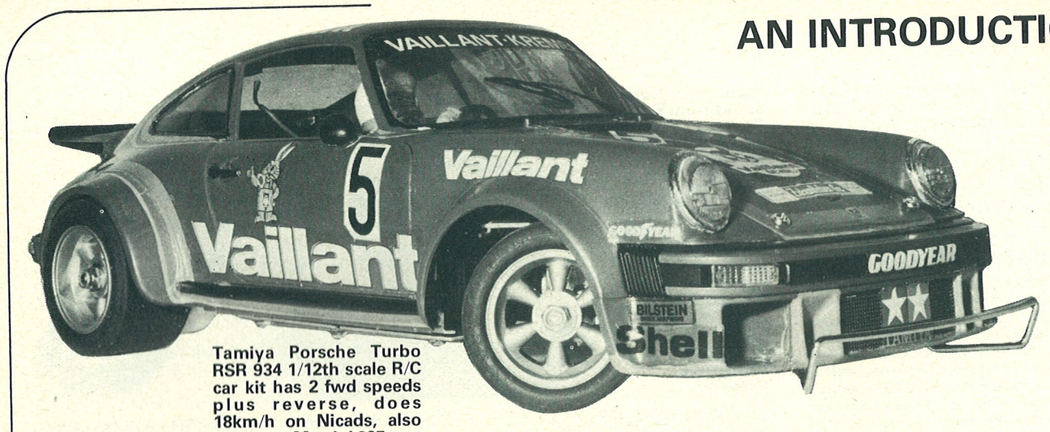
AN INTRODUCTION TO



Tamiya Porsche Turbo RSR 934 1/12th scale R/C car kit has 2 fwd speeds plus reverse, does 18km/h on Nicads, also comes as Martini 935 version.

Introducing Electrics

Latest boom in the field of R/C activities is the electric powered racing car. Various individual 'scratch built' cars have been seen over the years right from the start of the R/C hobby. Commercially, they have often been produced as a toy, or individually made as an exercise in building a 'different' R/C scale model. Performance of electric powered vehicles has historically been disappointing – we only have to look at the full-scale electric milk float to realise that heavy battery weight and poor endurance per charge has until recently blighted development.

Rechargeable batteries have, however, changed the scene more than somewhat. Vented nickel-cadmium batteries which can be recharged at rates hitherto unheard of and capable of supplying currents at levels well above the nominal rated capacity (for short periods) have provided the power source answer for racing cars. Racers they certainly are, for whereas the power flight of most electric powered aircraft has been somewhat less than 'sparkling' the performance of the racing electric car might be described as hair raising.

Most of the current interest is centred around 1/12th scale cars although some manufacturers are producing 1/8th scale electric powered cars. Already a profusion of manufacturers are endeavouring to meet the demands of the enthusiasts who have cottoned on to the attractions of this new sport. The accent has been on R/C electric car racing as a winter replacement activity for the outdoor IC powered 1/8th scale race series. Signs are that 1/12th scale racing will shortly become an all the year round specialist activity. Simple requirements for racing circuits, no pollution, negligible operating costs and low initial outlay are a few of the factors favouring electrics.

Many would-be enthusiasts for this (and many other hobbies) are reluctant to commit themselves when faced with the bewildering choice of hardware. Shy of asking what might appear to be stupid questions they either purchase unsuitable equipment or worse still don't take up the hobby at all. What follows could be considered a laymans guide to starting R/C electric car racing and lays out the options available (largely governed by the depth of the tyro's purse) and explains some of the mysterious 'folk' language used by those who are 'in to electrics'.

The Cars

Regular visitors to the local model shops and even the larger department store type of toy section, may have noted recently a number of ready to run or kit built 1/12th scale cars. Some of these notably the SANWA include 2 channel proportional R/C equipment at very moderate prices. Others such as the TAMIYA and OTAKI ranges do not include R/C equipment but are nonetheless highly detailed models. If racing is your interest, beware. Whilst any of these types of car will give many hours of pleasure if raced against one another and provide very valuable experience in handling an R/C car, they cannot be competitive with the full blooded electric racer for reasons of speed, durability, and demands on skill of control. Beware also of attempting to modify these models by fitting larger motors. The switch system is designed to cope with the motor supplied and will fail if fitted with a larger motor and a greater electrical loading.

