Flying Probe Data Acquisition PCB

TANGENT DESIGN ENGINEERING

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Abstract

Alongside Tangent Design Solutions, we are working to develop a Data Acquisition Unit PCB for a flying probe. The goal of the DAQ is to take multiple measurements including voltage, current and power. Our deliverables include two circuit boards, firmware, software for circuit board control, and the testing script. We have developed a power measurement board and its corresponding firmware, testing script and software needed for the system's functionality, and the hardware for the DAQ developed.

System Overview
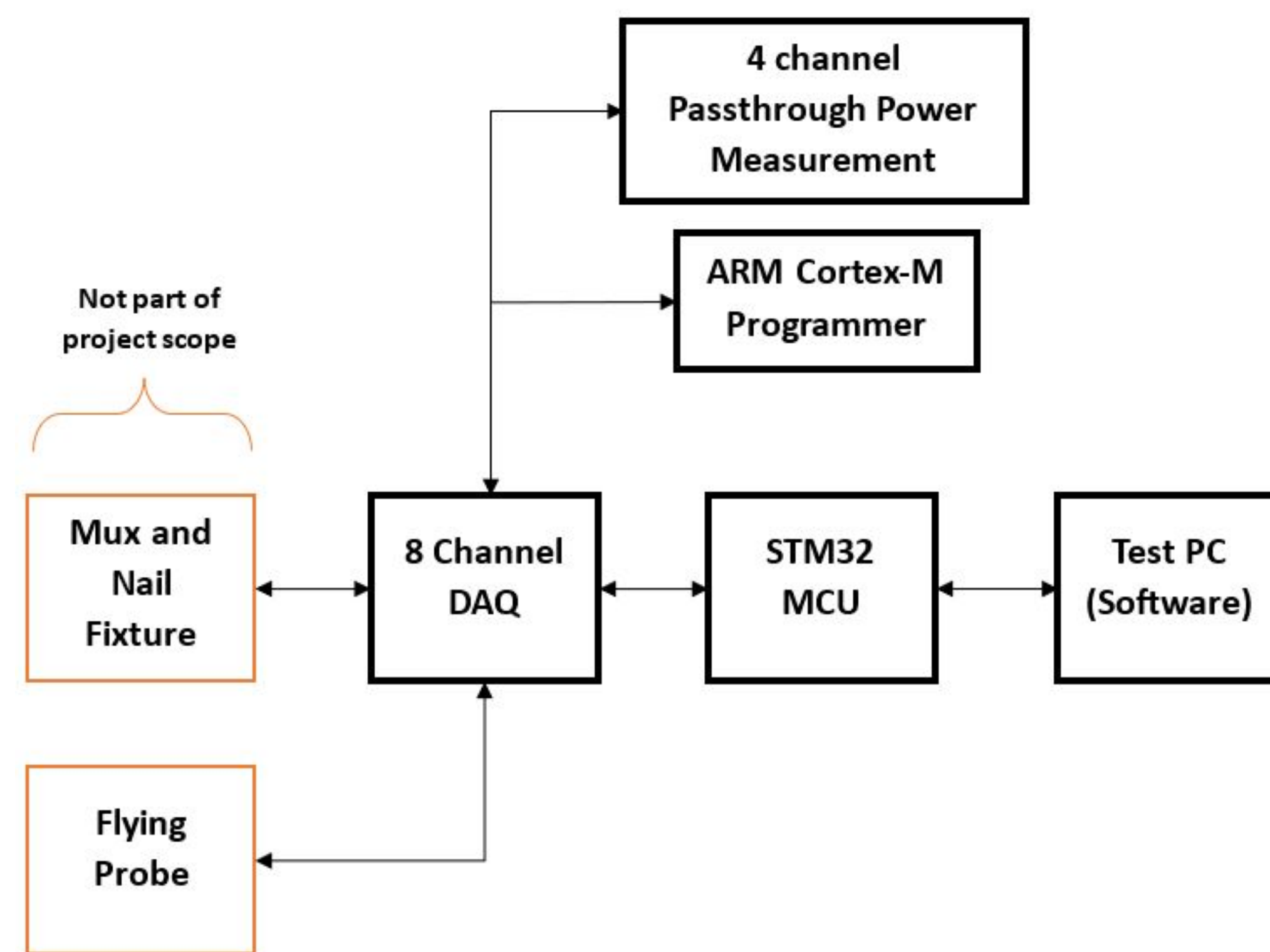

Electrical Diagram – Power Measurement PCB
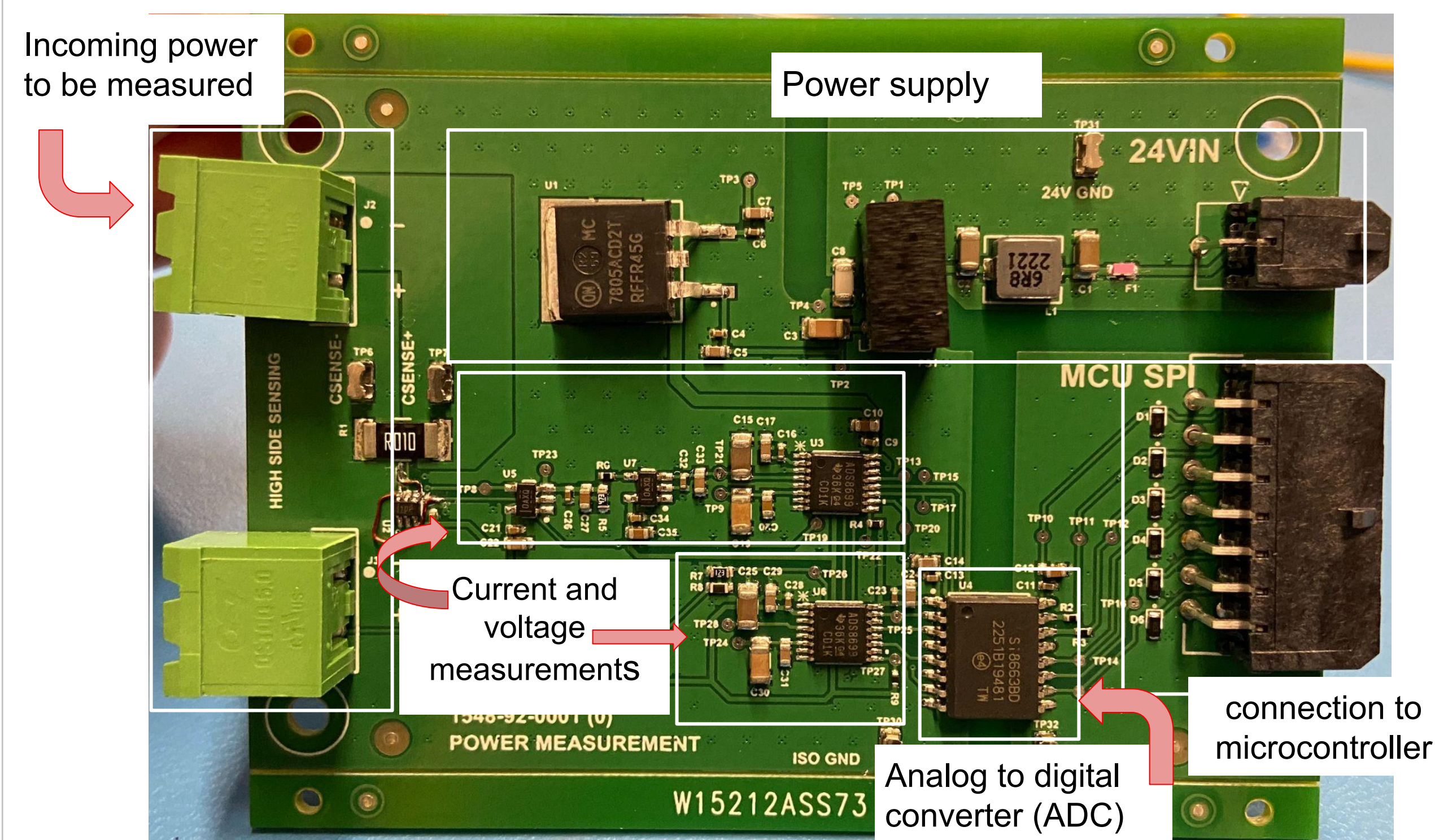
Introduction

- Tangent, based in Calgary, Alberta, offers electrical, mechanical, and software design services and recently acquired SMT equipment for faster printed circuit board assemblies.
- Testing these boards is time-consuming, using a dedicated bed of nails fixture.
- The project aimed to develop a versatile data acquisition system and software to automate PCB testing.

