



Department of Electronic and Telecommunication Engineering  
University of Moratuwa

# PCB and Enclosure Photographs

## Industrial Machine Vibration Monitoring System

EN2160: Electronic Design Realization

Index Number	Name
210542B	R.M.L.H. Ratnayake
210549D	N.P.S.S. Rupasinghe

Group K (30)

# Contents

<b>1</b>	<b>Photograph of the Bare PCBs</b>	<b>2</b>
1.1	PCB for the Main Controller . . . . .	2
1.2	PCB for the Sensor Module . . . . .	4
<b>2</b>	<b>Photograph of the Soldered PCBs</b>	<b>5</b>
2.1	PCB for the Main Controller . . . . .	5
2.2	PCB for the Sensor Module . . . . .	7
<b>3</b>	<b>Photographs as Evidence for PCB Testing</b>	<b>9</b>
3.1	PCB for the Main Controller . . . . .	9
3.2	PCB for the Sensor Module . . . . .	10
3.3	Integrated System Testing . . . . .	11
<b>4</b>	<b>Photograph of the Physically Built Enclosure/ Functional (Mechanical) Parts</b>	<b>12</b>
4.1	Enclosure for the Main Controller . . . . .	12
4.2	Enclosure for the Sensor Module . . . . .	14
4.3	Port - Connection between Modules . . . . .	15
<b>5</b>	<b>Photograph Showing the System Integration</b>	<b>16</b>
5.1	External Connections . . . . .	16
5.2	Main Controller Unit . . . . .	19
5.3	Sensor Unit . . . . .	20
5.4	System Integration - Powered Up and Working Software . . . . .	21

## Chapter 1

# Photograph of the Bare PCBs

Two PCBs are made during the project.

