

BY DEZ CHAND

# KNOWLEDGE IS POWER

## ON THE TEST BENCH

### Intro

In the old days the only indication of your car's performance was to touch the motor after a run and judge whether it felt too hot to touch, and later as battery dischargers were developed you could discharge your cells to judge how much capacity you had left, and know if you could afford to gear up a tooth higher without dumping before the end of the race. In those days battery capacity was the limiting factor to performance, but these days with huge battery capacities and insanely fast

motors pushing ever stronger, more efficient cars along, we rarely dump unless there's a problem so judging the optimum set-up is more difficult than ever. That's where Data Loggers come in handy, not just for full size motor sports, but thanks to miniature electronics we have units small enough to fit on 1/10th scale models that collect all the data the same as the full size engineers would use to analyse the chassis and engine performance.

The box contains a CD, which will install all the set-up software required to interface with the PC via the included USB cable, and also a full, in depth user manual, set-up guide and data collection tips and tricks for labelling channels etc. The box also contains adhesive tape and cable ties to tidy your installation although I was surprised by the lack of spiral wrap as per the brushless kits from Novak, so I bought some at Maplin Electronics to keep my installation super tidy.

The orange base can be fixed to the chassis and the unit simply clips in and out, for a quick install and remove process, but as a bonus it uses the USB socket to latch onto for security whilst also sealing that orifice from dust ingress, and the opposite edge clips over the sensor plugs to prevent them vibrating out of their sockets. What a neat touch! The clip fit orange base means you can install in a car and quickly remove for race day, so you don't carry a weight penalty (though the whole kit weighs under 50 g) and the extra wiring doesn't complicate your race day any further. You only need this gear installed for test days, maybe free practice in the morning before qualifying begins at a push, as most race organisers would take a dim view of any data loggers installed during a race or qualifying run, whether transmitting back to a pit man or collecting data for later analysis, as it's a definite advantage over your competitors.



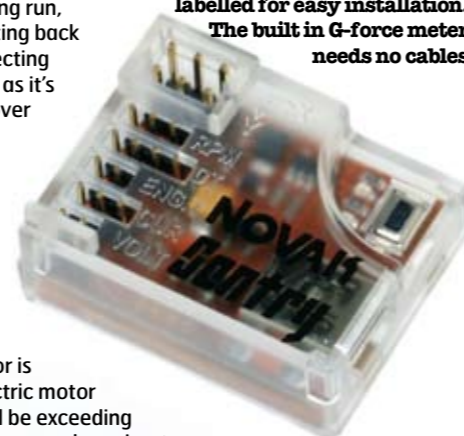
**Above:** Brain the size of a planet, in a tiny package

Novak present this tiny unit, with a footprint of less than 26 mm x 31 mm, it might look like a speed controller, but it has a lot more tricks up its sleeve than that! Information is power, but using the information is a skill, by analysing the data provided you can consider how your vehicle is performing and what you might do to improve it. Far better than any temperature check in the pits; by the time you have cruised round a lap and rolled up the pit lane the temperatures will have changed anyway. What you really need to know is what's going on out there, 'The 411' as it's known Stateside.

Collecting and playing back information gathered in real time allows you to keep an eye on the gauges, and make considered judgments about the limitations of any particular aspect of the vehicle, or any potential problems that might need urgent attention in order to avoid permanent damage.

#### "GET THE 411"

The box declares "Get the 411" which refers to the '411' police code, for "here's what's happening?" It is used to give people a rundown on the events that have transpired recently.



**Below:** All the ports are labelled for easy installation. The built in G-force meter needs no cables



**Above:** The Sentry Pro comes with all these sensors; it's a little daunting!

will monitor either throttle or steering position internally depending on which channel you decide to interrupt with the cable supplied to feed the Sentry with power. The Sentry Data Logger - Pro (NE2010) also includes four extra Digital temperature sensors plus a current sensor and this is the kit we have on review.

#### WHAT DOES IT DRAW?

The current sensor unit can measure current up to 100 Amps, by soldering on connectors to fit in line with the power supply. By monitoring the current draw you will be able to judge gearing to perfection and make a note of battery efficiency, as it will quickly show up any tired or low performing cells, as the voltage will drop sharply under load. You'll soon understand how good NiMH batteries or LiPo cells with a high discharge rate provide much better acceleration and overall performance than tired or budget cells.

Do the maths and you'll realise that a 5000 mAh battery discharged over a 5-minute race is an average of 60 Amps, yet you will see that it only draws around 25 Amps when running at full throttle on the main straight, so the momentary peaks must be well above that elsewhere around the track.



**Above:** The four additional digital temperature sensors have a port to accept the original two, making six in all! **Below:** The analogue temperature sensor is looped for fitting to nitro cylinder heads, motor end bells etc.



The current sensor goes in line with a power lead, making sure to get the polarity right, as everything on the Novak unit is vulnerable to reverse polarity and nothing is protected. Any slip will disable the unit and most definitely void the warranty, as Novak take the stand point that their unit is so reliable that if it goes bang you must have done something wrong.

