

NOVAK

Solid

STATE OF THE ART

JIM DAVEY (Mr Radio) tests: Servo — NES1A, Controller — NES-1 & NES-4, Receiver — NER-2S, Charger — NEC-1.

Bob Novak's range of specialist accessories have gained an enviable reputation in the USA for being both clever and extremely effective. The reviewer has watched with interest the range grow for sometime, albeit only via the medium of the American modelling press. We would be the first to admit that products seen from a distance sometimes lose their lustre when actually handled, so it was with some enthusiasm that the task of reviewing Tony Stephenson's spoils from the Toledo show was taken on. To say that the reality was every bit as good as publicity would be an understatement.

The products reviewed are not the full Novak range, but represent those items most of interest to the 'professional' electric car racer. The reviewer definitely does not fit into that category, so 'hands-on' assessment will come from better qualified persons. I am indebted to Graham Booker of Century Systems for the loan of Sanyo Battery packs, Motors and other equipment for the purposes of review, and for taking the close-up photos. The object of the technical part of this review is to get behind the jargon and see what's good about the goodies, so without more ado, lets move on.

Receiver NER-2S

Size:- 1.45 x 1.30 x 0.70ins. Weight:- 0.75 ozs.

Like all Novak products the receiver comes in a smart, bright orange case, with a black label and crystal cover. The design is of the A.M. variety and would be expected to be compatible with all known A.M. 27MHz transmitters, picking off the first two channels if there are more being transmitted.

The use of a special integrated circuit which contains both R.F. and decoding circuits has allowed an extremely low part count to be achieved. The less there are, the less can go wrong. All the right bits are

there, however, and the standard of manufacture is very high. The only large component is securely glued down against the effects of shock and vibration, and a sensible thickness of printed circuit laminate is used.

The receiver examined was fitted with a three-way Futaba 'M' type of block connector. It is capable of operating over a wide range of voltages, allowing safe operation with tired batteries on the one hand, and reliable operation on even six nicad cells.

So we have a receiver, now we need some muscle.

Servo NES-1A

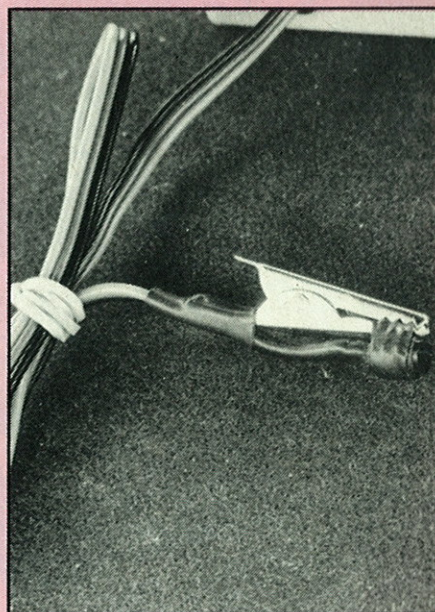
Size:- 1.50 x 0.750 x 1.180ins. Weight:- 0.98ozs.

In a world where styling rules all, servos are more and more seeming to take on the appearance of quasi-military hardware. It is somewhat refreshing to come across

something which has been designed to do a job — pure and simple. That is not to say that these servos are not attractive, far from it. Cleanly moulded in the bright orange Novak house colour they are very smart. A full range of arms, discs and other output widgets is supplied.

