Product Requirements

Team PRESS

Advanced Input Systems Button Cycler Enhancements

Updated: **12/11/2019**

Category	Metric No.	Metric	Priority	Units	Value	Comments
Function	1	Graphically assign test parameters prior to start	1	Hz, Cycles, Output channel, Input channel	Cycle rate, cycle amount, cylinders to actuate, keys to read based on cylinder	
	2	Upon start, system dials in desired button test force followed by a calibration routine before testing commences	2	grams-force	0-2000	This was changed from priority 1 to priority 2 because of the hardware changes that will be needed in order to gauge this measurement. Could use a combination of strain gauges on a bimba cross bar or have a floating bare where the reaction of the cylinder pushes on two load cells.
	3	Changes in switch resistance must be monitored during cycling	1	Ohms	Required	
	4	Verify switch open/closure upon each button press and log if and when it fails	1	Ohms	Required	
	5	Switch bounce on switch open and closure needs to be detected, datalogged, and flagged to the operator	1	ms	20	If it exceeds that threshold -> flag it. (both press and release - any switch-state). Open debounce period & closed debounce period
	6	System will datalog Metric No. 4, & 5.	1	-	Required	
	7	System will provide a means of compressing, sub-sampling, and/or summarizing data statistically or graphically	1	-	TBD	Will gauge this upon further research
	8	Monitor maximum applied button force during cycling	2	-	TBD	
	9	Adjust force up or down based on switch's "health"	2	grams-force	0-2000	
	10	Characterize switches F/D/R behavior at pre-programmed test intervals	3	graph	X vs. Y (mm vs Ohms & g)	
	11	Solution is expandable to accommodate X amount of buttons	1	-	20 (hard req.) - 30 (ideal)	
	12	Bimba cycle rate (per cylinder)	1	Hz	>= 5	
Electronics	13	DAQ	1	model #	NI USB-6008	This is not a 30-channel DAQ, but we will use this one for implementing our first 4 Bimbas and will expand after
	14	Keyboard electrical connector	1	-	0.1" pitch dual-row female connector	
	15	MOSFET or Relay bank to drive solenoids from DAQ	1	model #	TBD	Prefer to use MOSFETs due to their quick response time and long operational life, but are still currently looking for available products. Currently using a MOSFET w/ breadboard to drive our single Bimba.
	16	General size wire for system	1	gauge	18	
Hardware	17	Test hardware (i.e. pneumatics, electronics, etc.) must mimick that of the current setup at AIS	4	-	Required	New hardware may be implemented if timeframe allows for it. This would include a new gantry system and rail for Bimbas to attach to.
	18	Spatial requirements	1	inches	12 H x 24 L x 36 W	
	19	Strength requirements for Bimba rail	4	-	TBD	Rail will be able to handle fluctuating loads of up to 10 Bimbas per rail at maximum input force
Pneumatics	20	System must implement with existing facilities pneumatic supply	1	psi	100	
	21	3-2 solenoid to operate each bimba	1	model #	McMaster 61975K413	https://www.mcmaster.com/61975k413
	22	System will use existing Bimba spring-return air cylinders from AIS to press buttons	1	-	Required	
	23	On/off valve and manual electronic pressure control valve to regulate pressure & input button force	1	-	Required	
	24	General size for system pneumatic tubing (OD)	1	inches	0.125	
	25	Inline air tank (regulator) to help maintain constant pressure	1	-	Required	
	26	Manifolds will split air lines to run to each Bimba	1	-	Required	
	27	Solenoids will have a regulated exhaust pressure to avoid the Bimba from hitting to top of the bore every cycle	1	psi	7.5	This greatly reduces the noise of the Bimba during testing and can allow for quicker cycle rates if needed
Software	28	Solution will use LabVIEW instrumentation and software	1	-	Required	
	29	Will use PC hardware running Windows 7 or Windows 10	1	-	Required	
User interface	30	User-friendly means to see present values (ave, min, max) and look at previous tests to examine trends	1	-	Required	
	31	Means to pause/resume testing and/or make adjustments	1	-	Required	
	32	Be able to re-start a test that just completed	1	-	Required	
	33	Save & recall test setups	1	-	Required	
	34	Operator can enter parameters at pre-test	1	-	Required	
Additional Req'ts	35	Budget	1	USD ($)	2000	Subject to change upon hardware requirements for priority 2-4 components
	36	Project deadline	1	Date	8-May-20	

Key:

Necessary for prototype	1
Nice to have (Smart Bimba)	2
Extra nice to have (Switch Characterization)	3
Preferable for future product (Hardware redesign)	4