Team #2
Solar Car Project
Senior Design 2011 – 2012

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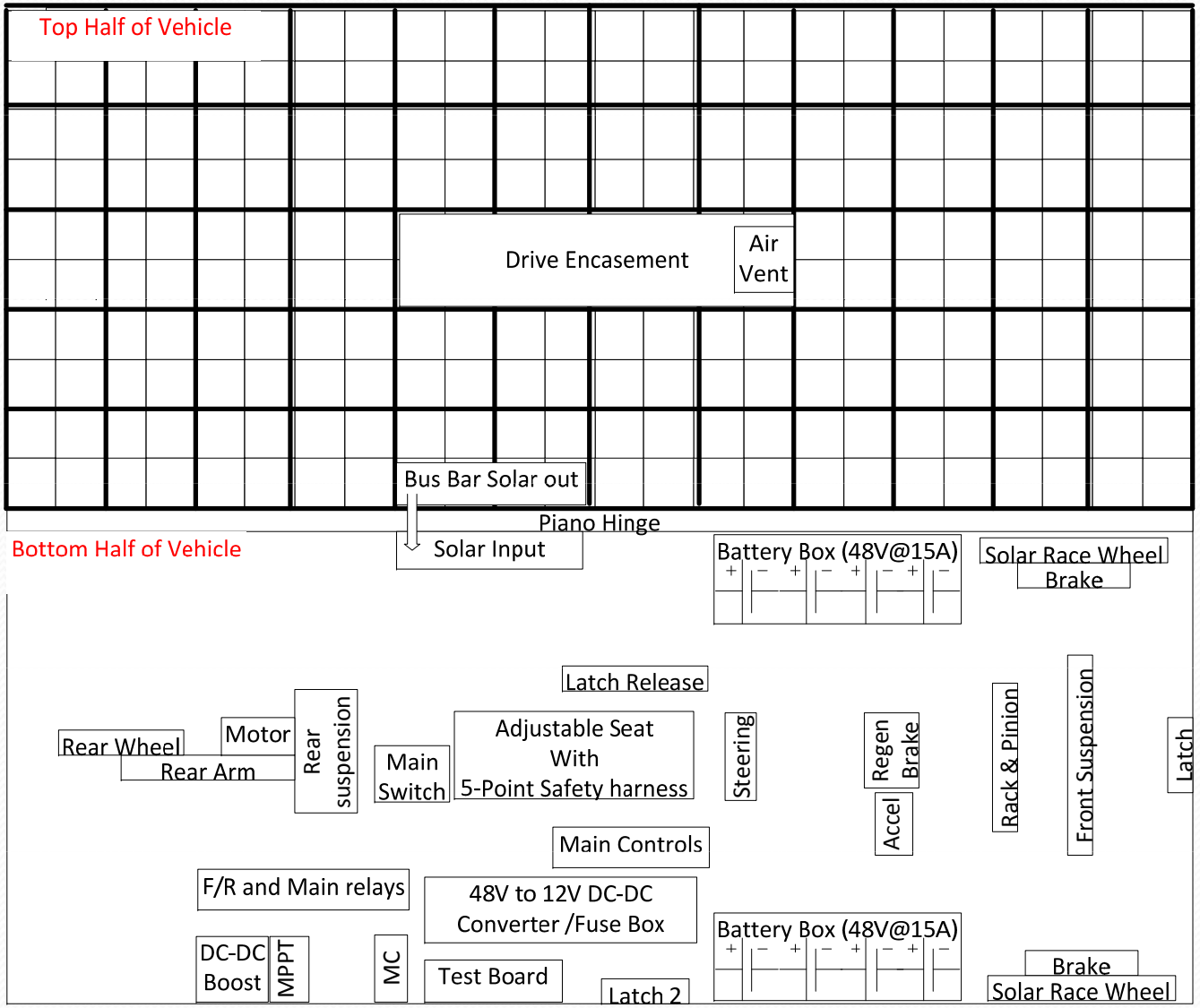
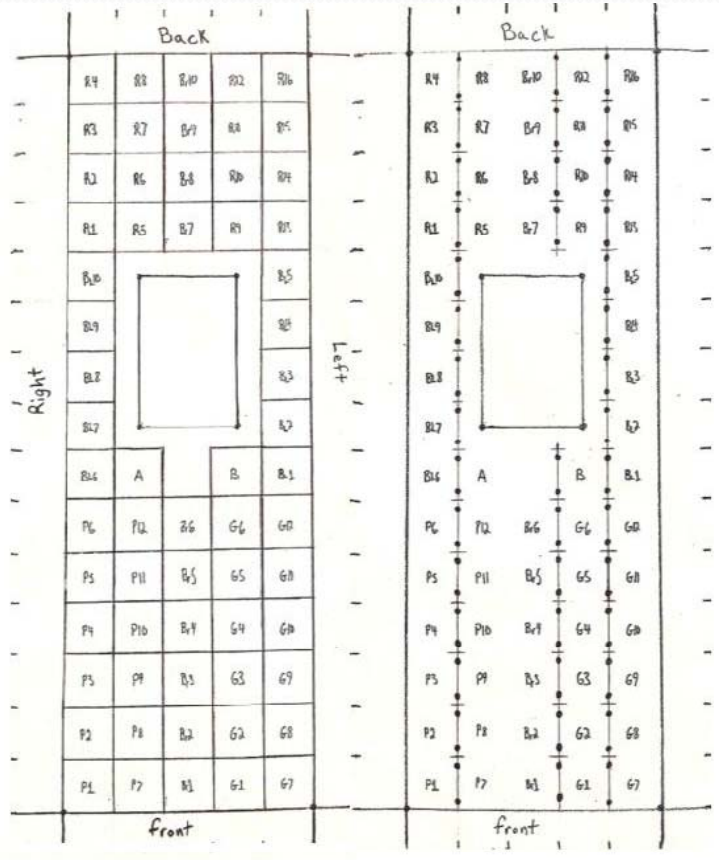
Introduction

- Multi-year, multi-disciplinary team
- Objectives:
- Charge batteries solely on solar energy
- Accommodate new motor → Redesign:
  - Regenerative braking
  - Rear suspension and drive train
  - Motor controller
  - 96V to 48V system
- Latch and hinge top to bottom
- Enclose the driver in a cockpit
- Air circulation within the vehicle

