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Senior Design II
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SOLAR PANEL ROTATION SYSTEM

OVERVIEW

Background

System Design

Efficiency

Components

Schematic

Component Specifications

Program Flow

Cost

Hurdles

Future Adjustments

Special Thanks

BACKGROUND

- Original Idea came from previous coworker
- Had existing solar setup for his home
- Asked me to build system for him
- Lost contact
- Every Engineer's dream right?



SYSTEM DESIGN

Major Mechanical Parts

- Solar Panel
- Weatherproof Box
- Worm Gear
- 12V DC Drill
- Roller Bearing Pillow Blocks
- Turn Table
- Aluminum Pipe & Plate



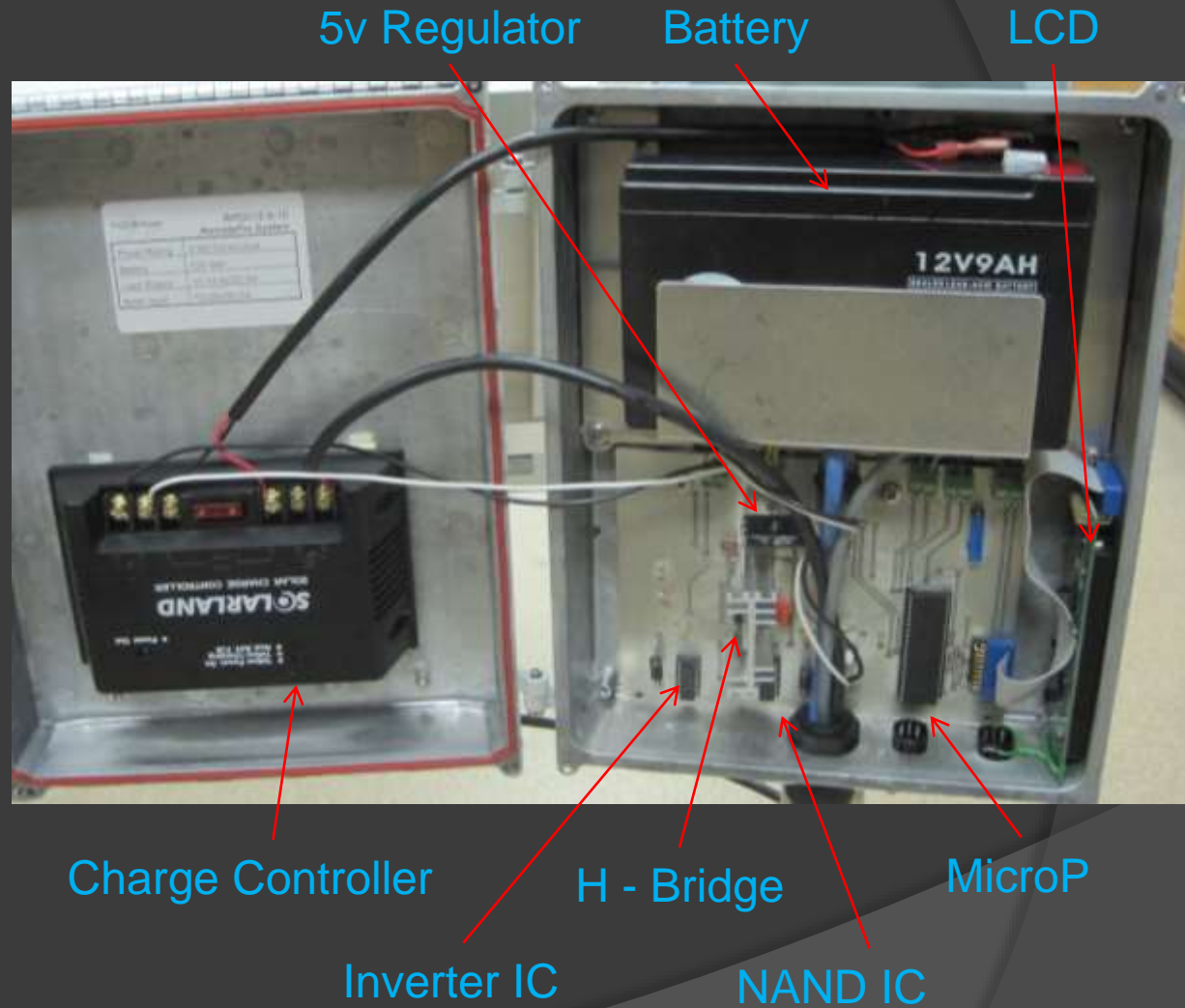
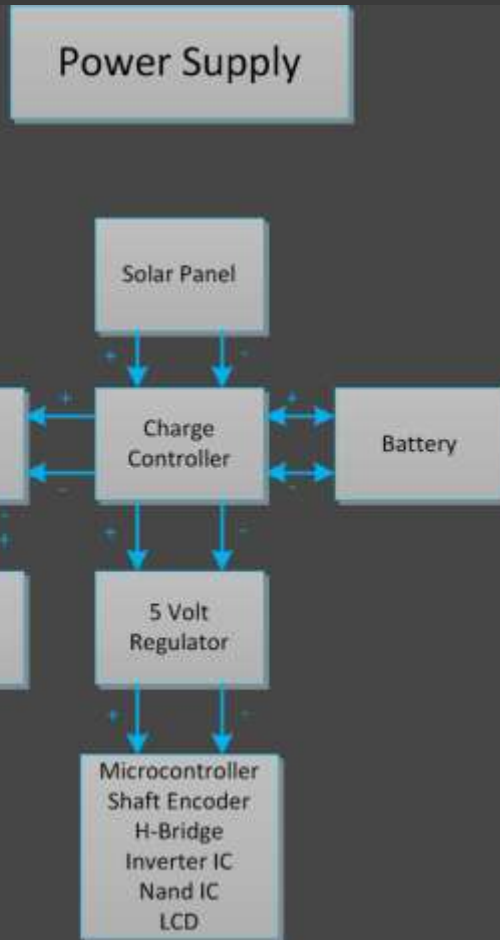
EFFICIENCY

