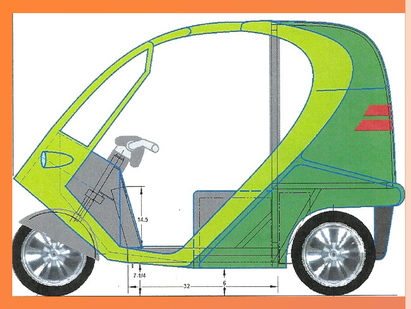
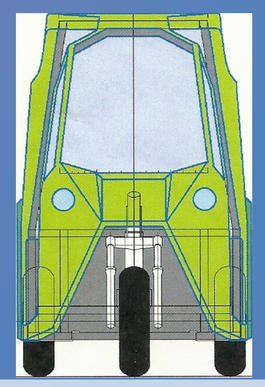


Paragon Pack-Rabbit Electric Systems

Group members: Lawrence Woody, Chris Larson, Nick Marquardt, Andy Goiffon, Kevin Flynn

Adviser: Timothy Bigelow

Client: PARAGON we manufacture fun



Scope of Project

For this project we were to work with Mechanical engineers and a Design team to design an Electric utility vehicle with a top speed of 25 MPH capable of transporting a driver and cargo or a driver and passenger (approx. 600 lbs) and incorporate user friendly features to add to customer appeal. These features included a Solar Panel, Audio System with Bluetooth for hands free calling, and a LCD User Interface. The car will also have a lighting system so that it will be street legal.

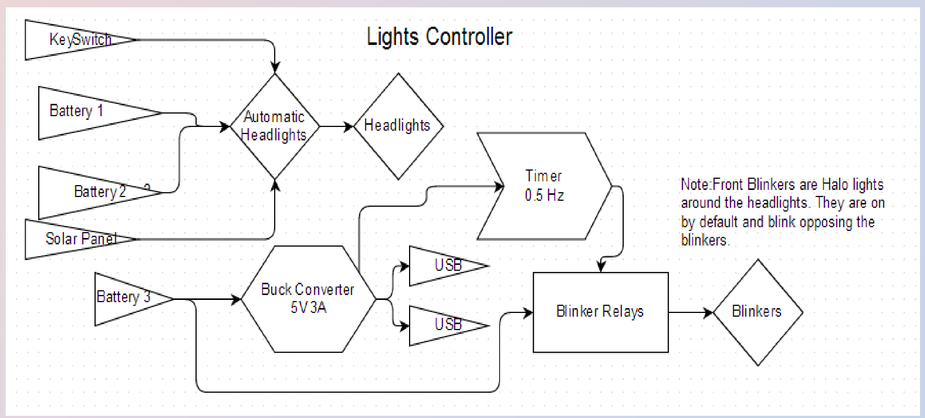
Lighting System

Description

- The headlights, brake lights, and blinkers on this vehicle are all LEDs.
- Controller utilizing relays was made that has the added capacity of an automatic headlight logic circuit directly linked to the solar panel.
- A 555 Timer is used to create a 1/2 Hz blinker frequency.
- The board also creates a 5 volt bus able to be used for auxiliary systems and USB charging, which are incorporated in the design.

Testing

- Due to the complexity and high power requirements of this system, testing was done after being installed.



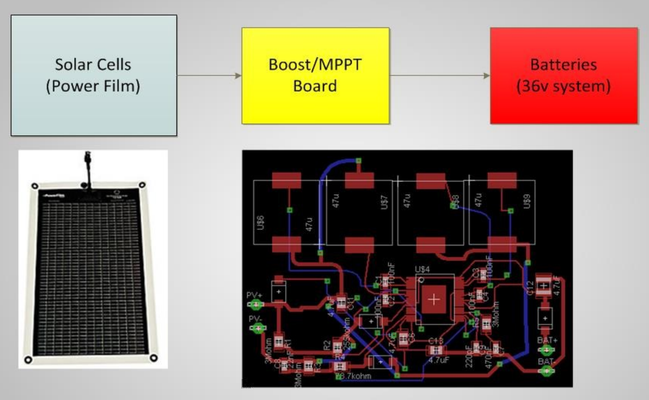
Motor and Batteries

- Description
- 3.3 hp shunt wound separately excited dc brushed motor
- Curtis 1266 SepEx Programmable Motor Controller
- 3 series connected Trojan 12 V 225 Ah Flooded Lead Acid batteries
- Hall effect hand actuated throttle
- 2 operating modes: Hi/Low with a max current of 150/100 A and a max speed of 25/15 mph respectively
- Capable of regenerative braking

Testing

- Our testing for the motor is done via the Curtis Controller. It contains a data logger which was used to estimate the minimum usable runtime. This also allows us to make decisions about the controller's programming on the fly in order to alleviate any concerns.

