

OBJECTIVE

The goal of our project is to design a next-generation keyboard testing equipment and LabVIEW software package that can be easily configured to a broad range of switchboards developed at Advanced Input Systems.

VALUE PROPOSITION

Exhaustive testing of human machine interfaces (HMI) associated with dependable technology equipment is necessary to assure that the HMI remain fully functional throughout the anticipated usage life. The current system at AIS counts successful switch closures with multiple air cylinders over millions of cycles, but provides no information on when errors occur, no way to adjust cylinder force, and no feedback on button health.



EARLY DESIGN

KEY REQUIREMENTS

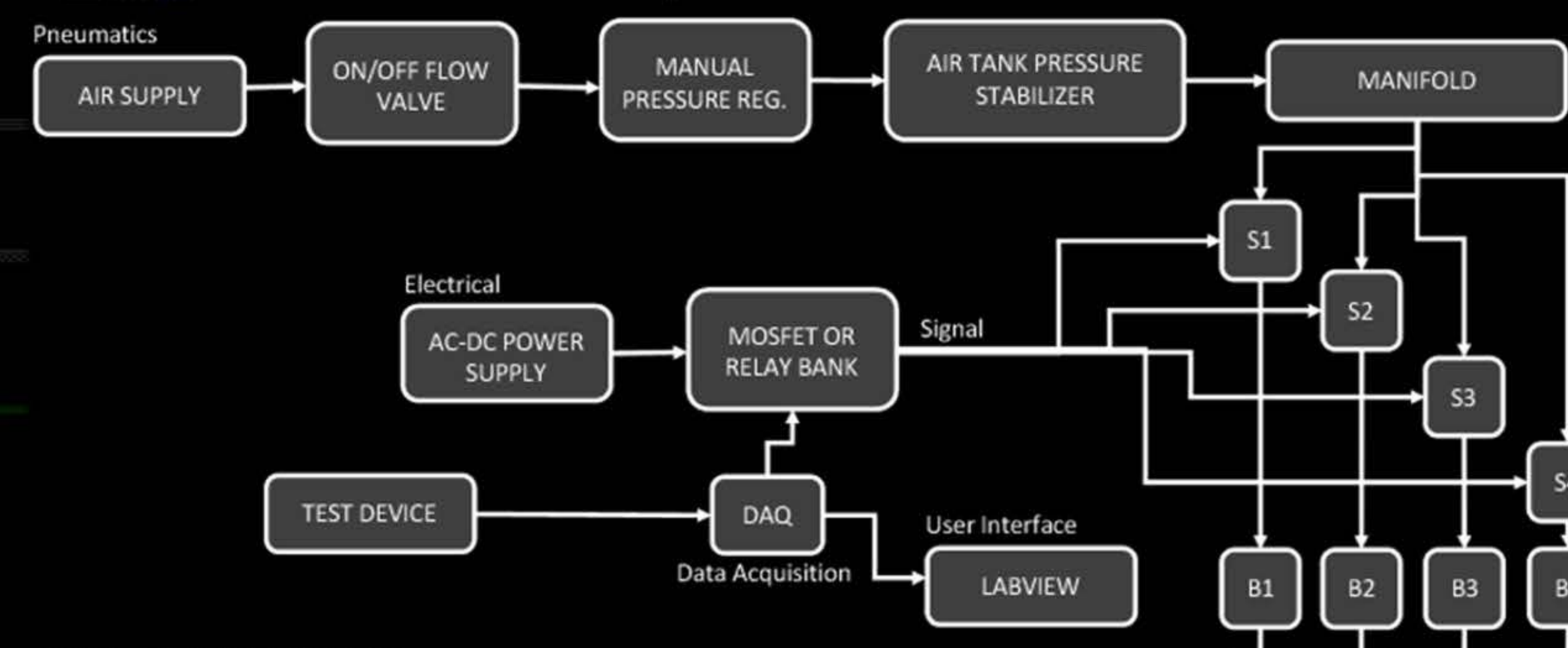
- Emulate current system capabilities
- Monitor switch resistance and debounce times
- Log closure and debounce failures
- Graphically assign and save test parameters
- Display present values during tests
- Summarize/reduce data to meaningful statistics

CONCEPT DEVELOPMENT



FINAL APPARATUS

An Arduino bootstrapped the initial design of experiment. This emulated AIS's cycler capabilities by controlling the cylinders with solenoid valves. Further development added an NI USB-6008 DAQ unit, MOSFET relays, a regulator tank and a 12V power supply. The LabVIEW VI was built piecewise by developing and testing modular tasks (read resistance, record debounce, etc.) before integrating each to a master VI.



