Power Outage Detection System

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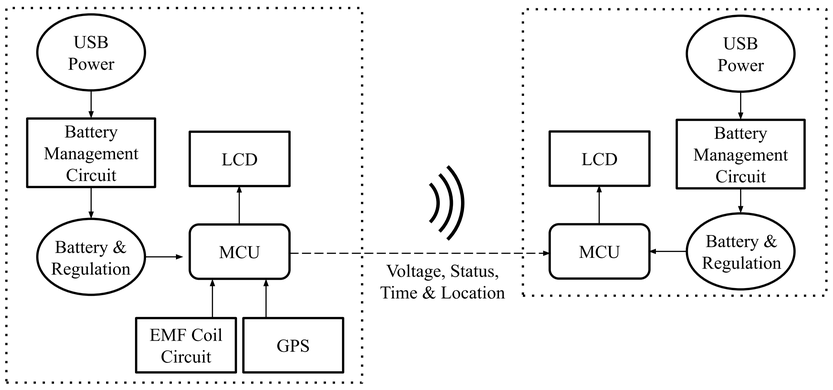
Abstract

Power Outage Detection System (PODS) is a device designed to monitor the electromagnetic field of power lines, particularly in rural areas. With its electromagnetic field (EMF) detection capabilities, the device can identify voltage irregularities and communicate these findings to a central device. PODS will be strategically placed along power lines to provide comprehensive coverage.

Each device will monitor the EMF at its location and communicate the presence of a fault or an outage to a central controller.

System Overview

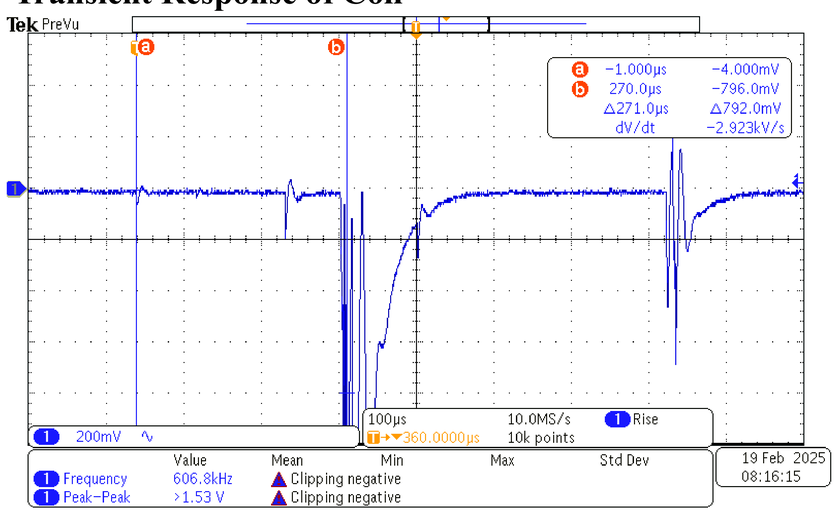
Detection Device **Hub Device**



- Calibrates to current position and voltage.
- Monitors EMF constantly.
- Detects faults and outage based on voltage thresholds.
- Displays voltage and status on an LCD.
- Communicates via radio the outage status, time, location, and device number.

Results

Transient Response of Coil



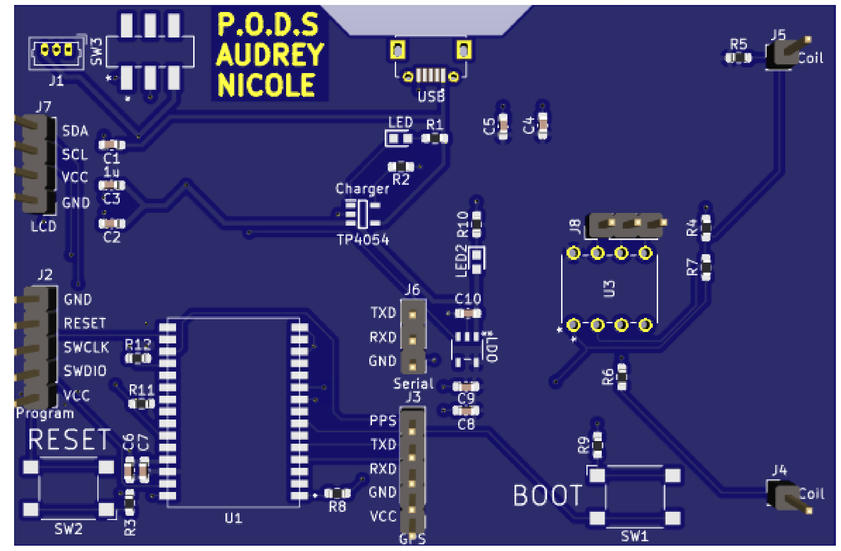
- Voltage change detection done using a coil and turning on and off a nearby power supply.
- Detection time: 270µs.

Arduino Serial Monitor

```
15:20:20.078 -> [PODS] Device #:          1
15:20:20.078 -> [PODS] Date:              5/27/25
15:20:20.116 -> [PODS] Time:              15:20:20:0
15:20:20.116 -> [PODS] Status:            Changing
15:20:20.149 -> [PODS] Location:          0,0
15:20:20.149 -> [PODS] RSSI:              -113.00 dBm
15:20:20.183 -> [PODS] SNR:               -4.00 dB
```

- Data received from the detector device is printed on the Arduino Serial Monitor.
- Displays Device Number, Date, Time, Outage Status, and Strength of Received Signal.
- Used to track outages at each device.

PCB



- E77-900M22S Ebyte STM32 microcontroller module, embedded with LoRa radio capabilities.
- TX, RX Serial communication for LCD and GPS.
- Size: 57mm x 87.5mm.
- Power and ground planes.

Future Work

- Adding features such as heat sensing for wildfires.
- Improving speed and communication system for increased efficiency.
- Development with a utility company.

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