

Class Day 3

Today we will make the truck able to move under its own power. We'll need to:

- Finish wiring the Control Board,
- Mount the throttle control (Pot Box),
- Mount the DC / DC Converter,
- Mount the Battery Charger,
- Mount the heater,
- Reinstall the instrument panel, and
- Wire all of the 12 Vdc accessories.

The goal is to be able to test-drive the vehicle.

Control Board Wiring: Please refer to the electrical schematic. We finished the Traction Battery Pack cable connections on the Control Board and made connections to the motor. We cabled the Primary and Secondary Contactors and the Main Battery Fuse. We used two contactors so if one should fail closed we can still control the vehicle by opening the other contactor. This avoids a “hung throttle” – full traction battery pack power applied to the Motor, and a runaway truck.

Pot Box: We found a place on the left front inner fender where we could mount the Pot Box and connect the truck's original throttle cable to it, without kinking the cable. We added a return spring to the lever. We tested the throttle pedal to prove that the Pot Box fully opened and closed (including activating its microswitch), repeatedly without binding. The microswitch activates the second (+side) contactor and tells the Motor Controller to cut power to the Motor when the throttle pedal is not being pressed.

DC / DC Converter: The Converter replaces the truck's alternator, to charge the 12 Vdc battery and power 12 Vdc accessories. The 12 Vdc battery is mounted in its original place. The Converter changes the 120 Vdc traction battery pack voltage to about 13 Vdc, similar to the output of an alternator.

We mounted the Converter on the right inner fender, under the hood. It is wired (using 12 AWG wire and crimped connectors) to a standard 12 Vdc automotive relay and its own fuse on the new 12 Vdc fuse block. The Converter is wired to turn on and off with the truck's original ignition switch. This points out why it's important to label wires as you disconnect the gasoline engine, and why you don't want to cut any original wiring until everything is hooked up and working. Several original and added 12 Vdc systems need constant or switched power, controlled by the ignition switch or other cockpit switches. We had to test several original wires under the hood to find the power sources we needed.

Battery Charger: The Nissan King Cab has room to mount the Charger in place of the jump seat behind the driver's seat, mounted to the floorboards. We could poke output

wires through an existing grommet in the firewall to connect it to the traction battery pack. For now, we coiled its input extension cable behind the driver's seat.

Instrument Panel: We connected the meters' lights to the existing instrument panel lights by sandwiching their wires under another lamp's socket. We did this by unscrewing that lamp and socket from the printed circuit board, lining up wires with circuit traces, then squashing them into place by reinstalling the lamp and socket. It took several tries to get it to hold. Other vehicles may have exposed lamp socket terminals that you can wrap the wires to and maybe even solder to. Don't try to solder to the printed circuit – it will probably burn through. We found an existing grommet in the firewall where we could pass the meter wires through to the Control Board. The Voltmeter is wired across the Traction Battery Pack, via a 2A fuse. The Ammeter is wired across the Shunt, also with a 2A fuse.

Now the truck is drivable. While it was still up on jack stands (wheels off the ground), we connected the traction battery pack quick connect connectors and turned on the ignition. We could hear fans running and the pump start pumping, and no smoke! We gently tested the accelerator pedal, and the rear wheels moved without odd or grinding noises! We could test drive the truck. In fact, everybody got a short test drive.

Driving Experience: To shift, you let off of the throttle pedal and change gears. The transmission's synchronizers quickly mesh when the motor cuts off (the electric motor doesn't idle) and there is no grinding. Although there is no power steering pump, the steering does not take a lot of effort. The power brakes feel very much like the original power brakes, except that you hear the pump turning on and off. We're advised not to pump the brakes because the pump may not be able to keep up, and to pay more attention to stopping distances and reactions since the truck is heavier. The truck may be a little more lumbering through the turns and rides more "truck-like" than before, but it felt quite easy to drive and get used to. Of course, it is quiet except for a little Controller whine as you start out. Terry expects to get about 20-30 miles of range at speeds up to 45 m.p.h. until his batteries get broken in; then the range should approach 50-60 miles. Safe battery discharge depends upon the batteries you install; these twenty advanced AGM batteries charge up to about 135 Vdc and are okay to discharge about 10% (down to 122 Vdc). Note that we only use a small portion of the Voltmeter's scale, so we must pay attention. Typical driving consumes about 100A to 200A, but Terry will have to work with the truck to get used to its power consumption habits.