Physics and Engineering Department

nanoNavigator

Design Contest

Than Aung, Mike Conlow, Tom Krausse

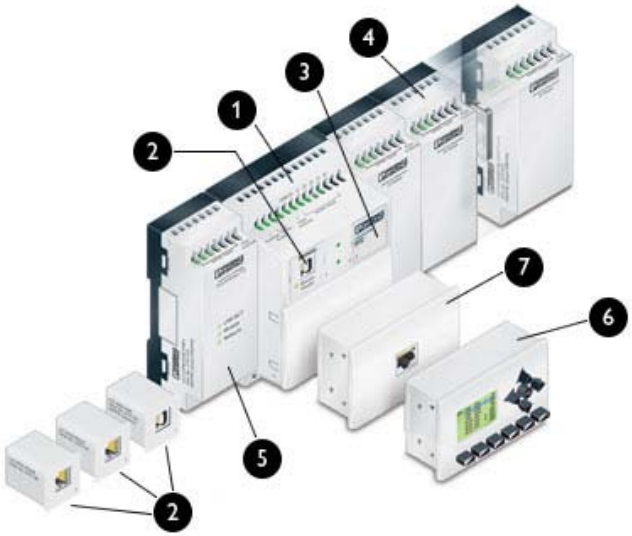
EGR 333

Agenda

- Introduction
- Initial Ideas
- Simulation of Initial Ideas
- Final Design
  - Conceptual Design
  - Physical Design
    - Electrical Schematic
    - Mechanical Schematic
    - Logical Control Flow Chart
  - Further Improvement
    - Frequency Reduction
  - Alternative Control Scheme
- Safety
- Marketability
- Acknowledgement

Introduction

The nanoLine is a new control platform with easy application programming and flexible, modular configurations.



1. Base Units
2. Communications Option modules
3. Real time Clock
4. Expansion I/O Modules
5. Ethernet Communications Expansion Module
6. Operator Panel
7. Remote mounting for Operator Panel

nanoLine Resource Center

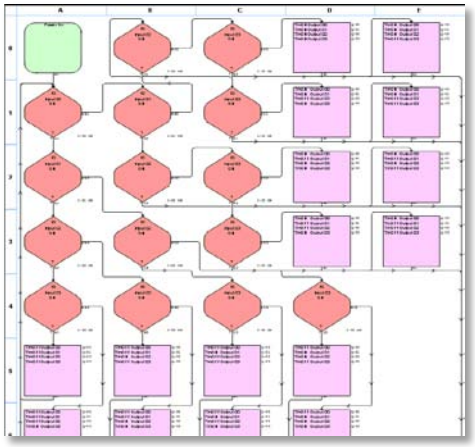
To fulfill the partial requirement of EGR 333, we did research and brainstormed some ideas (both existing and new) for nanoLine controller.

Source: http://www.phoenixcontact.com/automation/34197.htm

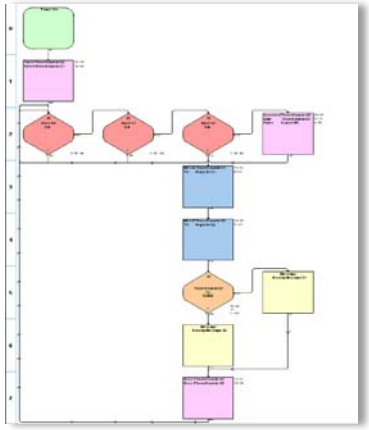
Initial Ideas

- PLC Pressure Cooker
- Redundant circuit manager
- Spark Block
- Personal Weather Man
- Remote Beverage Dispenser
- Self Dimmer
- Lighting and Display Control
- Automatic Speed Limit Control
- Water Level Control
- Temperature Control
- Oil Reader

