

# REGENERATIVE ELECTRIC DRIVEN POWER CART

## ECE 480 SENIOR DESIGN TEAM 9

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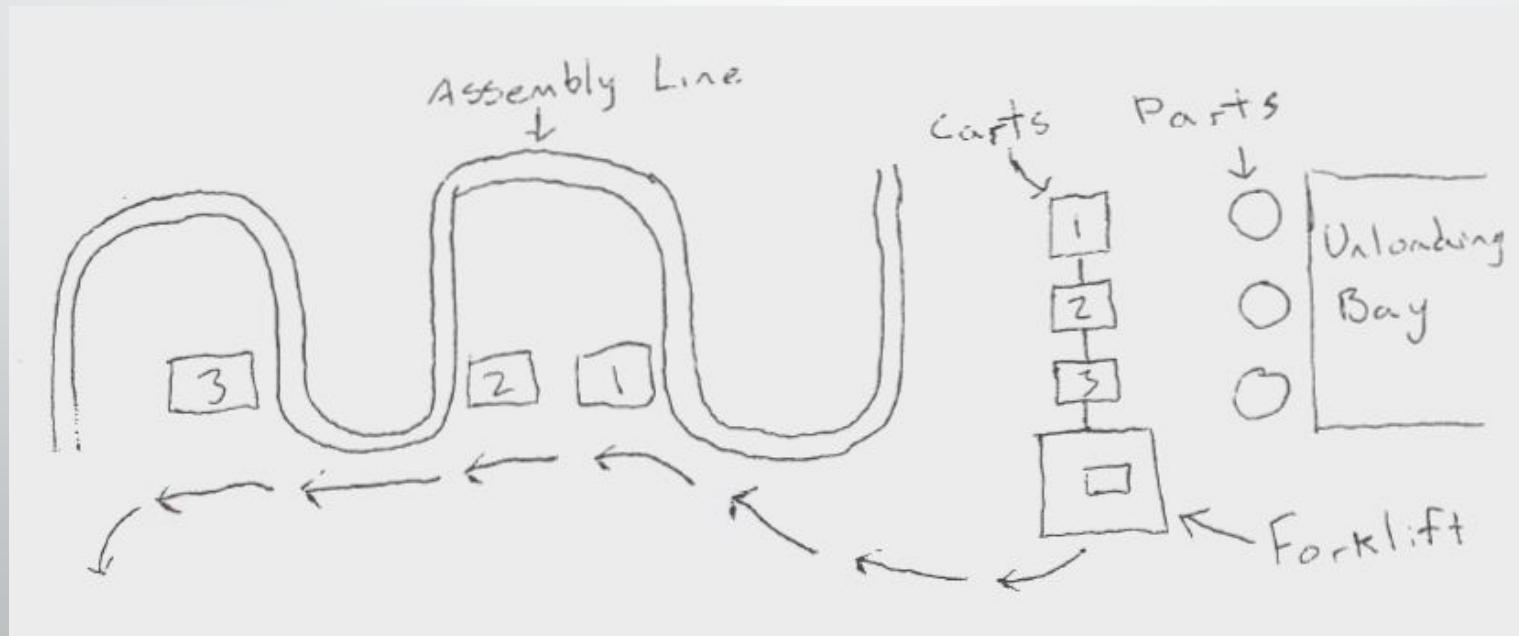
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**Sponsor:** Great Lakes Controls and Engineering / Conceptual Innovation



