Charging - a new approach

Text and artwork by Collyn Rivers W8054

Members who use the CMCA's associated website may have been intrigued by a much-read CMCA Forum thread that discussed the huge number of interfaces that form much of our known universe. It started with solar and alternator charging systems – and morphed into metaphysics!

The thread was timely. I was at the time installing a pre-production electronic unit in our Nissan Patrol, the development of which appeared to have been dictated as much by philosophy as electronic practice.

This not something the designers claim, nor possibly even intended – but that this somehow happened was deduced following conversations with those concerned when I visited the makers (Redarc) last year.

The aim was to attempt to solve, in one unit, most of the issues that plague vendors, installers and users when various brands and types of RV charging systems must work together, despite being known (or subsequently found) to be less than fully compatible.

On top of that is the ongoing problem of resolving or some of the above when an auxiliary battery is some 20 or more conductor metres from the alternator: especially if the interconnection conductor is grossly undersized. As most are.

Thinking evolved over time and presumably went something like this:

Firstly was the realisation that, from marital relations to global politics (via battery charging!), problems mostly occur through misunderstandings and failures between different entities. Even a seemingly minor 'mistake' can have totally unexpected outcomes.

Consider this. At 09.01 on 23 September 1999, the US Mars Climate Orbiter space craft executed a minor burn: it was then never heard of again.

The Review Board reported the cause was a *'human interface error'* due to some data being in Imperial units – instead of the required metric.

It was a classic but costly (!) 'interface error'. As, now seriously suggested, was the Iraq war.

The above very much relates to the design of the unit that is the main subject of this article in that it is virtually predicated on the *acceptance* that many devices work just fine if used alone, but often prove less than fully compatible, or worse, when interconnected.

An ongoing and very common example is that an alternator system that works fine for charging a starter battery is virtually by definition, less than ideal for charging an auxiliary battery.

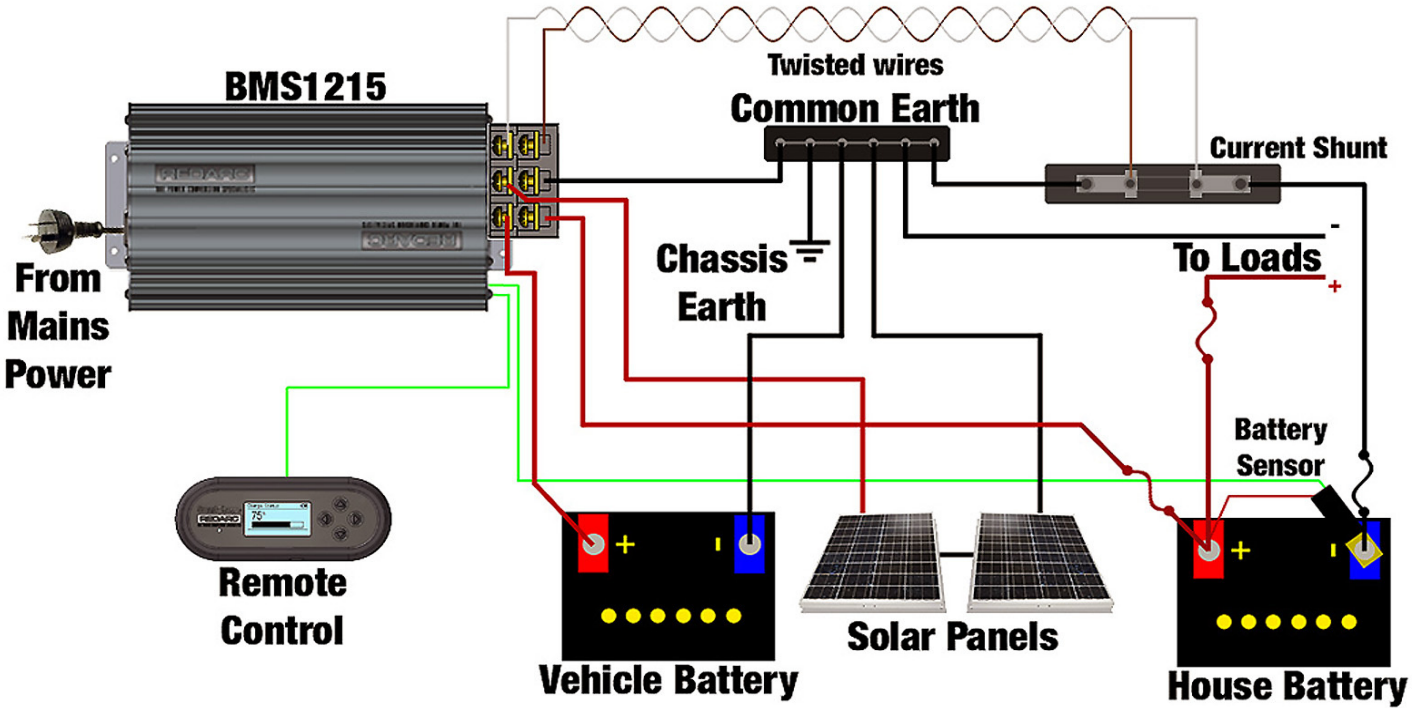
There also tend to be problems when an RV has both solar and alternator charging, in that neither auto-electricians nor solar types usually know about each other's area of expertise. (Another and classic example is that of electric motors and pumps: unless matched their combination is likely to grossly ineffective.)

