

Battery Cables

2/0 Cables: We used 2/0 welding cable (multi-strand) because of its flexibility. Good crimped connector ends on cables are critical; bad (loose or low contact or corroded) connections can heat up and limit current flow or become open circuits. It is important to size and orient cables so that they do not stress the terminals that they connect to. Stresses can break terminals and/or their seals to batteries or to the Motor Controller. Broken seals allow humidity inside leading to corrosion, or allow battery chemicals to escape. The 2/0 cables required to handle 500A current draws are usually thick and stiff but the welding cable is flexible.

To help build stress-free cables, Ampmobiles had several different connector shapes: straight, 90° bent vertically, 90° bent to the right, 90° bent to the left, and 45° bent vertically. We mostly used straight connectors, but others worked better between some battery boxes or under the hood. 45° connectors were good on the motor. Mike Moore had figured out the cabling pattern starting from the Control Board, through all batteries in each battery box, and back to the Control Board.

We measured individual cable lengths between sets of terminals. We placed connectors on each set of terminals, oriented them, and measured between their inner crimp areas. Each cable needs a little extra length so it can flex (and not pull on its terminals) but not too much extra length (to twist against terminals or waste cable); you could see a slight bow in each cable.

Cutting the cable requires a heavy-duty tool that looks like a gardener's branch pruning shears. Although it has long handles, it takes some effort to cut through 2/0 cable (it's about 1/2" thick). You can brace one handle with your foot on the floor, and use your body weight to press down the other handle to cut. Use a knife to remove enough insulation so the exposed wire will fit completely inside the crimp area of the connector. The wire should butt completely against the inside of the connector, and about 1/8" of bare wire should extend past the end of the connector. You don't want to crimp down upon any insulation. However, before crimping, slide a piece of heat shrink insulation onto the cable so it can be placed into position after the connector is crimped.

Crimping also requires a heavy-duty tool that looks similar to the cutter, but has a hexagonally shaped inner jaw. You position the jaw over the connector and squeeze, leaving a pattern of flat surfaces around the connector. Do this twice – once near each end of the connector's crimp area, and rotate the connector slightly between crimps so that the flats do not directly align. This helps maximize contact area. You should not be able to pull the connector off of the cable when you're done. Last, slide the heat shrink tubing over the connector so that all of the crimp area and at least 1/4" of the cable insulation is covered, to keep water out. Shrink with a heat gun. We used red heat shrink on positive lead terminals and black heat shrink on negative lead terminals.

Our batteries had bolt-through terminals for connectors. We covered connections with rubber boots; red on positive and black on negative. The boots were made to slip over

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the cable (before crimping) but they were a little too snug so we slit them to fit over the assembled cable and tied them on with plastic wire ties.

In two places between battery boxes (approximately 1/3 and 2/3 along the battery chain) we installed fuse holders in the cabling. They will hold 500A power fuses to protect against short circuits back in the truck chassis.

Cables that run under the truck or over the rear axle are placed inside plastic tubing. The tubing protects the cables from road debris and from rubbing on the body or chassis. The tubing was large enough to slide over the cables after their connectors were crimped. After installation, find low spots (where the cable hangs down) and carefully drill small holes to let accumulated water out.

We also made traction battery power cable connections to the Motor Controller and contactors on the Control Board, and on the motor. Please refer to the electrical diagram. Again, it was important to build cables that do not stress any connection points.

We crimped Anderson connector halves to the ends of the battery string for quick connect / disconnect. Halves? Anderson connectors come with two sets of contacts side-by-side, but our Control Board was set up with about two feet between the places for each battery string connection. Anticipating this, Ampmobiles had already sawed the Anderson connectors in half to separate each set of contacts. Now we have two quick connect / disconnect points.