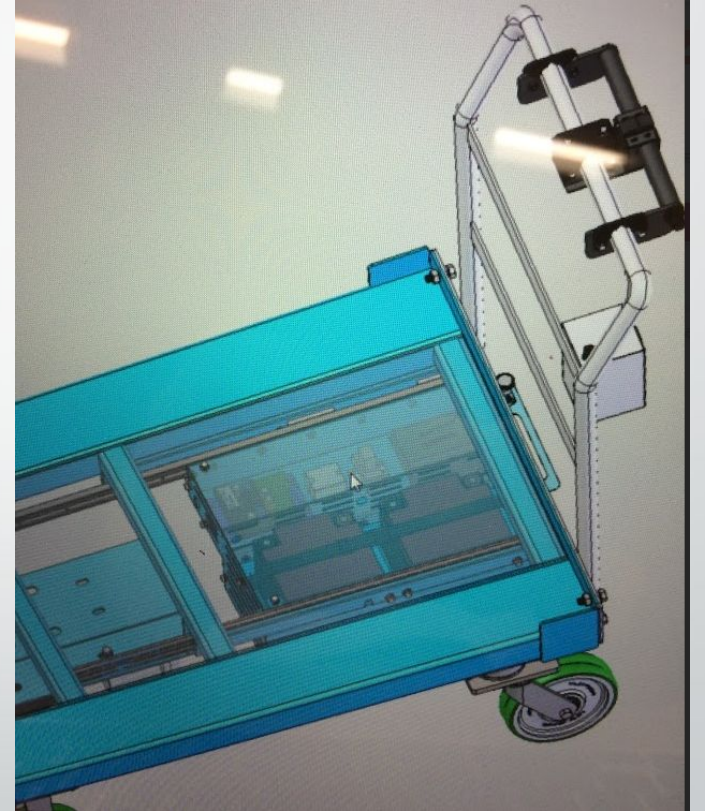
# Introduction

Companies need to move their parts for production closer to the assembly line. The parts are very heavy (4000-6000lbs) and cannot be moved manually but instead need a cart to be moved. A forklift picks the carts up and pulls them to their corresponding location. As the carts are being pulled the motor is being charged through a charge controller. When they are unhooked, they will have enough power to move the required distance (~15ft) to be closer to the assembly line. The forklift will then come back around and pick up the empty cart and then the process is repeated.



# Main Objectives

- Design a control system that will be enclosed in an industry tight vessel.
- Design customer-friendly outputs that will be displayed on a control panel.
- Regeneration system must provide a high enough efficiency to supply power for at least one 8-hr shift.



# Objective Specifications

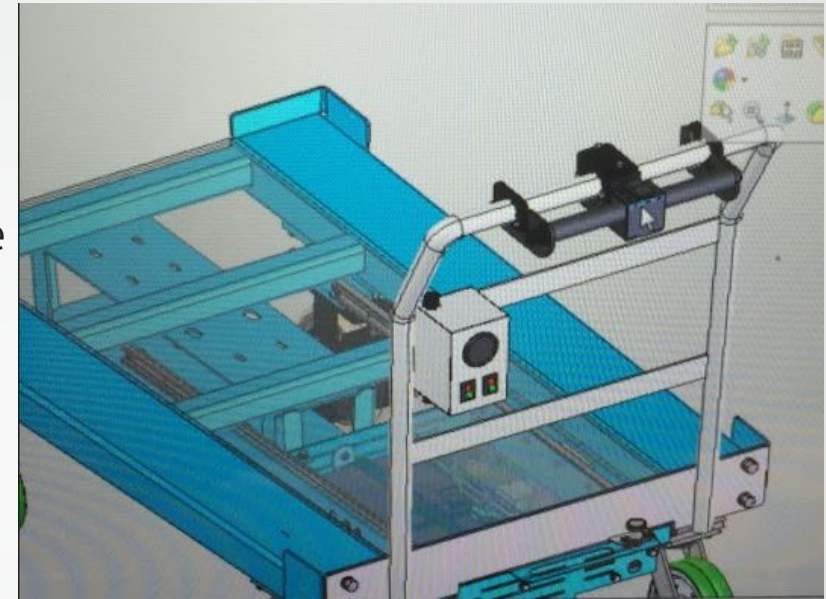
Switch Control Driving mode (flipped to on) and Regeneration mode (flipped to off)

