



# POWER and the PAIN

With great power comes great responsibility. An article for the inexperienced contemplating a DIY 12-volt installation.







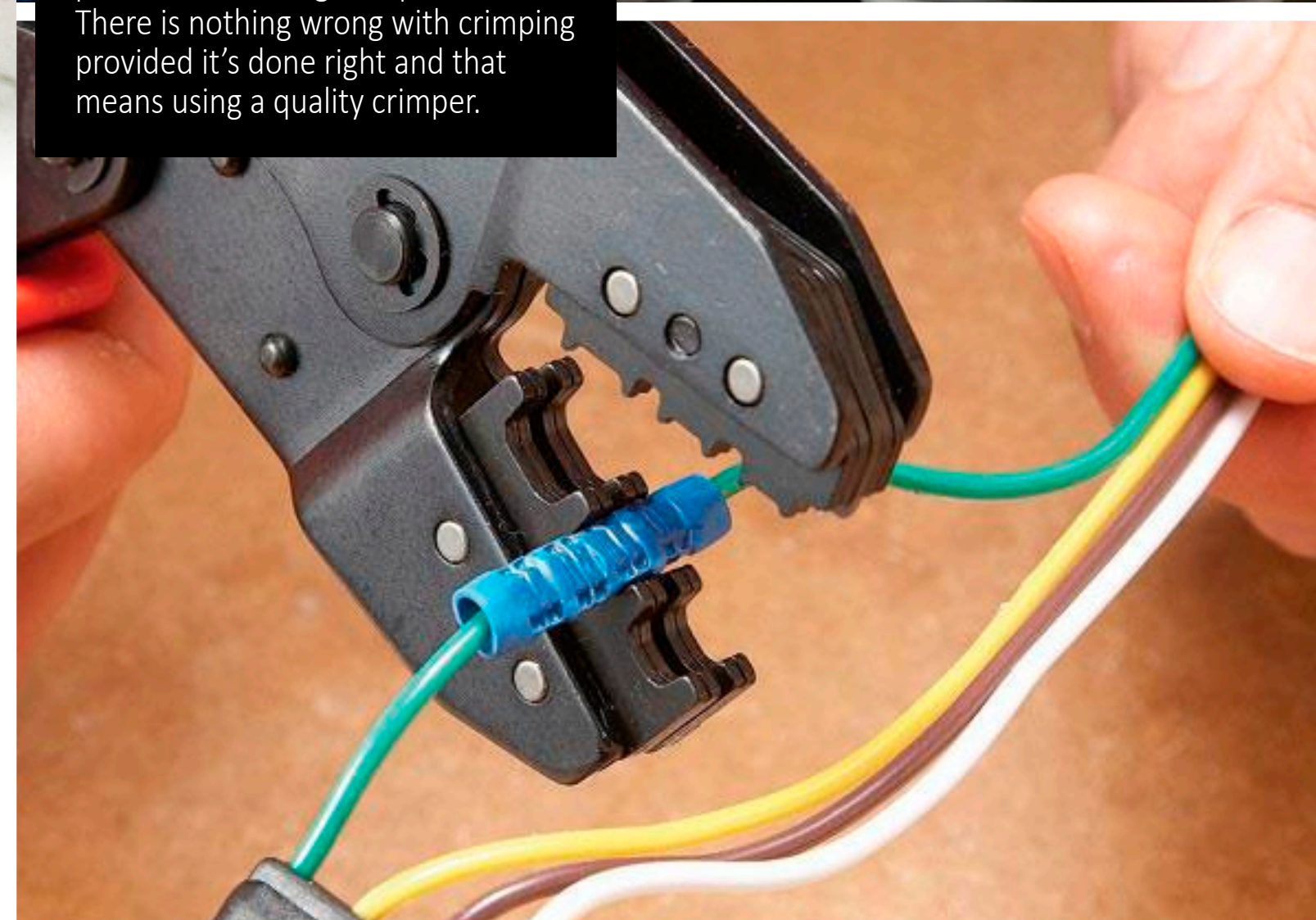
Grant is the brains behind the 12-volt mods made to TREV, our 'Project Triton'. TREV is going strong and there have been no fires.

As the deadline for this article approached, our mate 12-Volt Vince was over in Las Vegas at SEMA flying the flag for Battery World and feasting on St. Louis barbecue ribs at the Bellagio's buffet. But neither SEMA nor a good chunk of barbecued flesh, stop the volts swirling madly through our 4X4s, so in Vince's absence, we called in Grant from Battery World Parafield. Yep, Grant is going to keep us all well-grounded.

If you read our last issue, you'll know that Grant is the brains behind the dual-battery system in TREV our Project Triton, and what he doesn't know about 12-volt stuff, can be written on the tip of a test light with a sharpie. So, this one goes out to all the DIY installers out there. It's Grant's list of the common issues he sees, when people who don't know what they are doing (like we Loaded 4X4 fellas), get all electrical with their 4X4.



