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BIGGER IS BETTER

Why you might need larger electrical cable than you might first expect

Ever wonder why the caravan's battery never seems to get charged up while you're driving between campsites? It could be because of the wiring between the tow vehicle and the caravan is not up to the task. In this article we revisit some basic electrical theory to explain what's required.

The first thing to realise is that all cables exhibit electrical resistance. This resistance causes heat to be generated in the cable in direct proportion to the current in the cable. Double the current and you double the heat. If the cable gets too hot its insulation may break down, the cable might melt and it could start a fire. Current rating for cables are based on them not exceeding the critical insulation temperature in a specified environment.

Electrical resistance also causes voltage drop. This means that the voltage at the consuming device is always less than the voltage at the supply. Voltage drop is also directly proportional to current; double the current and you double the voltage drop. If the voltage drop is too great the consuming device may not operate correctly.

With this in mind, let's examine what cable size is needed to charge the caravan's house battery from the tow vehicle's alternator while in transit.

Firstly, a lead acid battery needs more than 12V at its terminals in order to be recharged. Let's assume it needs at least 13.8V and that the alternator is putting out 14.2V. That means that we can only tolerate a voltage drop of 14.2V – 13.8V = 0.4V. Remember that this voltage drop consists of the voltage drop in the positive supply to the van battery plus the voltage drop in the negative return from the van battery. Let's also assume that the battery will accept up to 20A at this voltage and that the cable distance between the battery and the fridge is 16m (that's 8m each for the supply and return leads).

Using Ohm's Law we can calculate the maximum allowable cable resistance (ignoring losses in electrical connectors) as being 0.4V ÷ 20A = 0.02Ω. If we assume that this resistance is equally shared between the two cables this implies the cable resistivity must not be greater than 0.02Ω ÷ 16m = 0.00125Ω/m. That's a very low number and requires a large cable of around 6AWG or 13mm2 in cross sectional area. Note that this size cable has an amperage rating of 65A using 75°C insulation. If we had used 20A rated cable (14AWG/2mm2, 0.0083Ω/m) instead, the current going into the battery would have dropped to a measly 3A.

This is why people in the know use a low contact resistance Anderson plug and heavy gauge cable to charge the van's battery. The voltage drop across an ordinary 7-pin or 12-pin trailer connector is simply too much and anyway it's impossible to terminate sufficiently large diameter cables in them. ■

What cable size and connectors do you use to charge the van battery while on the move? Please write to me at **tech@candm.com.au** to share your story.

"DOUBLE THE CURRENT AND YOU DOUBLE THE VOLTAGE DROP"

Using the right equipment make for worry free travelling

An Anderson plug (right) with heavy gauge cable is required for direct charging of the van's battery from the tug