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Monitoring of Streetlighting at Pembrokeshire County Council to verify that the Part Night switching policy is being implemented correctly

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Introduction

This project attempts to address the lack of a robust system to verify that the PN switching policy is being correctly implemented across Pembrokeshire's street lighting network. Customer complaints regarding specific lights not working correctly tends to be subjective in nature, as they want it to be on when carrying out some tasks. Corporate Complaints are therefore having to be upheld due to the lack of evidence that the streetlight in question may well be working within its intended parameters.

Aim

To design and develop a device that can be used across the PCC Streetlighting network to log the switching on and off times, to answer the question of “does this streetlight comply with PN switching policy?”

Objectives

1. Design and develop a compact, cost-effective monitoring device using a PIC microcontroller that can be easily installed on the existing street lighting network.
2. Capture streetlighting switching ON & OFF times
3. Real-time feedback via LCD and LED indicators
4. Data Logging of the switching on and off times of the streetlight that needs examining. This data will need to be stored for analysing later.
5. Data Retrieval of the logged data needs a user-friendly interface for analysing the data and reporting it to members of the public.

Research

Research was carried out on the history of streetlighting, as well as modern technologies.

- Part Night (PN)
- Smart Streetlighting
- Internet of Things (IoT)
- Central Management Systems (CMS)

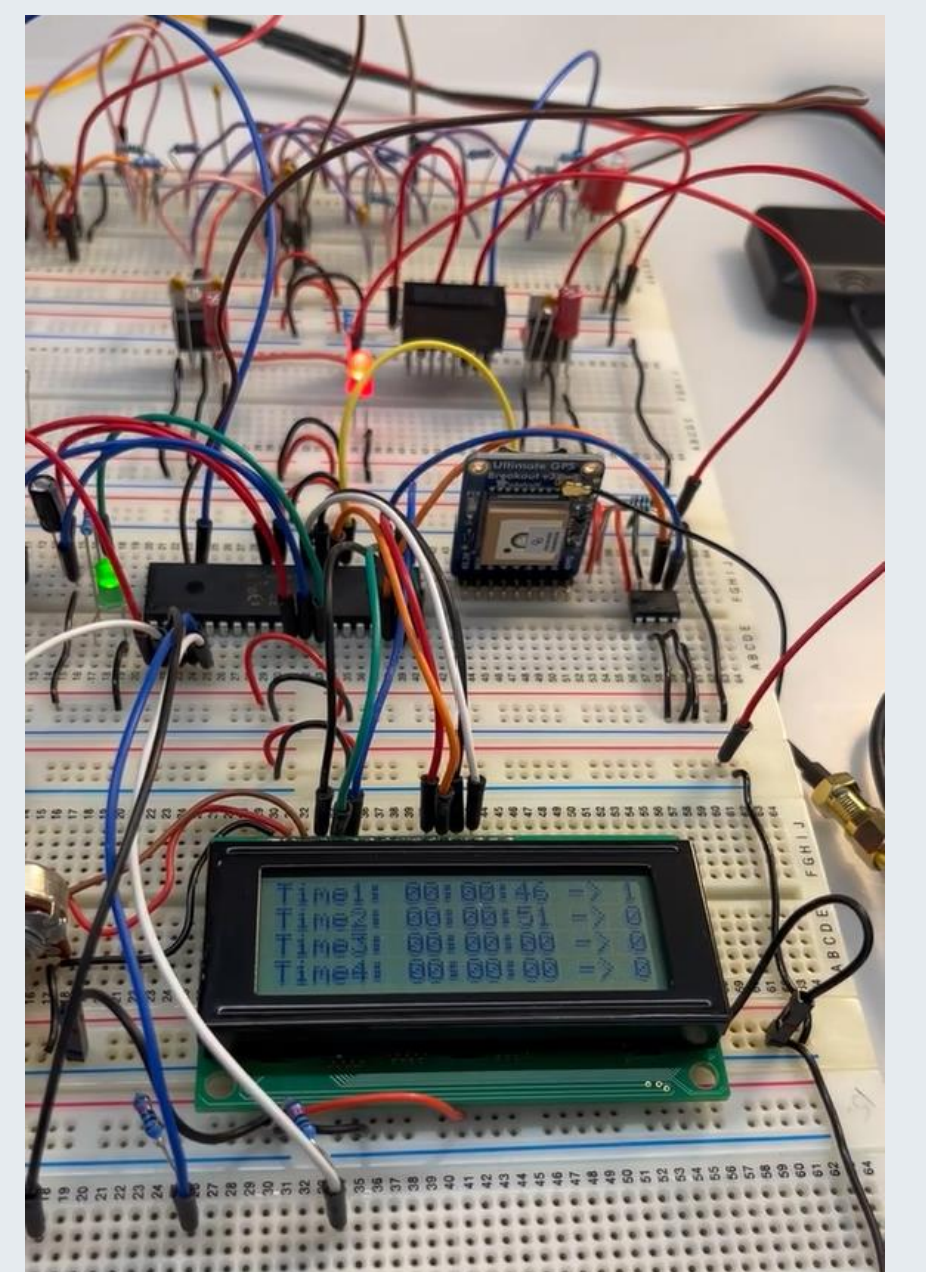


Hardware components were researched and compared. These included;

