

Design and implementation of a test Assembly for monitoring an occupancy sensor during cyclic and vibration testing using a PIC

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Introduction

- SAFRAN creating New Technology (seat occupancy sensor)
- Used for the safety of passengers on an aircraft and for crew knowledge.
- This project aims to create a way to collect data for testing
- To ensure the sensor works within its guaranteed period

Aim

Create an assembly for interfacing of components to test and certify an aerospace grade sensor

Objectives

- Analyse existing monitoring methods
- Design and validate a prototype assembly
- Design a full test assembly
- Evaluate performance under vibration and cyclic testing

Materials and methods

Design software has been used to create visual representations and simulate the tests; visual representation software includes CATIA V5, simulation software includes Proteus & PCB creation software was Easy PC.

PROTEUS

CATIA

Easy-PC

Other sources of literature have been used to find the correct sensor to use for the frequency of the testes which would have been simulated.

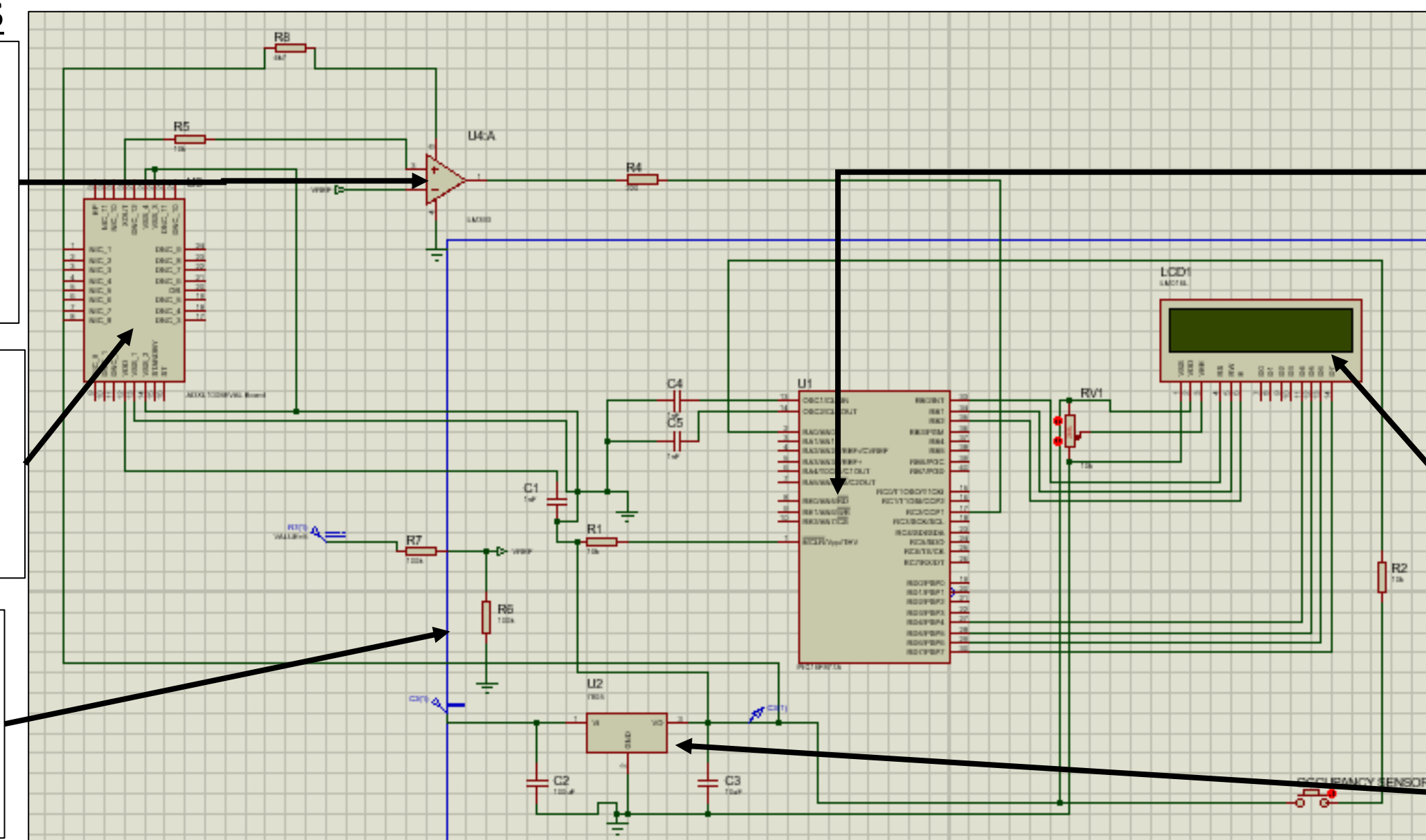
Agile methodology has also been used to attempt to implement ideas efficiently and quickly whilst still being in line with the customers requirements.