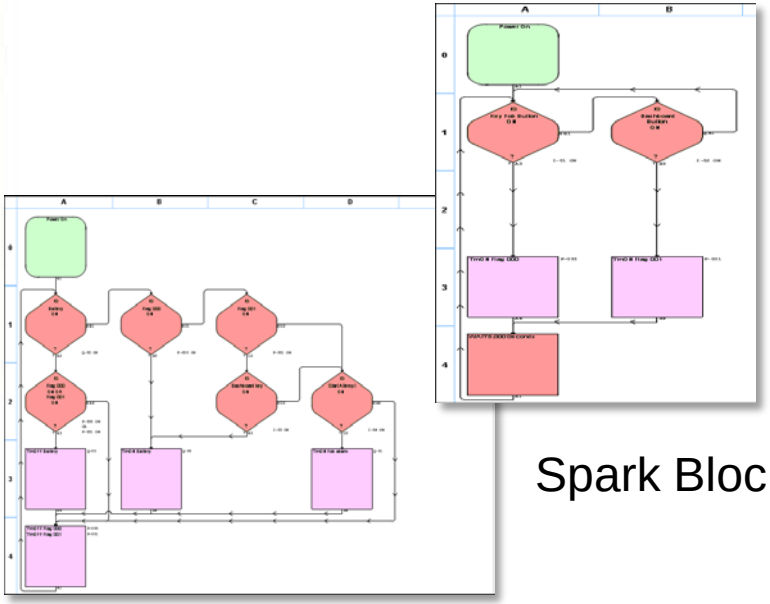
Simulation of Selected Initial Ideas



Self Dimmer

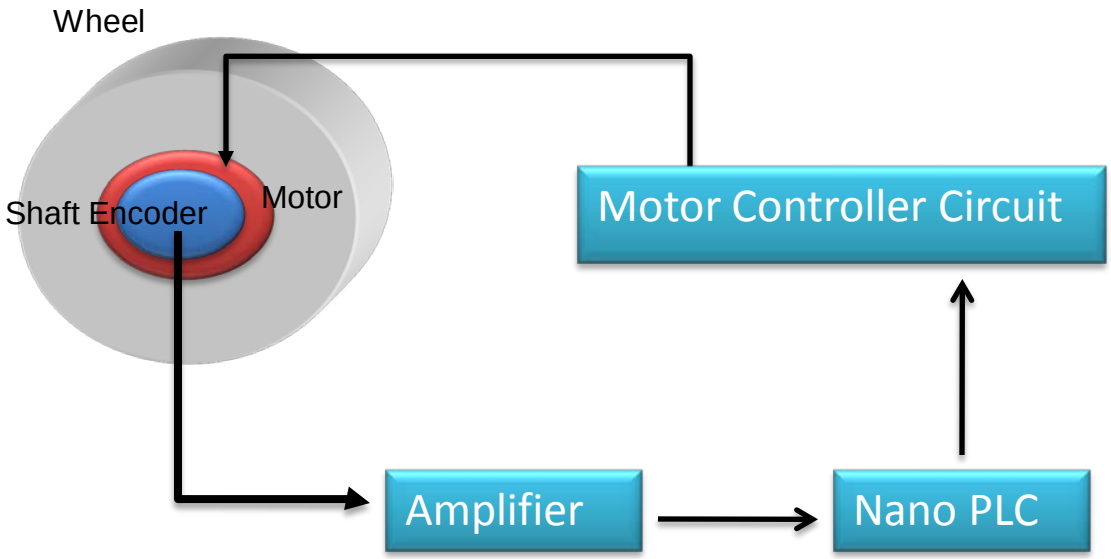


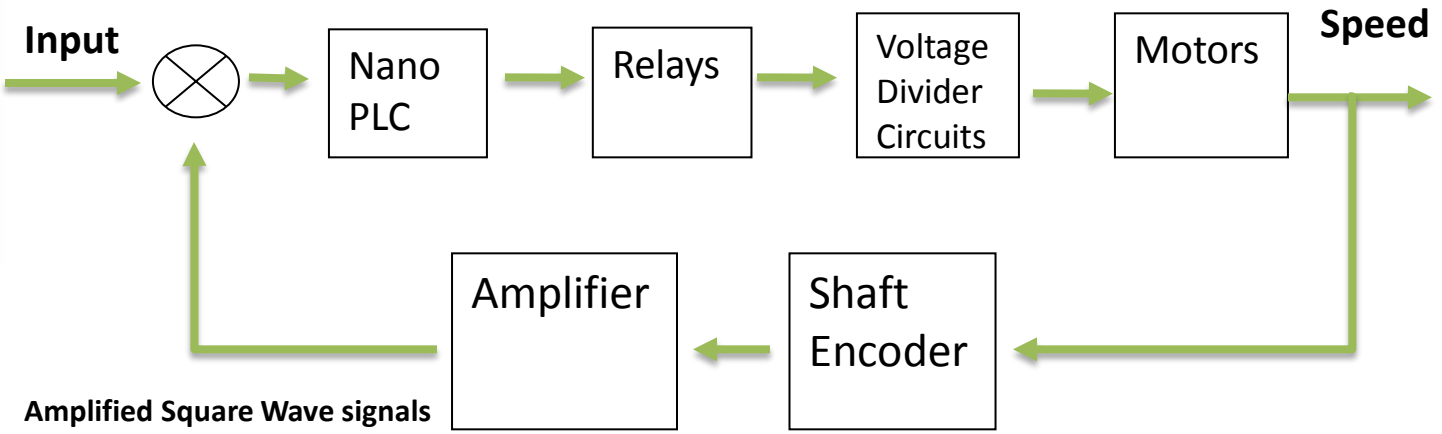
Automatic Speed Limit Controller



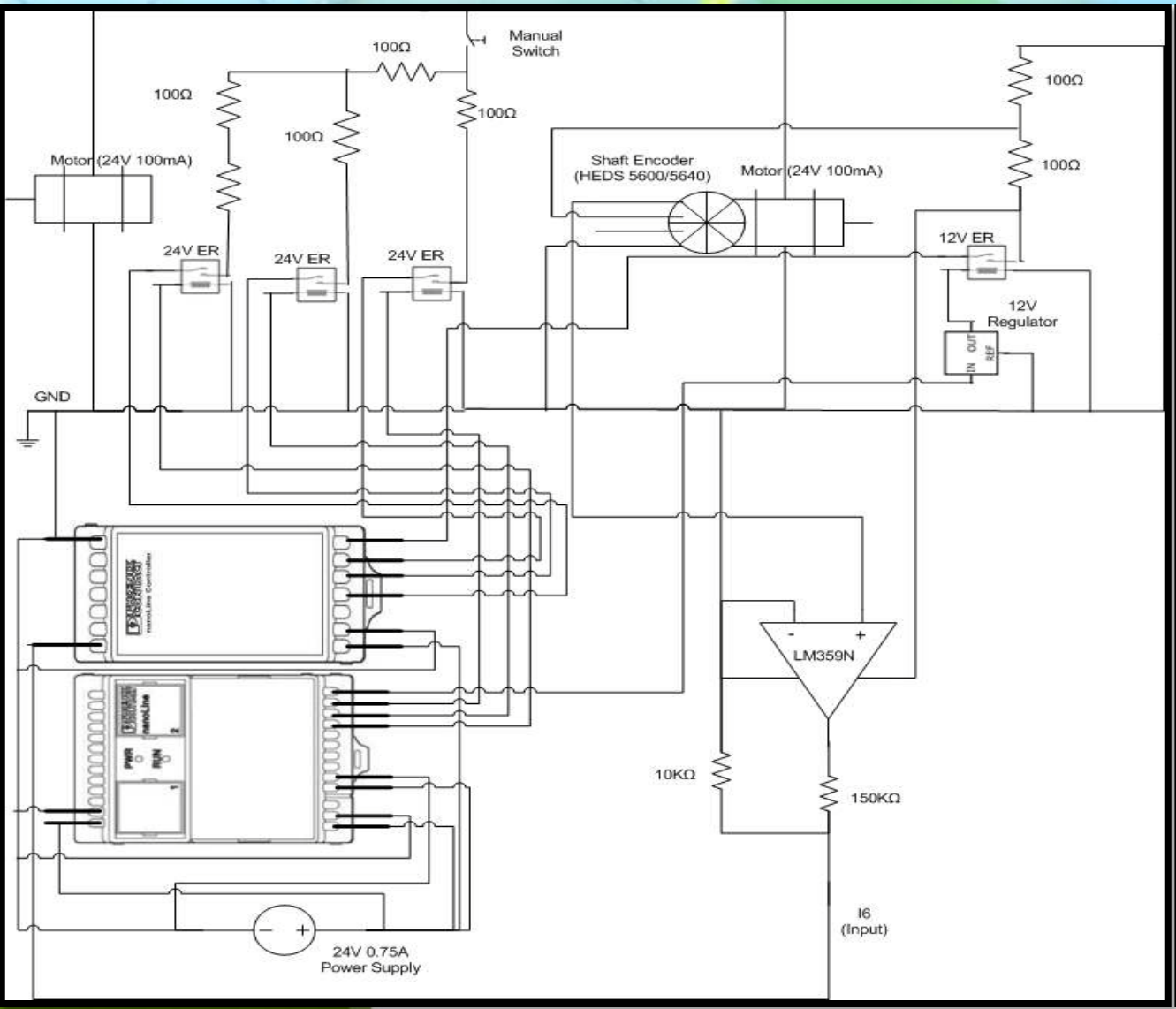
Spark Block

Conceptual Design of Automatic Close-loop Speed Controller