Vertical Single Axis Tracker (VSAT)

- More effective at higher latitudes
- Best benefit in winter time
- Increase efficiency up to 30%
- Why not dual axis?
 - Only increases efficiency by an additional 6%

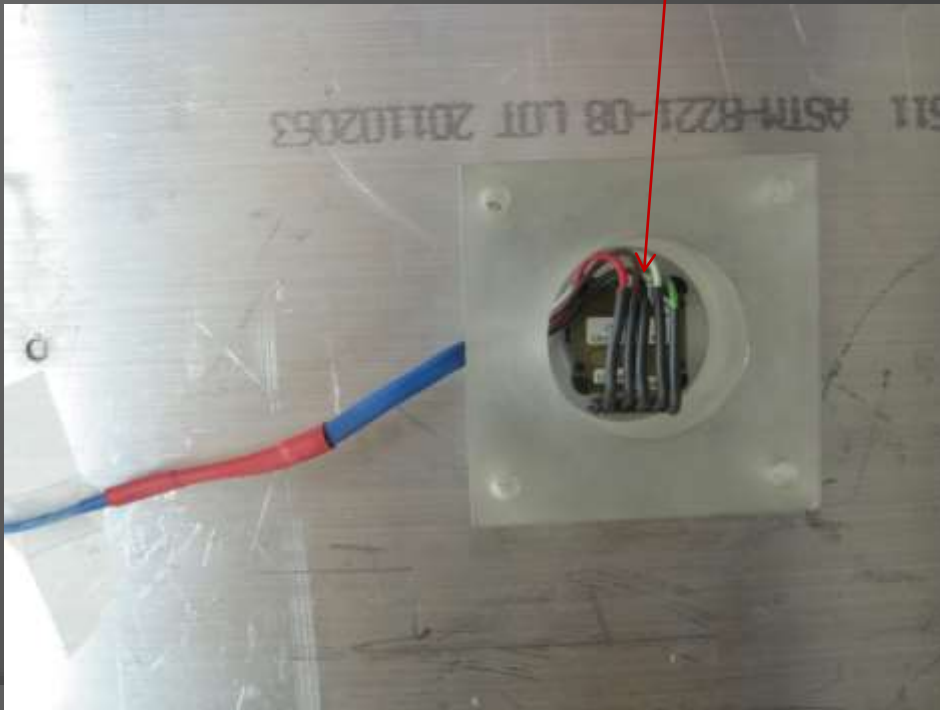


COMPONENTS



COMPONENTS

Mechanical Encoder

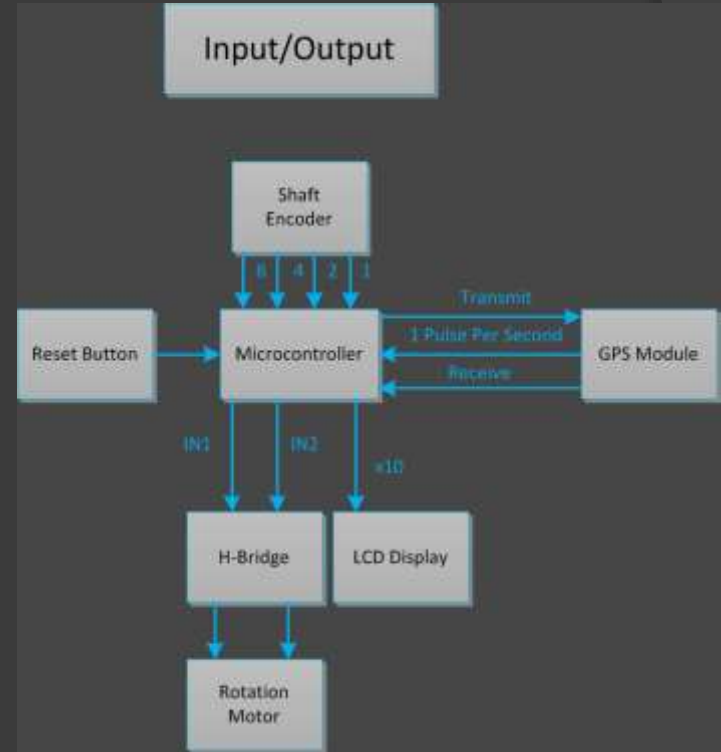
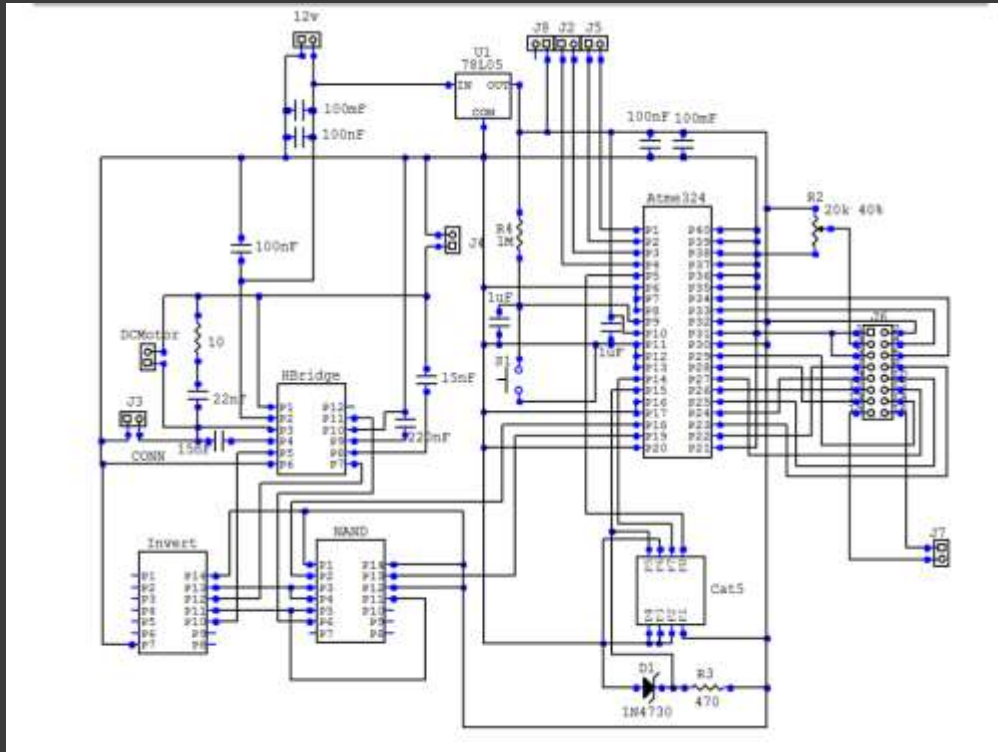


GPS Module



LCD Screen

SCHEMATIC



COMPONENT SPECIFICATIONS

GPS – Global Sat EM-406a

- 20 Channel, Built in antenna, TTL, 5V
- 4800 Baud Rate, Output Message – GGA, GSA, GSV
- Altitude to 60,000 ft, Up to 15 ft Accuracy
- Power Consumption (44mA) Continuous, (25mA) Trickle

Microcontroller – Atmel Atmega 324P

- 32KB of memory, 32 Programmable I/O Pins
- Running at 1 MHz
- Power Consumption – 0.4 mA

Charge Controller

- Automatic overcharge protection (14.4V)
- Automatic discharge protection (12.4 on, 11.0 off)
- Self Consumption < 10 mA

Solar Panel

- $P_{MAX} = 10 \text{ W}$, $V @ P_{MAX} = 17 \text{ V}$, $I @ P_{MAX} = .58 \text{ A}$