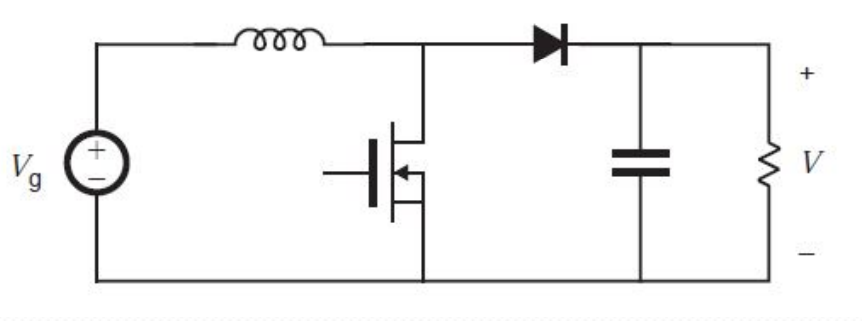
Functional Diagram



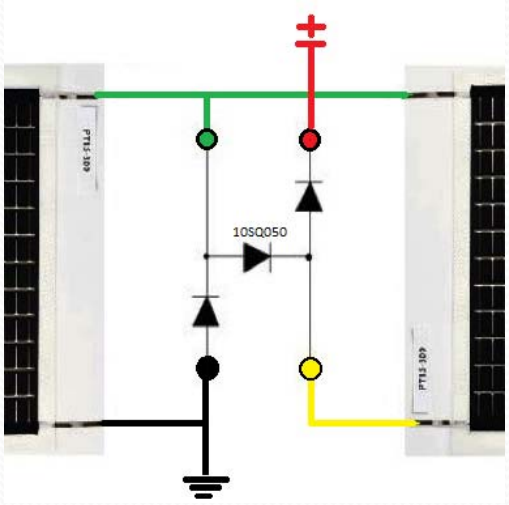
Concepts Description



Solar Array Placement

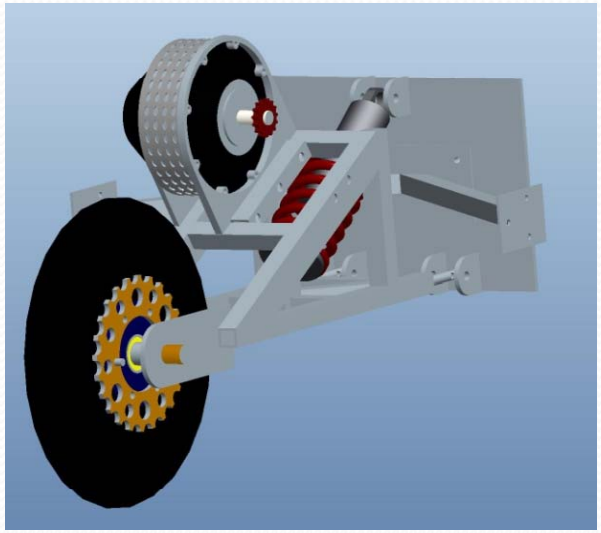


Boost converter



Protection Circuit

Concepts Description

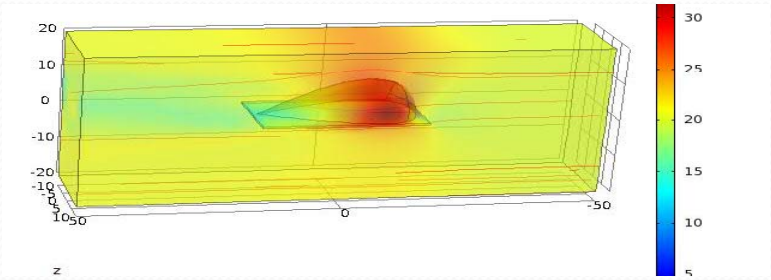


Drivetrain

Hood Scoop Placement

Motor

Motor Controller



Bubble Design

Concept Matrix

Piano/Continuous Hinge			
Criteria	**Weight**	**Score**	**Weighted**
Low Cost (ranks high)	20%	3	0.6
Durability	10%	9	0.9
Ease of Installation	20%	8	1.6
Ease of Operation	30%	9	2.7
Applicability	20%	9	1.8
TOTAL	**100%**		**7.6**

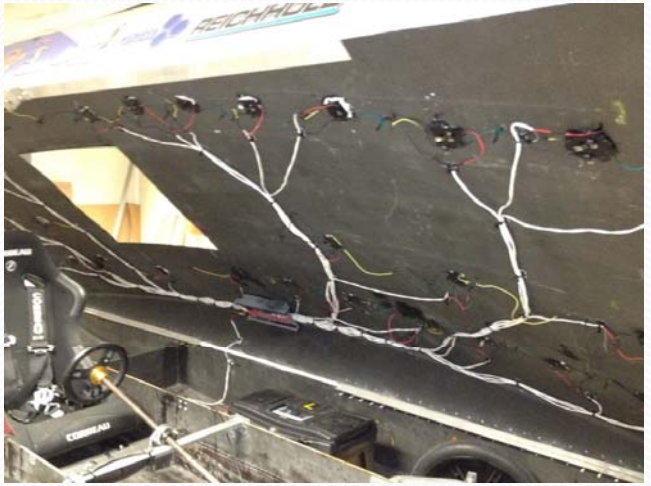
- Example decision matrices
  - Hinge
  - Latch

- Benefits:
  - Cost saving
  - Time saving
  - Meets all requirements
  - Organizational tool

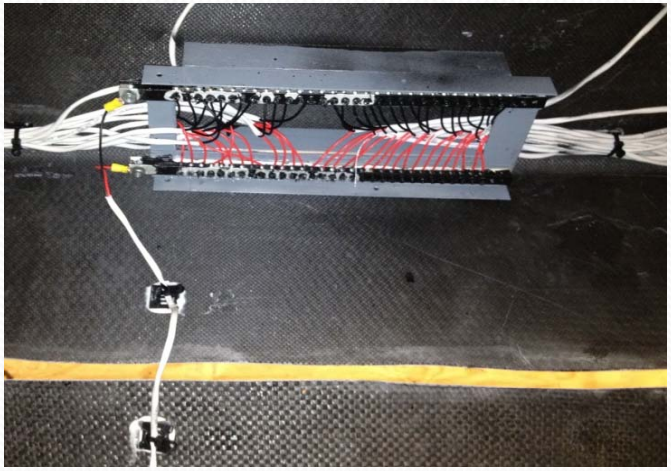
Remote Release Cable Latch			
Criteria	**Weight**	**Score**	**Weighted**
Low Cost (ranks high)	20%	3	0.6
Durability	10%	7	0.7
Ease of Installation	20%	7	1.4
Ease of Operation	30%	10	3
Applicability	20%	10	2
TOTAL	**100%**		**7.7**