## Motor Control

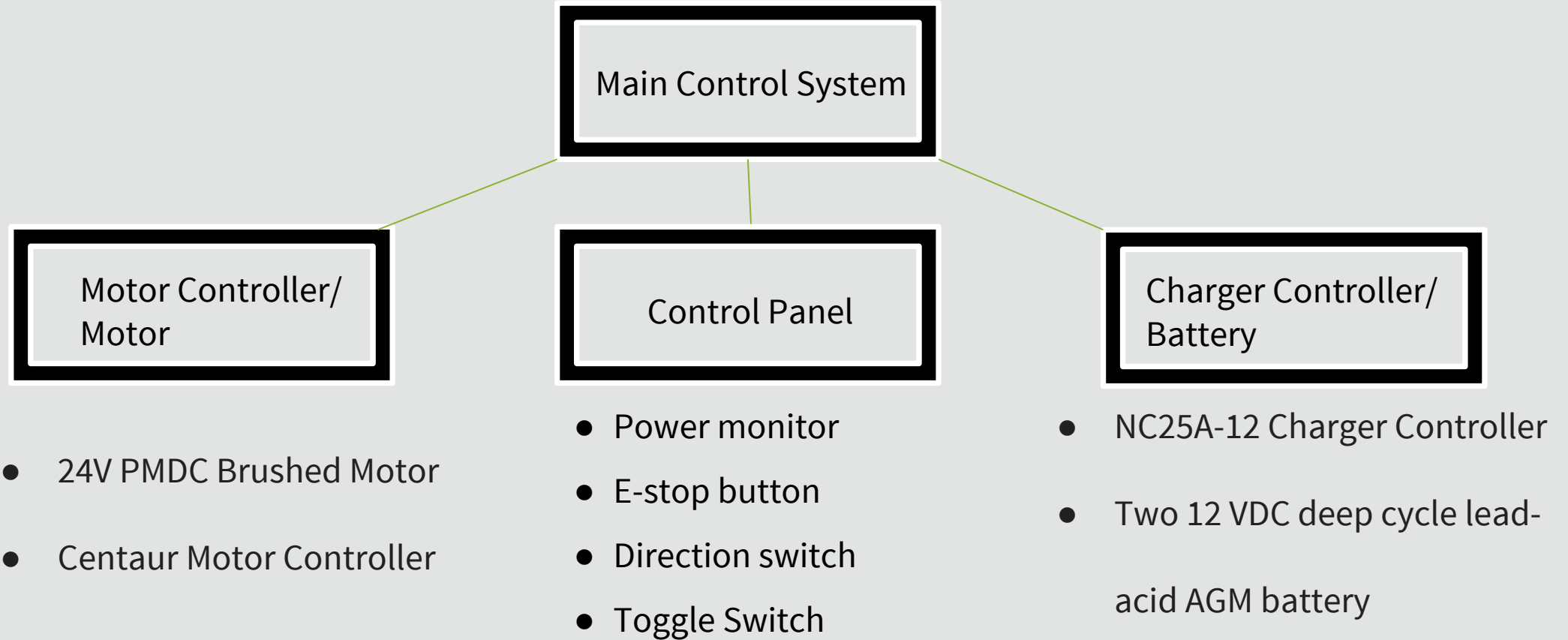
- Controller and Power can support 24V PMDC Brushed Motor
- Direction switch to control moving direction (forward and backward)
- Speed/Acceleration/Deceleration can be preset in motor controller
- E-stop

## Regeneration

- Automatically shut down charging mode when battery fully charge
- Battery meter to show battery level



# Engineering Design Subsystems



# PMDC Brushed Motor

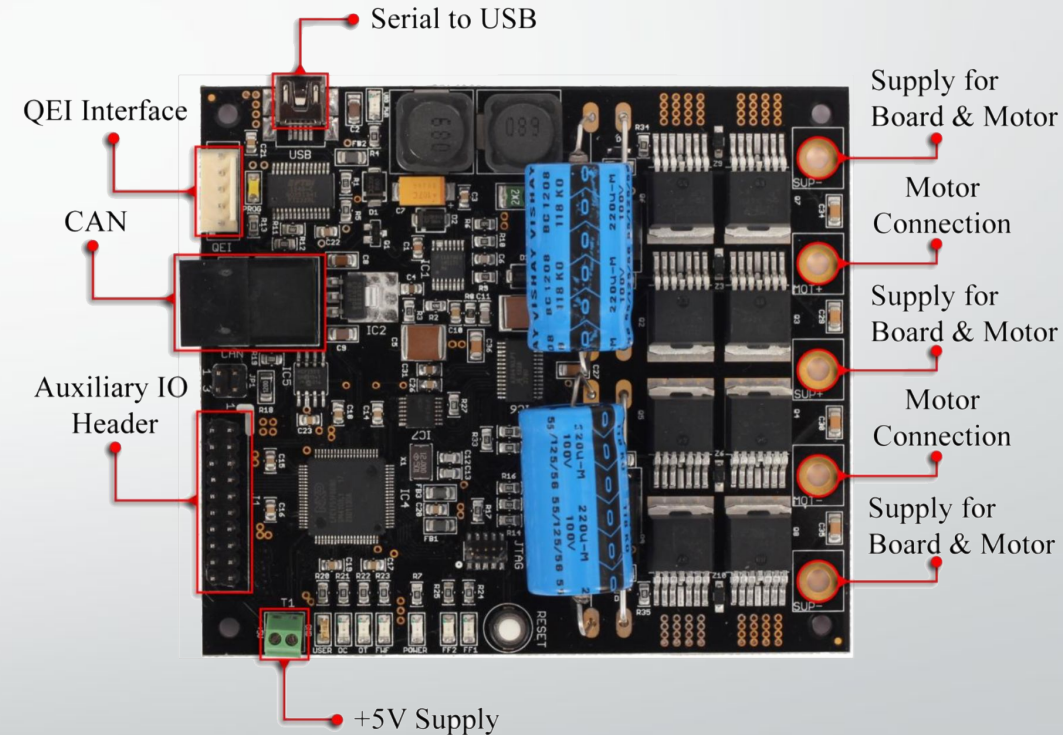
## Specifications:

