

On TEST

Any of you who can remember what a Tamiya Frog looks like will have been racing long enough to have heard the name Barracuda. This company has been involved with model car racing for a number of

Barracuda Smart Charger 2 and Cell Analyser

years and many will be familiar with their Modular Lap counting system which is still in use in over 90 clubs throughout the UK and Europe. They also had almost the monopoly on battery analysis three or four years ago with their Barracuda Battery Analyser and several of the major cell suppliers, including Nosram, matched their racing packs using the equipment. Then, in 1988, Barracuda ran into supply difficulties, the outcome of which caused a lot of heartache for several wouldbe buyers. Understandably this tainted their name somewhat, and resulted in them spending most of last year sorting out their problems. The company, run by Chris Watling, is now moving swiftly into the 1990s with a renewed reputation for reliability and some interesting new products which I though should be investigated. So here goes!

Some time ago Barracuda produced a charger which could be used in several modes of operation and appropriately called it the Smart Charger. Now the

latest version called the Smart Charger 2 has hit the scene with a magnificent specification which claims to be the total solution to fast charging Ni-Cads. What I wanted to see was how user-friendly and reliable it would be when faced with the ultimate test - ME! If yours' truly was let loose with one and we both survived it would get the thumbs up!

The charger is micro-processor controlled. In layman's terms, this means that a program is written on a computer, and then transferred to a microchip, called an Eprom. This Eprom is plugged into the circuit board of the

charger. The upshot of this is that when any new advances in charging come along, a new Eprom is produced by Barracuda to update any Smart Charger to the latest specification. The obvious benefit of this being that once you own a Smart Charger 2, or if you have one of the original versions you can have any subsequent update done for a moderate sum. It's the only charger that I'm aware of that has this facility and it's obviously a great idea. We've all experienced the frustration of buying a piece of equipment that two weeks later is superseded by a souped-up version.

The charger looks sparse in comparison to some that are on the market. Nothing fancy, just a flat white box with a Liquid Crystal Display and four buttons on the top of it. There are sockets at one side to take leads to your Ni-Cads and for a discharge resistor. Next to these is the temperature probe which is on the end of a long flex, and the leads for the connection to the 12 volt DC supply, via crocodile clips. What other features has the Smart charger which

makes it different from the rest? Well, it's similar to most other quality chargers on the market in that it has protection against idiots, like me, reverse connecting the leads to the 12 volt or Ni-Cads but in addition to this kind of standard feature, it has a host of innovations that makes it a unique product giving the serious racer the opportunity to get the best out of his Ni-Cads. The Barracuda pulse charges. This method of charging Ni-Cads is used in the more expensive chargers on the market, and subjects the cells to very high current pulses, several times every second, obtaining maximum

performance from the cells without causing damage. The first move is to hook the Smart Charger up to a 12 volt battery. The LCD then tells you that all systems are working. Now to connect the Ni-Cads. A quick glance at the display when this is done prompts you if the polarity is incorrect. So far so good. If everything is OK - and the LCD will tell you if it isn't - you can select the mode of operation. As this Charger is Menu Driven, by using the buttons the different operating modes can be selected, so to charge a pack of cells the charger mode is used. Other modes are Cycler or Analyser, but more about these later. Once in the Charger Mode we can select various parameters depending how we wish to charge the cells. Generally, there are three methods in use to charge Ni-Cads. A *peak* charge is one where the charger senses the drop in voltage that occurs when cells are fully charged. To explain this more simply, imagine filling a shock absorber with oil, if you overfill it the oil

performance from the cells without causing damage.

overflows (we've all had oily

with. A clockwork timer is incorporated in the charging device and a time is set, the charger switches off when the time has elapsed. The Smart Charger incorporates all three methods of charging, electronically and, allows you to select Peak, Temperature or Timed charge. By the time you read this review the charger will also Slope Charge. Basically this means that the voltage drop at peak can be preset. So if you want your cells just warm, you set the charger to cut off at, say 50 millivolts below peak, or if you want a pack warmer the cut-off could be set at 150 millivolts. The higher the chosen cut-off voltage - the hotter the cells become. As well as having three methods of charging, the Smart Charger 2 lets you set the charge current from 0-8 amps. This enables you to charge any type of Ni-Cad, fast or slow, from a single penlight to a racing pack. The 12 volt battery voltage

can be displayed so you can keep an eye on its condition, and it gives you the choice of charging the cells up to your chosen KJ rating. All the parameters are assigned using the keys, and I found the instructions clear and easy to understand.

Once the decisions are made, which in our case was to peak charge a pack of SCE cells at 5 amps, the Red button on the charger is pressed and the display tells us that charging is in progress. Dead simple! In all charging modes the charge time is displayed along with the charge current and temperature of the cells. It's a good idea to use the temperature probe even if you're not Temp. charging as this is a safety feature and will act as a cut out should the cells start to overheat!