1. PCB for the Main Controller
2. PCB for the Sensor Module

### 1.1 PCB for the Main Controller

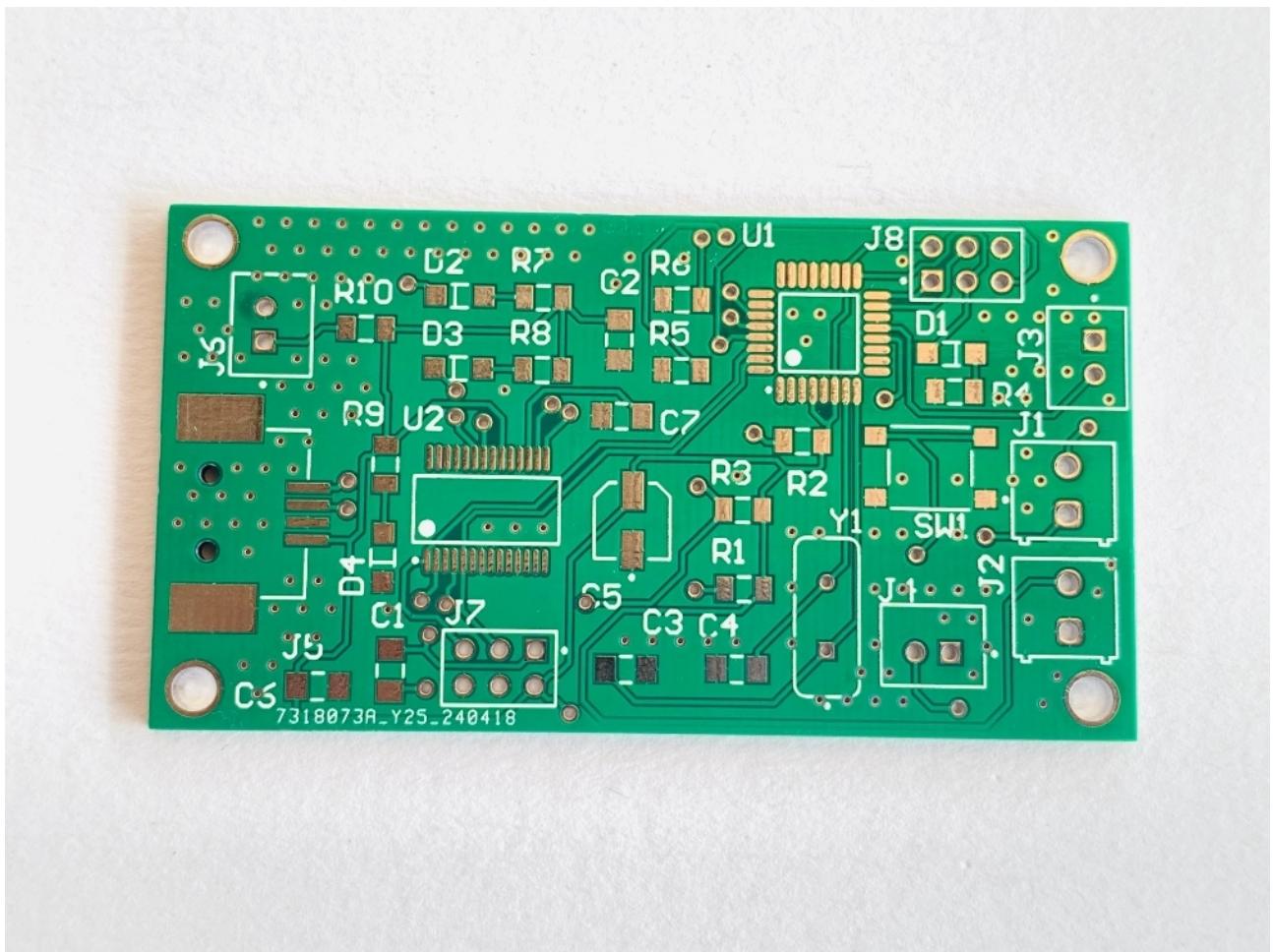