**Above:** When deciding on wire size, take into account amp draw and the potential for voltage drop. **Below:** There is nothing wrong with crimping provided it's done right and that means using a quality crimper.







**Above:** Soldering is the other way to connect wiring. It's NASA's preferred method so it must have something going for it. **Below:** The 'twist and tape' method is a great way to unwittingly start a fire in your 4X4.

### Incorrect wire size:

Electrical devices require current (measured in amperes or amps for short) as well as voltage. You can pass voltage through just about any size of wire but current is limited to the size of the wire, and if the wire is too small it will eventually let some smoke out. A rough rule of thumb to avoid wire meltdown is to identify the device's maximum current draw and choose wire thick enough to handle double that amount. It's a bit crude, but it will ensure the chosen wire is up to the job and won't melt under the strain.

### Voltage drop:

Is caused by resistance. The longer the wire run, the higher the resistance/voltage drop. If you can't avoid a long wire run – say from your starting battery to your ute's tub – then make sure the wire you use is up-sized enough to get the required volts through to whatever you want to power.

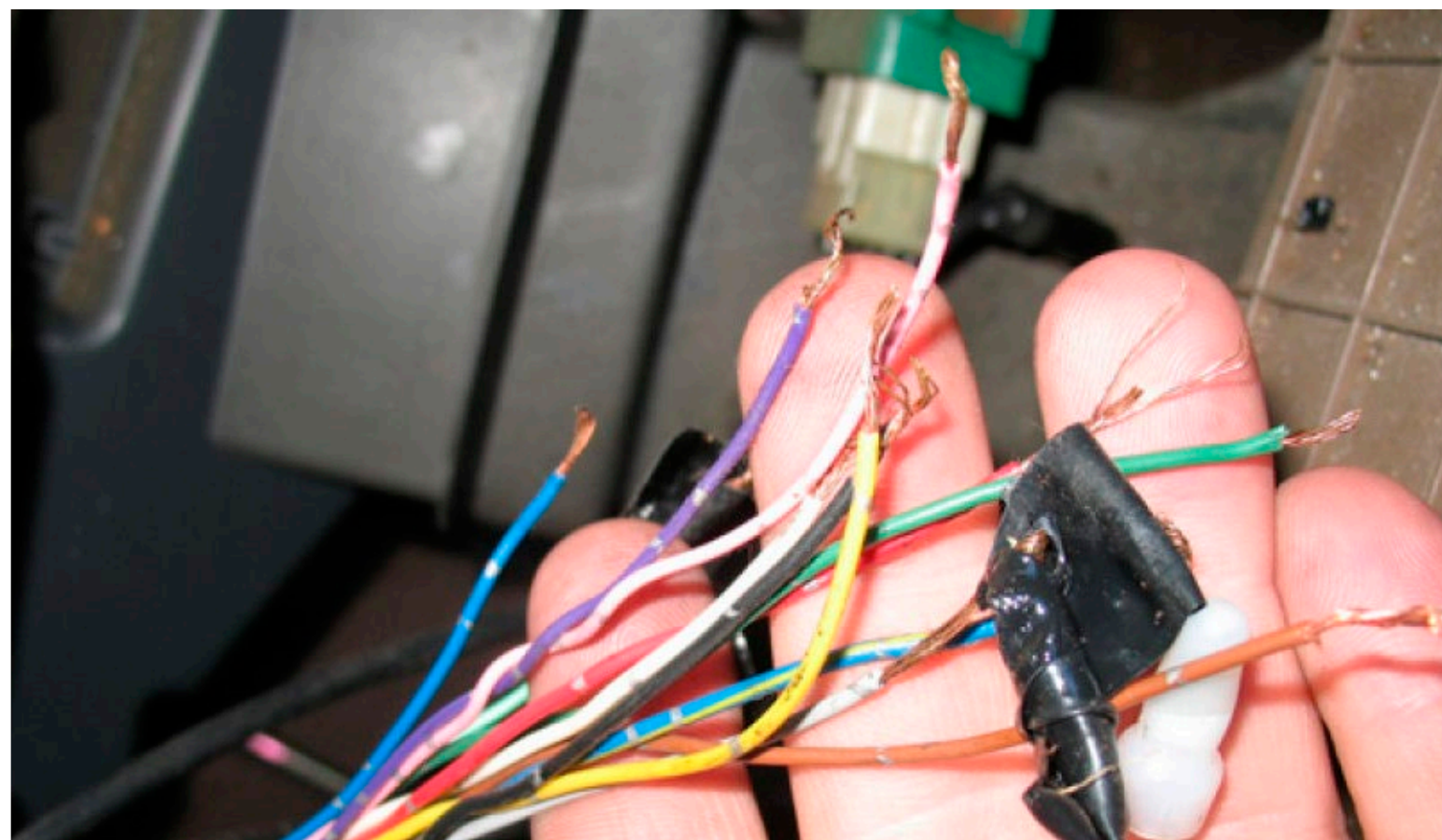
### Earths:

