4-20 mA Detector Interface:

A Versatile Hand-Held Monitoring Tool

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Problem Statement

It is difficult for technicians in <u>volatile environments</u> (i.e. naval ships, industrial plants) to <u>consistently monitor</u> various parameters (i.e. temperature, pressure).

How can we design a simple, hand-held, and configurable device to help technicians in volatile environments measure a variety of parameters?

Design Goals

1. Arduino Implementation
2. Integrated Touchscreen
3. Capable of 4 Sensor Inputs
4. Ergonomic & Hand-held
5. Configurable Inputs

Fig. 1 Arduino with touchscreen

Software Design

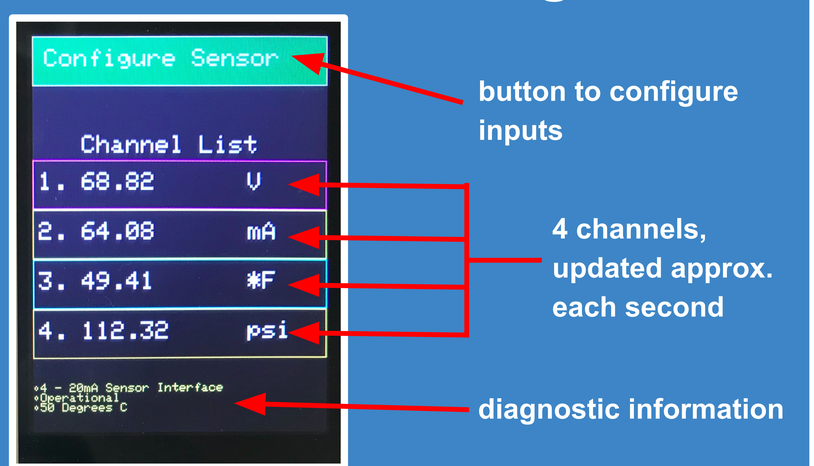


Fig. 2 Touchscreen visible to the user

Hardware Design

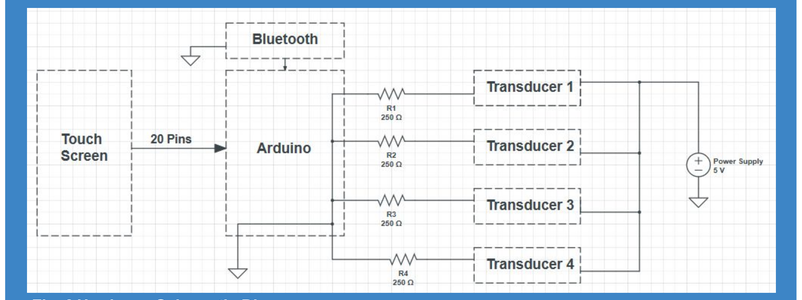
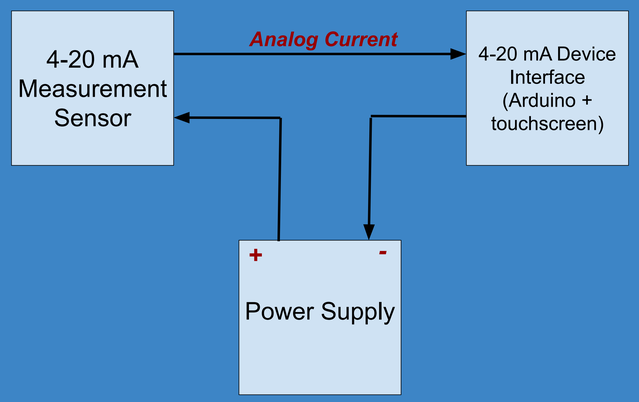


Fig. 3 Hardware Schematic Diagram

4-20 mA Current Loop



Features

Feature	Achieved?
Arduino Implementation	✓
Integrated Touchscreen	✓
Capable of 4 Sensor Inputs	✓
Ergonomic & Handheld	✓
Configurable Inputs	✓
Bluetooth-enabled	X
Standalone Chip Design	X

Why 4-20 mA?

- **<u>Applicable to multiple use cases</u>:** A current range of 4-20mA is the standard for process control engineering. Thus, our device is transferable to multiple environments.
- **<u>Built-in error checking</u>:** Any current input below 4mA or above 20mA automatically indicates an error with the device. This ensures the user is correctly interpreting the output they see on the touchscreen.
- **<u>Allows for long distances</u>:** The electrical design allows there to be minimal error even when the sensor is far from the device.

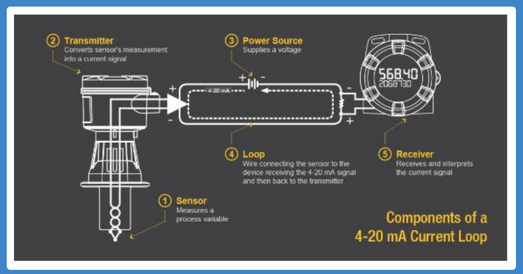


Fig. 4 Components of a 4-20 mA Current Loop

Future Directions

- **Add software to support Bluetooth data streaming**
- **Support data logging**
- **Add ability to save configurations for future use**
- **Improve mechanical design**

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