

Senior Design Project Description

Company Name	<i>International Wire and Cable Symposium</i>	Date Submitted	<i>May 6, 2020</i>
Project Title	<i>Design and Build of a Small Multiplex Switch Module</i> (IWCS_SWITCH)	Planned Starting Semester	Fall 2020

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project.

Please provide your estimate of staffing in the below table. The Senior Design Committee will adjust as appropriate based on scope and discipline skills:

Discipline	Number	Discipline	Number
Mechanical	1	Electrical	2
Computer	2	Systems	
Other ()			

Company and Project Overview:

The IWCS International Cable & Connectivity Symposium is the premier venue for new technologies in wire, cable and connectivity products, processes and applications. The IWCS Symposium Committee generates an extremely high caliber program for each year's conference, with over 100 papers and presentations in 20 compelling sessions over three full days.

In addition, a variety of strong Professional Development Courses provide great learning opportunities from renowned industry experts. The Executive Track features speakers and topics of interest to general and commercial management, with a focus on supply chain issues. The Supplier Exhibition introduces the latest products and services from the important suppliers to our industry. The annual Plenary luncheon features a Keynote Speaker providing insight on a topical issue. The Plenary is also a time to honor the best paper and the best presentation from the previous year, as well as recognition to university students who have received various scholarships with the ambition to join our industry in the near future.

IWCS organizes the International Cable & Connectivity Symposium as the premier technology forum for the exchange of information about product, material and process innovation for cabling and connectivity solutions and for the development of industry professionals through education and scholarships.

In support of its mission to support education, the IWCS organization has made a donation to UNC Charlotte to support this project. You can read more about IWCS here:

<http://www.iwcs.org/>

This project is to design and build a new type of multiplexed switch system. Enter the “SVITCH System.” A new take on small scale multiplexed wiring systems.

Modern wiring systems often use multiplexed wiring systems in order to save weight, lower project cost and increase design flexibility. Unfortunately, while flexible they are often prohibitively expensive and overly complicated for small scale wiring projects. There is a market need for intelligent power distribution wiring projects with low I/O counts and low cost.

The Project goal is for the senior students to design, produce and test a small, user friendly, multiplexed wiring power distribution module system.

Project Requirements:

Henceforth known as the “SVITCH system”. It is of utmost importance for this module to be field/user configurable easily without a PC or other programming device. It is imperative that simplicity win over complexity. Someone should be able to configure the system easily with no tools and basic knowledge of wiring systems. Low cost is of utmost importance.

The module should be rugged, weather resistant, capable of high side only drive and output current comparable to automotive style relays (20-40 amps)

This system should ideally be viable alternative to small and medium count switching systems. A suitable J1939 low cost input module has been identified. The goal would be to incorporate these E33 J1939 switches as the user interface. These switches are easy to daisy chain and configure without software by changing rocker pieces. What is missing is the 3 channel complementary power distribution module.

<https://www.eaton.com/Eaton/ProductsServices/Electrical/ProductsandServices/AutomationandControl/VehicleandCommercialControls/ElectronicProducts/eSME33/index.htm>



Desired Power Distribution Module features:

Deutsch connector, single 12 pin male or other Deutsch combination of connectors.



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J1939 CAN interface

J1939 Feedback to E33 switch module LED for output status

3 channels

30 amps (accomplished by paralleling contacts)

Optional high current ring terminal input?

Vibration resistant

Water Resistant

105C at desired Power rating

On module Push button switch with LED or LEDs for feedback.

LED to indicate each output.

When all switches are off, power drain should be under 10 milliamps. It is desired to be even lower

Example pinout: (this would allow a contact limited 32A per channel, or 48A per Module

1 CH1A

2 CH1B

3 CH2A

4 CH2B

5 CH3A

6 CH3B

7 PWR in A

8 PWR in A

9 PWR in A

10 CAN L

11 CAN H

12 GND

Basic user configurability.

-CAN ID

-Latching or momentary output

Wishful features:

-configurable Circuit trip current

-configurable output ID to allow 1 switch to control multiple outputs or mix/match

-Daisy chainable footprint (perhaps a feature to share a power bus bar)

-no enclosure or minimal pre made enclosure or potting costs

-Small footprint similar to the connector

Electrical considerations:

Surface mount components should be utilized.

The PCB should utilize a modern low cost, microcontroller

Arduino is fine and encouraged but focus on costs and low power.

Bluetooth capable would be nice but not required.



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Expected Deliverables/Results:

Working SVITCH power distribution module
Schematics for the module
Code for the module
Mechanical designed if required.
Documentation for the SVITCH system.
Thermal Modeling and or Spice Modeling.
Thermal testing under load.

Disposition of Deliverables at the End of the Project:

Present either virtually or in person the results of this project at IWCS.
Provide all documentation of the SVITCH system to IWCS.
Be available to demonstrate the SVITCH system.
Publish a video of the SVITCH system in action.

List here any specific skills, requirements, knowledge needed or suggested (If none please state none):

CAD
Schematic Capture
Programming
Machine Design
Basic Wiring Knowledge