I soldered the voltage sensor lead into the battery connections on the ESC, and installed a pair of Corally style gold tube connectors to the current unit so I could simply plug it into the positive cable, between battery and speed controller, to measure the whole system power consumption, so with the motor not working I can activate the steering servo and tell just how much juice it is using, and what current rating I should be looking for when selecting a LiPo receiver pack regulator. If you buy a 3 Amp LiPo regulator and install big digital servos, you might find yourself lacking steering speed, as the unit simply cannot cope with the power demands of the servos when it is under considerable cornering loads and being asked to make rapid direction changes. Likewise you may be lacking braking force simply because the regulator cannot cope with the steering loads as well as supply the throttle servo with several amps as it pulls hard against the brake linkages. There's only one way to find out, and that is to measure it!

#### HOT TO TROT

Temperature is probably the most important tuning guide of any hence the system leans heavily towards gathering as much of this simple, yet highly valuable information as possible. Four optional temperature sensors are included in the #2010 kit, and there is an extra port on the multi base, to insert the original pair of sensors to make a total of six digital temperature sensors altogether.

While most temp gauges work on resistance hence need for only twin wires, here there are four wire sensors supplying digitally signed signals so they can be separated and identified by the base unit, and hence each sensor turns up as a separate line on the graph. Just be sure to make a note of the sensors, which are labelled 1 to 6 when rigging your



**Above:** The Sensored Brushless interface cable provides accurate RPM measurements direct from the electronic signals



**Above:** For non-sensored brushless and brushed motors or nitro engines a magnetic rpm sensor is also provided



**Above:** Solder on your choice of connectors and put the current sensor in line to see what loads you draw



system up to the car, so you know what each gauge indicates. The separate analogue loop temperature sensor is for wrapping around things like engine cylinder heads, electric motor end cans, or exhaust silencers; cylindrical surfaces that would be tricky to install with one of the square tag sensors. As it is not a digital signal it gets its own two-wire channel in the base unit and is easily distinguished from the 6 digital sensors.

**WIRED**

I tried the system in a 4WD buggy, 2WD buggy and 1/5th motorcycle, all equipped as they are with sensored brushless motors, and fortunately the industry standard sensor cable connection means the Novak system will measure all sensored brushless motors regardless of label or manufacturer. If you have a sensor-less brushless, or are running a brushed motor you can't use the sensor interface cable provided, so Novak kindly include a magnetic pick up, and four magnets for you to stick to spur gears, propshafts or even nitro flywheels so you can measure the rotation of anything you desire, and if you need to install it to read a propshaft or something else that isn't rotating at engine speed you can dial in the gear ratio so the system works out how fast your motor or engine is rotating.

By installing the data for overall ratio and tyre diameter (in inches) it will even tell you the actual ground speed in mph, cool huh! By judging the actual top speed or maximum revs achieved on a long flat road, and then comparing the data recorded around a circuit you can tell

how far short of full revs you are, so you know how far to gear it down. Alternatively, you might see that the motor is making full revs half way up the main straight so can afford to go up a tooth for a bit of extra speed to get past your rivals.

The internal servo position monitor coupled with the G-force readout meant I could dial in exactly the right tyre for the surface, simply by watching the G-forces rise as I got closer to the best set-up, verified by what I could feel on track also. As I went through my entire tyre collection for my B4 buggy and logged them all into the system with a description of the set-up in the notes area, I knew exactly which tyre combination to choose simply by looking at the G-force readouts for each run. Different front tyres determined the maximum cornering forces while my choice of rear tyres made a huge difference to the acceleration available before the tyres began to spin away the power.

Despite running a hotter 5.5T motor in my 4WD buggy it didn't exceed the 100 Amp draw, which I expected seeing as the 2WD buggy was hitting spikes over 90 amps with a softer 6.5T motor installed. That was surprising considering that I could use more throttle by virtue of more grip in 4WD than 2WD but it became apparent that the 4WD buggy is geared considerably lower at 11.69:1 while the 2WD was geared at 9.57:1 so despite the 4WD being heavier, having more grip and using more throttle the motor loads are never as high. Now I understand why 4WD are always running hotter motors than 2WD, not just because they can use the power, but because of their lower overall gear ratio.



**QUICK SPEC**

**Class:** Measurement Equipment  
**Type:** Onboard Data Logger  
**Manufacturer:** Novak  
**Price:** Sentry (NE2000) £114.99  
 Sentry Pro (NE2010) £139.99

**DISLIKES**

No spiral cable tidy included

**LIKES**

Unique design innovations  
 Small and light  
 Simple to use and set-up  
 Accurate sensor cable pickup  
 G-force meter built-in  
 Quick remove clip base  
 Great 'Must Have' gadget

**CONTACT**

CML Distribution 01527 575349  
 or www.cmldistribution.co.uk



**Above:** All the sensor cables are retained in their sockets by the orange clip in base unit



**Above:** The only way to correctly gear a brushless motor is temperature, so the analogue loop detects exactly how hot it gets in action