Solar Array

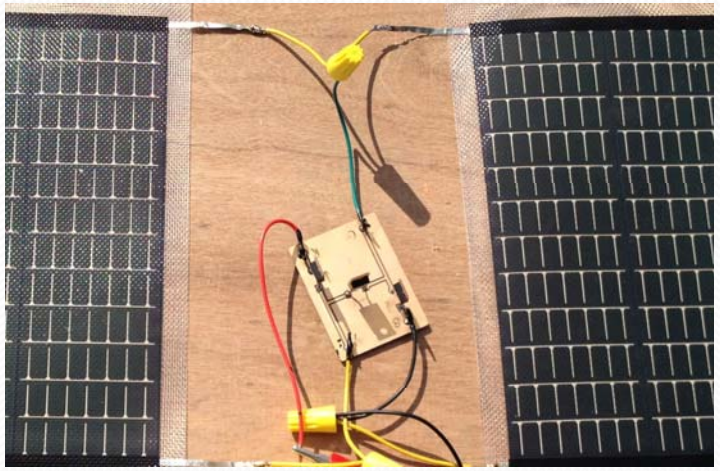
Solar Array Mounted



Solar Panel Wiring

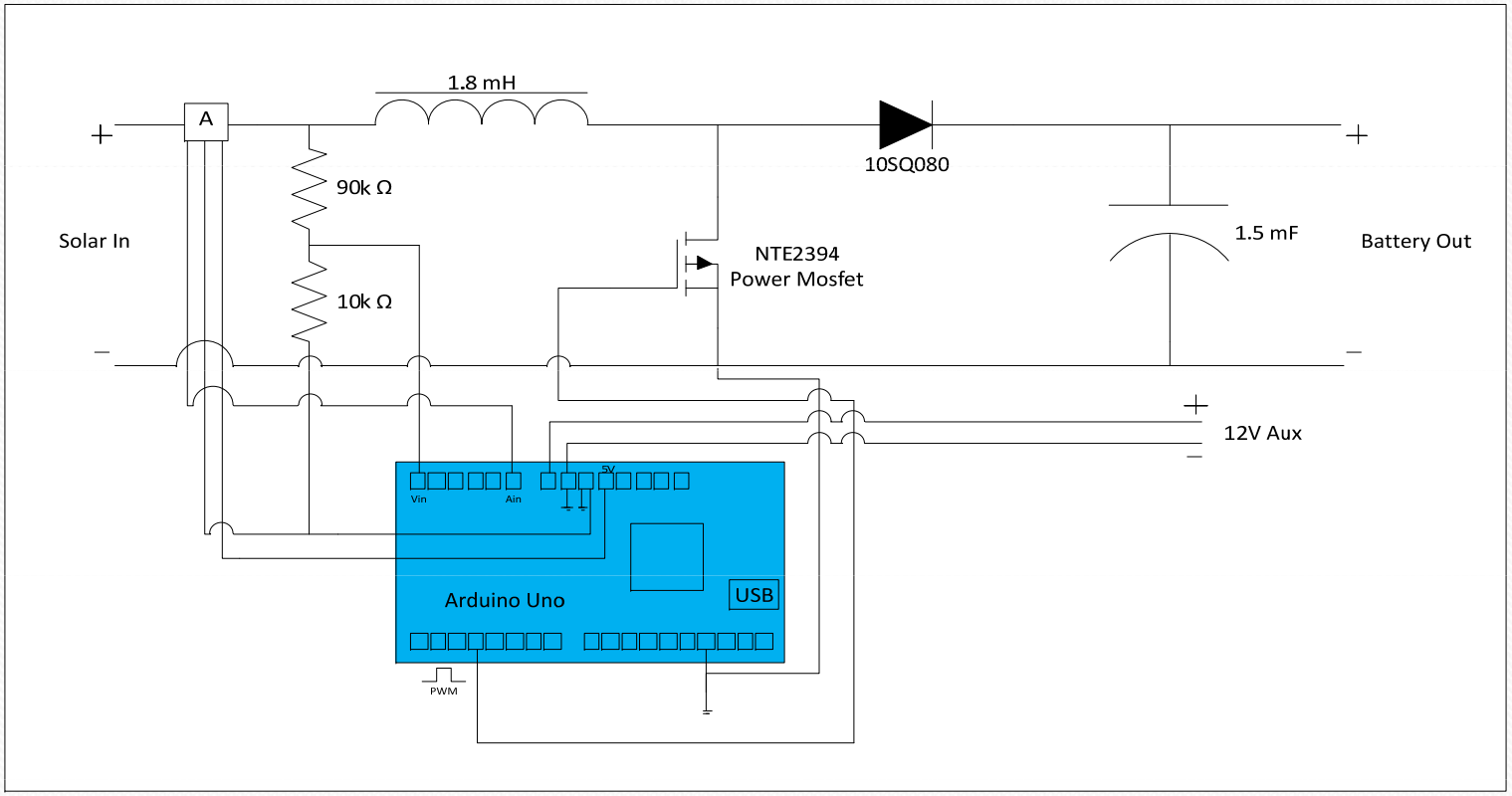


Solar Wiring Bus



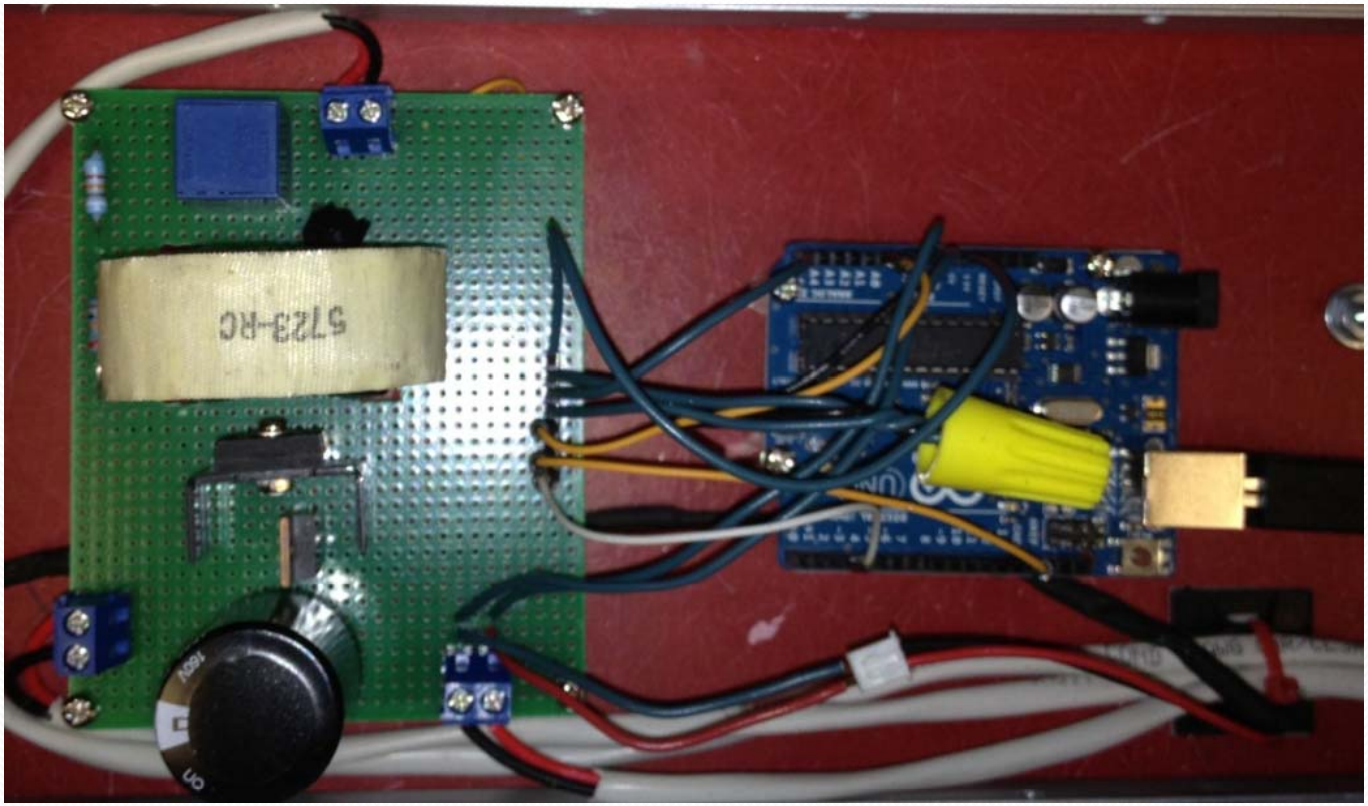