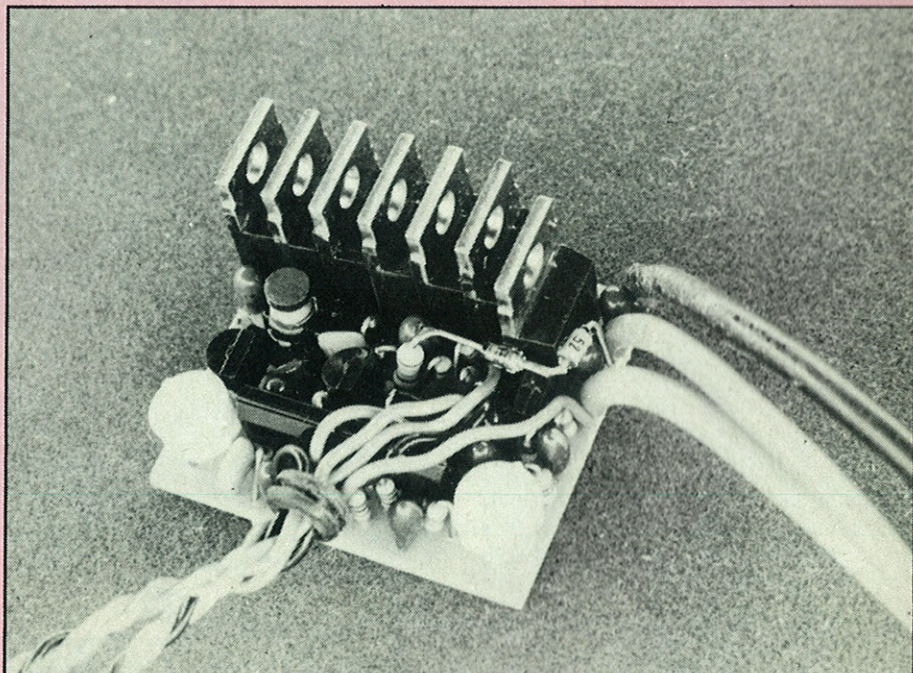
The servo is light and compact, and when it is switched on it impresses. The action is very fast, without the least bit of twitchiness. When asked to creep, the demand is followed faithfully. Whilst no direct measurements of pull were taken, the well-known 'grip-test' would indicate that torque has not been sacrificed to obtain speed. Indeed a 6.5 ohm motor is fitted and this would bear that out.

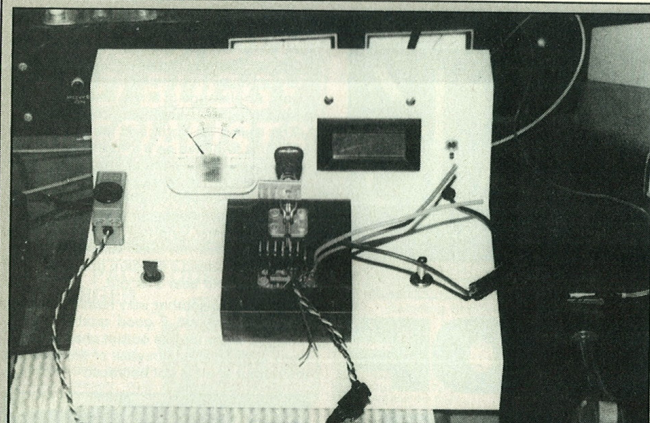
Inside we find another very neatly made bit of electronics and a good quality motor. The lack of slop in the output shaft is especially commendable in view of the fact that the output shaft is not ballraced — rather a



The sensor — what a really smart idea. Sensor slips under heat shrink on battery and is held in place by the alligator clip.

Inside of controller is packed tight, but still very neat.

