Do not be

be sympathetic. Of course in the end you might just find a piece of rough building land which the owner may be only too pleased to let you use while he waits for the building business to pick up. What you have will have to do is get out there and ask. If you don't ask then you won't find out. Don't worry about being

from your 12 volt car battery. There are many types and prices of charger ranging from something you could put together for a pound of two up to something pretty sophisticated that can cost around one hundred pounds. I will not go into any great

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