Protection Circuit

Max Power Point Tracker (MPPT) and Boost Converter



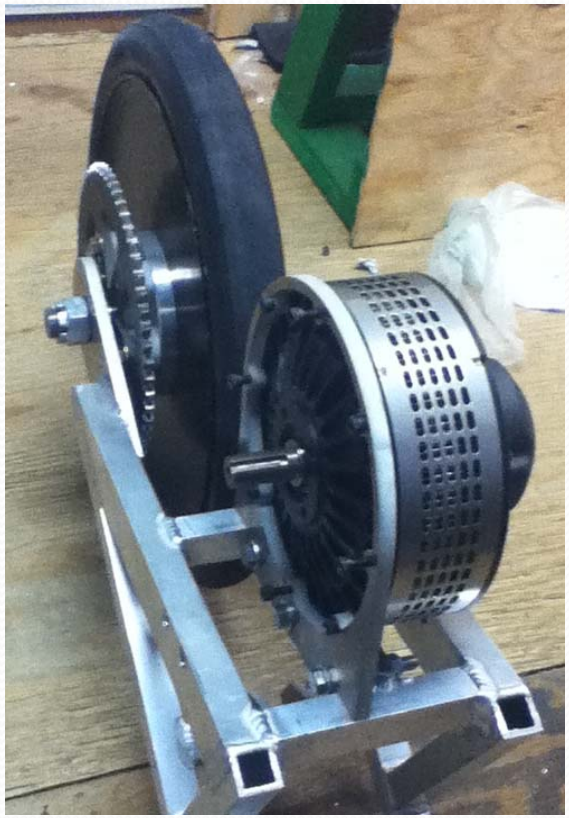
Design for Wiring Diagram of MPPT / Boost converter