Discussion

- The Data Acquisition PCB project is an essential tool needed for any hardware manufacturing company, to efficiently test any PCB in an automated fashion.
- Lessons learned
  - correction of wiring when a PCB connection is incorrect and discovered after assembly
  - Utilizing Altium and resolving issues
 - Organization of all meetings and overall scheduling of the project.
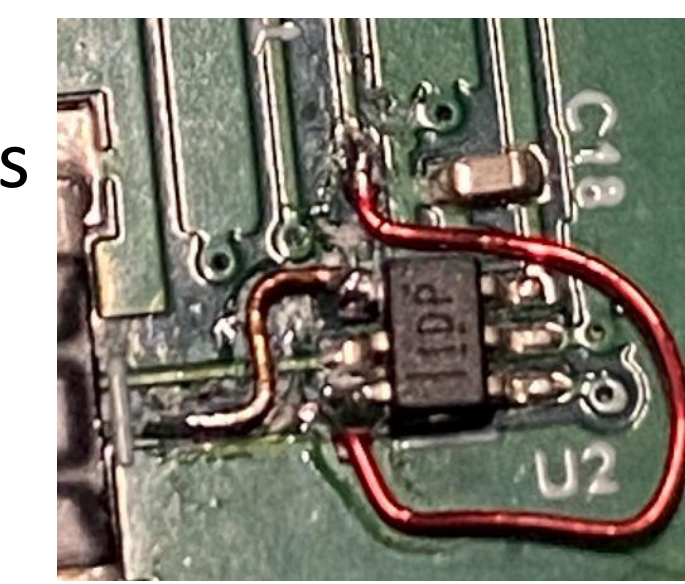
| Specification	Details
Device Power Supply	Device shall run via USB or external 5-24 VDC power supply
Control and Configuration Interface	Device shall connect to computer for control & configuration via USB and/or Ethernet
Programmable Data Channels	Number of 8 channels for measurements and stimulus of the unit under test. Channels shall be configurable in function via software. Data channels shall be capable of sampling at 0.5-5 Msample/sec.
Measured Values	Power, Voltage, Current, Resistance, Capacitance