Also, was service-derived knowledge that failures more often than not are due to faulty connections. Circuit components can and do fail, but far less often.

On top of that was the knowledge (reinforced by the company's own experience) that, for the better part of 30 years, motor vehicles used in all kind of environments have proved that automobile electronics can be astonishingly reliable.

Lastly, and given that the above still had to successfully transfigure into metal and silicon, it could be reasonably assumed that if a number of previously disparate functions were to be combined into one unit, all the bits *must* work harmoniously together because most of the interfaces are hard-wired and defined.

Such an approach simply *has* to benefit vendors, installers and end-users.



The Redarc BMS 1215 Battery Management System - a new approach that, by combining several previous functions in one unit, reduces troublesome interfaces, and substantially increases reliability. Pix: courtesy Redarc.

Integrating functions may cause failure in one area to cause failure in another, but that tends to happen anyway with interconnection issues. By reducing interconnections, the *overall* likelihood of failure is significantly less. And hugely easier to fix if that does happen.

Vehicle electrics are in any case now more complex than space vessels of only a decade or so ago (some have 100 or so microprocessors – and as many lines of programming code as a big Boeing airliner of that same era). Yet most run without failure for the life of the vehicle.

Battery Management System.

The (Redarc) unit concerned, the Battery Management System (BMS 1215), combines five functions. The main unit comprises a 240-volt (very) smart charger, a solar regulator, a dc-dc alternator charge system and a battery isolator. There is also a remote monitor.

The main unit temporarily located for initial testing in the author's Nissan Patrol.

Over and above that described above, the unit addresses other known issues, and one (as far as I am aware) uniquely.

This is that most multi-stage chargers are tossed by fridges running whilst charging – the sudden voltage drop due to the 'on' cycle resets chargers to boost mode.

This problem is overcome via dual 'Touring' and 'Storage' modes. The former ignores fridge cycling. The latter a five-stage system, charges only when the stored battery drops below a predetermined level – healthier for batteries than float-charging.

Any issues of charging from the alternator and solar at the same time are overcome by the unit automatically selecting whatever charging source is perceived to be required at the time.

As with units from West Electronics (NZ), Sterling (UK) and a few others has proven, dc-dc conversion enables vehicle alternators to charge auxiliary batteries of *any* type fully and efficiently.

The BMS unit isolates the auxiliary battery from direct alternator connection – it uses a dc-dc converter and multi-stage charger to ensure full and speedy charging regardless of battery type. The (much cheaper) Arrid dc-dc converter overcomes the voltage drop issue but does not include a smart charging function.