- Current Transformers
- GPS Modules
- Operational Amplifiers
- DC-DC Converters
- Microcontrollers
- Memory
- Batteries

Testing

Proteus simulations were carried out successfully by simulating the streetlight switching ON and OFF. Prototype testing was carried out indoors where the GPS failed to acquire a signal. However, the device did capture the events as timer stamps instead of time stamps. Events were stored to the PIC Microcontroller EEPROM and not to the external EEPROM



Results

Time1: 17:45:12 -> 1
Time2: 00:08:03 -> 0
Time3: 05:36:45 -> 1
Time4: 07:11:54 -> 0

Simulation of switching times were captured successfully. CT voltage triggered time stamp logging as expected. Prototype GPS testing was limited due to indoor constraints.

Conclusion & Recommendations

Conclusion

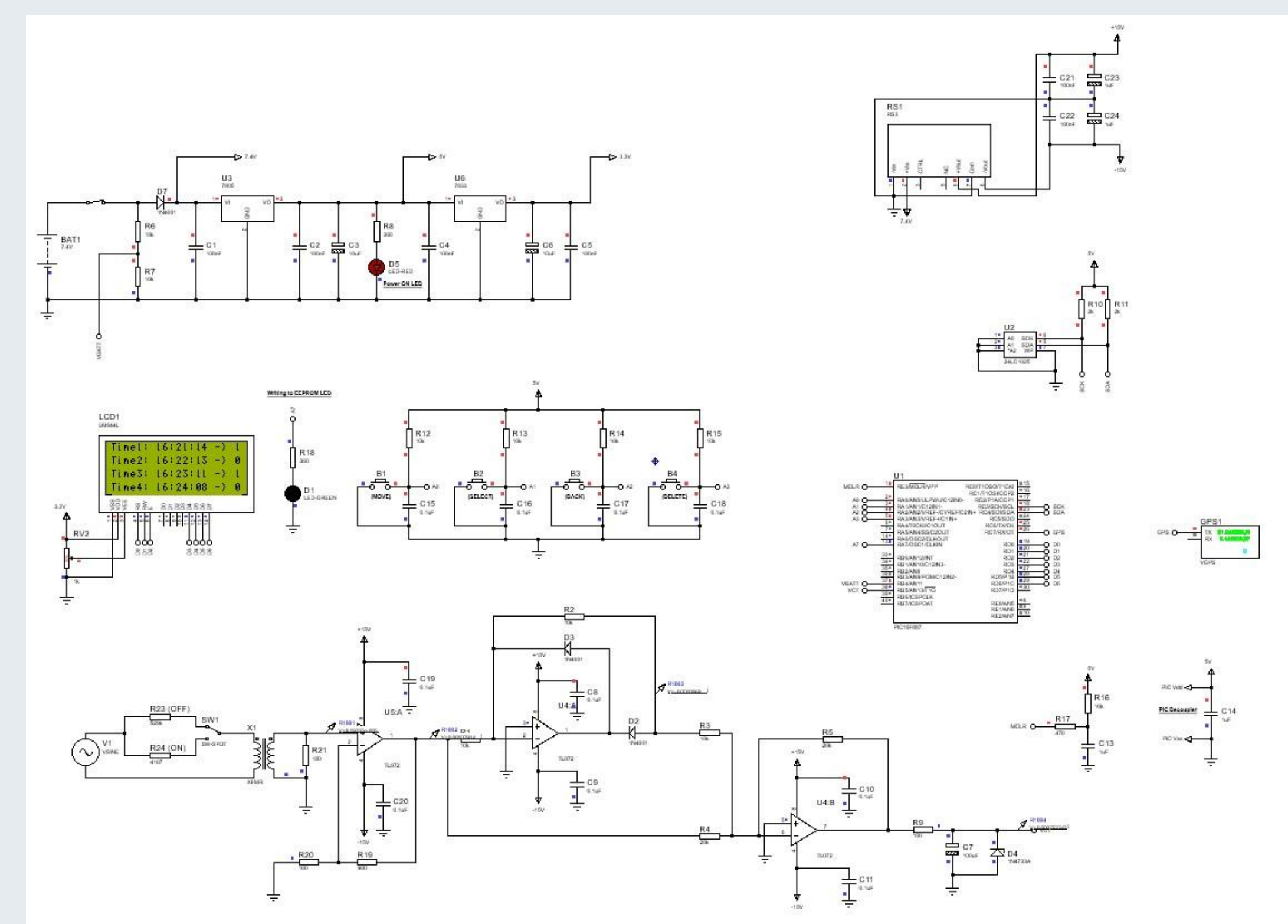
In conclusion the concept and theory behind the design was proved, with minor software tweaks and a little more time a full working model could be produced.