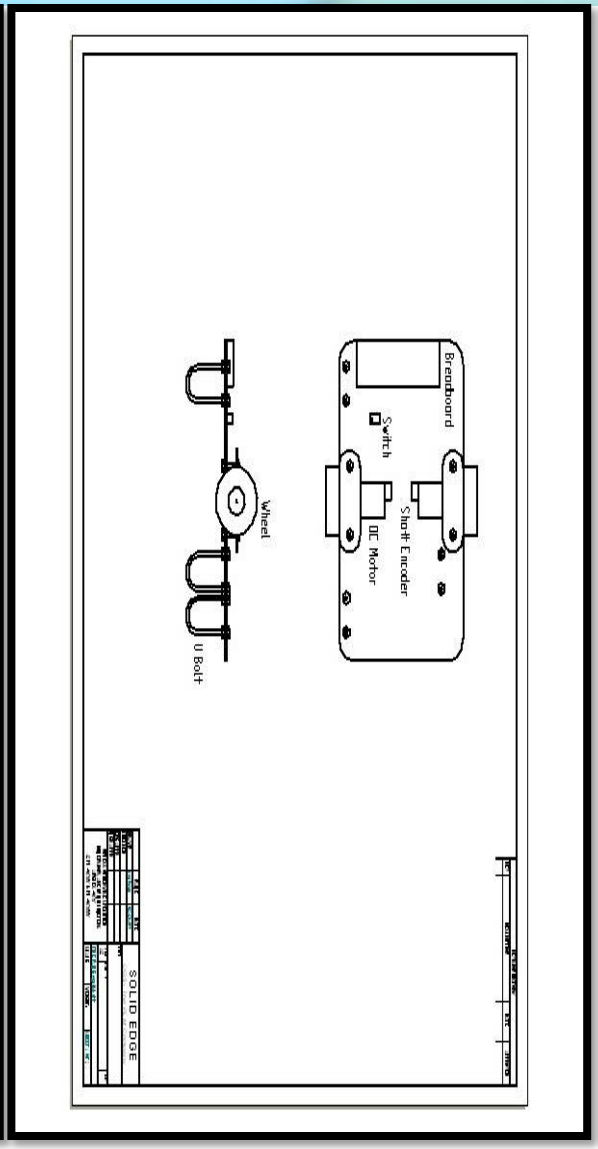




Physical Design

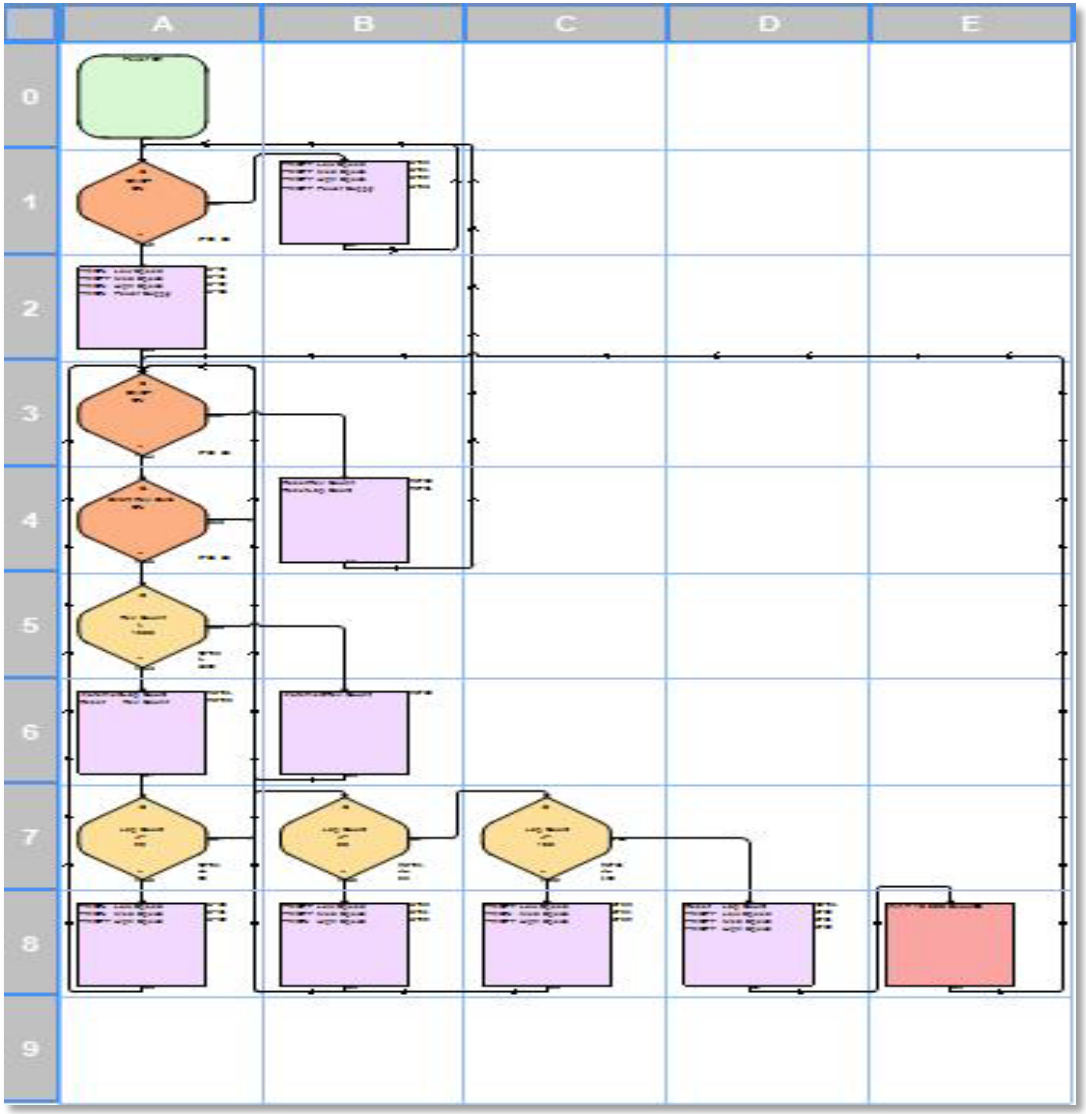


Electrical Schematic



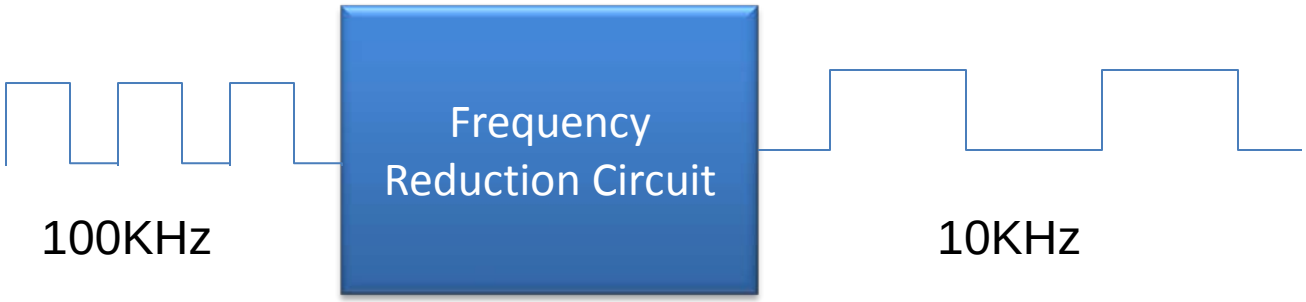
CAD Schematic

nanoNavigator Control Logic Flow Chart

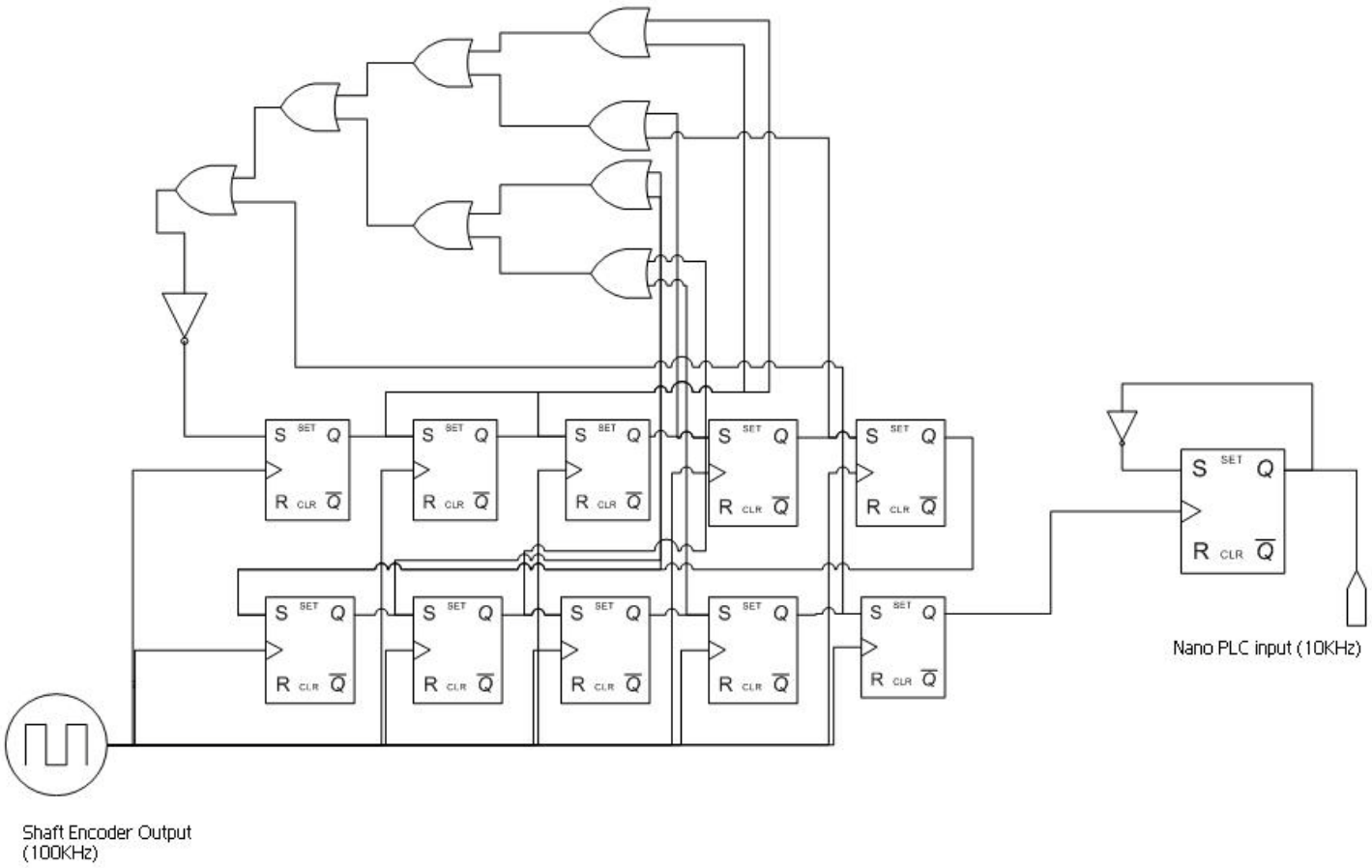


Further Improvement

- Shaft's Encoder Output Frequency is 100KHz
- PLC input frequency is 10KHz.
- PLC is not designed for HF (High Frequency) input
- Required an interfacing circuit for frequency mismatch



Frequency Reduction Circuit



Alternative Control Scheme

After learning microcontroller 80251 assembly language, we figure out that we could implement 80251 instead of nanoPLC.

Benefits of 80251

- Has more operations
- More customizable
- Has more memory space

Benefits of nanoPLC

- Eaiser to program
- Good for simple control operations
- Easier to interface into application

Safety

- Design has rotating wheels
  - Wheels could be placed inside clear box
- Emergency off switch for both motion and power supply

Marketability

- Simple design
- Widespread availability of components
- Can be extended and applicable to any rotary system

Acknowledgement

- Dr. Wunderlich
- Phoenix Contact
- Teammates
- Physics and Engineering Department, Elizabethtown College

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