

Sukup RTD Circuit Tester

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Client: Sukup

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Problem

Sukup has developed a temperature measurement PCB for grain dryers. A test kit is needed to test these PCBs at the end of production, so Sukup does not implement faulty devices. The test kit is also needed to aid in the development of future

Overview

Our team started out testing and working with the Sukup PCB to fully understand how it works, and what the best way is to test it. We went through a few choices but ended up deciding that the best route would be to make our test kit take the place of the RTDs (resistive temperature device). Our device would then act as an RTD, but allow us to manually control the temperature reading, and simulate various fault conditions such as open, short and over-voltage.

Requirements

- Uses standard USB
- Measure accuracy of circuit
- Simulates temperature values
- Test open and short conditions in RTD
- Test Modbus communication
- Test for overvoltage condition

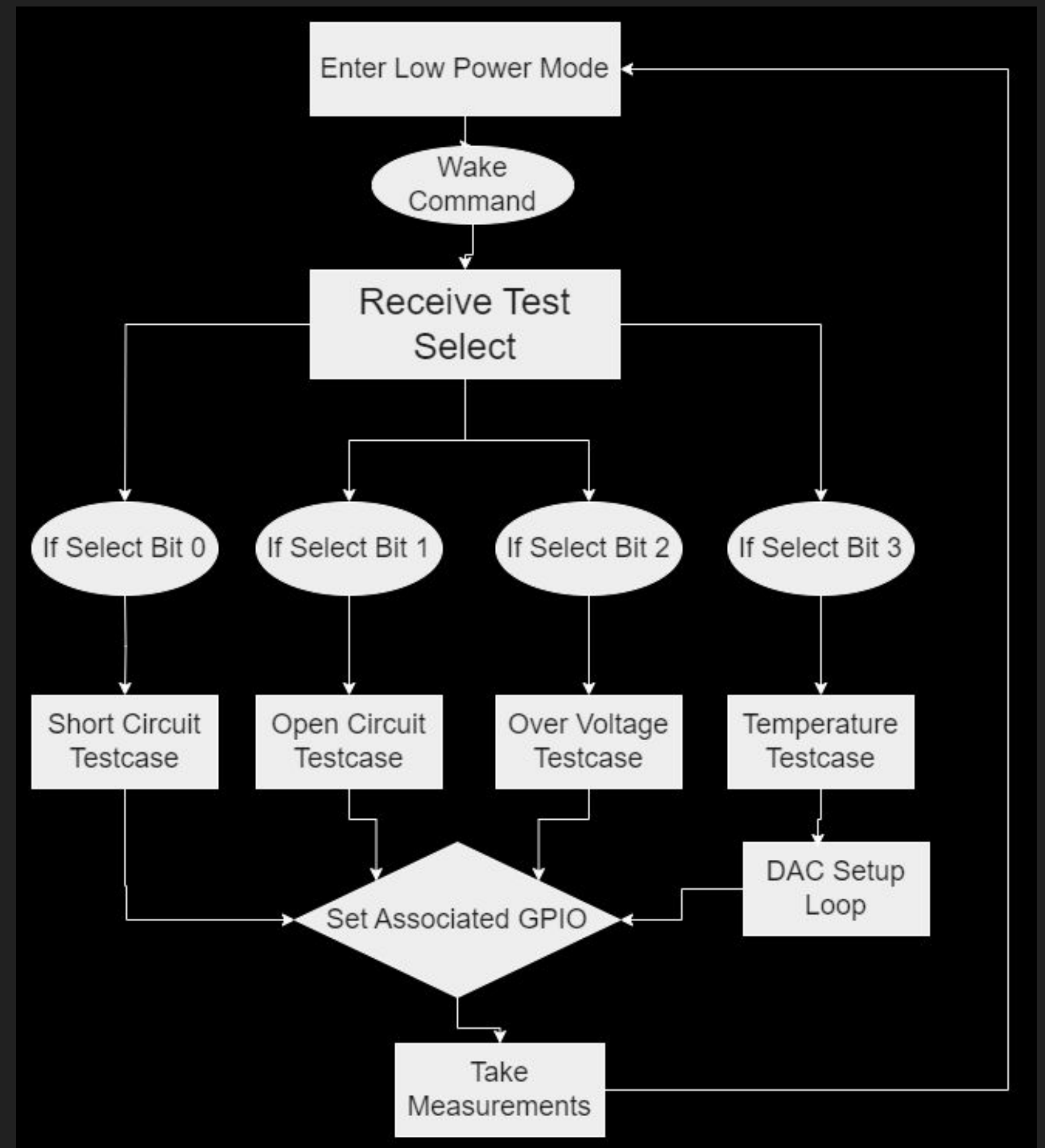
Users & Needs

- Sukup electrical engineer
 - Use as developmental tool
- Sukup technician
 - Quickly test PCBs at end of line

Design Choices

The design decision that we spent the most time on was deciding which method we wanted to simulate the RTDs resistance with. Our main choices were an analog potentiometer or a DAC and simulate the voltage difference across the RTD connections. We ultimately chose to use the 16-bit DAC that allows for high resolution, and make testing accuracy much easier.

MCU Code Flow



Testing & Results



During testing and at the end of this project, the majority of our requirements have been successfully met. Our design uses a standard USB, and it tests open, short and over-voltage conditions. Unfortunately, we were unsuccessful in getting our DAC to work properly, as it outputs a constant voltage of ~1.3V. (For the oscilloscope traces above - Blue: Chip select, Green: System clock, Yellow: Data line 70°F Testcase)

How It Works