Recommendations

- Interface external EEPROM
- Add GPS location tagging
- Data retrieval via SD card or Serial Interface
- Add real-time reading via IoT, GSM or Wi-Fi.

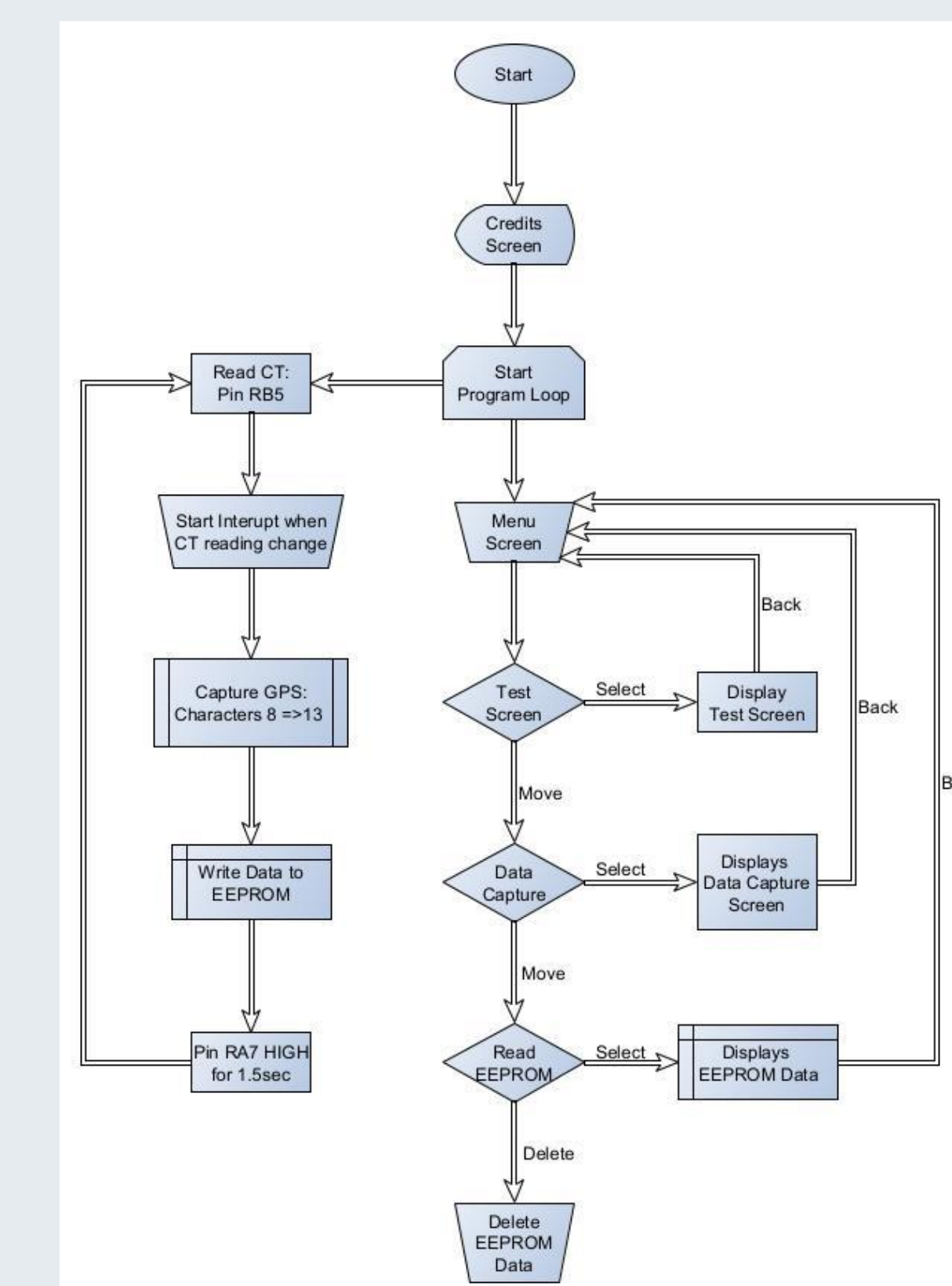
Design

Hardware Design



Schematic built and simulated in Proteus
The hardware was then assembled onto a breadboard for testing purposes.

Software Design



The software flowchart above was created using the yEd software, while the code was written using the CCS compiler.