Solar Panel



Description

- PowerFilm solar panel to supplement batteries during the day.
- The solar panel is a 15.4 V output at maximum sunlight with the estimated output is 30 watts
- SPV1020 DC to DC boost converter that has overvoltage, current and temperature protection
- MPPT for maximum power conversion from solar panels to batteries
- It has power capabilities of 320W at 40V output

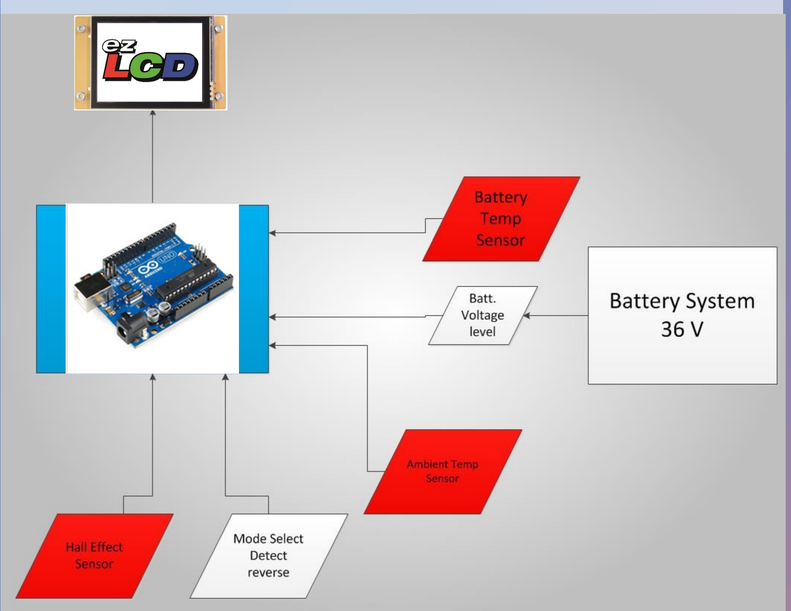
Testing SPV1020

- Hook it up to a voltage source at 15.4V with 2 amps
- Measure voltage and current output

Testing solar panel

- Put it in the sun
- Measure avg. voltage and current output

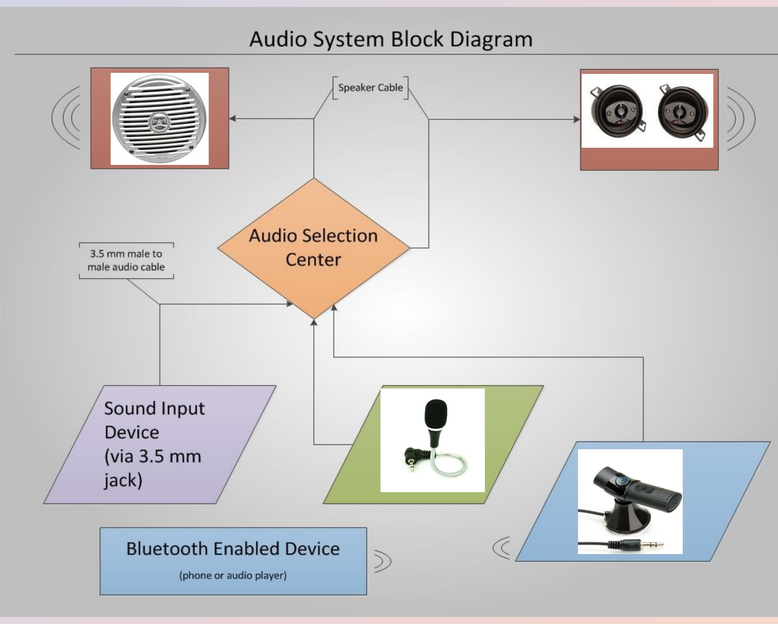
User interface



Description

- LCD screen to display speed, battery life, and ambient and battery temperatures.
- Temp sensors output linear voltage signals
- Voltage divider will be used to monitor battery level
- Hall effect sensor outputs 5V amplitude varying frequency signal.
- Detect reverse will automatically display the distance to objects behind the vehicle.
- PCB boards were designed to supply power to the Arduino and LCD and to act as an interface between them and the separate components
- Testing was done during the assembly process to save time and to simplify debugging the program.

Audio System



Description

- Interfaces Bluetooth adapter and internal speakers for hands-free calling and music streaming
- Interfaces sound input device via 3.5 mm input jack to either/both sets of speakers
- Interfaces cart microphone with external speaker
- Internal and external speakers operate independently
- Operates both internal and external speakers simultaneously

Testing individual components

- Logic circuitry
- Audio amplifiers
- Switches