# Purdue Solar Racing Apollo Electrical Susystems

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## Contents

# 1 Battery Protection Controller

Main Function: Protect batteries and relay information fo the telemetry and driver display boards.

## 1.1 Board I/O

**Inputs:**

CAN:

- Init Startup

Hardware:

- Battery terminals
- Thermal sensor
- Voltage Sensor
- Aux Voltage

**Outputs:**

CAN:

- Board Ready
- Battery Themperature
- Battery Capacity

Hardware:

- Protected battery output

## 1.2 Processor Ports

(a.) power/ground

(b.) CAN I/O network ports

(c.) # of thermistors

(d.) # Voltage info from IC

(e.) CAN status

# 2 Driver Display

Main Function: Display all necessary info to the driver.

## 2.1 Board I/O

**Inputs:**

CAN:

- Init Startup
- All car signals

Hardware:

- Aux Voltage

**Outputs:**

CAN:

- Board Ready

Hardware:

- LCD Display, if not actually integrated into the board
- Aux enable/kill?

## 2.2 Processor Ports

(a.) power/ground

(b.) CAN I/O network ports

(c.) SPI output for display

(d.) Logical out for another type display

(e.) Multiplex line out for display

# 3 Light Controller

Main Function: Take CAN messages input from driver controller to turn on lights

## 3.1 Board I/O

**Inputs:**

CAN:

- Init Startup
- Turn Signals (2)
- Headlights
- Horn
- Windshield Wiper

Hardware:

- Aux Voltage

**Outputs:**

CAN:

- Board Ready
- Current Light Settings

Hardware:

- Hardware inputs
- Power to lights, horn, and windshield wiper
- Control signal to windshield wiper

## 3.2 Processor Ports

(a.) power/ground

(b.) CAN I/O network ports

(c.) Switch to determine if it is a rear of front controller

(d.) # PWM output for light controls

# 4 Junction (saftey) Controller

Main Function: Buck down the voltage for the low power system and safely turn on all the subsytems.

## 4.1 Board I/O

**Inputs:**

CAN:

- Init Startup
- Soft Start System

Hardware:

- Protected battery voltage
- Aux Voltage

**Outputs:**

CAN:

- Board Ready
- Current subsystems connected

Hardware:

- Bucked down voltage

## 4.2 Processor Ports

(a.) power/ground

# 5 Motor Controller

## 5.1 Board I/O

**Inputs:**

CAN:

- Forward/Reverse
- Cruise Control
- Desired Speed

Hardware:

- Thermistor
- Hall effect sensor
- Aux Voltage

**Outputs:**

CAN:

- Board Ready

Hardware:

- 3 Phase motor outputs

## 5.2 Motor Controller Processor Ports

(a.) power/ground

(b.) CAN I/O network ports for control

(c.) thermistor input from motor

(d.) hall effect input from motor

(e.) 3 PWM output for motor

(f.) desired speed output via SPI

(g.) current measurment output via SPI

(h.) voltage measurment output via SPI

(i.) SPI data output to controller 2

# 6 Solar Array Controller

Main Function: Let the rest of the system what's going on with the solar panel

## 6.1 Board I/O

**Inputs:**

CAN:

- Init Startup
- Mode of operation

Hardware:

- Solar array
- Aux Voltage

**Outputs:**

CAN:

- Board Ready
- Solar array power
- conversion efficiency

Hardware:

- Power out

## 6.2 Processor Ports

(a.) Power/ground

(b.) CAN I/O networ ports

(c.) # Panel Voltage info

# 7 Vehicle Controller

Main Function: Multiplex through all the buttons on the driver wheel to check if any button has been pressed. Once a button has been pressed send proper CAN message.

## 7.1 Board I/O

**Inputs:**

CAN:

- Init Startup

Hardware:

- Aux Voltage
- Muxed buttons

**Outputs:**

CAN:

- Board Ready
- Button Status

Hardware:

- Mux control

## 7.2 Processor Ports

(a.) power/ground

(b.) CAN I/O network ports

(c.) Button logic input

(d.) Button mux select line output

# 8 Wheel Controller

Main Function: Multiplex through all the buttons on the driver wheel to check if any button has been pressed. Once a button has been pressed send proper CAN message.

## 8.1 Board I/O

**Inputs:**

CAN:

- Init Startup

Hardware:

- Aux Voltage
- Muxed buttons

**Outputs:**

CAN:

- Board Ready
- Button Status

Hardware:

- Mux control

## 8.2 Processor Ports

(a.) power/ground

(b.) CAN I/O network ports

(c.) Button logic input

(d.) Button mux select line output