Electric Vehicle Optimization

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Aim: To increase the current range and operable conditions of an electric vehicle by utilizing a secondary power source in efforts to apply this to semi-trucks.

Background

In harsh weather conditions semi-truck drivers who sleep in their cabin often must leave the engine so as not to drain the truck battery powering heating and A/C. As such Cummins would like to sell a battery-engine package that would activate or deactivate the engine as needed. Cummins provided us with a generator and an electric golf cart to model this system.

Objectives

- Ensure operation at -29°C.
- Incorporate a generator.
- Integrate a battery monitoring system.
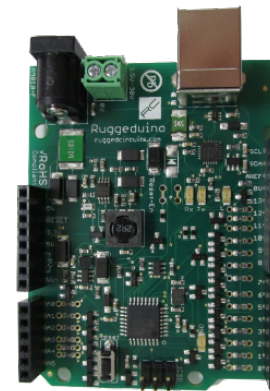- Ensure the vehicle can charge while running.
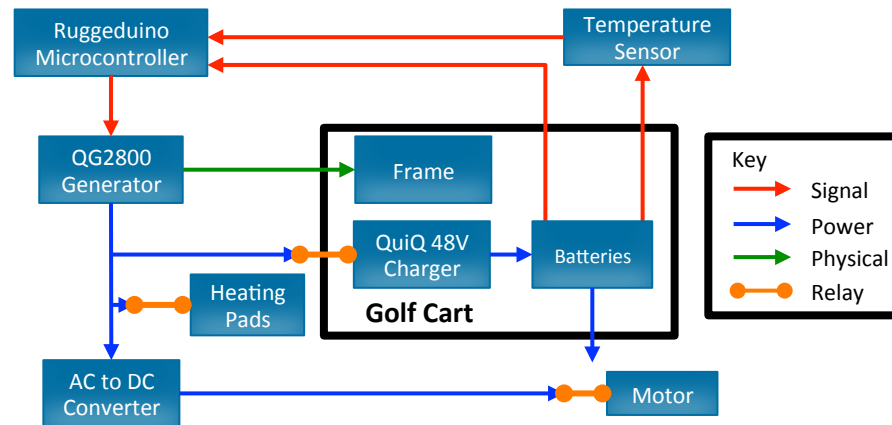
Simplified system diagram of design

Mechatronic System

- Battery charge monitored with voltage divider.
- System powered by the generator's 12V battery.
- NPN Transistors used to switch relays.

Major Components

- Ruggeduino-ET Microcontroller
- TMP36 Temperature Sensor
- RSP-1500 48V power supplies

Ruggeduino-ET

TMP36

General Design Features

- Microcontrolled relays regulate power distribution.
- Generator starts when the batteries need charging.
- Power supplies convert AC output of generator into DC to power the cart's motor.
- Heating pads keep the cart batteries at their optimal temperature.

RSP-1500 Power Supply

Future Plans

- Better determine battery voltage and temperature relationship.
- Wire system into the cart.