Encoder Automation Table

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Engineering Release Review - February 27, 2020

Encoders in Action



Printing



Equipment



Food & Beverage







Programmable Encoders

Linear Encoders

Value Proposition

- Showcase functionality of EPC's products
- Attract individuals at tradeshows
- Inform the public
- Train new employees
- Increase income and efficiency

Project Objective

- Design and create an attractive, interactive display that educates individuals on EPC's lineup of products.
- Demonstrate the programmable encoder's functionality.
- Demonstrate the linear encoder's functionality.
- Demonstrate an industry application ("cut to length")

Product Requirements + Constraints

General Description	Measure	Target
HMI Integration	visualize variables, supply inputs, back end programming	motion control works as designed, user interface is self evident for people to use.
Operation time	staff	8 hours per day, enough to run continuously for the duration of a fair
Easy set-up	Set up time and staff	Less than 15 minutes for 2 people to set up
Engages audience	Attractive, interesting, user friendly	Finished (painted/anodized, no wires showing), logos applied

Current Progress

February 27, 2020

User Experience

- 1. User engages in either Citizen or Engineer mode, within the HMI.
- 2. User attempts to actuate the block to a specified distance.
 - a. Success/failure is determined based on the degree of accuracy.
 - b. In citizen mode, the options for the programmable encoder will be pre-determined.
 - c. In "Engineer mode" the user will get to manually change the resolution of the programmable encoder in order to achieve the goal.
- 3. Upon failure, the block returns home and the user may try again.
- 4. Upon success, the user will experience a "random success routine"
 - a. Candy dispensed
 - b. Flashing lights
 - c. Music or sound is played



Physical Apparatus - Linear Actuator



Design Animation



Custom Plate Fabrication



Mock PLC User Interface



Block Diagram



Logic Diagram

Test	Target Date	Completed	Performance	Result	Reco
Can the PLC read the Programmable encoder?	2/10/20	1/28/20	The PLC can read the encoder	Р	
Can the PLC read the Linear encoder?	02/10/20	1/28/20	The PLC can read the encoder	Р	
Can the PLC run the stepper motor?		01/28/20	The PLC can run the stepper.	Р	
Can the PLC rotate the stepper motor a given number of rotations?	02/10/20	<mark>2/19/2</mark> 0	it can run a given number of rotations	Р	
Can the PLC run the servo motor?	02/14/20	2/23/20	the PLC runs the stepper	Р	
Can the PLC rotate the servo motor a given number of rotations?	02/21	2/23/20	it can run a given number of rotations	Р	
Can the PLC measure actuator speed?	02/21			F	
Can the PLC adjust the actuator speed?	02/21			F	
Can the origin limit switch send a signal to the PLC that it is depressed?					
Can the overtravel/end limit switch send a signal to the PLC that it is depressed?					

Design Validation Matrix

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Expense Items	Vendor	Date Puchased	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	ा	otal		
quipment/Tools:	1	-		2										
Stepper Motor	Automation Technology INC	2/5/2020	~	4				\$ 212			\$	212		
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Travel Expenses		2/26/2020				-		\$ 260			\$	260		
Annodizing Expenses	Deming Industries	2/26/2020		3	i (1		\$ 75		i di	\$	75		
General Expenses	Univerty of Idaho	2/26/2020		22				\$ 160			s	160		
upplies / Parts / Services:		<u> </u>	1		1		<u> </u>	1 8		-			É	
linear actuator	Amazon	10/27/2019		\$ 177	-	-	-	-	-	2	s	177		
stepper motors	Amazon	10/27/2019		\$ 44		1		2	8	2	s	44		
brackets	Amazon	10/27/2019		\$ 11							s	11		
speaker	Amazon	11/18/2019			S 17						s	17		
food dispenser Amazon	11/18/2019		1	\$ 16						\$	16			
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hop Usage (est. Hrs):	2	2		4				20		5	Н	ours		
shop expenses	University of Idaho	2/26/2020		3				500		1 - 3	1	500		
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Purchase from 11/18/2019	i i i i i i i i i i i i i i i i i i i			2	1			1	3	3	3	2		
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Budget Excess

Project Budget & Cost

Future Issues + Risks

- Original scope was 2-3 modules
- 2-color anodizing timeline
- Difficulty getting PLC+HMI to work with encoder and motors
- Difficulty getting linear actuator to reset after each trial
- Hiding wires and making everything look professional