The negative post of the battery you are using is THE most important part of the 12-volt circuit. Underestimate



Vince will be back next issue we said... but he ditched us for Vegas and the SEMA show. You better buy us something mate!

this at your peril. Current flows from negative to positive and a battery's ability to produce current is directly proportional to how well the current passes through its connecting cables. The earth cable to your battery needs to be sized according to how you plan to use the battery. If you are planning to start your vehicle off the battery, you would need it to be able to produce a couple of hundred amps, so the cable chosen needs to be able to support that draw. And for the sake of a few extra dollars and a small amount of time, run twin-







core wire to your accessories so that you can earth them back to the battery or fuse block. Running an earth from the device to a nearby rusty bolt or tub fixing is less than ideal. Tubs are often rubber mounted, and the fixing points can be made of composite materials. Rusty bolts are just rusty bolts and not suitable earth points.

### Fuses and fuse sizes:

Yes, you must use fuses, and you must use the right

size of fuse. As with wire size, you need to know what current your accessories will draw and select fuses to suit. I've seen as many underrated fuses as I have overrated fuses, and while an underrated fuse will cause you plenty of frustration, an overrated fuse can start a fire. When designing your 12-volt system choose fuses that are rated to handle the expected current flow and make allowances for current spikes that can occur when some devices are powered-up.

### To crimp or to solder:

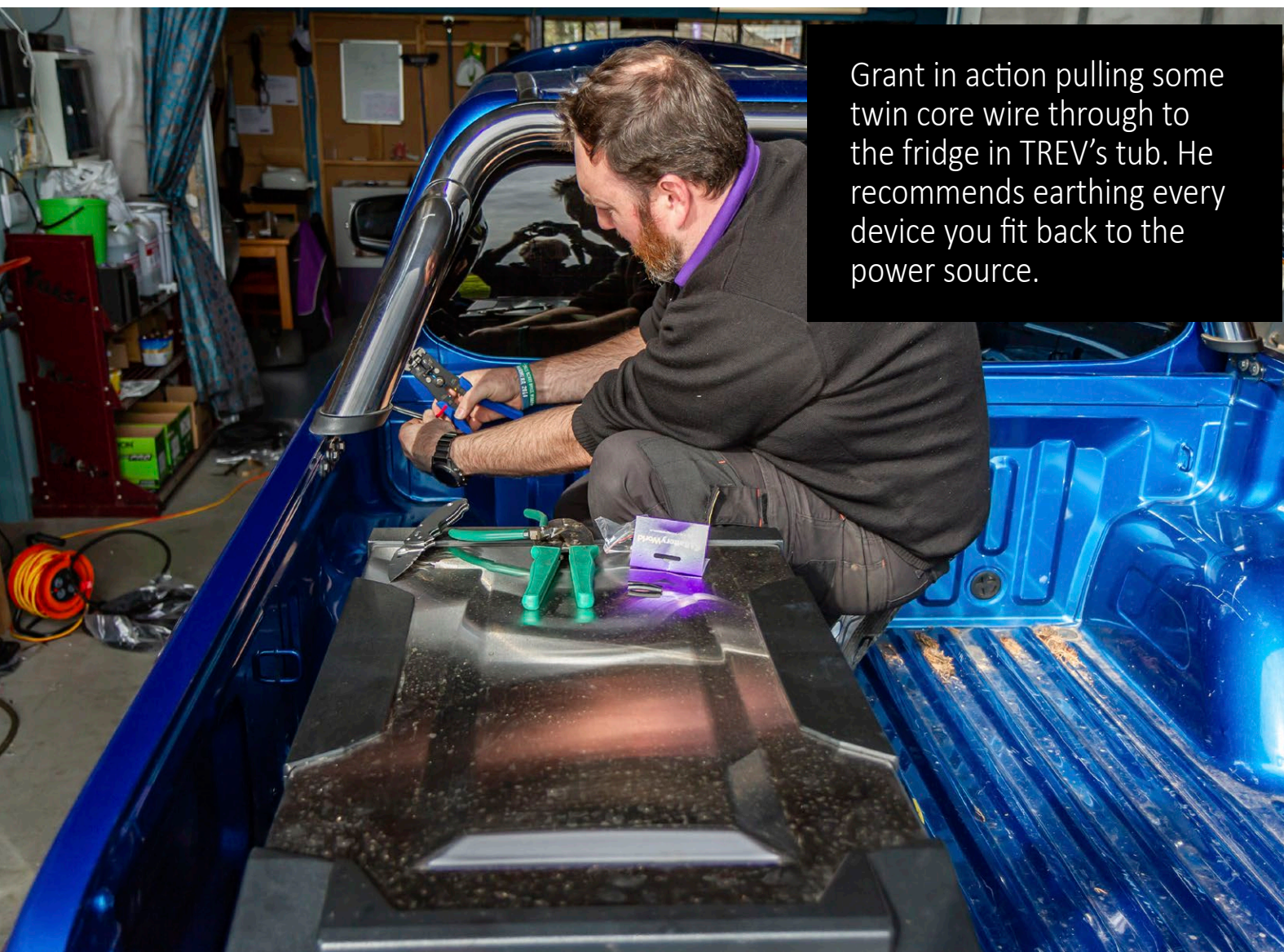
It's one of those debates that is destined to run forever. Either method is infinitely better than twisting wires together and taping over the dodgy join. DIY is all about doing it yourself, so take pride in what you are creating and do it right the first time. Crimping is fine, provided you have a quality crimper. If you don't, then soldering the joins is more difficult but just as effective. If you don't have a decent crimper (they aren't cheap) and don't want to deal with hot solder, then get your local Battery World store on the job. Loose and poorly connected wires can cause equipment failure and start fires, so getting this aspect of the job right is imperative.

