On TEST

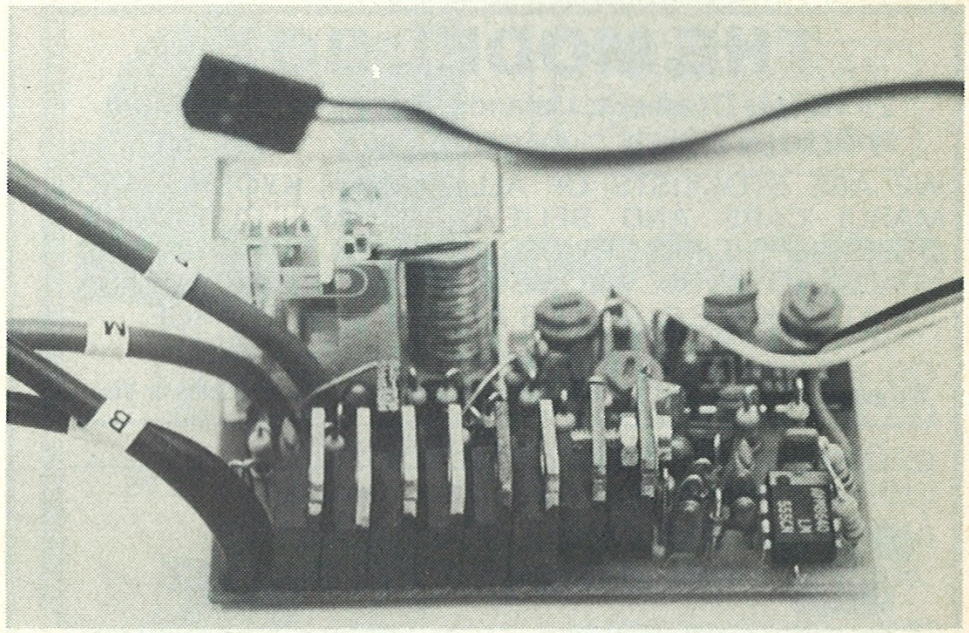
NOSRAM FET SPEED CONTROLLER

Some readers may think that reviewing products is a pretty cute way of getting handfuls of free handouts. Let me put you straight. Occasionally the editor does allow me to keep the reviewed goods, but often when an item looks particularly interesting or useful I am told in no uncertain terms to return it. The Editor claims he needs to check it out for himself!! Sadly after this review is completed the *Nosram* 'FET' speed controller will be sent off to the *R/C Model Cars'* office. That's what editorial power does for you!

Electronic speed controllers have been around for quite a few years. During this time we have seen advances in technology bringing about changes in design, performance and reliability. However, most owners and certainly manufacturers have realised that nothing is indestructible. So what's so special about the *Nosram*? Is it just another controller trying to fill the supply gap or is it offering something extra for the rather high recommended price of £62.00.

The unit arrives encased in heatshrink. This practice is fine if you are looking to save milligrammes, but I really think that nowadays UK manufacturers should follow the lead of US and Japanese makers and come up with something a little smarter. Apparently the manufacturers of the *Nosram* plan to introduce a vacuum formed box to cover the electronics, which should be an improvement in appearance as long as the box does not melt. To find out what, if anything, was different with the *Nosram* I removed the heatshrink.

The first thing that is apparent, even to the untrained eye is that the controller is well engineered. Mounted on a GRP board, all the tracks are tinned (coated with solder). Indeed the tracks I discovered are of 2oz. thick copper, many PCB have copper tracks of half this thickness. In addition the sections of track that carry high current have been further thickened with wire. Along one edge of the PCB are the six forward and two reverse/braking FETs. On an opposite corner is the forward/reverse relay. The remaining components cover the 65 × 35mm board. packing density of the discrete components is not high, but there is no wasted space. This does mean that maintenance becomes a practicable



proposition for the manufacturer. Leads are provided for connection to the battery plug and to the motor. A nice touch was the labelling of the leads, confirming the identity of each wire, not leaving the purchaser to sort it all out from a diagram. The controller sent to me arrived with a *Futaba* connector.