Figure 1.1: Unsoldered Main Controller PCB - Top

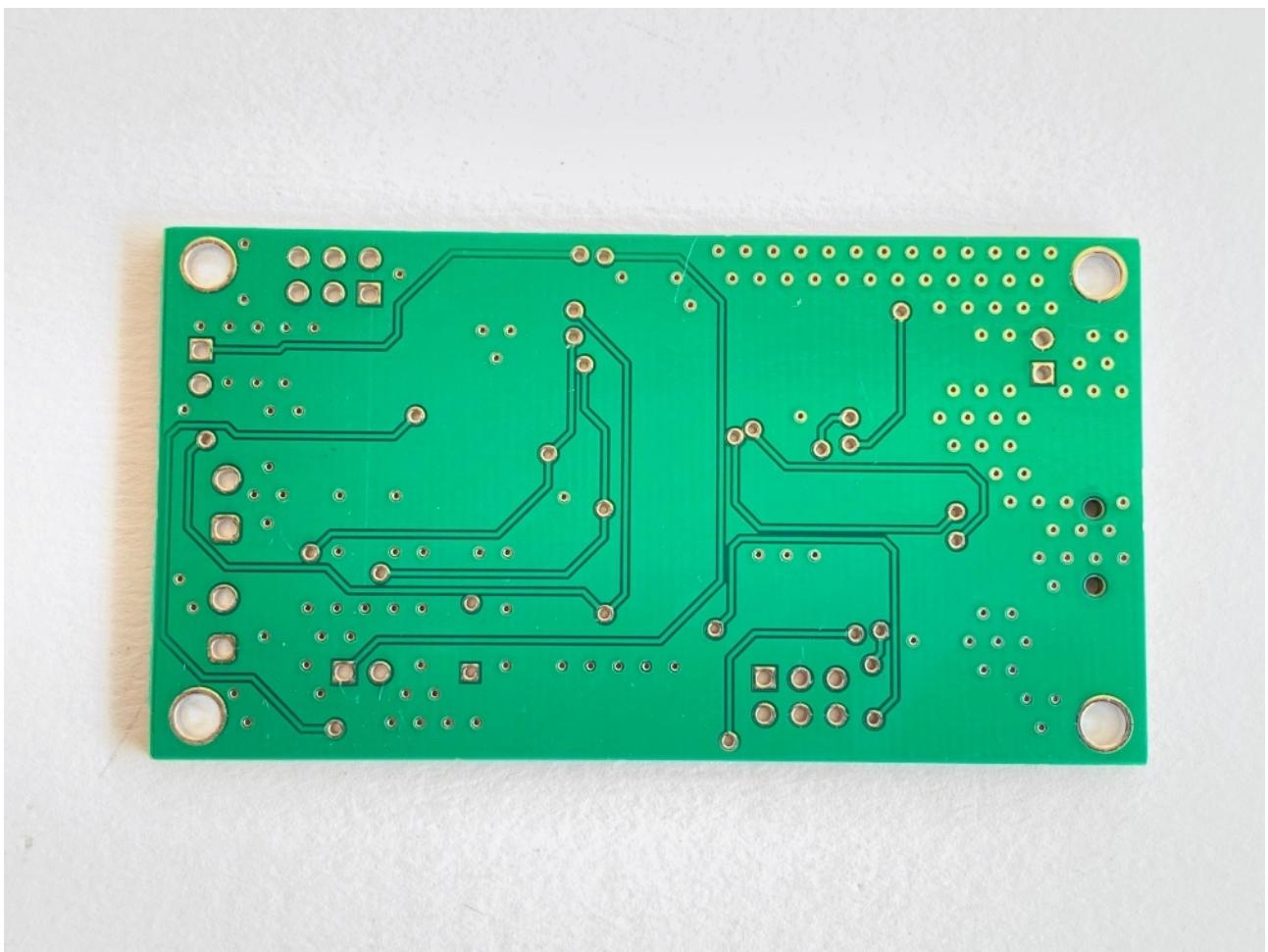


Figure 1.2: Unsoldered Main Controller PCB - Bottom

## 1.2 PCB for the Sensor Module