Max Power Point Tracker (MPPT) and Boost Converter

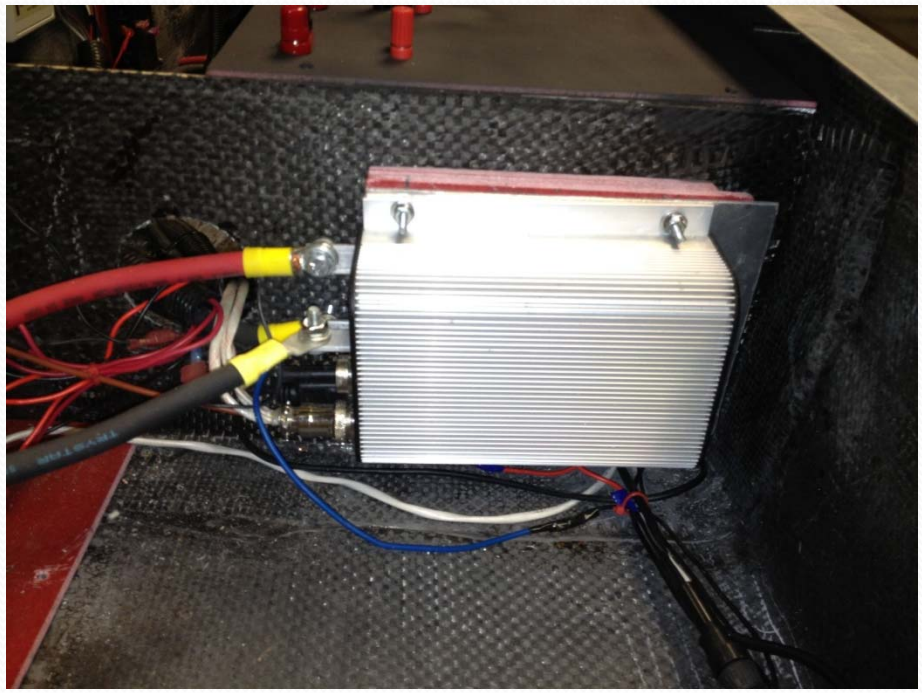


MPPT/ dc-dc Boost Converter Implementation

Motor and Motor Controller



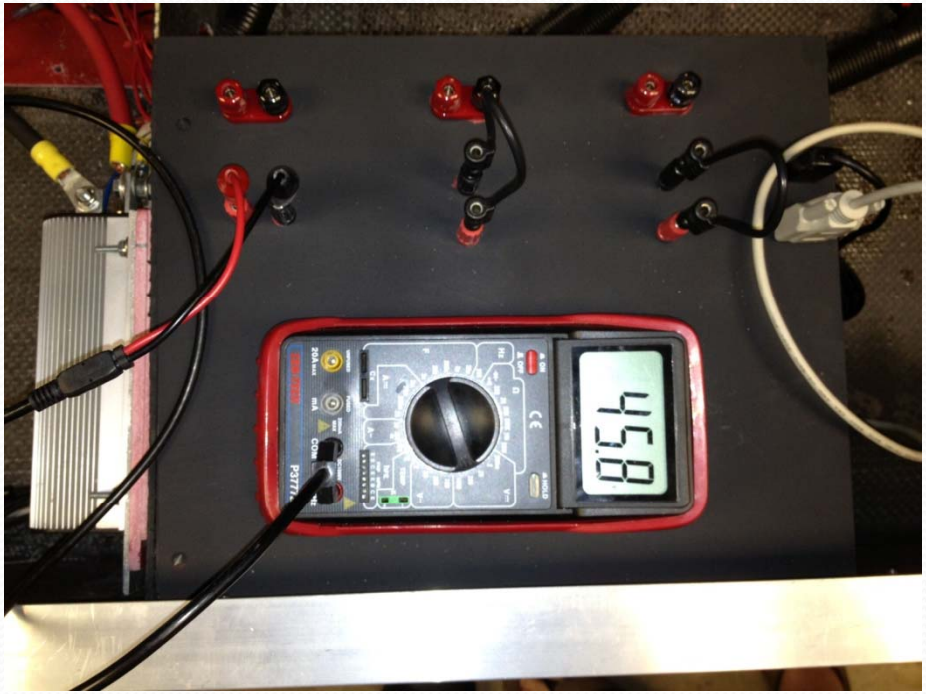
Lemco DC Brushed Motor
(LEM200-127)



Kelly Motor Controller
(KDZ48201)

