

INGRAM SCHOOL OF ENGINEERING

Project Overview

Our project is a bending apparatus that characterizes mechanical and electrical properties of conductive materials, to aid in the production of flexible electronics. Cyclic bending will aid in determining device sustainability while resistivity/conductivity measurements will aid in performance analysis.

Requirements	Results
Control	45° +/- 1.188°
bending Angle	90° +/- 2.142°
0-180° within +/- 1°	135° +/- 21.47°
	180° +/- 9°
Bend Sample For	100% Cycle
Inputted User Cycle	Inputted = Bends
S	Achieved
(0 - 10,000)	
Measure	Decreasing
conductivity in	conductivity
real time	(normalized),
	when probing
	every 5, 10, 20
	cycles for 1000
	bends.
Store angle/cycle	Memory writing
vs conductivity	operations
	validated up
	to 1000 cycles



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E2.05 - Flextivity

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TXST Sponsor: Dr. Maggie Chen

Top Level Block Diagram





Probes	Testing		
upply Current to Probes	156mA 0.1mΩ scale 15.6mA 1.0mΩ scale 1.56mA 10.0mΩ scale		
Read Resistance	Utilizing a 10Ω resistor		
	9.8763Ω0.1mΩ scale9.876Ω1.0mΩ scale9.88Ω10.0mΩ scale		
Transfer Resistance to System Control	Character Array transmits resistance values from input resistance.		
Calibration	12.475Ω 0.1mΩ scale 100Ω 1.0mΩ scale 1000Ω 10.0mΩ scale		

	commands					
Power Specification	Measured Voltage vs. Measured Current Draw	Pov Requir	ver ements			
Probes: 7V - 12V	7V - 12V 56mA - 209mA	11V	.5 A			
Motor Subsystem & UI Module: 5V	4.99V 1.83A	5 V	3A			
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Features • 0° to 180° degree tension bending. **4-Point Probe resistance** measurements **Resistivity/conductivity** calculations **Accepts user inputs and displays** real-time data to user interface. **Stores data on micro-USB for** external data analysis **Control System** Arduino 2560 R3 Microcontroller Cycle count and 9. Send cycle 1. User Prompts displayed to Resistivity values prompted for count and stored onto resistivity value inputs LCD micro-SD card CD ...

		to SD module	12
Bending Angle Number of Cycles Sample Dimensions Cycles/Probe	2. Keypad inputs stored in character arrays	8. Process resistance value and produce	ART resistivity value, and job status
Variables displayed back to user via LCD	3. Char arrays unloaded into corresponding variables	7. Read I2C bus and convert	information displayed to LCD
Current cycle count, resistivity value, and job status	4. Enter for-loop controlled by cycle count.	incoming resistance data from a char array to a float variable	I2C Probe subsystem (resistance data)
displayed to LCD	5. Motor functions set	6. If cycles/probe condition is	For-loop environment Function environment
Power subsystem <u>5V</u>	bending arms to specified angle then reset.	met. Drop probes and raise platform.	External data transmission Program stage transition
	GPIO 😽	GPIO	

Movement subsystem reacts to input

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