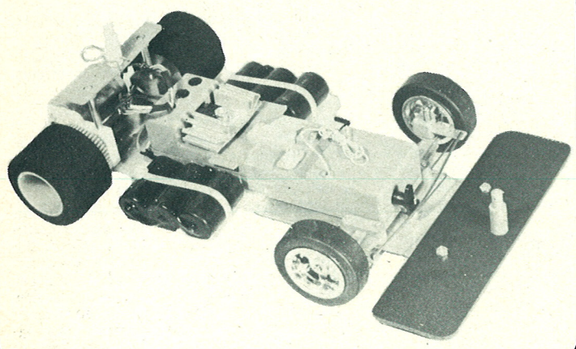
Current competitive 1/12th racers are Jerobee, Lectricar, Mardave, MRP and Bolink. It is also possible to purchase individual parts and assemble your own 'scratch built' special.

Motors

Propulsion motors are all virtually identical, *Mabuchi* do, however, make approximately 20 motors in the '15' range all with different impedances, etc., so motors cannot be described categorically as identical. Power for the motors is universally supplied by six, vented rapid recharge nickel-cadmium batteries. Wired in series, the pack supplies a nominal 7.2 v. The cells are rated at 1.2 Ah but the '15' size motor draws considerably more than this – on peak loads up to 20 amps. Typical input would be in the region of 100 watts. Drive from motor to solid rear axle is universally by single reduction spur gearing without differential. Ratios vary from one make to another between 3½ and 4¾:1.

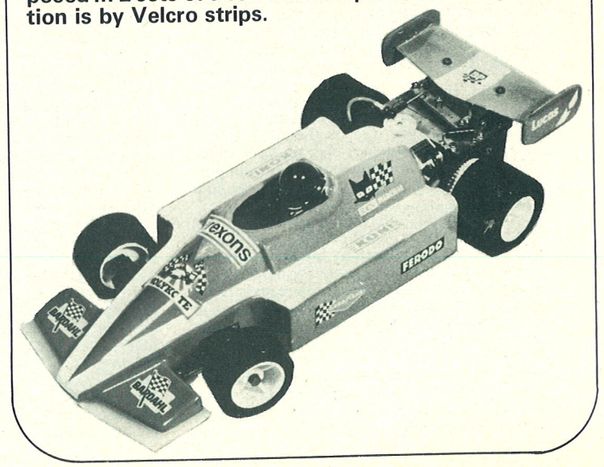
MRP

A metal chassis with Jerobee wheels and tyres, clip retained 'Lexan' body and rheostat speed controller. Propulsion batteries are carried in side panniers. Various gear ratios available.



Mardave

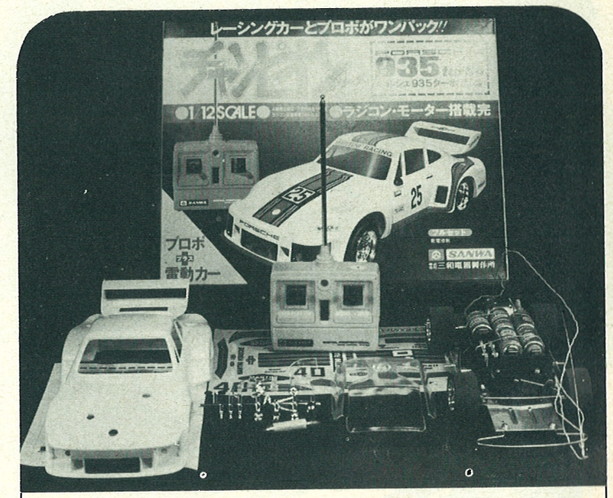
Virtually identical in specification to the Lectricar with the exceptions that speed control is via a 3 speed resistive type controller and the rear axle runs in nylon bearings. Drive ratio 4:1. Propulsion batteries are disposed in 2 sets of 3 cells on side panniers. Body retention is by Velcro strips.