SYSTEM DIAGRAM

1) Select test settings

Configuration

Test Config CSV File Path
C:\Users\aoveryby\Desktop\AIS Capstone\AIS Button Cycler U of I Test Config.csv

Analysis

Data Logging Folder Path

Data Logging File Name (no extension needed)

Test Parameters

Test Duration (Cycles)	100
Cycle Rate (Hz)	5
Failure Criteria (%)	2
Data Logging Period (Cycles)	10
Closed Resistance Threshold (Ohms)	40
Closure Debounce Threshold (ms)	10
Open Resistance Threshold (Ohms)	1000
Release Debounce Threshold (ms)	10

CLEAR ALL
RECALL

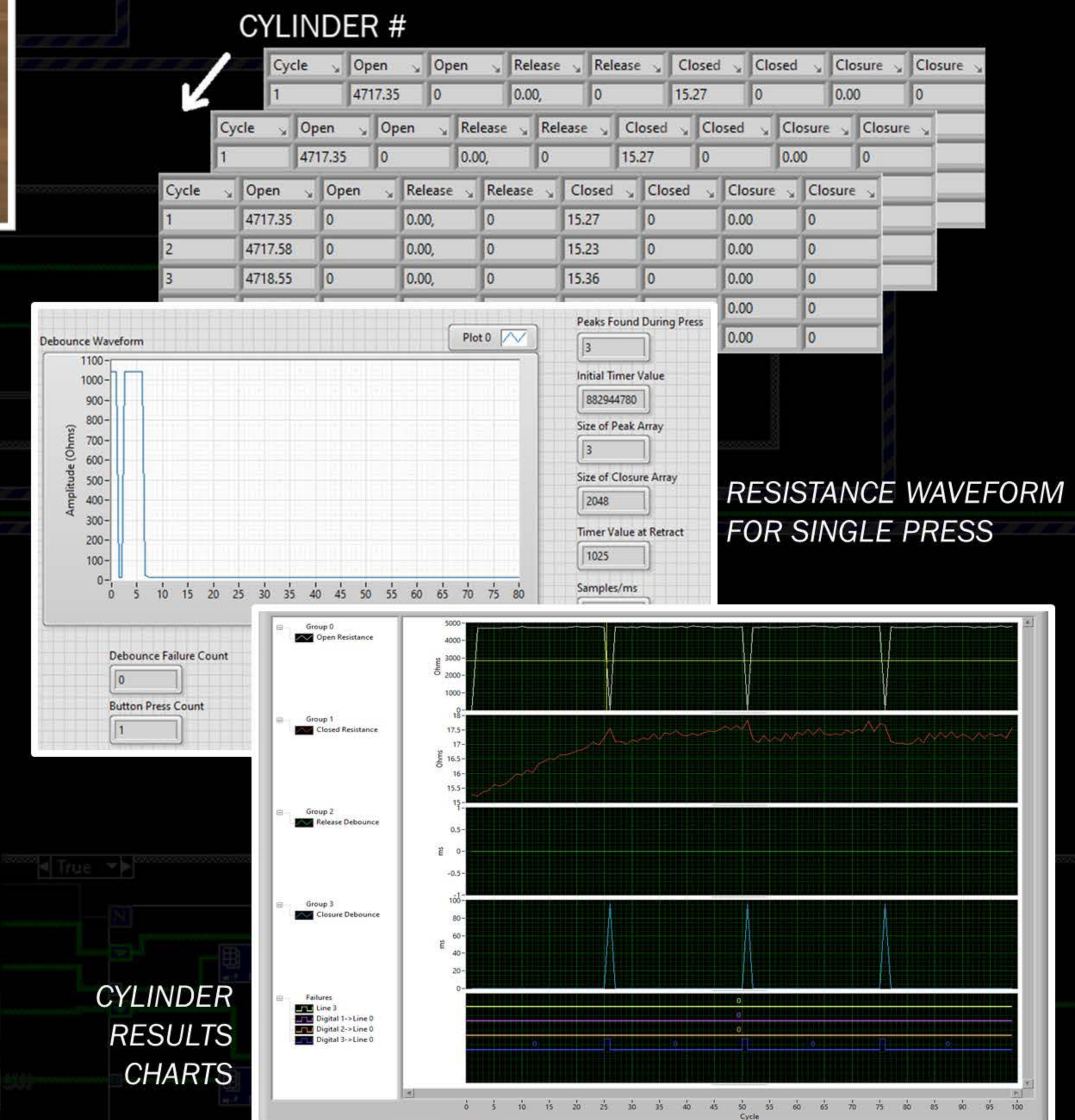
2) Choose cylinders/buttons to test

Cylinder ID	Switch ID	Cylinder Output Channel	Total Failures	Avg. Closed Resistance (Ohms)	Avg. Closure Debounce (ms)	Avg. Open Resistance (Ohms)	Avg. Release Debounce (ms)
☐ 1							
☐ 2							
☐ 3							
☐ 4							

CONFIGURATION INTERFACE FOR TEST SETUP

VALIDATION

Resistance waveforms were sampled and cached for each button press to extrapolate average open/closed resistances and debounce times. Key data was stored in a 3D array.



NEXT STEPS

- Dual Action cylinders to reduce spring irregularities
- Debug 3D array indexing
- Consider implementing Events in lieu of States

ACKNOWLEDGEMENTS

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