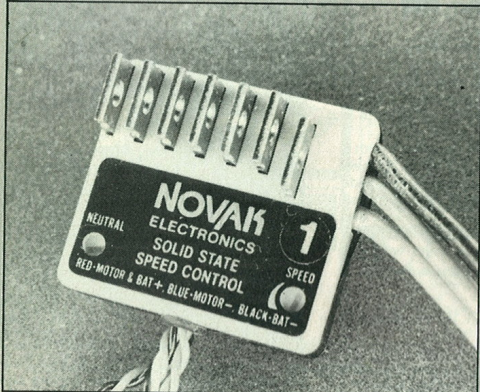




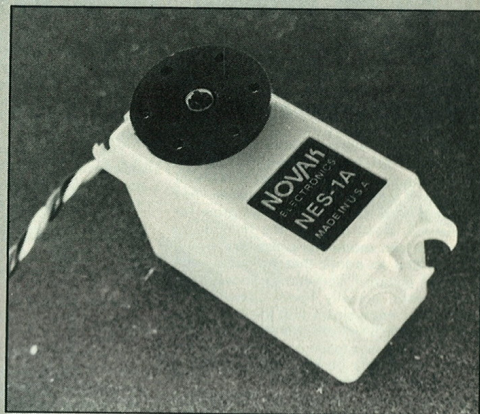
All Novak items are thoroughly checked out. Here an FET controller is being linked upto the test rig.

sociated with the switching of many Amps. Over the years, however, larger and larger devices have been developed and the latest offerings exhibit characteristics not far short of a decent piece of wire, when turned on! Fortunately they don't need a lot of power for control circuits either, so, provided the designer knows what he is about, a very efficient controller may be produced which delivers all the battery's power to the motor — not to the British summer in the form of waste heat. As usual, you don't get something for nothing, and the best FETs are not cheap. A quick calculation shows that a large percentage of the asking price for these controllers is most definitely due solely to the FETs.

Now, the performance claimed is really very impressive, the two controllers claiming drops of .05 and .12 volts, respectively, at 12 Amps draw. At first it was not possible to substantiate these claims until the penny dropped that they are so good that the hook-up wire is contributing a considerable drop in its own right! At this point engineering training took over and some very careful measurements were taken. In



Controller is very small. Note the cooling fins of the multiple FETs. A clip-on heat sink unit is also available for hot climates or where air flow is restricted.



Servo looks a little old fashioned, but performance is definitely up to date.

surprise actually, but a tribute to the accuracy of the moulding. The gears themselves are of a very hard plastic and look pretty tough. Gear fit is very good and the action smooth.

Right, receiver and some muscle, let's get in some power to make it all go.

Controllers NES-1 & NES-4

Size:- 1.45 x 1.30 x 0.5ins. Weight:- 1.40ozs. These two controllers differ only in the claimed voltage drop they cause at full power. Examination shows that they differ only in the type of field effect transistors (FET) used as the switching devices. Both include a voltage regulator to enable the operation of the receiver and one servo from the propulsion batteries. External adjustment is provided for neutral and full power setting, brake being presumably self-adjusting. A miniature on/off switch is included with the controller, attached by a small fly-lead to allow convenient mounting in the car.

When the FET first came on the electronics scene, it was a fragile device, useful for the precise control of small signals, but hardly the sort of thing that would be as-



The man behind it all, Bob Novak at his work bench.

order to put the results in perspective, the same measurements were also run on a length of good quality power hook-up wire, and a 'full-power' relay. For ease of reading, all the results are expressed as a voltage loss across the test item at a current of 12 Amps. The controllers were hard on, driven by normal receiver signal and measurements were made as close as possible to the controller inputs.

Device Under Test	Voltage Drop
NESC-1C	0.042 Volt
NESC-4C	0.112 Volt
Relay Contact	0.168 Volt
1 Metre wire	0.156 Volt

A few seconds thought will indicate that the worst controller is as good as 28 inches of wire, and the best as good as 10 inches of wire. It will also not escape your notice that the relay is worse than either! Commoning up the two contact sets in the relay will beat the cheaper controller — with a new relay. The relay tested was new and will not improve with age, whilst the FET will not change at all. It's difficult to see how this sort of performance can be bettered in terms of pure efficiency. The controller itself draws around 20ma — about the same as a relay or servo at rest — so there is very little waste anywhere.

The in-built regulator provides a steady 6 volts (6.25 and 6.1 measured on the two controllers tested) and is of a design that should keep on regulating to the bitter end of the propulsion battery. The user also has the choice of eliminating the regulator and running direct, or using a separate battery — all is clearly explained in the instructions provided.