R/C ELECTRIC CARS

Speed Control

Speed control is accomplished in a variety of ways ranging from simple rheostats and switched resistors to the fully proportional, plugging directly into the receiver type – which incidentally eliminates the second servo. Lectricar use a hybrid system in which a servo operates a rheostat which in turn varies the driving current and thus the output of a power transistor. This system eliminates the need for a very large and expensive wire wound rheostat and avoids the subsequent power loss through such a device and still provides proportional speed control. With any type of system which involves resistances, be they fixed value (as on the Mardave car) or variable (Letricar and MRP) duration is effected as the current prevented from flowing to the motor is dissipated in the form of heat. Resistive type controllers do not take kindly to being overloaded. The inevitable result of continued abuse is a burn-out. Overload can take the form of either continuous low speed running or a stalled motor or even over enthusiastic changes from full forward speed to full reverse speed. Several of the proportional controllers feature adjustable 'dynamic braking'. Quite simply if a load (a resistor) is applied across the terminals of a free-wheeling electric motor the motor (which when being driven round by the momentum or kinetic energy contained in the rolling car acting as a dynamo) will be slowed down proportionate to the load. By varying the resistance, adjustable braking results.

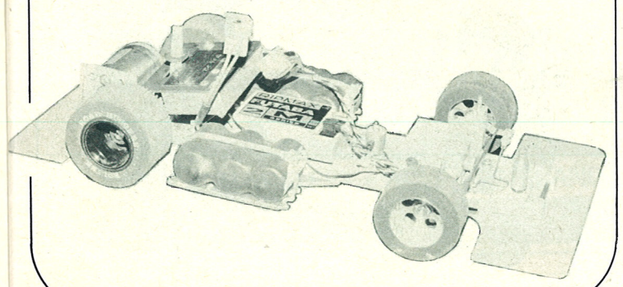


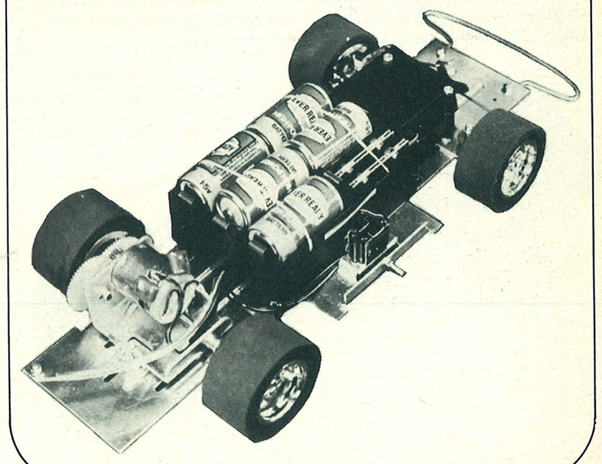
Sanwa Turbo Porsche

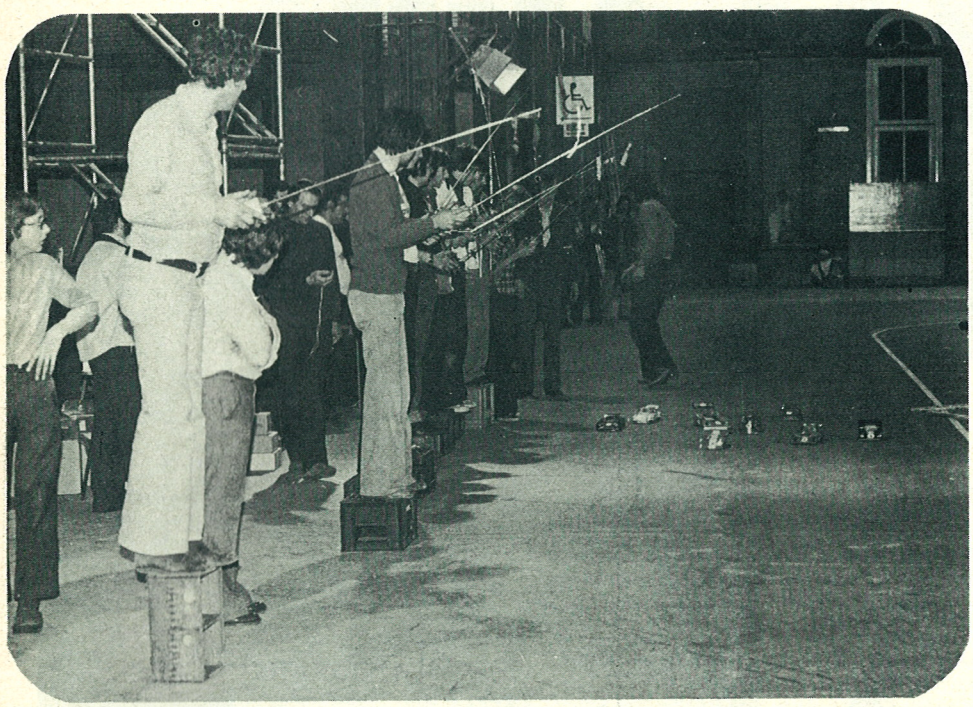