Designs

LM393 – edge cleaning of Analog output

ADXL1005- used for frequency detection

Voltage divider to create VRef



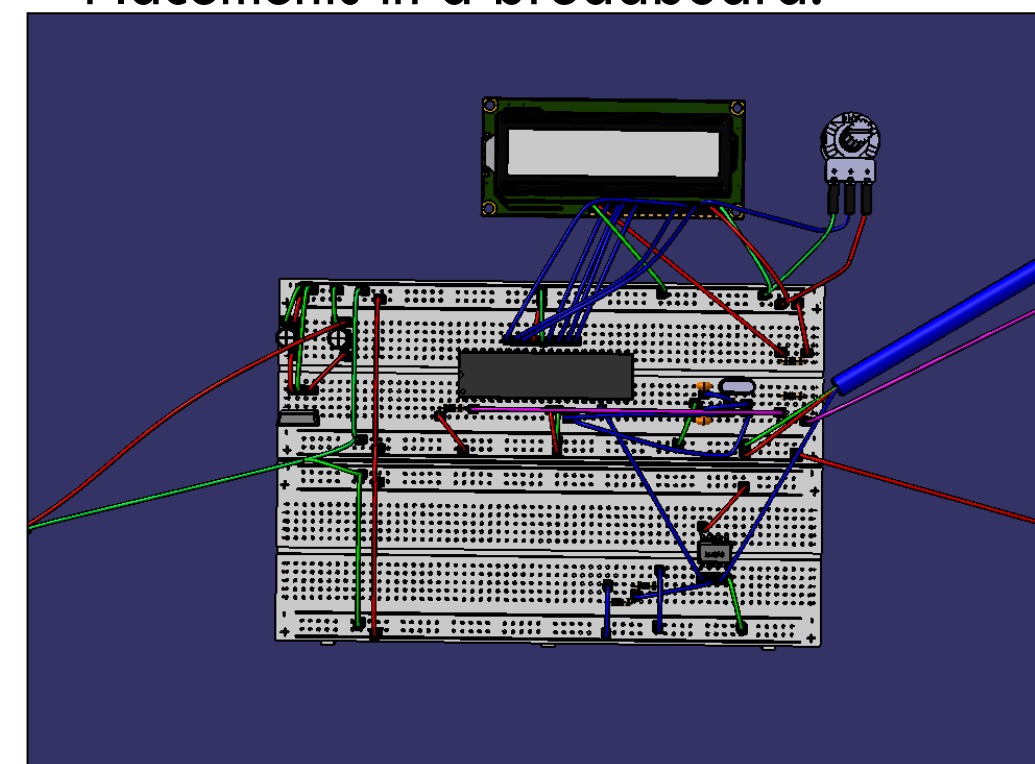
PIC16F877A- used for controlling LCD display and determining frequency