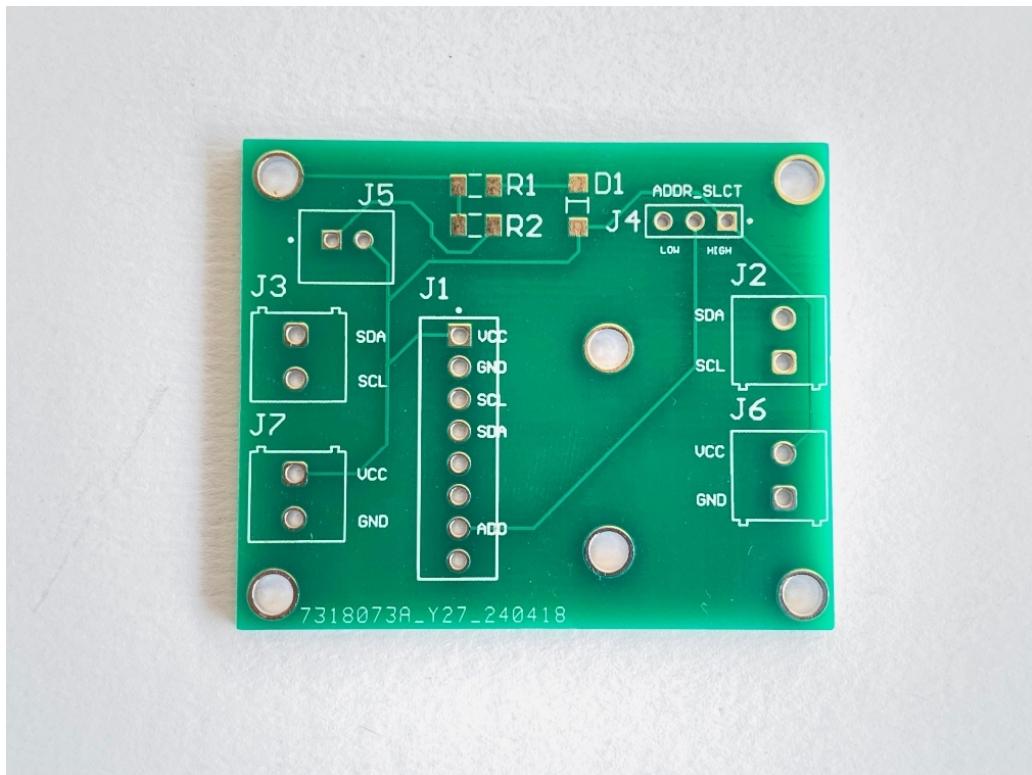


Figure 1.3: Unsoldered Sensor Module PCB - Top

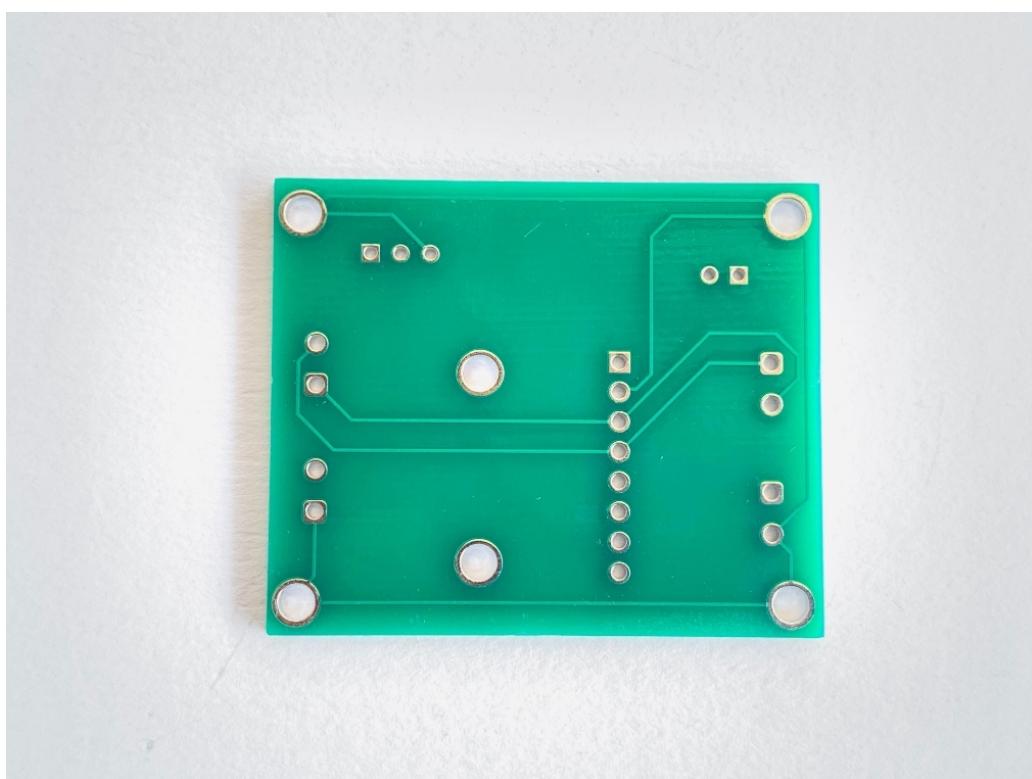


Figure 1.4: Unsoldered Sensor Module PCB - Bottom