Three miniature preset potentiometers are provided for setting up the controller. One each for neutral, forward and brake. The instructions suggest using a voltmeter to ensure that the motor is connected the correct way round. I can understand why this is thought desirable as it would be possible to wire the motor in reverse which would mean that the reverse FETs would be driving the car forward, but not for very long. Most motors have a + and — symbol on the endbell which makes matters simpler. Experience has shown that if a FET electronic speed controller is going to fail its most vulnerable area is that of reverse. Most reverse functions of speed controllers are under-rated. This means that reverse is designed as an intermittent operation, this allows a saving in weight and cost. The *Nosram* is no exception. What is interesting with the *Nosram* is that the designer has incorporated a temperature sensing device that causes the controller to shut down if the braking/reverse FETs become overheated. I am sure that at some time or other someone will become more than irritated with this feature, if it should shut down during an important race. However, consider the alternative, blown up FETs, a repair bill, the inevitable delay and of course no more racing on the day. If you consider that you can manage without

reverse and this safeguard, then the *Nosram* even offers you the option of forward only. A very simple change in the wiring without even altering the PCB and the forward/reverse relay is out of circuit, substantially reducing the controllers' overall impedance and hence increasing the available current to the motor.

Reading through the specification, the controller incorporates voltage tripling circuitry, very interesting you may say, so what. This design feature does allow the FETs to be driven very hard on, keeping the junction impedance to a minimum. Unlike conventional transistors the Field Effect Transistor carries virtually nil current in its biasing circuitry (other than leakage current). However, FETs do require a decent biasing voltage to get them to work efficiently. The *Nosram* has this. There are, in addition, some other rather nice circuit features to ensure that the controller does not go into a self destruct mode, a feature not found on all controllers.

Enough of theory; how does the unit perform. For interest's sake I did some basic voltage drop measurement across the unit, just to see the effect of keeping the relay in and out of the circuit.

Using a 7.2 volt battery delivering four amperes, the voltage drop across the unit was 0.028 volts. This I noticed was exactly the figure given by the manufacturer, I can assure readers I was not fiddling the results. This measurement was taken at full throttle, at intermediate throttle the voltage drop was proportionally lower.

For those of you interested in such things the pulse length is 20mS, which means the controller is synchronised to the receiver 50Hz, (some Japanese controllers operate a lot faster) and the minimum pulse width is about 25% for forward and reverse which gives an entirely adequate range of operation for racing, but if you are expecting full proportional control from rest then I would say that starting off was a bit of a jolt. As this is intended as a racing controller then starts will be straight to full throttle. The

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Nosram Speed Control
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controller handles this perfectly. The only reservation I have about the basic measurement I took was that at full throttle reverse I could not achieve 100% pulse length, it was pretty close at about 95%. I checked this point with the designer who told me that this was due to a limitation of the Ferranti chip and not due to the *Nosram* design. In practical terms I do not think that it matters in the slightest, it is just an academic point.

The controller has a built-in delay if you shift from full forward to full reverse in something under a second. This was in no way a disadvantage, in fact it could be just the opposite providing you, the driver, with just that split second to recover your senses before adding to the errors that made you need reverse.

I deliberately tried to work the speed controller hard by choosing a test car that had a fair bit of transmission drag with four wheel drive (*Tamiya* 'Big Wig') and driving the car slowly. If anything should bring about failure then this should. I also tried a substantial amount of reversing.

The results were most impressive. True the FETs did warm up, but not enough to melt the solder and the car kept going. I did manage to overheat the reverse FETs which brought the temperature sensor into action and simply inhibited reverse. This did not affect forward operation and as soon as the sensor had cooled then reverse was automatically reinstated. It did seem to me that the reverse inhibit came into action pretty quickly, but I suppose that the reverse FETs must have heated up quickly. I connected the controller to give forward only operation, missing out the forward/reverse relay, which incidentally still operates but has no effect on motor control. I tried to take a voltage drop measurement but it was so small that I could not get a reliable reading on the voltmeter. In practice I did not notice any appreciable change in performance on the test car, but I suspect that with a more efficient car the effect may well be noticeable especially from the start line.

In conclusion, a very well made unit that performs excellently as a racing controller. The unit offers reliability and has sensible built-in safeguards. On the deficit side it is quite expensive, although I understand that for a short period there may be some special offers from some dealers. The shrink wrap does nothing to enhance the appearance of the unit although this is being rectified.

Servicing. At the moment this has not created a problem as there have been very few units returned for repair. It seems that the main problem has been incorrect connecting of battery supply by users and some difficulties created by BEC (battery eliminator circuits on receivers). As long as the instructions are followed, and they are elegantly simple, then

you should have no problems. As far as BEC is concerned this is perhaps best disregarded on the receiver and make use of the low volt supply from the controller.

A final note. With a product name of *Nosram*, which sounded more like a nasal spray than a speed controller I was interested to find out where the name came from. Easy when you know; the designer's name is Nick Marson — work it out?

Available from Malvern Models, 1 Pump Street, Worcester.

Price £64.95.