On TEST

MacGregor speed controller

When *MacGregor Industries* approached me to review their 'Mac 2' speed controller I had my doubts. Firstly, we are not heavily into electric racing and secondly, Geoff Driver had previously done such a thorough job in his review of the 'Mach 1' controller that there seemed to be very little left for me to say. The other thing which worried me was that the unit looked identical to the 'Mach 1' controller that we are already using with the only visible difference being the addition of a heatsink as standard.

In the end a telephone conversation with the units designer, Mick Ridley, revealed that although it looked the same the power transistors were a significant advance on those used in the 'Mac 1' design, and should give much better acceleration, and a slightly higher top speed coupled to good duration. Mick told me that whatever the theoretical claims made for FET devices he was convinced that his latest design would be as good as any on the track. That was enough to get me interested, such a confident claim could not be allowed to pass without being checked.

Not being in a position to carry out the type of bench test so often used to assess electronic speed controllers I decided to take the approach we have always taken with eight scale equipment and carry out a track test, after all it's the results on the track that really matter in the end.

A brief description first of the controller is perhaps in order just for the benefit of those readers who may not have seen the November issue in which the original test was published.

The controller is constructed on a circuit board measuring 78×32mm. The track widths and thickness of solder on them is impressive, certainly more than sufficient for the job in hand. Reverse is provided by a single pole relay. The designer has for various reasons, which will become clear later, chosen to use high performance bipolar power transistors rather than the currently more fashionable FETs that most of the present crop of speed controllers use. Whilst these are individually undoubtedly less efficient than FETs he has counteracted this by using a massive bank of them coupled to a very effective heat-sink. No less than eight of these transistors are used for the forward speed control and four for reverse making a total of twelve.

Whilst the circuit design of the 'Mac 1' and 'Mac 2' controllers is virtually identical it is in the specification of these transistors, and the addition of a heat sink that the major difference between the two lies. Those used in the 'Mac 2' are significantly superior both in terms of the peak and continuous current they can handle. They also have a much lower resistance than those used in the 'Mac 1'.

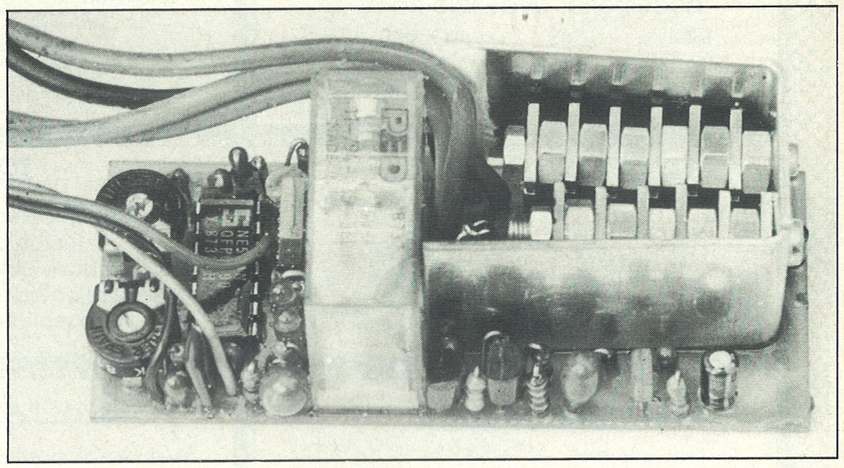
No specific claims are made for peak current carrying capacity or for the voltage drop that will occur across the device. *MacGregor* simply claim that the peak current handling capacity of the unit is adequate and that under racing conditions the voltage drop is on a par with that of the best of the FET controllers. They claim that figures given for FET controllers are often taken from those quoted by the manufacturers of the FETs and that these are invariably taken under ideal conditions.

The only area in which they make a specific claim is in the controller's ability to handle an average continuous current draw of 30 amps. They point out with simple logic that since an average current draw of just 17 amps would dump even the best cells in less than five minutes the controller should not only be able to cope with any demands that are likely to be made on it by currently available equipment but should also have more than enough in hand to deal with any foreseeable future demands that may be made on it by improvements in cell technology.

As is now the norm with electronic speed controllers no separate battery is needed for the radio. A built in circuit takes care of this by feeding the correct voltage directly back into the receiver.

Setting up the controller is made simplicity itself by the use of two small LEDs. The first one is used to select the neutral position accurately and the second one to adjust the sensitivity of the throttle control. That is to say so that full throttle is obtained when the throttle stick has been moved through about two thirds of its possible travel.

Being a track test I have to be careful to be specific about the conditions under which it was carried out and the equipment used. I chose to put the controller in youngest son Shaun's car and take it to a Crystal Palace Circuit Meeting. His car is a lowered *PB* 'Mini Mustang' that has been fitted with the latest fine pitch belt to help improve its efficiency. The motor used was a seventeen turn tripple modified of the cheaper variety rather than one of the latest works specification motors. The cells used were SCRs. They had been correctly cycled and charged but were not of the so called selected variety. It must also be pointed out that Shaun is an experienced eight scale driver with a handicap in the low forties. That is to say whilst not one of the top drivers in the country he is certainly in the top group of drivers and would normally be expected to compete in A finals at national events.



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Set against him was a fair array of the better club drivers from the tenth scale off road scene, most of whom were driving lightened 'Cats' or 'Optimas' with fine pitch gears, FET speed controllers, and a fair selection of motors etc. Also racing against him was his equally experienced elder brother with his two wheel drive *Associated* 'RC10', works *MG* motor, selected cells, and FET speed controller. There were none of the top works drivers present. Had there been of course the results may have been very different.

The weather was dry and sunny. For February it was a mild day. Not hot but warm enough for a coat not to be needed.