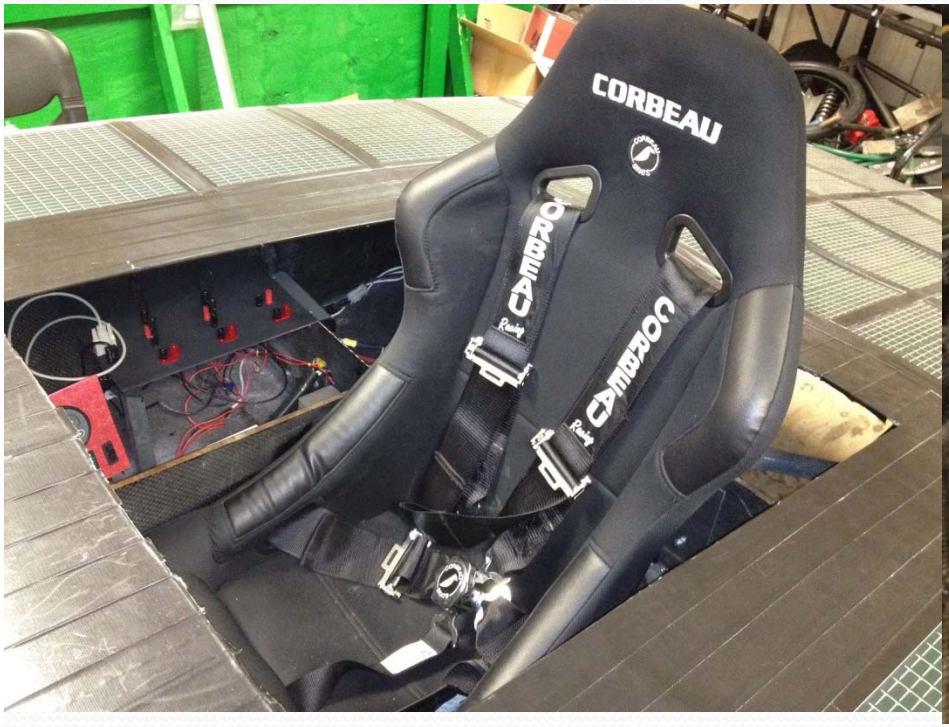
Batteries and Test Board

Battery Box



Test Board

Seat and Steering Adjustment

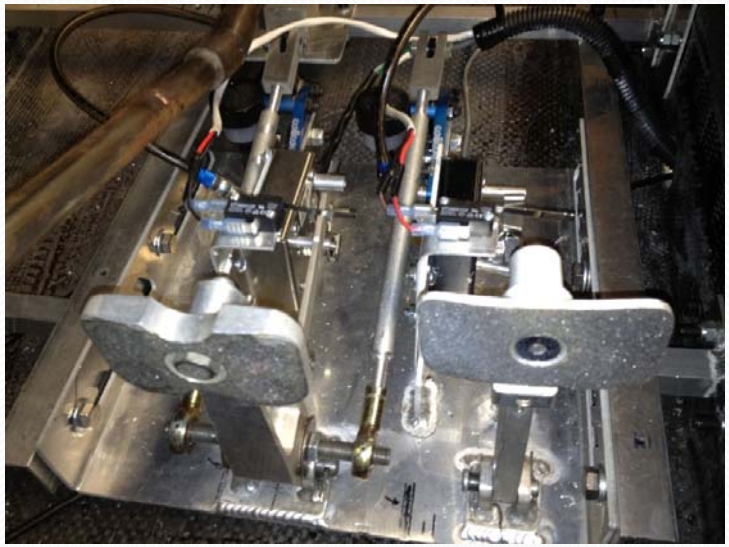


New Seat with 5 point seatbelt

Steering Adjustment shin guard

Controls, Relays, and Pedals

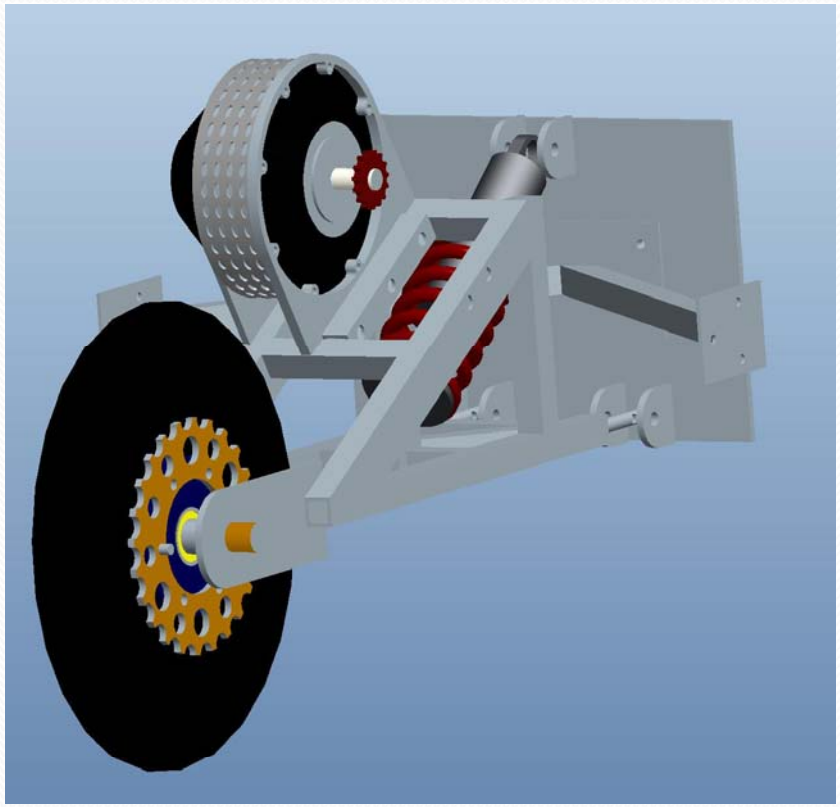
Driver Controls



Regenerative Braking

Forward, Reverse,
and Main Relays

Drivetrain

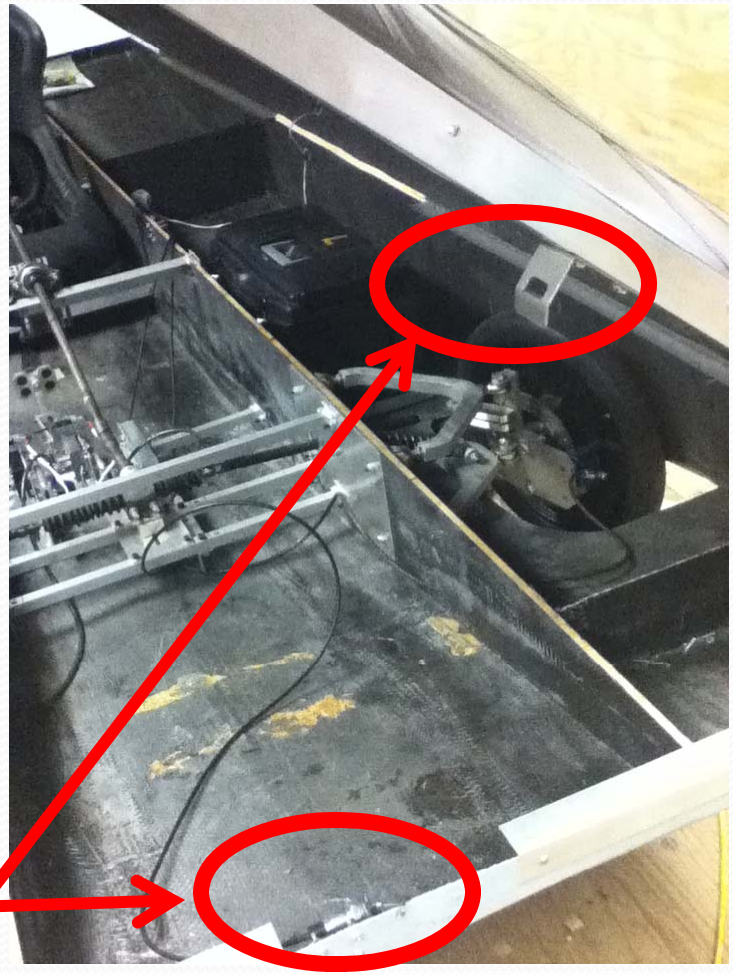


Rear Arm/Suspension model in Pro-Engineer

Rear Arm/Suspension

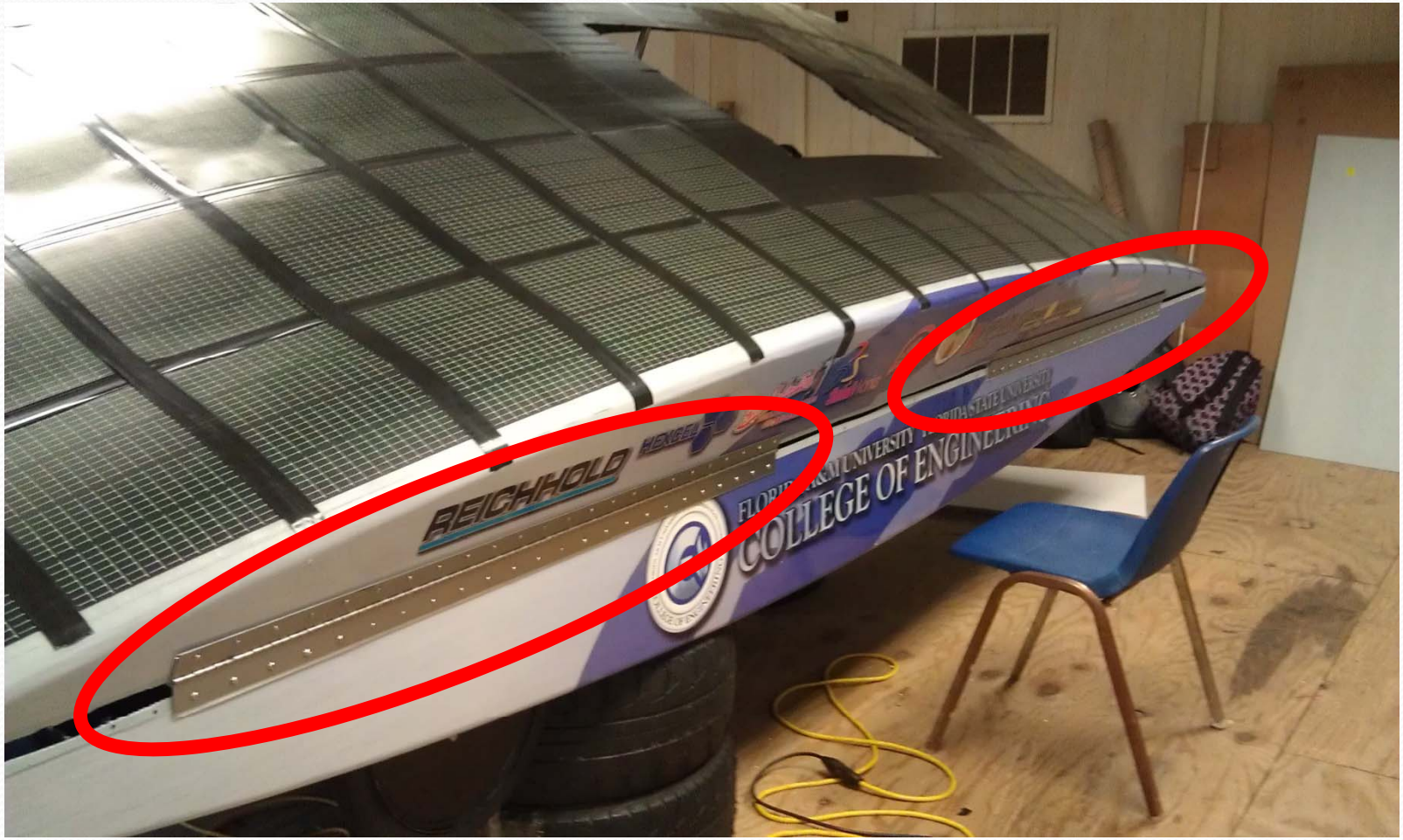
Double Point Remote Release Cable Latch