Data Flow
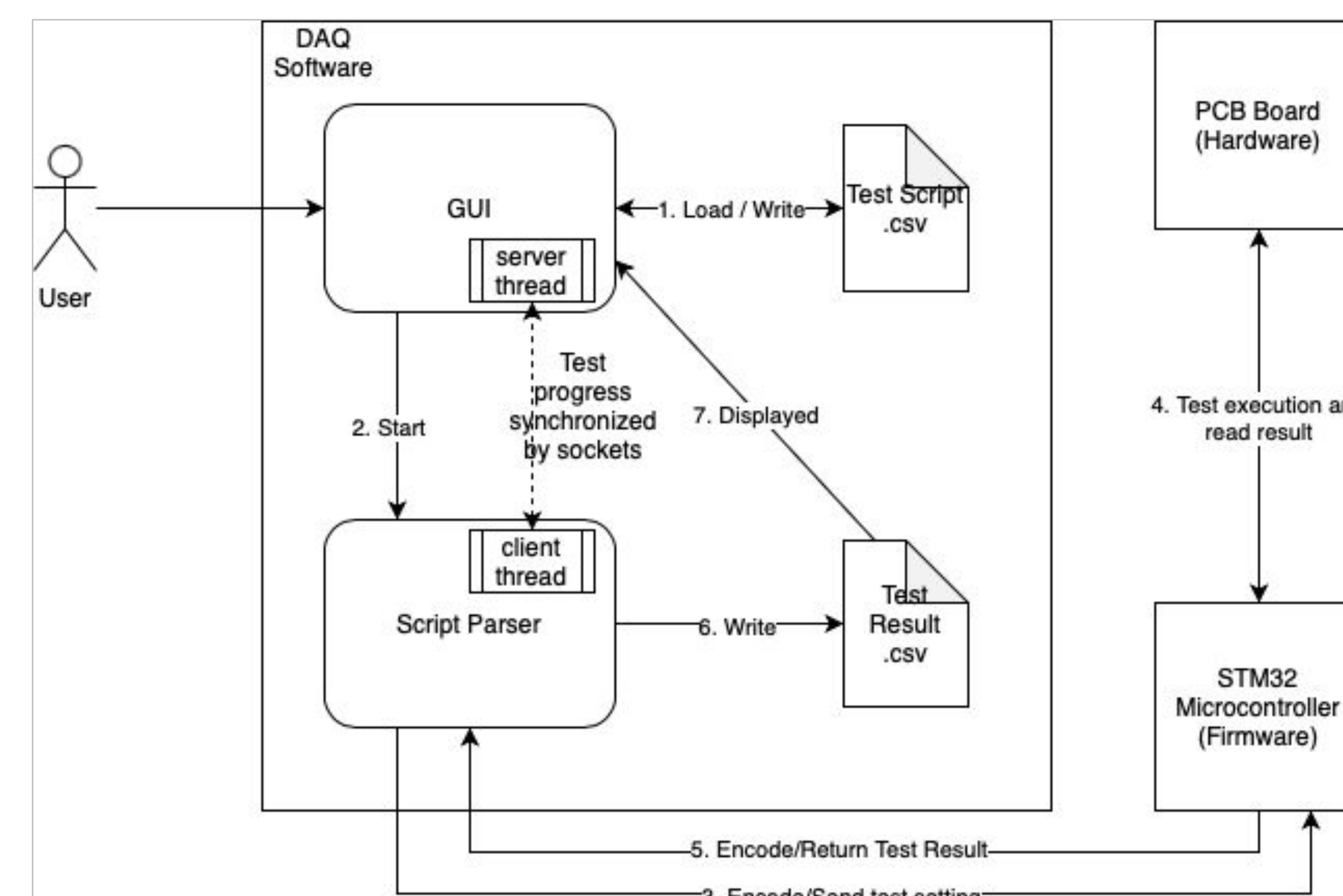
Results

- PCB Design Package for Data Acquisition and Power Measurement board.
- One physical copy of the Data Acquisition Board, four physical copies of the Power Measurement Board.
- Software GUI for scripting test sequences.
- Firmware for controlling the Power Measurement Board.
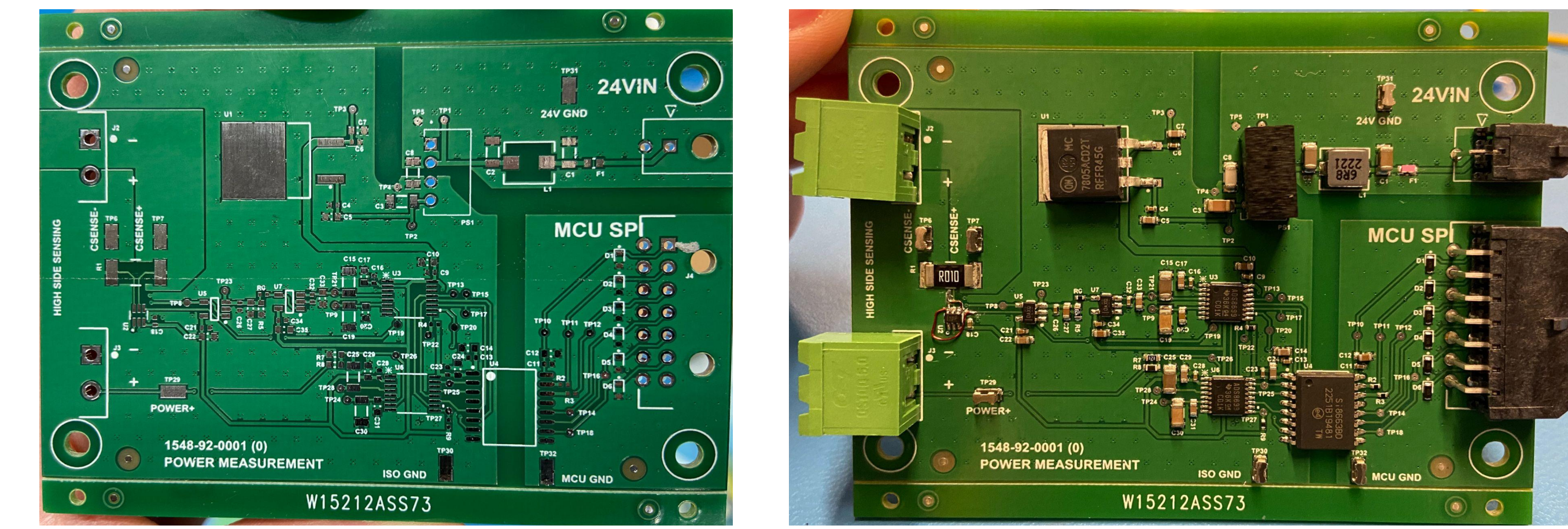
Before and After PCB Assembly
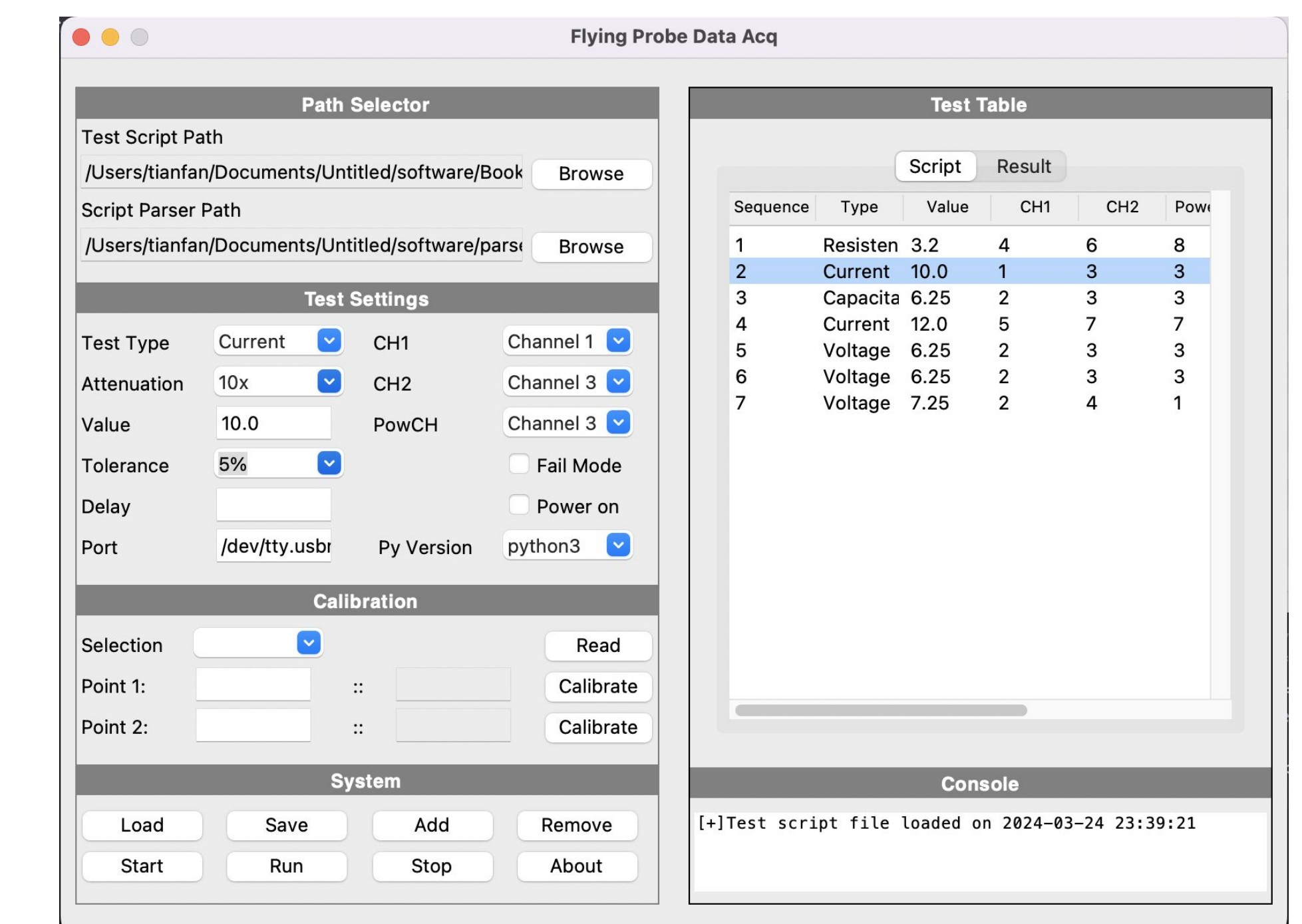
GUI Interface

Methods and Materials

- All materials, supplies and tools were provided by Tangent Design Engineering and MakerSpace (Schulich School of Engineering)
- The technology commonly used today to assemble a Printed Circuit Board (PCB) is Surface Mount Technology (STM). We are using NUCLEO-H743ZI2 as our CPU and firmware is being developed in STM32CubeIDE.
- Designed the PCB in Altium. Parts were chosen from Digikey or Mouser and imported into Altium.
- Bill of material (BOM) was generated to help us estimate the price of the project.
- Oscilloscope, power supplier and digital multimeter were used to support project execution.

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