The improvement of the 'Mac 2' over the cheaper 'Mac 1' was immediately obvious. In previous weeks he had just made the A finals well behind the leaders. His problem had been a lack of sufficient acceleration off the line and out of the slower corners, coupled with a less than impressive top speed. With the 'Mac 2' controller he had no such problems, indeed he led each heat he competed in from start to finish.

At the end of the last round but one he was lying joint fastest with his brother well ahead of the remainder of the drivers. In the end he finished second fastest in qualifying just one second behind the two wheel drive car of his brother.

The final was started Le Man style and provided the perfect situation in which to judge the effectiveness of this new controller. For the first three minutes the two brothers went round the circuit in line astern never more than a few feet apart. Try as his elder brother might there was nothing he could do to shake off the following *PB*, not for that matter could Shaun do anything about catching the 'RC10'. In the end a slight tap from a back marker made a gap for Shaun to go through and take the lead. As the end of the race approached his cells held up just that little bit better and he finished in first place some half a lap up on his brother and over a lap ahead of the third place car.

At the end of the race I felt the speed controller, cells and motor. The cells and motor were well warm to the touch but the speed controller was hardly warm.

If this was the middle ages I would be in danger of being burned at the stake as a heretic for daring to say so, but given these results the only possible conclusion is that, in the given set of circumstances under which the test was carried out, the designer is right and the *McGregor* 'Mac 2' speed controller is indeed the equal of the more fashionable *FET* controllers! With its claimed current handling ability there is no reason to believe that this would not be so under other circumstances but similar tests would have to be carried out to ascertain this for sure.

Having got the test out of the way it only remains to look at the advantages and disadvantages of the controller.

Starting with the disadvantages the most obvious one is the size and weight of the device. This certainly rules out its use for twelfth scale. Indeed, it was never intended for that use. *MacGregor* tell me that they are intending to launch a twelfth scale controller next.

For tenth scale use the size is no real problem, it should be quite easy to fit it into most of the popular cars that are available. For club use the weight is no real problem either. When I say it's heavy I am comparing it to some of the very latest and expensive American and Japanese products. It is no heavier than many of the European and UK products that are on the market. The weight could only be considered to be a problem if one is competing at the very lop levels in the sport, and only then if the car is having a problem making the minimum weight limit. Many competitors actually end up having to add ballast to make their cars legal.

The other area where it lags behind the best of the competition is in the presentation. It comes as a plain open circuit board not even protected by shrink wrapping. Obviously it is not as easy to either fit or protect it from the effects of dirt and water as it is the more sophisticated designs that are totally enclosed. Certainly I would recommend that the circuit board be protected by some suitable lacquer. We used *RS Components* tropicalised varnish on ours. Such products are not easy to come by and I would have thought that, since the manufacturers are only too well aware of the damage that can be done by customers spraying the boards with the wrong materials in an effort to protect them, they would have had the foresight to provide the board with a suitable protective coating themselves.

On the plus side the price is very competitive for a speed controller that appears well able to compete with the more expensive *FET* controllers. Whilst its open circuit board form of construction suffers from the disadvantages already convered it does have the very significnt advantage that in the event of repairs being required they can be easily carried out. Some of the fully enclosed units that are currently available are virtually impossible to repair. If you are unfortunate enough to damage one the best you can expect is a so called service repair, which will in fact be a new unit supplied at a reduced price. What is more the use of traditional transistors means that the repair costs can be kept reasonable.

One of the other unexpected advantages we discovered in the track test was that the speed control was very much smoother than that given by *FET* controllers, especially from lower speeds and at the lower end of the power band. Whilst the *FET* controllers are theoretically proportinal they tend to be very fierce and difficult to control off the line. In low conditions the smooth progressive control of power that is possible with the 'Mach 2' would most definitely be an advantage.

The final advantage that came to light is one that I have no doubt will appeal to dads who are expected to shell out some of their hard-earned cash for the purchase of a speed controller. The use of tradtional bipolar power transistors means that the unit is more tolerant of misuse. Connect the battery leads up the wrong way around and no damage will occur. Try the same thing with a *FET* device and it's a case of, "Dad, my speed controller is not working".

A thoroughly workman-like product which I have no hesitation in recommending for club drivers. One that because of its robust nature, ability to withstand abuse, and potentially low repair costs is especially suitable for the less experienced, yet at the same time is fully competitive in performance terms.

As supplied the lead is not surprisingly fitted with a *JR* socket. This provides me with an excuse to give an answer to a question I am often asked by beginners. "How do I connect my make X radio to a make Y speed controller or servo"?

The answer is that with the careful use of a sharp modelling knife it is possible to fit most manufacturers' plugs into sockets of another make. The only problem in doing this is that the wires are usually in a different order. It is thus necessary to remove one or more of the contacts from the plastic moulding and replace them in the necessary hole for the correct wires to line up. These contacts are held in place either by little prongs or the contact itself or by little fingers on the plastic moulding. All that is needed is to carefully spring the prongs and slide the contact out. It is then possible, after gently levering the prong back up, to slide the contact into the correct hole in the moulding.

Of course to do so it is also necessary to know what the various colour wires are on different makes of radio gear. *Futaba* is red +VE, black -VE, white Signal. *JR* is red +VE, brown -VE, orange signal. *Multiplex* is red +VE, black -VE, yellow signal. *Sanwa* is grey or red tracer +VE, centre -VE, third signal. *KO* is red +VE, black -VE, blue signal. *Digifleet* is red +VE, black -VE, yellow signal. Price:- £49.96. Manufactured by:- MacGregor Industries Ltd., Canal Estate, Langley, Slough, Berkshire SL3 6EQ. Available from most good model shops.