Switch Doctor Project

ECE 4011

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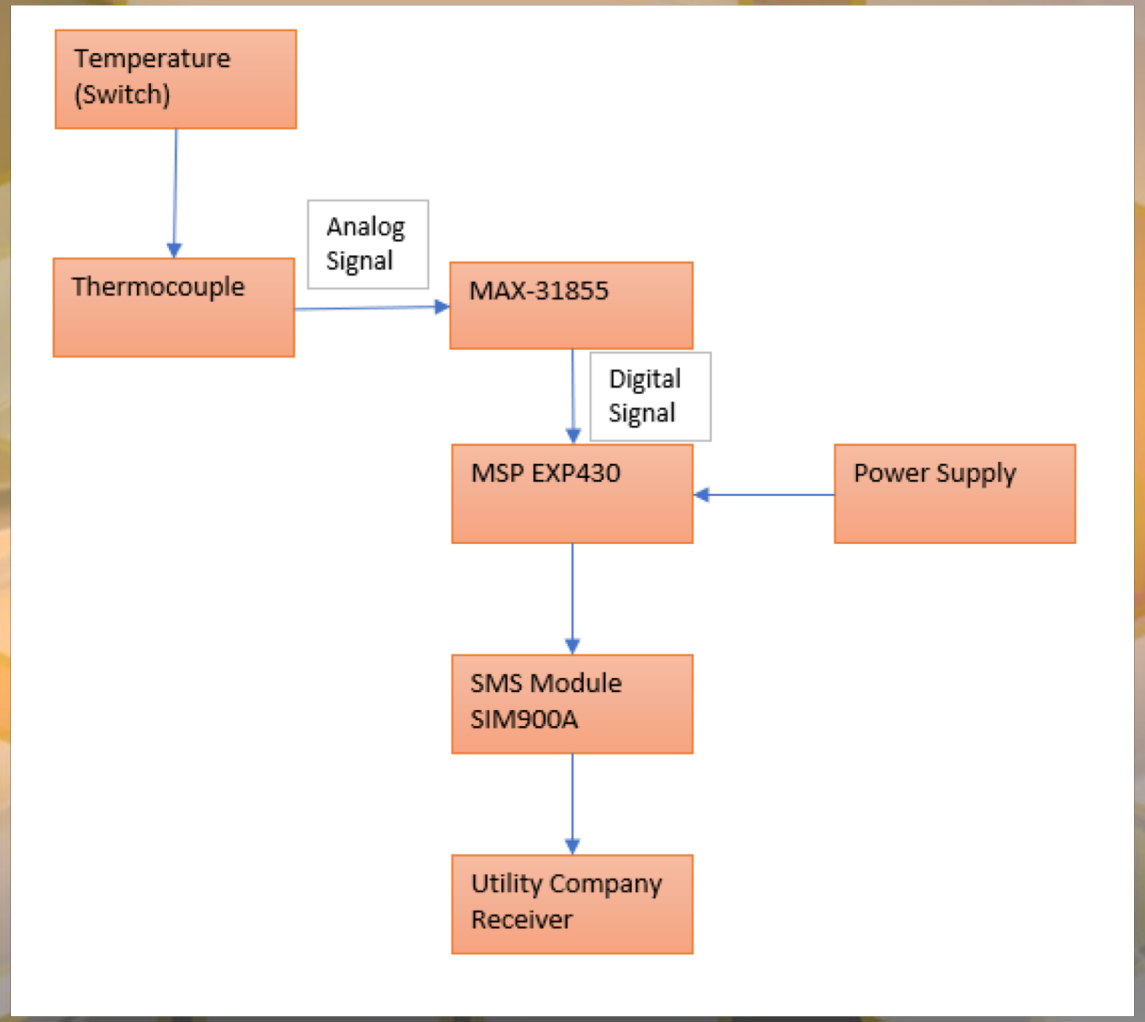
End of the Semester Presentation

- In today's presentation, we will look at the finalized design decisions that the team has made as well as the overall topology of the project.
- We would also like to begin preparing for the upcoming semester, and explain progress.