Battery

- 12 V, 9 Ahr Capacity, 5 yr float life

COMPONENT SPECIFICATIONS

Mechanical Encoder

- 5 V, 4 bit Hexadecimal
- 16 Position, 22.5 deg

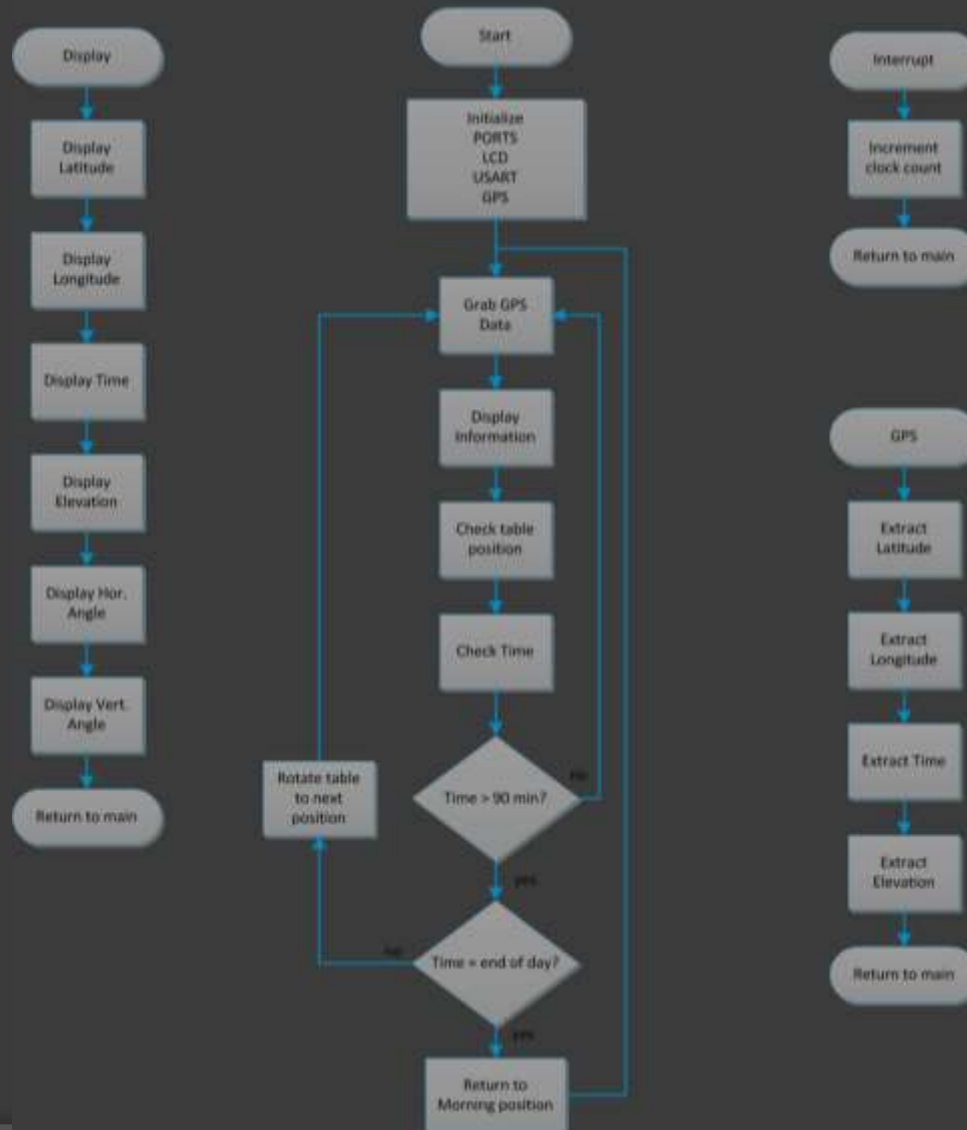
LCD

- 2x20 Character LCD
- Temperature Range (- 40 to 185 degrees)
- White LED Backlight
- 5 V, 1.6 mA current
- Parallel Connection

H – Bridge

- Voltage – Up to 48 V
- 5 A Max peak current
- 4 A RMS current
- TTL Compatible

PROGRAM FLOW



COST

Mechanical Encoder	5.35
LCD Module	23.09
GPS Module	73.55
Turntable, Worm Gear	135.56
Solar Panel Kit	221.96
Aluminum Plate & Pillow Blocks	83.71
12 V Drill	19.99
Other Components – Donated by EE Department	0.00
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Total	563.21

HURDLES

- Interfacing components to work properly
- Burned out H – Bridge
- Correct Coding to receive data
- Aligning mechanical encoder
- Appropriate size of worm gear

FUTURE ADJUSTMENTS

- Higher amp capacity H – Bridge
- Different Design Possibilities
- Possibly remove NAND & Inverter ICs
- Develop code structure for better functionality
- Add buttons for user friendly information gathering

SPECIAL THANKS

George & Dean Twitchell (3rd Floor Shop)

George Janack (EE Shop) Vic Bershinsky

Dr. Legowski Beau Tippetts

Machine Shop (Basement)

Senior Design Classmates

SPECIAL THANKS NOT GIVEN IN ANY SPECIFIC ORDER

Questions???

Sources

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- <http://tyconpower.com/>