Double Point



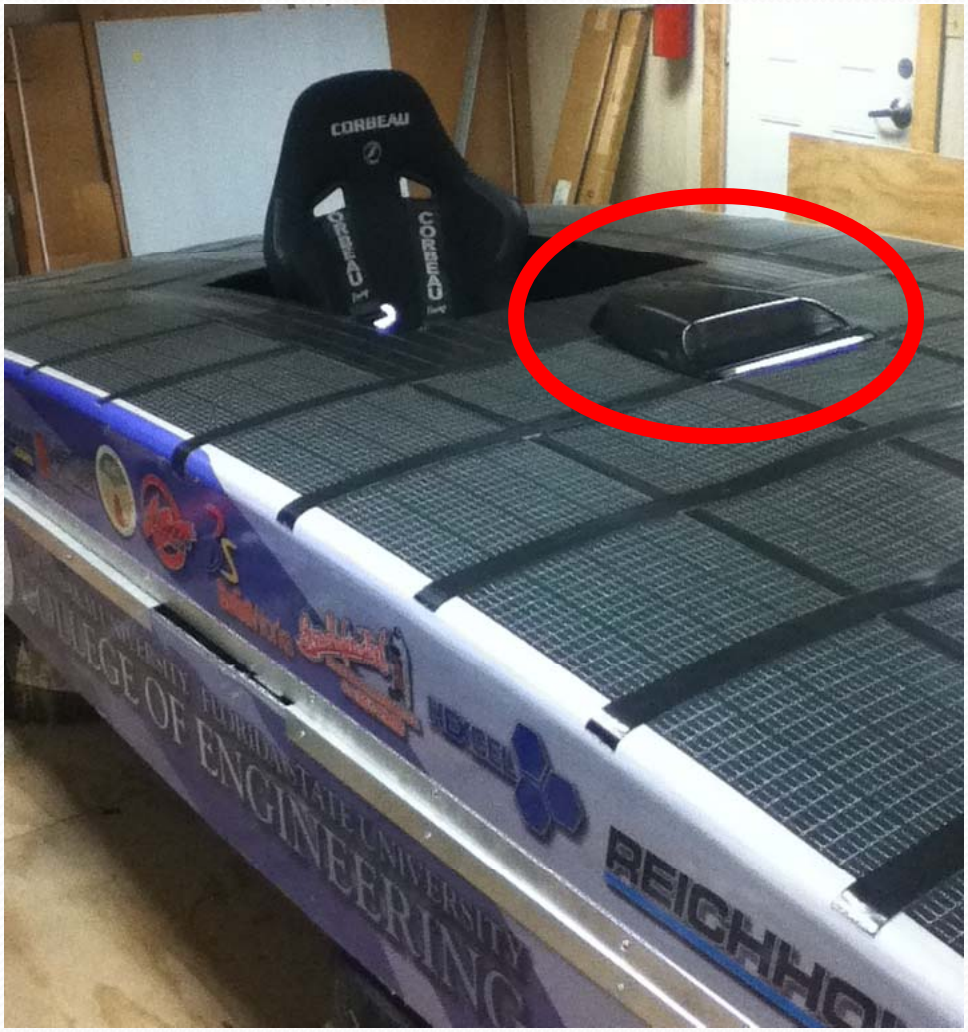
Front Latch Placement

Piano/Continuous Hinge



Air Circulation

- Allows direct airflow to driver and components
- Mounted to frame



Engineering Economics

- Original Budget allocated :
  - **$ 848.33** – Left over from last year
  - **$ 750.00** – ECE Department
  - **$ 2,500.00** – Dean Perry's office
  - Total = **$4,098.33**
- Total expenditure = **$3267**
  - Motor , motor controller, MPPT = **$2289.33**
  - Drivetrain, latch, hinge = **$931.01**
  - Miscellaneous = **$46.66**
- Remaining = **$473.33**