- Power: ½ hp
- Voltage: 24 DC Volts
- Current: 20 A
- Speed: 1800 rpm



# Centaur Motor Controller

- Motor supply voltage up to 36V and can supply continuous current up to 40A with peak current up to 100 A.
- Microcontroller: LPC1751 with ARM Cortex-M3core.
- Fully Programmable with 20 I/O Pins.



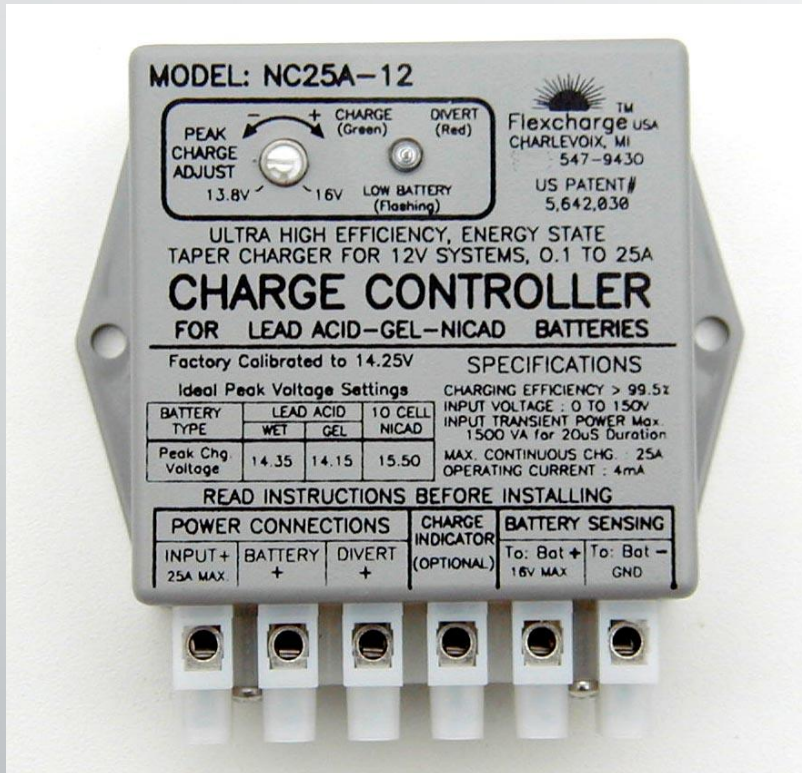
# Control Panel

The visual panel that customers will see when controlling the cart. This panel will have the following:

- On/Off switch
  - When switched to off, cart will switch to regeneration mode
- Toggle Switch
  - Forward and reverse toggle
- E-Stop button
  - Shuts entire control system down in case of emergency
- Battery meter
  - Tells users of battery level