When the desired charge is reached, an audible warning is given in conjunction with notification on the display. The

following information also can be seen: Charge Time, Temperature of Cells, Kilojoule reading of stored energy of cells to let you know how good your cells' capacity is and cell voltage - and so you're ready to race.

Discharge Meter

Another feature of the charger is its discharge capabilities. This enables us to find out how much energy remains in a pack of cells after use. This being helpful as a guide to the gearing of a particular motor. It also lets us check out cells to find the best packs. We need to connect an external resistance to the SM 2 to use this facility. Any electronics shop will supply a 1 ohm metal clad resistor, a couple of leads and jackplugs, and a large heat sink for this purpose. Any 50 watt metal clad resistor between 0.7 and 1.0 ohm is suitable for a 7.2 volt pack. The resistor is secured to the heatsink and connected to the charger via the leads and jackplugs. To discharge a set of cells the discharge resistance must be set to give accurate readings. This is accomplished by stepping through the menu until 'Des Res 1.0R' is displayed and then setting the resistance. Next move will be to set the discharge cut-off point in volts. Let me explain why? When matching cells, whether they be SCR or SCE

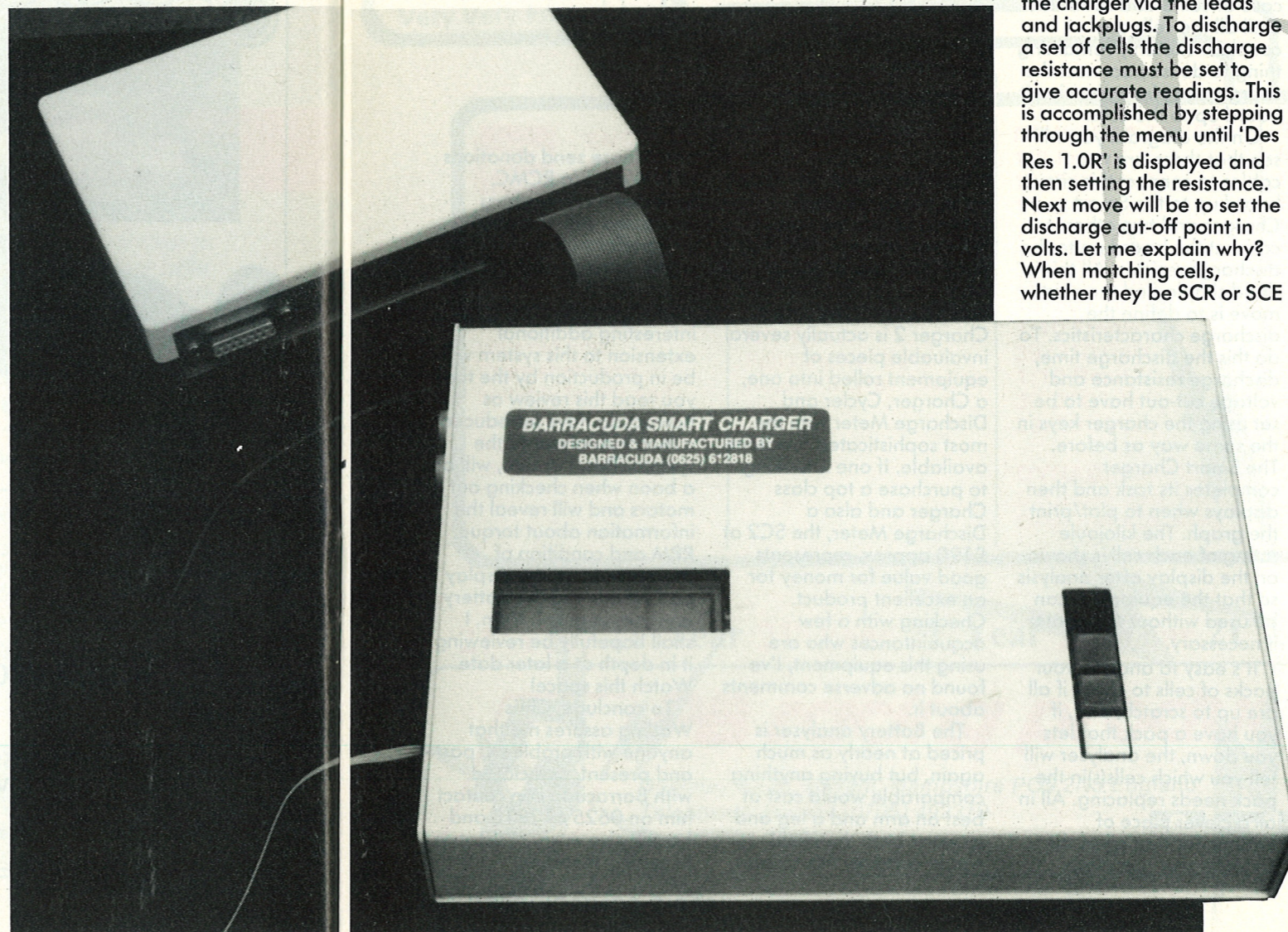
types, the important energy readings are above 1.0 volt per cell or 6.0 volts per pack of cells so most of the honest suppliers only give energy readings down to a cut off point which is around 1.0 volt per cell. Just check out a pack of Parma or Galeforce cells and, from the graph, you will see that the cells are matched to a tail off point around one volt per cell. So any energy below this point is irrelevant to good performance. Setting the cut-off voltage at 6.0 volts gives the best indication of how much 'usable' energy is left in the pack. The readings given are in Kilojoules. The time and energy levels of the cells are displayed after discharge, and comparing discharge time and the energy levels of the pack along with the average discharge voltage, gives a quick and simple method to determine your best cells.