Having completed the kit needed to control the car, we now need to charge the batteries, and Bob Novak has thought of that too.

Charger NEC-1

Size:- 1.50 x 1.35 x 1.15ins. Weight:- 1.50ozs.

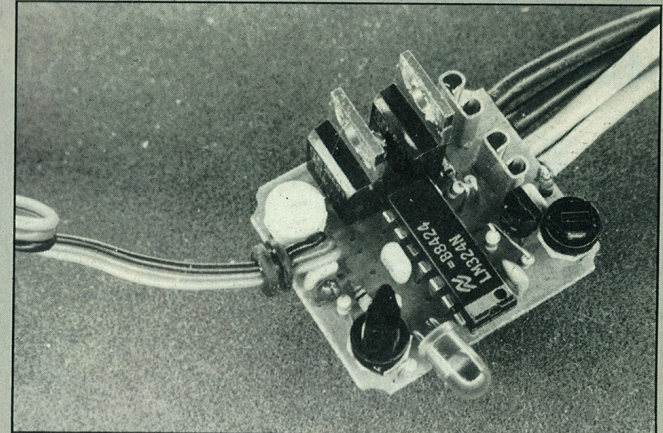
Once again Bob Novak has harnessed the power FET to achieve a very neat package. Combined with the latest in switching technology is the latest and best method of high rate charging Nicads, the thermal sensor.

The tiny package contains a constant current charging circuit, adjustable by the user, and a thermal cut off device whose trip point is also user adjustable. Normal resistor chargers charge at an initially high rate, and then taper off as the battery accepts charge. As the charge source 'tires' during the day this problem becomes worse and it is very difficult to predict charge times — safety constraints dictate a conservative approach, and the best cannot, therefore be had from the batteries. The constant current circuit gets round this by controlling the charge rate to be always the same. To add the finishing touch, hanging out of the charger is a flylead with a tiny semiconductor temperature sensor attached. This sensor is clamped to a small alligator clip so that the whole thing may be clipped into intimate contact with your battery pack. In use, the battery is connected up and charging commenced. After 2-3 mins the temperature adjustment is set up using a built in LED indicator to suit the ambient temperature of the battery. Charging is automatically terminated when a subsequent temperature rise is detected. The actual rise is dependant on the owner's

adjustments, and a bit of careful experiment will be required to obtain the best results. According to the instructions, setting the adjuster to maximum temperature will result in a battery temperature of about 54 deg. C, at cut-off — a bit high, but probably safe in warm weather.

Various safety and protection features are built-in and detailed in the instruction. No attempt was made to test these, but it would appear to take a good deal of effort to destroy the unit!

The internals of the charger. Once again very tidy, and once again the use of the power FET.



On test, the current could be set over a range of 1 to 5 Amps, and once set, did not vary throughout the charge of a totally flat battery. This took about 27 minutes at 4 Amps, representing an input of 1.8 AmpHours into a 1.2 AmpHour battery — about right for a good one! At the end of the charge, the battery was comfortably warm.

Conclusion

As an electronics engineer and something

of an 'ideas man' by profession, one of the highest compliments I can pay to a piece of equipment is to say "I wish that I had thought of that". There are a number of features on the Novak range that elicited such a response during the course of this review.

The controllers and the charger in particular represent a combination of size and performance that is difficult to fault. The whole range is beautifully manufactured and presented, with instructions that are

clear and easy to understand. All the little bits you need, such as suppression capacitors and spare fuses, are there in the packet waiting for the installation. A great deal of thought has evidently gone into packaging of the units — with evidence of assembly by people who care. It must be said that the equipment is not cheap, but you do appear to get what you pay for. In the Novak range that is a top quality product designed by people who understand the user's needs.

Interior of the receiver is uncluttered despite small size — low parts count helps.