## Chapter 2

# Photograph of the Soldered PCBs

### 2.1 PCB for the Main Controller

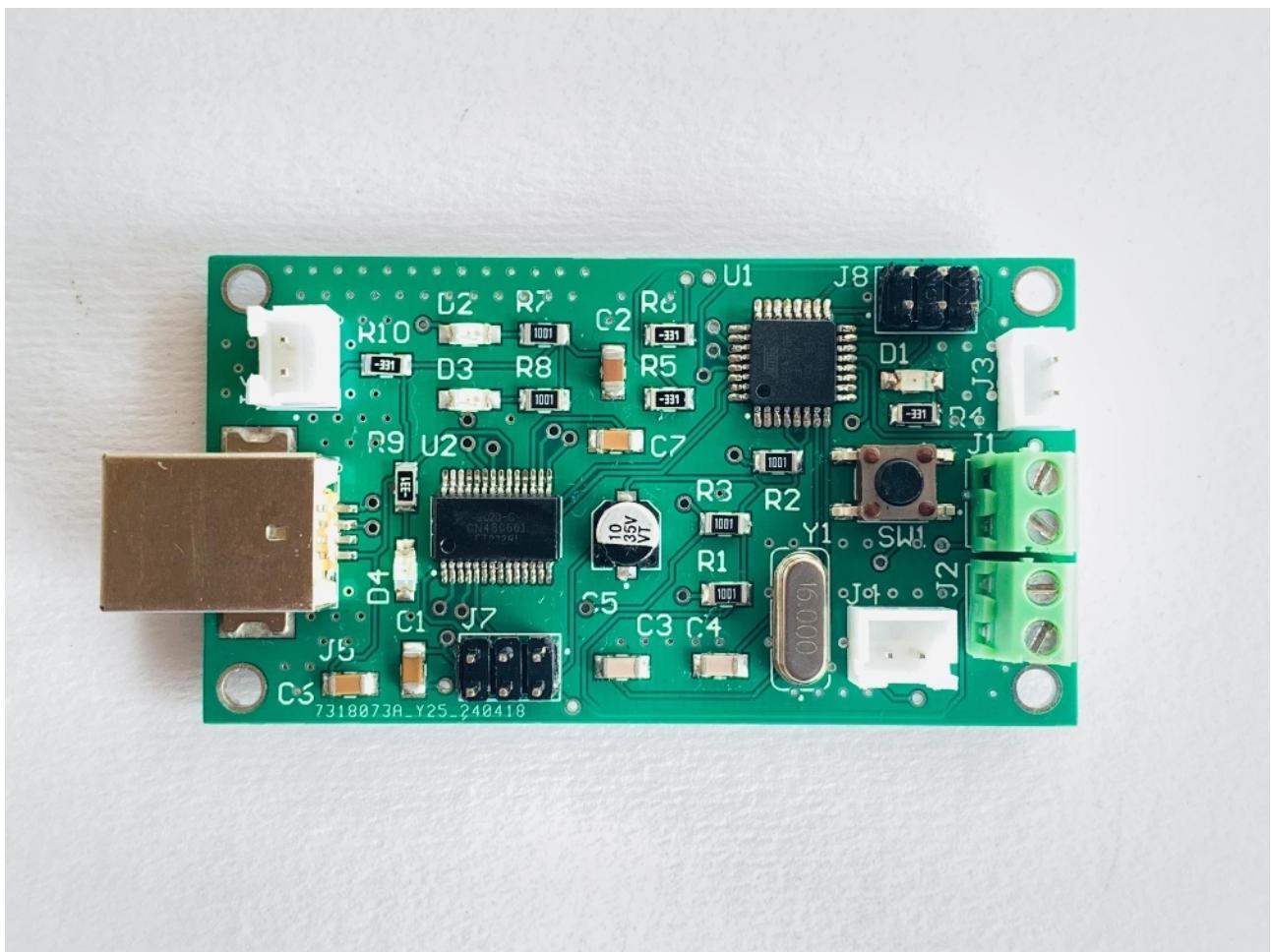