Supplied as a complete almost ready to drive (ARTD perhaps?) 1/12th scale model including the R/C equipment. Sanwa have produced what has been described as a 'Toy Propo' outfit with super small drycell powered 2 function Tx plus receiver/battery box/speed controller brick, with separate servo for steering. This R/C package could conceivably be used in an electric powered boat but is not suitable for aircraft use. Fully proportional speed control both in forward and reverse plus proportional steering (with trim facility on both functions) make the Sanwa Turbo Porsche a delight to drive and great fun for competitions such as driving tests and even races with cars of like performance. Using the recommended Mallory cells to power the car, speeds of 15 Km/hr are claimed whilst 5, 1.2 ah Ni-Cad cells give a duration of approaching 1 hour and a considerable increase in top speed. Tx battery life is in the region of 5 hrs. with ordinary HP7 cells six of which are required.

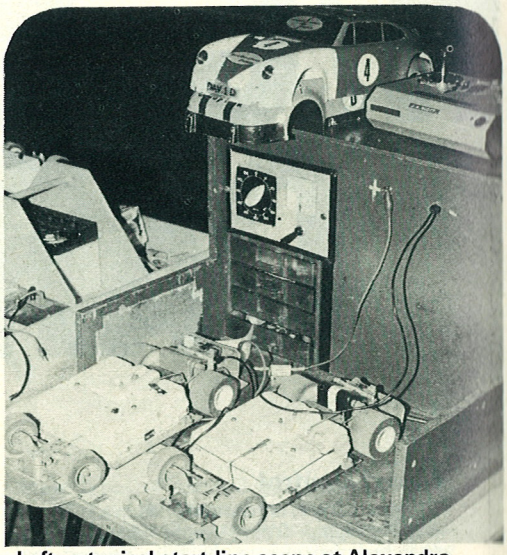
Jerobee

Moulded plastic chassis can either be an 'ordinary' plastic or the more expensive (and tougher) 'Lexan'. Fully proportional (forward only) with dynamic braking, sprung front wheels, heat treated large dia. light alloy rear axle, decorated Lexan body retained with spring clips fore and aft. Using the Jerobee speed controller only one servo is needed – this for steering. No receiver battery is required either, as the receiver power supply is tapped from the six cell propulsion battery.









Left: a typical start-line scene at Alexandra Palace. Club Secretary is Jane Adams 79 Northumberland Road, North Harrow, Middlesex. Above right; a typical electric car field box comprising charge timing and monitoring circuitry and tool storage 12v charging battery is in the box.