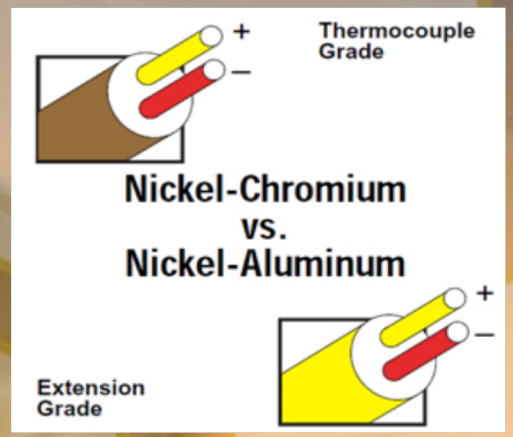
Overall Topology

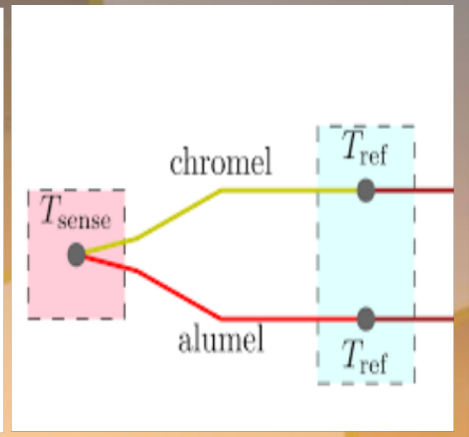
- Attached is the current topology of the design
- This will allow us to organize and prepare to order parts at the beginning of the Fall semester

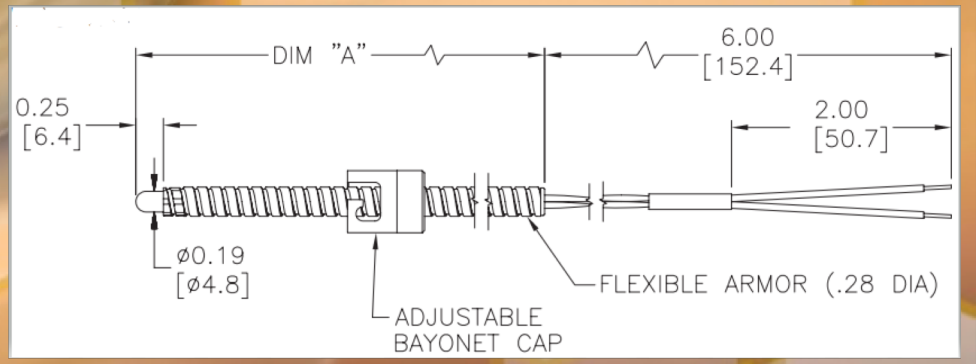


Thermocouple

- Preference to use type K Thermocouple (Chromel/Alumel)
  - Nickel based, good corrosion resistance
  - Temperange range -200 to 1260 degree celsius
  - Handle rugged environment water, mild chemical solutions, gasses,dry areas
  - Uncoated wire probe, quick response time
  - Suited for MAX38155





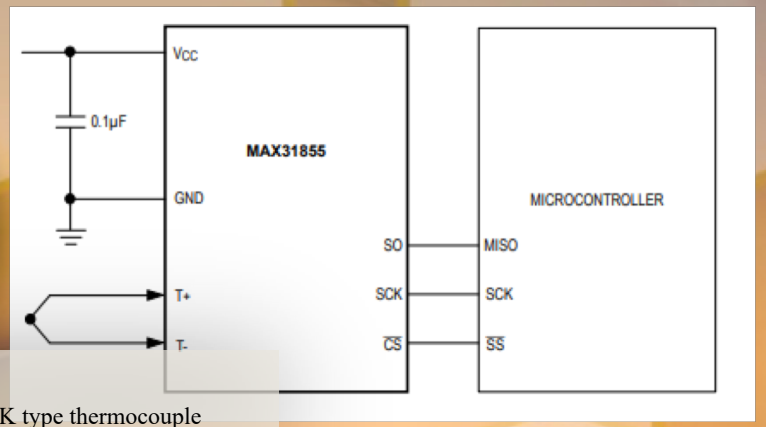


TOLERANCE OF A TYPE K THERMOCOUPLE			
	°C		
ANSI	Temperature Range	Standard	Special
K	-200 °C to -100 °C	± 2% T	____
	-100 °C to 0 °C	± 2.2 °C	____
	0 °C to 275 °C	± 2.2 °C	± 1.1 °C
	175 °C to 293 °C	± 2.2 °C	± 0.4 % T
	293 °C to 1260 °C	± 1.75% T	± 0.4 % T