LCD Display, used for displaying data gained from PIC

Voltage regulation

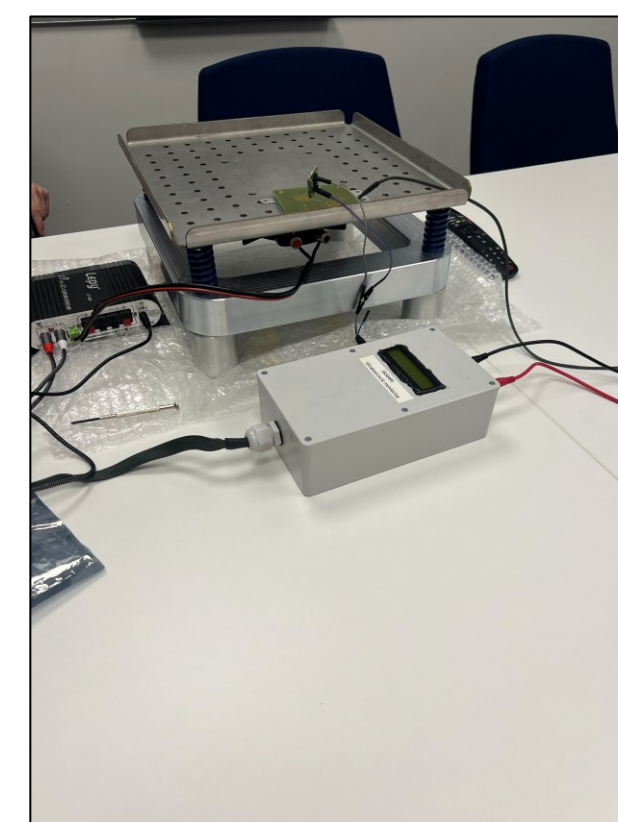
CATIA Design

To represent the components used and their Placements in a breadboard.



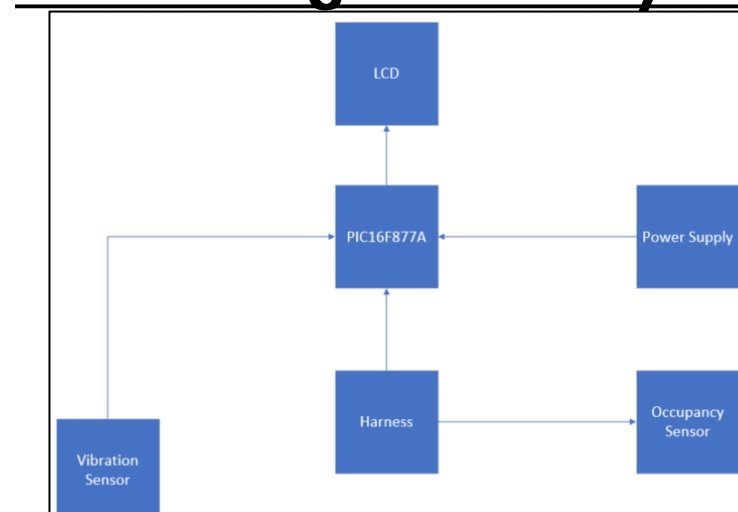
Representation of the assembly

the ADXL mounted to the same Axis of direction of vibration.
Banana plugs for I/O of Occupancy Sensor



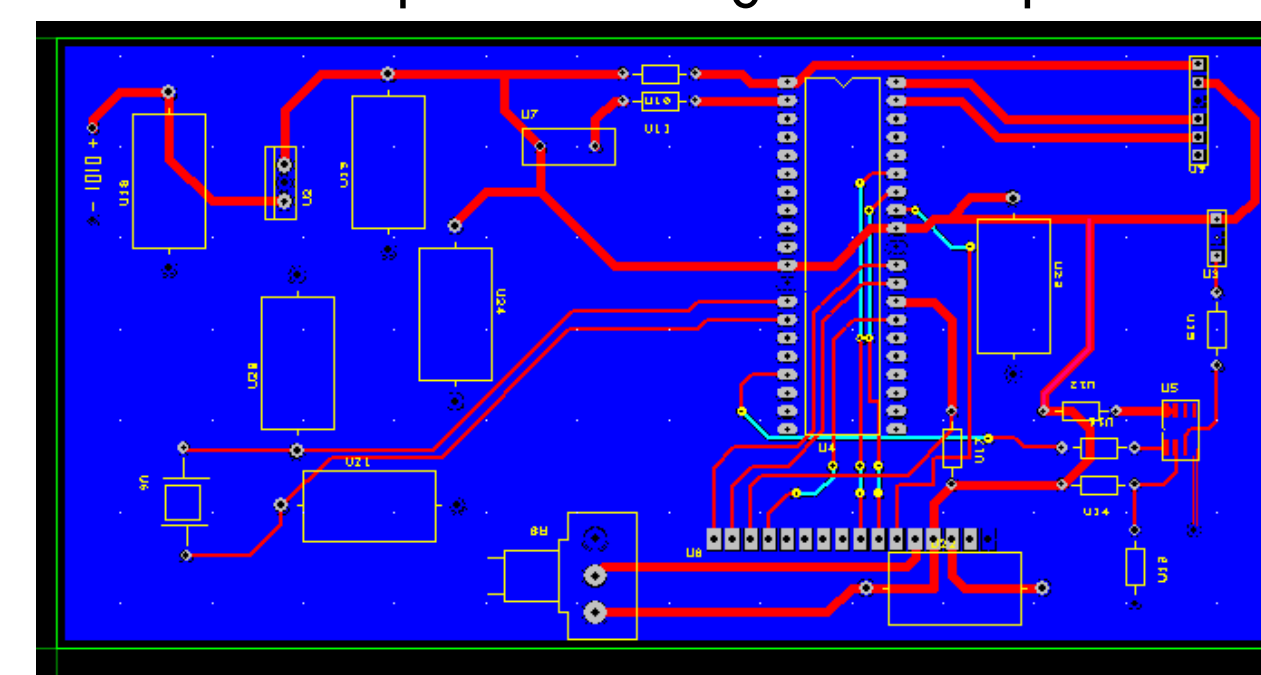
input from 9V plug, input power to ADXL1005 from power of the PIC. Occupancy sensor input from power rail, output to RA0 of the PIC.

