

Solar Wombat 2023

Important

The *Solar Wombat* electronics circuit does not represent the only way, or even the best way, to design the electrical system of a solar car. The *Solar Wombat* design is far from optimum. For example, powering the 12V dc/dc converter from only one of the battery packs will result in cell imbalance. The circuit diagram is provided only to show teams the level of detail expected in the circuit block diagram they must provide as part of the compulsory documentation.

It is also important to note that even if a car were to be built according to this circuit, it still might not pass static scrutineering. For example, if the 12V dc bus did not decay rapidly after power is removed, it might be possible to exit Safe State by quickly closing the e-loop switches again—in violation of Regulations 2.29.3 and 2.29.5.

What the circuit diagram shows

Regulation 1.29 states that one of the items required for Group D documentation is “A simplified wiring diagram, printed on A4 paper, showing how the main functional blocks (PV array, energy storage packs, electronics modules, etc.) are connected, together with circuit breakers, contactors, and fuses.” This diagram assists the electronics scrutineering team to understand how the car works, and to trace the physical connectivity of major components.

From the supplied circuit diagram, the *Solar Wombat* can be seen to comply with Regulations 2.5.7, 2.28.10 (assuming a satisfactory data sheet is supplied for the fuses), 2.29.1 and 2.29.3.

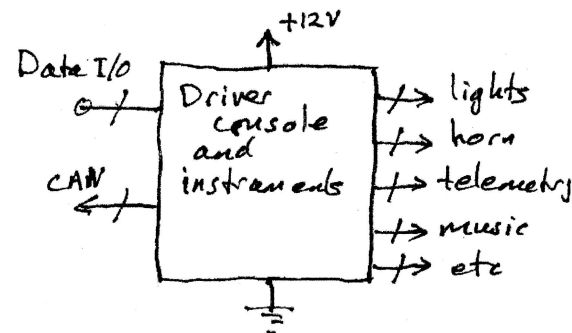
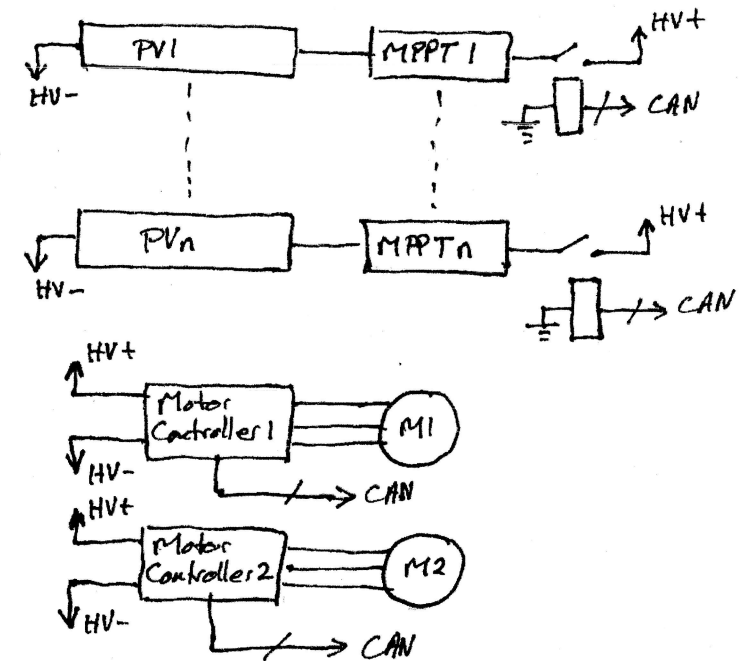
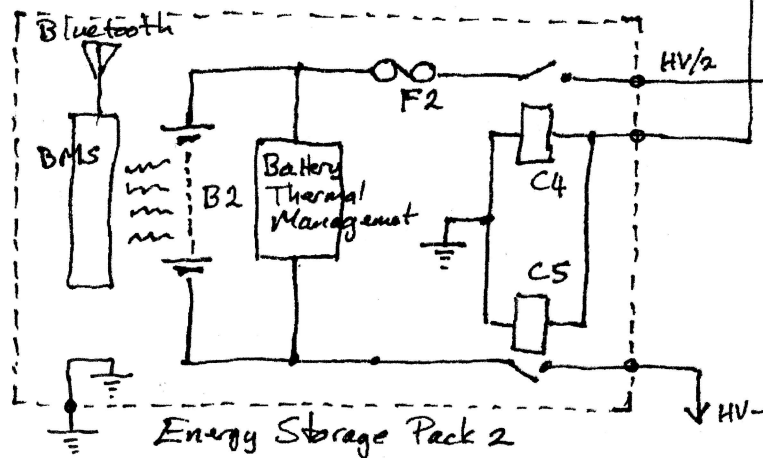
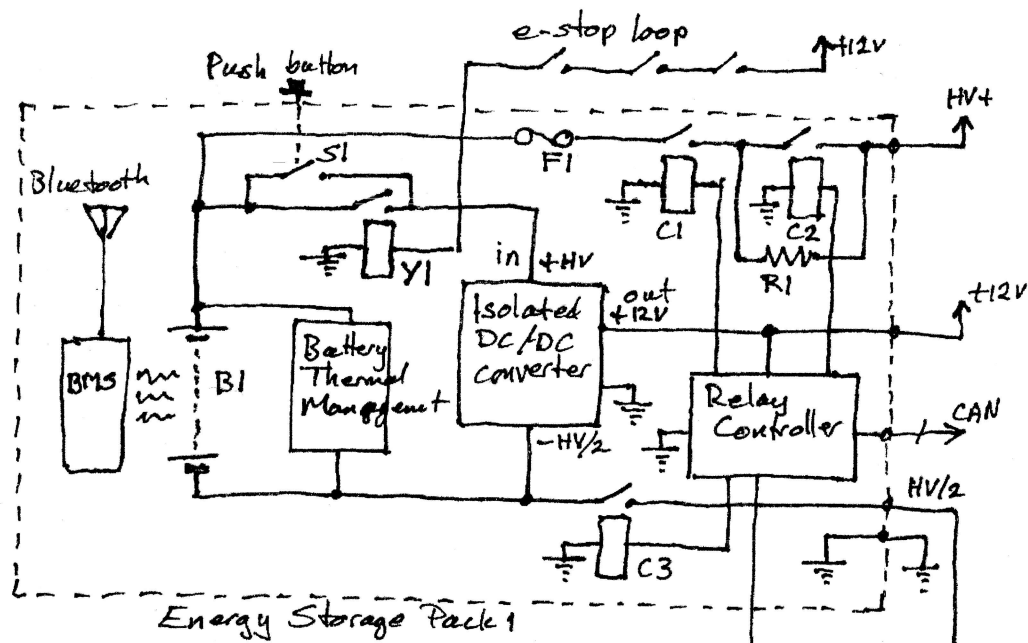
Safe State description

In Safe State, relay Y1 is open and there is no power to the 12V dc/dc converter. With no 12V power, all contactors are open and so both energy storage packs and all the PV arrays are isolated. The only systems still energised are the two battery thermal management systems, which are entirely internal to the energy storage packs, and the BMS, whose only connection to the outside world is via Bluetooth.

To bring the system out of Safe State, a mechanism on the outside of Pack 1 closes the momentary-on switch S1, mounted inside the energy storage pack. Provided all switches in the e-stop loop are closed, this powers up the 12V dc/dc converter, closing relay Y1. Communication with the relay controller via CANbus then allows the operator to progressively power up the other vehicle systems.

Pressing any of the series connected, normally-closed switches in the e-stop loop opens contactor C1, removing power from the 12V dc/dc converter and thus immediately opening all the other contactors. This also prevents relay Y1 from closing again until switch S1 is pressed.

Solar Wombat



Note:

F1 and F2 are 100amp, 25kA dc. breaking capacity.

J. Storey July 2020