Thermocouple Amplifier MAX31855 Breakout Board

Benefits and Features of MAX31855

- The MAX31855 performs cold-junction compensation and digitizes the signal from a type K thermocouple
- Exhibits K type thermocouple accuracy of ±2°C for temperatures ranging from -200°C to +700°C for K-type thermocouples
- Integration Reduces Design Time and Lowers System Cost
  •14-Bit, 0.25°C Resolution Converter
  - Integrated Cold-Junction Compensation
  - Detects type K Thermocouple Shorts to GND or VCC
  - Detects Open type K Thermocouple
  - Interfaces to MSP-EXP460G2 microcontroller



K type thermocouple

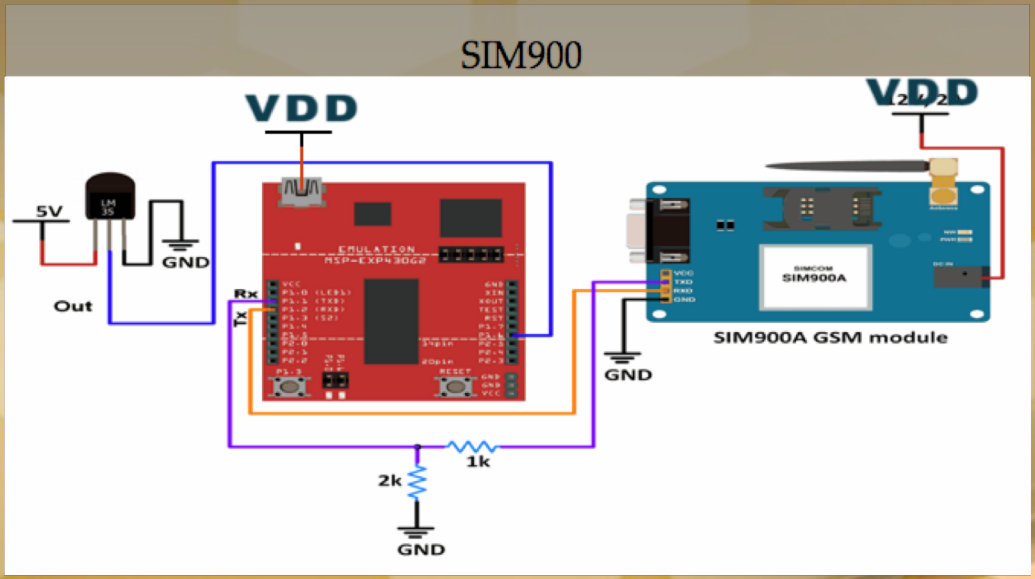
Application Circuit

Microcontroller

- The microcontroller has the basic requirements needed for the design project
- CAN bus
- Sufficient clock frequency
- ADC pins
- The reason for using this microcontroller is cost and power consumption
- Low cost $10
- ultra-low power consumption

Specifications of the MSP-EXP430G2 microcontroller	
Microcontroller Design Requirements	Specifications
Clock Frequency	32.76 kHz
RAM Memory	512 bytes
Flash Memory	16 kB
Input Voltage	1.8 V- 3.6 V

Sim900 GSM Module



Design parameters	Specifications
Supply Voltage	3.2 to 4.8V
Operating Temperature	-40°C to +85 °C
Low power consumption	1.5mA (sleep mode)
control	Via AT command (GSM 07.07,07.05)
Dimensions	24x24x3mm
Operating frequency	Quad-Band 850/900/1800 MHz
Industrial Temperature Range	-40°C to +85°C

- The reason for using/choosing this device is Quad-Band frequency, which is recommended for U.S.A network
- It supports 3G/4G cellular networks

Power Supply

Supercapacitor:

PCAP0050 P230 S01

50 F, 2.3 VDC, 36 mΩ ESR

Buck-Boost Converter:

TPS63050

0.5 A continuous output current, 2.5-5.5 V Vin, Overtemperature Protection

PV Panel:

FYD-004

1.5 W, 2.2 V 0.68 A at max power