Propulsion Batteries

As previously mentioned, the universal power pack (and indeed that demanded for racing) is of six 1.2 v, 1.2 Ah quick re-charge nickel cadmium batteries (Ni-Cads for short). The cells are wired in series (+ve to −ve) to provide 7.2 v for the pack. Up to 1000 cycles of fully charged to fully discharged state can be expected from one set of batteries. Whilst they are able to withstand some abuse, over charging is not to be recommended! Over charging results in a break-down of irreplaceable electrolyte to gas. Never allow the cells to become more than slightly warm to the touch when charging. Most cars are supplied with resistive charging leads and charging is accomplished quite simply by connecting the power pack to a suitable 12 v source such as a car accumulator for a maximum of 20 min. Resistors become quite hot during the charge and could benefit from fixing to a heat sink. Ideally a timer and meter should be used and it is possible to buy complete monitoring/charging systems. A surplus store clockwork timing switch and 0 -5 A meter could, however, be pressed into service in conjunction with the resistor provided to produce a comparable system. Typical figures to expect are an initial charging current of about 4 amps dropping to around 2 amps after 20 mins. A constant current of 4 amps is the ideal. Approximately 10 mins. running is to be expected from a 20 min. charge.

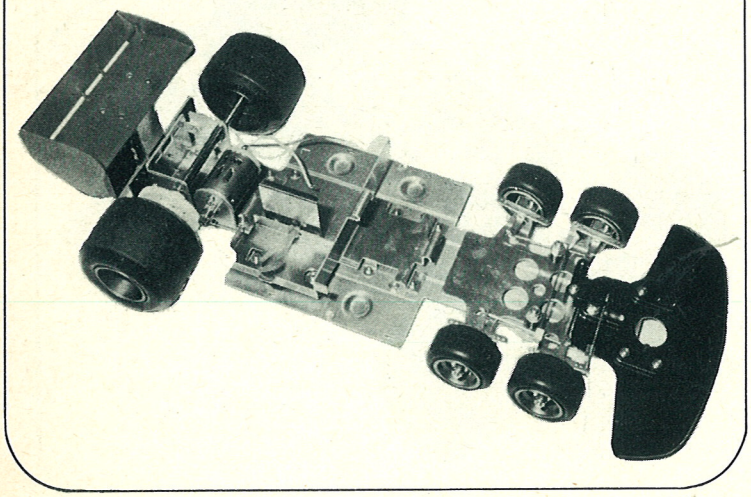
Radio Control Equipment

Any 2 channel proportional R/C equipment can be used. As operating cost needs to be kept reasonable the initial higher outlay for rechargeable batteries for Tx and Rx is to be recommended. Dry battery costs mount up very quickly to the amount paid for rechargeables. Plug in crystals are a definite advantage as one is able to readily slot in with other competitors to form sensible sized heats for competition. Servos need to be at least of the chosen makers 'standard' type. Super mini's are to be avoided even for the comparatively light duty of an electric car. The odd collision with circuit markers is unavoidable and can damage servo gears, even those protected by a servo saver. Vibration is no great problem with electric cars so insulation need only be minimal – little more than location to prevent the receiver rattling around inside the body of the car.

In short, the complications are few, most of the cars in kit form can be assembled in little more than an evening. Any village hall, school gym or works canteen is large enough for an indoor circuit where a group of enthusiasts can get together for an exciting day's or evening's racing. Car, transmitter a 12 v battery, a pocketful of crystals and head for the chequered flag. Outdoor operations call for a dust free, or smooth tarmac surface. Americans use 'astroturf' – a synthetic grass pile carpet for a laid course – which gives plenty of food for thought on prospects for tracks here.

Tamiya

Two Porsche, the FMC XR311 US Army Jeep and the Tyrell P34 (below) come as true scale R/C kits using the Mabuchi RS-360 motor driving through plastic differential gears. Lightweight chassis carries bolt-on pressed housings for 2-function control plus either drycell or Ni-Cad power pack. Clever switchgear provides variable fwd speeds and reverse.



Lectricar

Aluminium alloy plate chassis with bumper extensions fore and aft. Heavy duty moulded front axle beam and servo saver. High carbon steel rear axle running in ball-races. Drive ratio 4.5:1. Radio required is 2 function 2 servo – one for steering and one to drive a transistorised speed controller (fused) with reverse and dynamic braking. Radio receiver battery pack and servos are housed in a vacuum formed box which wraps around the six cell propulsion battery. Body is retained with locating pegs at front and spring clips at rear.