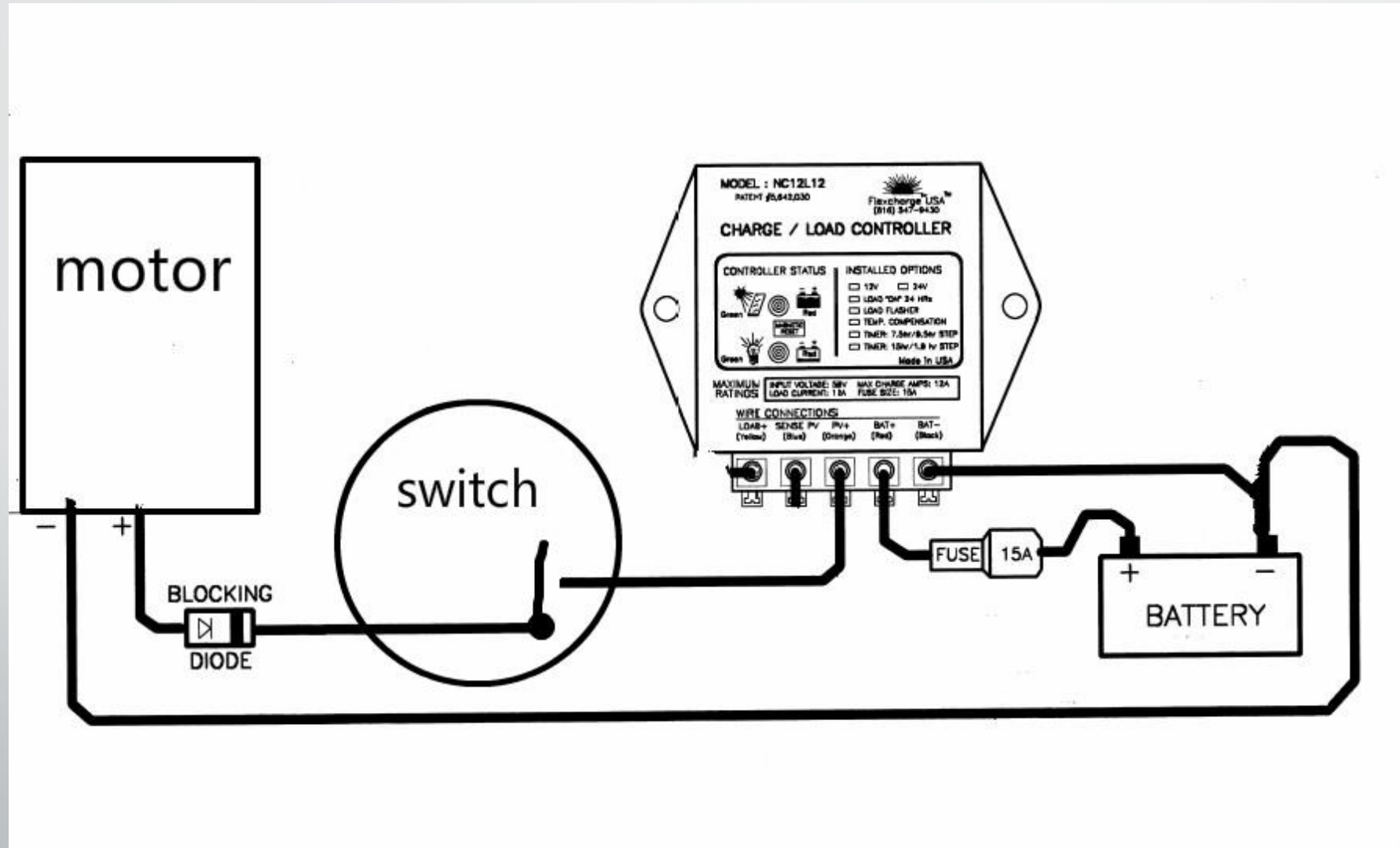


# Charge Controller



- Proven quality
  - Ultra high efficiency
  - Voltage Regulation
  - Battery Protection & Battery sensing
- wire protection

# Regeneration System



# Issues and Limitations

## **Brushed PMDC Motor**

- Short life span (Battery & Demagnetization)
- Lots of maintenance (Carbon Brush)

## **Main Control System Box Size**

- Components must be contained in a 24" x 10" x 8" box

## **Speed and Controls**

- Ease of access to motor controller to adjust speeds

# System Level Schedule and Milestones

- Pick and/or design controllers (Week 6, by February 26)
- Establish connection from DC motors to motor controller (Week 8, by March 11)
- Establish connection from Batteries to charge controller (Week 8, by March 11)
- Establish connections from Control Panel's components to related system (Week 9, by March 18)
- Establish Power control system (Week 9, by March 18)
- Establish communications between each system and test (Week 10, by March 25)
- Have first prototype working, installing control system to cart (Week 11, by April 1)
- Debug and improve our system (Week 12, by April 8)
- Have final prototype working (Week 14, by April 15)



# Budget

Motor Controller: \$142.00

Charge Controller: \$90.00

Battery Meter: \$12.00

**Total: \$244.00**



Questions?