Testing

Solar Array

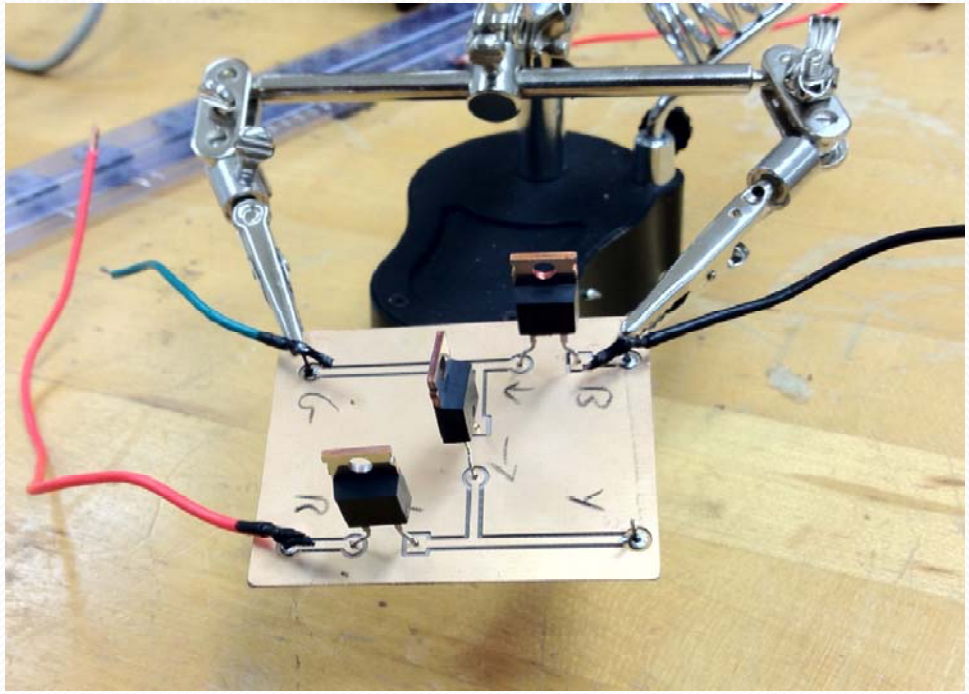
Solar Charging

Testing

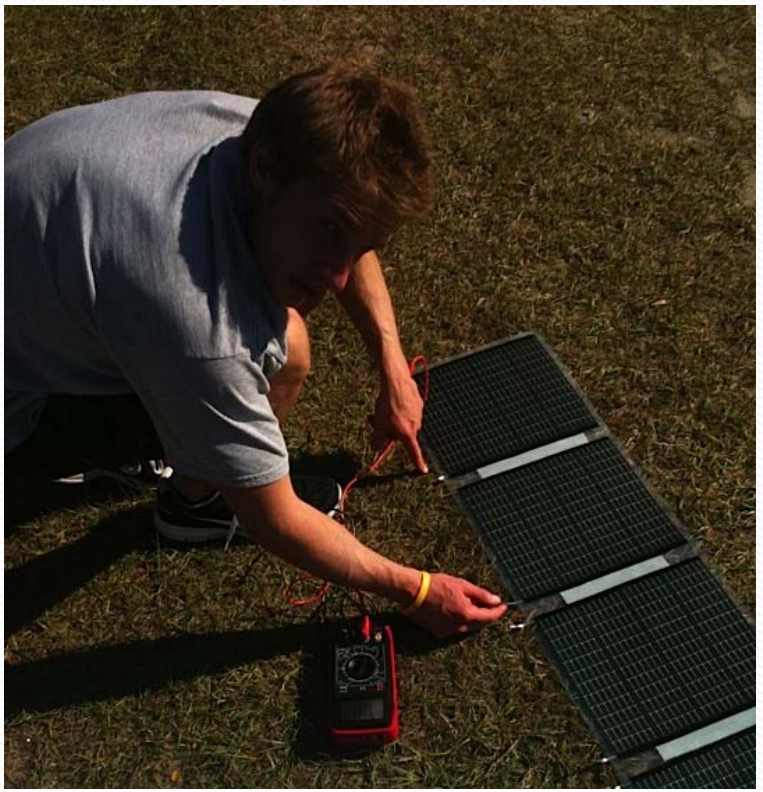
Driver Adjustment

Boost Converter

Testing

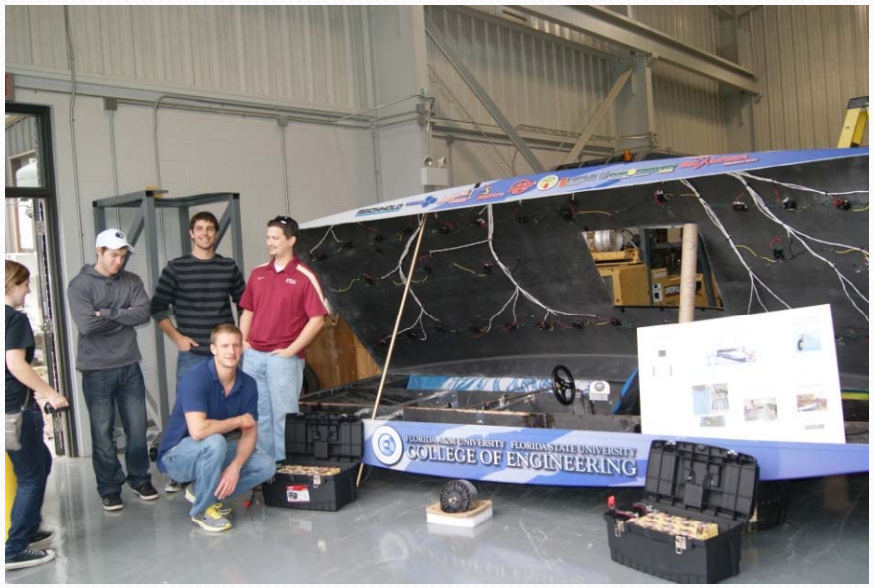


Solar Protection Circuit



Solar Panels

CAPS Open House



CAPS Open House

Conclusion

Original Objectives	Progress
Solar powered rechargeable vehicle	Complete
Implement regenerative breaking	Complete
Latch and hinge system	Complete
Driver enclosure	Installing
Air circulation	Complete
Conversion from 98V to 48V/12V	Complete
Rear arm suspension & Motor mount	Complete
Steering column	Complete
Adjustable seat with 5-point harness	Complete
Solar array	Complete
Max power point tracker	Complete
Progress of three year solar project	Complete

Questions?