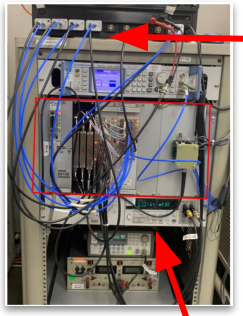
Automated Oscilloscope Tester

Team Oscillating Ocelots | Teledyne Lecroy

Haley Smallwood, Will Foerster, Mark Gautier, John Ramsdale, David Hetherington, Bjorn Tingstad

Problem: Quality assurance of oscilloscopes is time consuming



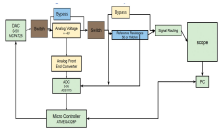
Only 4 channels at a time!

Current Testing Setup

Manually Operated

Obstacles We Faced:

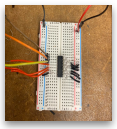
Redesigns



During our design process we went through several iterations of our overall design as well as individual modules. Having to constantly redesign delayed our ability to start working on PCB design.

Part Selection

As part of our redesign process we constantly were changing parts. For example, the picture shows our early tests for a demultiplexer which would not be used in our final design.



Bootload Issues

Once the final PCB was designed and delivered we faced several issues preventing us from using it in the final product. Our main issue was we could not bootload the microcontroller in order to establish communication and upload our code.

Solution: An automated oscilloscope testing station that will reduce the time required to verify oscilloscope quality.

Components: Connections to power supply.

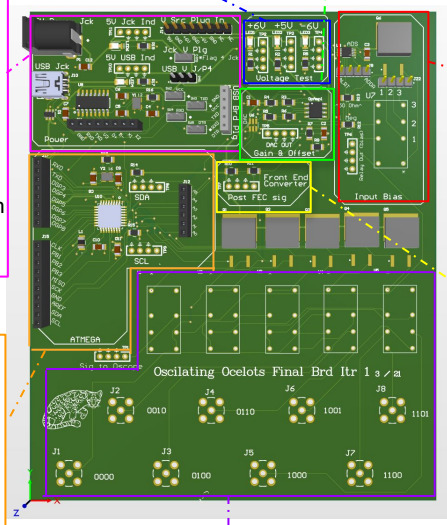
Purpose: Allow 5V, 6V, -6V plugins.

Components: MCP4725 DAC, LM358 OPamp.

Purpose: Create voltages from -4V to +4V.

Components: USB port, CH340G.

Purpose: Converts USB to serial to allow communication to the ATMega328P.



Components: ADC Input Bias resistors: 50Ω and 1MΩ.

Purpose: Used to measure input bias, measures signals on board for verification.

Components: ATMega328P microcontroller.

Purpose: Controls the creation of signals, signal routing, and communication with PC.

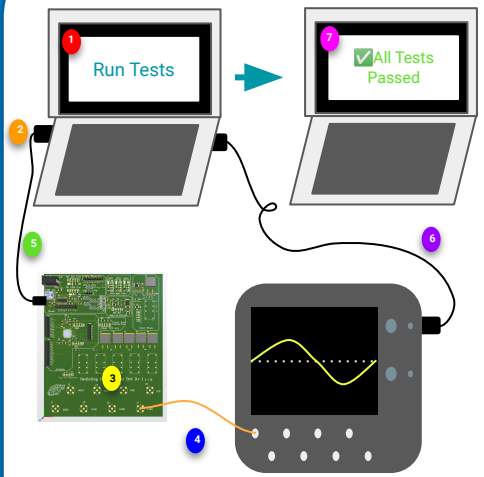
Components: Front end converter circuit.

Purpose: Convert negative voltages to a positive voltage range that can be read by ADC.

Components: Relay tree of J104D relays, 8 SMA connectors.

Purpose: Allows for the user to choose which of the 8 channels on the oscilloscope the signal gets sent to.

Product Operation



1. User runs a Python script which initiates testing.
2. PC communicates with AOT via USB
3. AOT begins generating signals and routing them to oscilloscope, ADC, and other areas depending on which test
4. Signals are sent to the oscilloscope via SMA to BNC
5. AOT returns AOT data to PC via USB
6. Oscilloscope sends its reported measurements via USB to PC
7. Parsing the data from both the AOT and oscilloscope, the software reports to the user whether or not the oscilloscope meets quality standards

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