Voltage Drop

Basic physics determines that a battery charger must work most efficiently when connected to a distant alternator by adequate cabling. The design approach here however is essentially pragmatic!

It accepts that cable reality is usually between inadequate and grossly inadequate. The BMS is thus intended to be located within a metre

or so of the auxiliary battery. It accepts whatever comes out of the cable from the alternator, as low as 9.0 volts, and brings that up to full charging voltage. In doing so it draws more current from the alternator to compensate for that lost in the cable.

The quoted output current is 15 amps. There are plans to produce 25 amp and 50 amps versions – also for 24 volts.

Temperature Compensation

Unlike many designers of locally-designed products, this one's acknowledged that parts of Oz get very hot. The unit thus includes automatic battery temperature compensation that modifies the charging rate: the hotter the day, the lower the charge voltage needed for any specific current. It also doubles as a safety cut-out.

The unit is also, protected against things like short circuiting (not just via a fuse!), reverse polarity, surge and overload.

The largish (186 x 74 x 29 mm) Remote Monitor provides all the essential system information (including the total charge, i.e. including alternator input) and a 30-day log. The information is presented in a manner that is understandable by non-technical users, yet auto-electricians will find invaluable. Even the handbook is readable!

I am delighted to note that the Smart Start BMS 1215 system (to give it the proper name) is both designed *and* manufactured in Australia. It meets ISO9001 quality and ISO 4001 environmental standards. It is backed by a two year warranty.

I have one of the very first in my 4.2 litre TD Nissan Patrol and TVan. As you (hopefully) read this, my wife (Maarit) and I will somewhere along the Gary Junction track, or the Gunbarrel Highway heading for a meeting of CMCA technically-minded Members at Maleny – north of Brisbane.

I am grateful to CMCA Member Julian Lawrence for providing the inspiration for the theme of this article.

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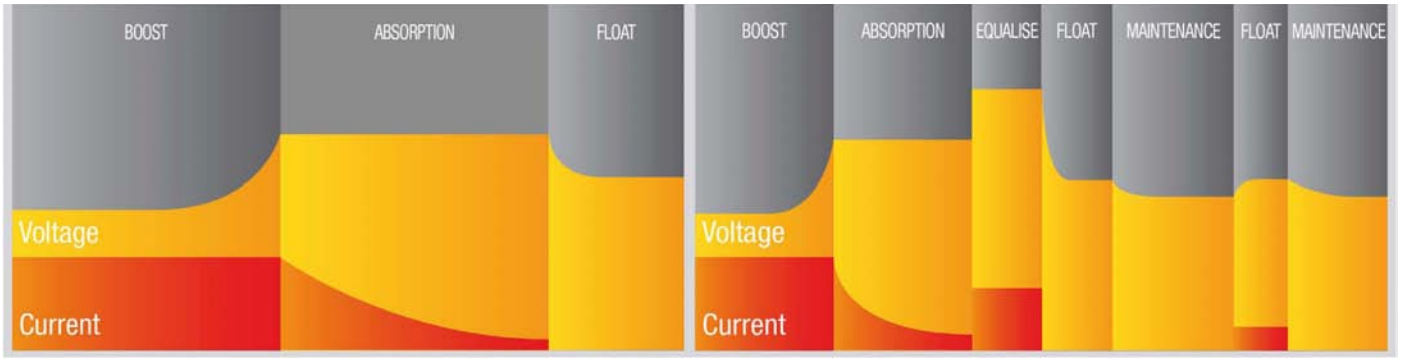
Disclaimer

I have no financial or other beneficial relationship with Redarc or its staff. I did however provide minor (gratis) comment during the design of this unit.

Collyn is the author of various books in the above and associated fields. They include: *Motorhome Electrics, The Campervan & Motorhome Book, The Camper Trailer Book, Solar That Really Works,* and the recently published *Solar Success.* Website is: www.caravanandmotorhomebooks.com



Left: (three stages) Touring mode. Right: (remaining stages) is the full Maintenance cycle. Pix: courtesy Automotive Electrical & Air Conditioning News.