At a race meeting, the remaining energy in the pack of cells you've just raced can be calculated using the SM2 Discharger to help you decide how to gear the motor.

Cycler Mode

A new pack of SCR Cells will need to be charged and discharged a number of times to reach their best performance. This is a timeconsuming job which, in the past, has taken the best part of a week to do manually, assuming one was fortunate enough to have three or four new packs of cells to cycle. Barracuda have the answer to this laborious job - they have incorporated a Cycler Mode into the Smart Charger which allows this task to be performed automatically.

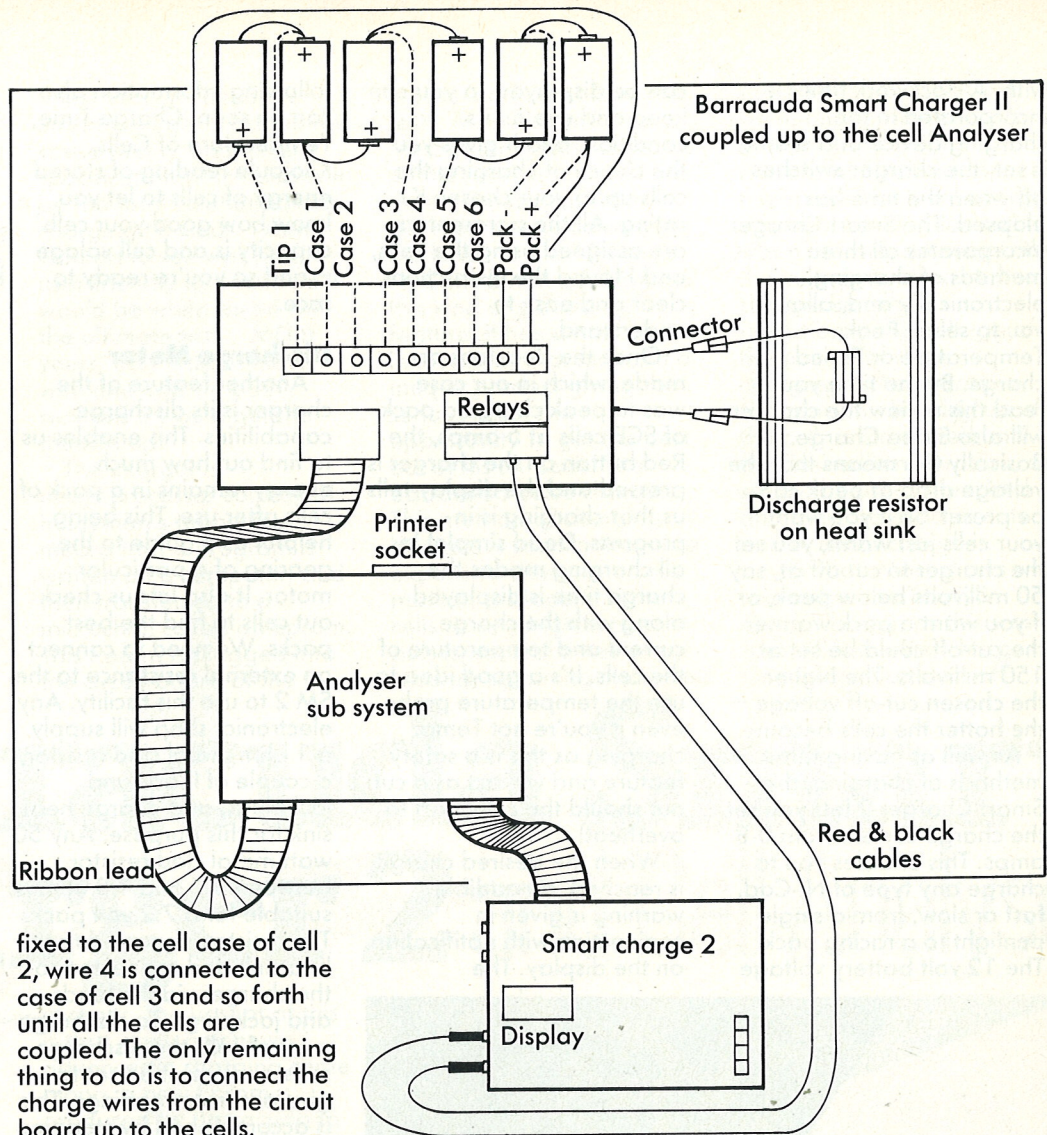
By stepping through the menu, Cycler mode is selected. Then the parameters for charging are set - either time, temperature or peak charge and the current and maximum number of Kilojoules required are adjusted accordingly. After this the discharge setting are made - discharge resistance, cut-off voltage, and a discharge time is set. A discharge time of about 1