### Batteries:

The biggest misconception is that a sealed battery must be a GEL battery type. Most sealed batteries are AGM (Absorbed Glass Mat). GEL batteries are mainly used in applications where a long constant low current draw is required; an example would be mobility scooters. So, if you're looking for a sealed auxiliary battery, the chances are that you'll end up buying an AGM battery type unless you plan to mount it under the bonnet. AGM batteries are not temperature rated, and I've seen them blow out their sides when mounted in a high-temp environment. Wet or maintenance free batteries are best for under bonnet installations, and sealed AGM is best for in-cabin and some tub installations. Never locate a wet battery inside a vehicle, doing so can be illegal and dangerous, as they vent hydrogen gas and can explode.

### Battery size:

Choose the wrong size battery, and you'll find that your fridge (as an example) won't run as long as you were expecting. If you can't find your fridge's specs, use 40Ah in a 24hr period as a rough rule of thumb. If you plan on base camping for two days, that'll mean you require 80Ah to run your fridge and need a battery that can provide that without dropping down below 50 percent of its charge. Your local Battery World batteryologist will be able to point you in the right direction from there.



Grant in action pulling some twin core wire through to the fridge in TREV's tub. He recommends earthing every device you fit back to the power source.





Grant's dual battery installation in TREV completed. It's super tidy and the Redarc charger is mounted on a bracket, not cable tied in place. Note circuit breaker (fuse) sitting on top of the auxiliary battery. This protects the wire run to the fridge in the tub.

### Two-way radios:

This one is close to home for me as I majored in RF Electronics and worked for the government in their Radio fit-outs. Nowadays, 5-watt UHF radios are the norm. They don't draw much current, but the same rules apply when fitting them. You want to use some quality, correctly sized wire to prevent voltage drop and ensure a correctly sized fuse is fitted in the power cable as

close to the power source as is possible. The aerial type and placement are critical if you want your UHF to perform well. A quality medium gain antenna is a good all-rounder option, while a longer high gain antenna is better for highway usage. Make sure the antenna is mounted away from any metal objects as this will, in simple terms, reflect the transmitting signal and degrade your UHF's range. Here's a hot

tip; don't coil leftover antenna cable, this acts as a ferrite coil and plays havoc with signal reception.

### Cable ties:

They're the best invention ever, but it's important to know when not to use them. Equipment that needs to have a good earth shouldn't be cable tied. I've seen an inverter cable tied under a seat once, with the earth screw not providing the additional ground to allow the internal RCD to operate correctly. Inverters push out 240-volts, so you want to mount them correctly to avoid what could be a serious electrical incident. Any accessory located under the bonnet should be mounted correctly. I recently had a vehicle in the workshop with a bracket that was cable tied in position. It had come loose, causing the dual battery isolator to short, resulting in (we believe) the failure of the vehicle's smart alternator. Cable ties can wear through steel fuel, brake and oil lines, so take care when using these lines as anchor points.

### Good advice:

The only problem with good advice is not taking it. You may be lucky enough to get good advice from your mate or neighbour, but if not, you'll find it for free at your local Battery World store. We're all ears when it comes to 12-volt matters.

If you're planning to fit some 12-volt gear to your 4X4 but aren't sure what you need to do the job right, drop into one of our many stores around the country or give us a call on 13 17 60. 📞

Grant Cameron is a 12-volt guru who manages a handful of Battery World stores in Adelaide for our mate Vince. He majored in RF Electronics and has years of 12-volt installation experience.

