



OBJECTIVE

Develop a wireless stream velocity measurement device that can communicate with 2 or more conductivity probes, and have the readout being accessible from a phone or tablet

VALUE PROPOSITION

- Update a system that has been out of date for several years
- Create a safer working environment for the researchers
- Allow for more efficient data collection by having all data accessible from a tablet or smart phone immediately

KEY REQUIREMENTS

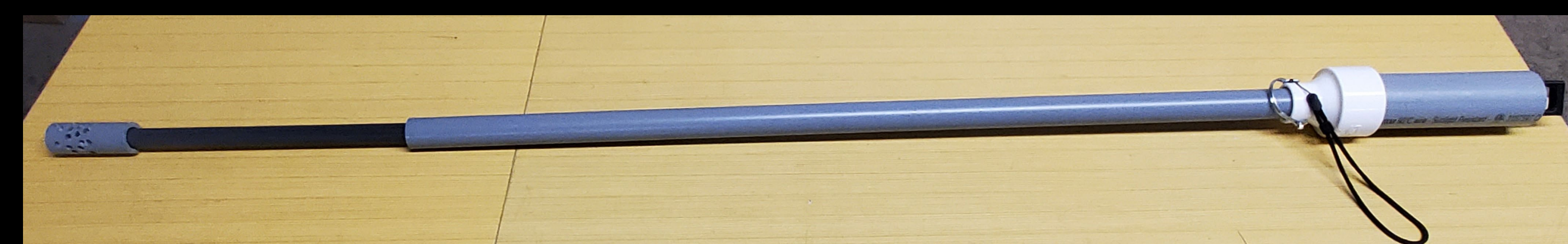
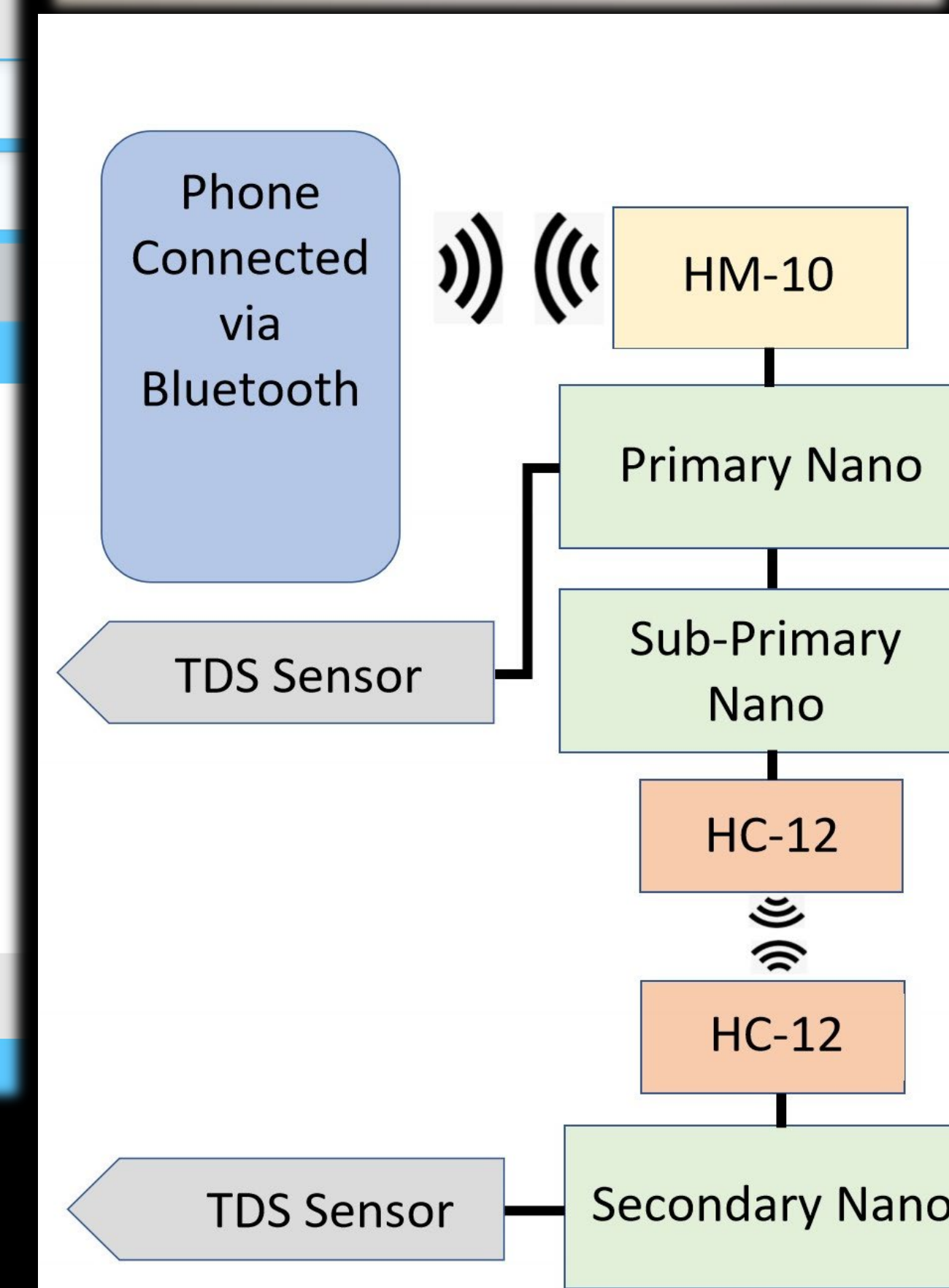
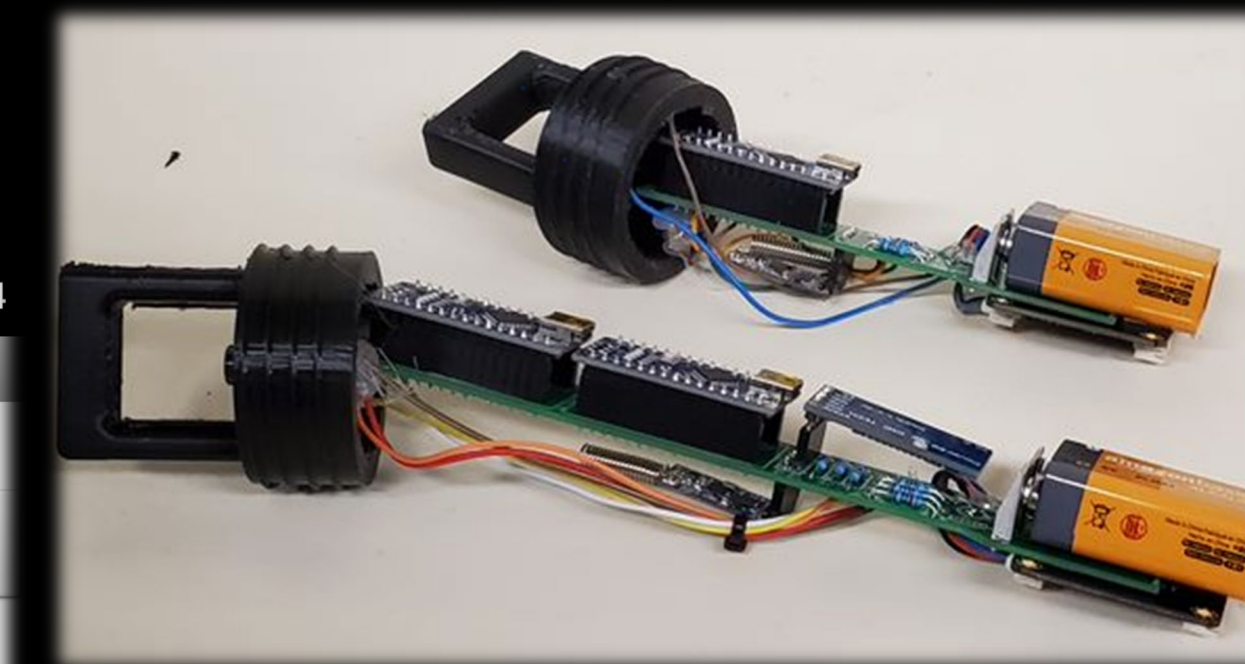
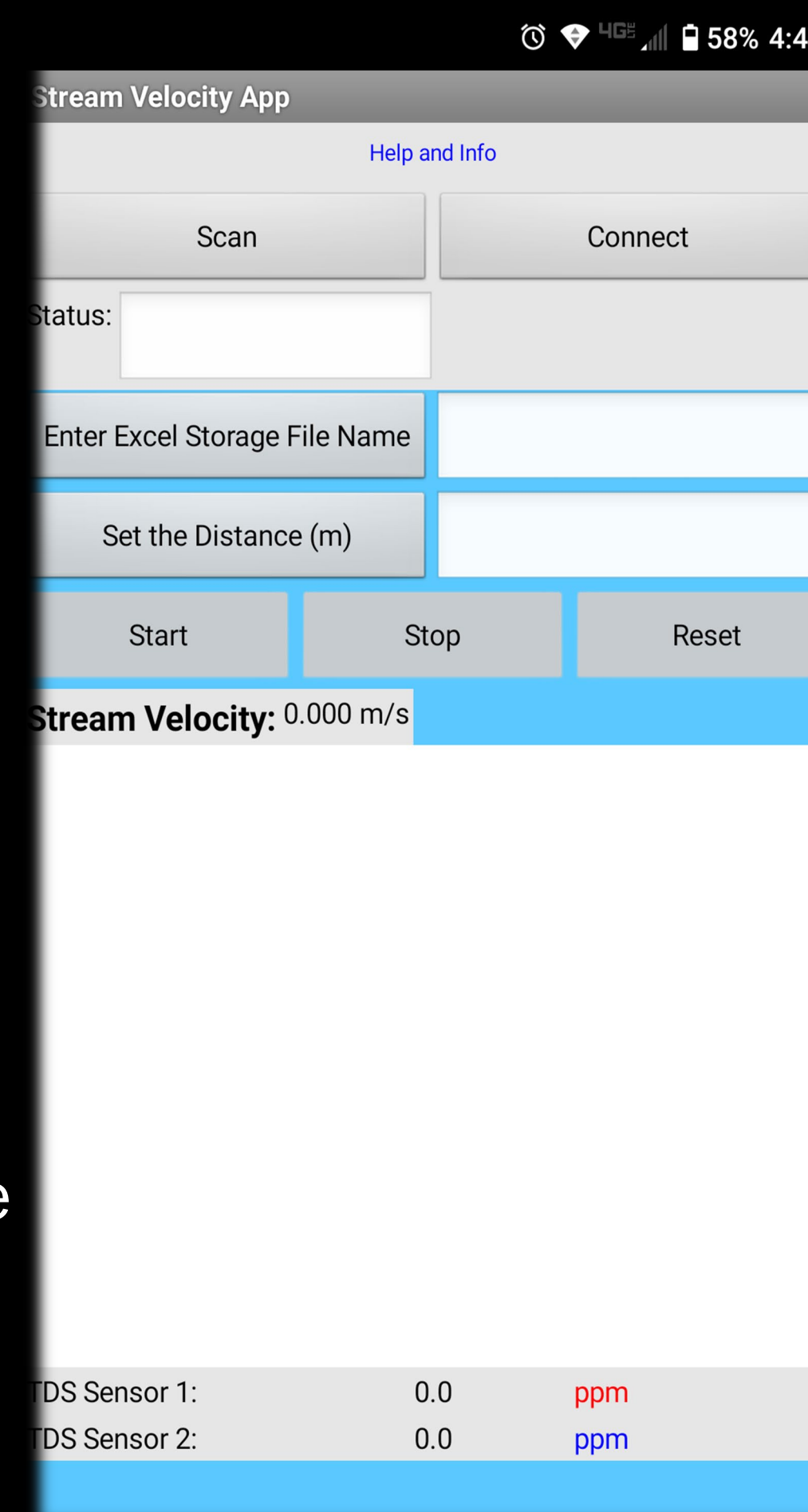
- Work with a wide stream velocity range (2 L/min to 4 cfs)
- Work with a wide variety of stream widths (5 inches to 5 ft)