**Above:** The rpm sensor cable adapter installed, voltage cable and a temp sensor squeezed into the heatsink

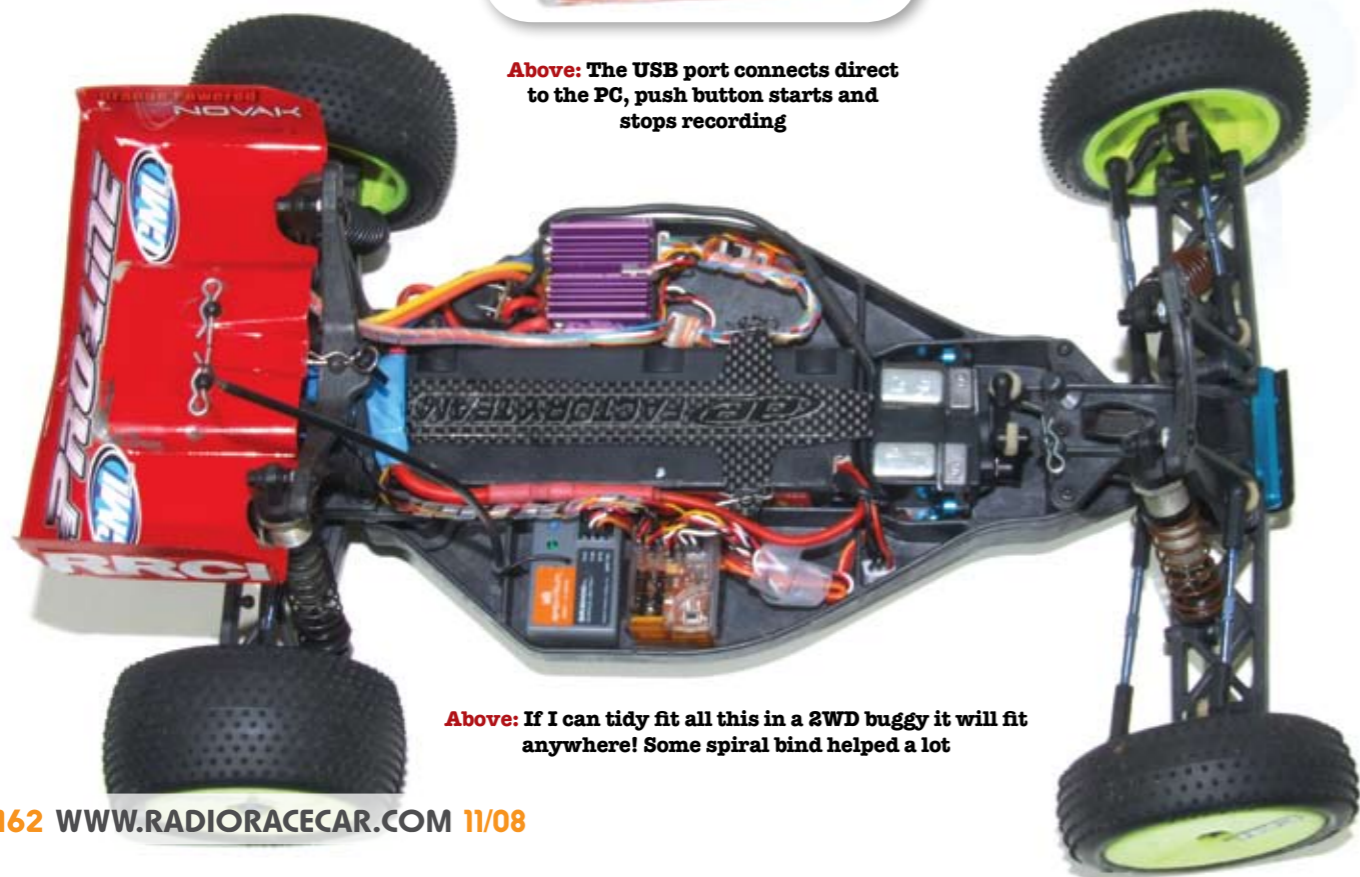
**YOU LEARN SOMETHING NEW EVERYDAY**

Having tried the Novak Sentry in so many different vehicles it really hit me just how much more time you spend at full throttle with a 4WD vehicle over a more sensitive 2WD car or buggy. The more throttle applied and the bigger your battery packs and motors are, the better your wiring and connectors need to be in order to deliver the performance the equipment is capable of!

So why guess when the Novak Sentry can deliver all the real time information you need to fully understand exactly what your car is doing out on track, so you know how to make it perform better or more efficiently.

Knowledge IS Power, so a serious data logger is a major piece of weaponry to add to your arsenal. **RRCI**

**Above:** The USB port connects direct to the PC, push button starts and stops recording



**Above:** If I can tidy fit all this in a 2WD buggy it will fit anywhere! Some spiral bind helped a lot



**Above:** Playback graph data can be singled out, see how my speed controller got steadily hotter, but only peaked out after 6 minutes, no need for a fan here!

**Below:** Playback in real time and watch the gauges tell the whole story!



**Above:** Data max and min are highlighted in red on a simple chart for quick reference