Block Diagram for System



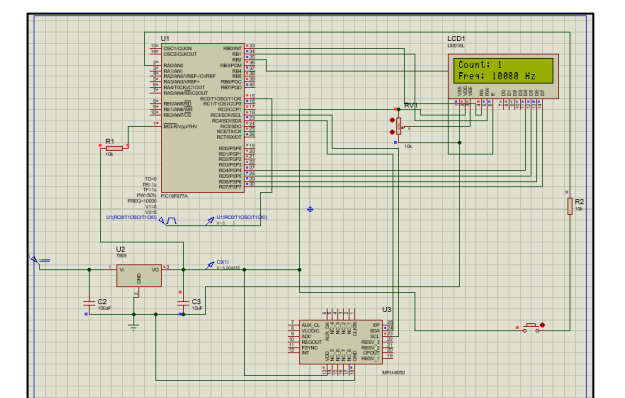
PCB Design Revision B

Issues with previous design forced updates



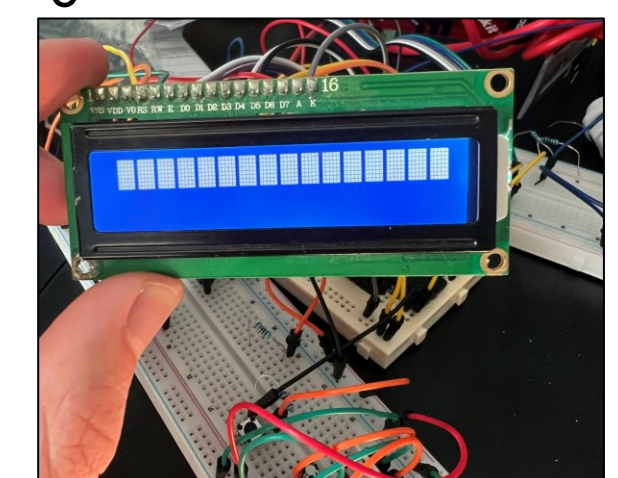
Conclusions

- The Outcome of this project is, the integration between the components prevented validation.
- Results were unable to be gained. A proof-of-concept system works on proteus.
- As proteus is perfect conditions the issues encountered have not been able to be simulated.



These issues have been fault found and the system has been unable to initialize the LCD for data to be collected. Faultfinding & troubleshooting includes:

- changing placement of LCD
- changing LCDs, changing PICs
- adding decoupling
- changing code for LCD timer.



Seen in the table below is scenarios of possible outcomes.

Expected Results		
Test And outcome	Count	Frequency (Hz)
Vibration Test	5	Freq: 200Hz Freq: 750Hz Freq: 2000Hz Freq: 6580Hz Freq: 9000Hz
Vibration Test (Ideal Scenario)	0	Freq: ----
Cyclic test (example)	6500000	Freq: ----