- Be able to work with a probe separation of about 6 stream widths
- Must be compatible with most phones and tablets
- Must be less than 20 lbs
- Must be suitable for all weather conditions (rain/sleet/snow)
- Device can be up and running within 20 minutes

CONCEPT DEVELOPMENT

- We decided to use Arduino nanos as they are the only Arduino microcontrollers that will be able to fit inside the PVC tubing
- We ended up using the HM-10 Bluetooth module over an hc-06 Bluetooth module as the hc-06 could not connect to devices using Bluetooth 4.2
- We are using PVC as it is light, durable, and easy to replace

FINAL DESIGN

- All electronic components are housed on custom printed circuit boards (top right)
- Block diagram of the circuitry (bottom right)
- A screenshot of the designed app (right)
- Exploded view and assembled view (below)



DESIGN VALIDATION

- The HC-12 wireless communication module works when separated by 100 ft with objects in the way
- HM-10 Bluetooth module works with a 50 ft distance between phone and probe
- Battery life of probes when powered by 9V battery lasts more than 10 hours when running continuously
- Data from probes matches data from old system within .05% error

CONCLUSIONS

- Our system is accurate while offering a more user-friendly interface
- It is also safer than the previous version by being light weight and wireless

RECOMMENDATIONS

- Prototyping early and often leads the best results of any design
- Thinking outside of the box is often the best solution to any problem

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