hour seems sufficient to completely discharge the pack, and allows enough time for cooling before the cycle recommences. Then off we go . . . the charger now takes over and continuously charges and discharges the pack until the required condition has been reached, at which point the cycle can be aborted. Usually after about six cycles, the cells are approaching their maximum capabilities.

Battery Analyser

All the above facilities are present when you purchase the Smart Charger 2, but for those who want the ultimate in cell technology Barracuda have gone a step further and produced an attachment which analyses individual cells. Called a Battery Analyser, as you might guess, it comes in the form of a small white box which connects to the charger via a computer-type lead. The Smart Charger needs some modification, which is incorporated in the price of the Analyser, to enable this additional attachment to be used. The analyser sub system, which is what the extra box is called, has a socket so that a printer can be attached. The system gives accurate Kilojoule readings without the use of a printer, but to be able to match cells accurately the discharge curves of the cells need to be seen. An ordinary computer printer can be used, and in fact there is provision in the Analyser to accommodate most printers and plotters on the market. From the Sub system another computer type lead attaches a small printed circuit board on which lies a couple of relays and a connector block with nine connectors. These connectors are coupled to the pack of cells to be analysed using wire and small crocodile clips. See diagram. This is the part of the procedure where a little extra care is needed. Wires are fastened to the Ni-Cad pack so that tip 1 connects to the positive side of cell 1, the next wire is fixed to the case of cell 1. Wire 3 is



fixed to the cell case of cell 2, wire 4 is connected to the case of cell 3 and so forth until all the cells are coupled. The only remaining thing to do is to connect the charge wires from the circuit board up to the cells.

On the diagram you will see that there are two cables to connect this circuit board up to the Smart Charger and two others to connect the board up to the discharge resistor. All this is dead simple and the next move is to define the discharge characteristics. To do this the discharge time, discharge resistance and voltage cut-out have to be set using the charger keys in the same way as before. The Smart Charger completes its task and then displays when to plot/print the graph. The kilojoule rating of each cell is shown on the display after analysis so that the equipment can be used without the printer if necessary.

It's easy to analyse your packs of cells to check if all are up to scratch, and, if you have a pack that lets you down, the analyser will tell you which cell(s) in the pack needs replacing. All in all a clever piece of equipment that gives the serious racer complete

control of the most important part of his tackle – the power source.

Now, what's the cost I hear you asking? Well, first of all let's take a look at what you get for your hard earned cash – the Smart Charger 2 is actually several invaluable pieces of equipment rolled into one, a Charger, Cyler and Discharge Meter with the most sophisticated functions available. If one is looking to purchase a top class Charger and also a Discharge Meter, the SC2 at £190 approx. represents good value for money for an excellent product. Checking with a few acquaintances who are using this equipment, I've found no adverse comments about it.

The Battery analyser is priced at nearly as much again, but buying anything comparable would cost at best an arm and a leg and at worst both thumbs! I would certainly like to own

one. Please send donations to E. West, c/o RCMC. Seriously, I am very impressed with the quality and performance of the whole concept and can recommend it wholeheartedly. An interesting additional extension to this system will be in production by the time you read this review as Barracuda have introduced a Motor Analyser to the system. This, I'm sure, will be a boon when checking out motors and will reveal the information about torque, RPM and condition of motors both on the display and similarly to the battery analyser in graph form. I shall hopefully be reviewing it in depth at a later date. Watch this space!

To conclude, Chris Watling assures me that anyone with problems, past and present, associated with Barracuda can contact him on 0625 612818 and he will give every assistance in sorting them out.