Figure 2.1: Soldered Main Controller PCB - Top

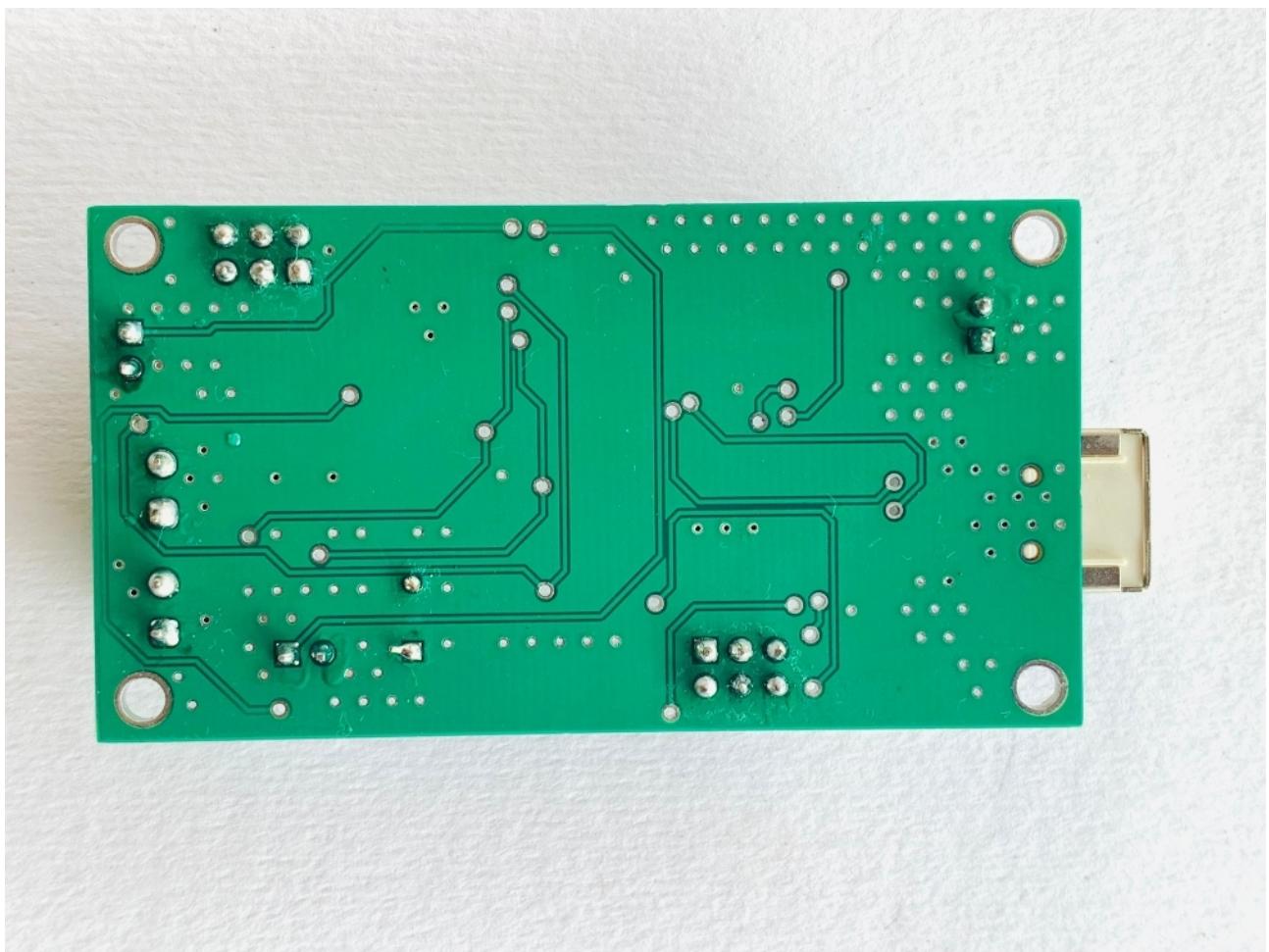


Figure 2.2: Soldered Main Cotroller PCB - Bottom

## 2.2 PCB for the Sensor Module

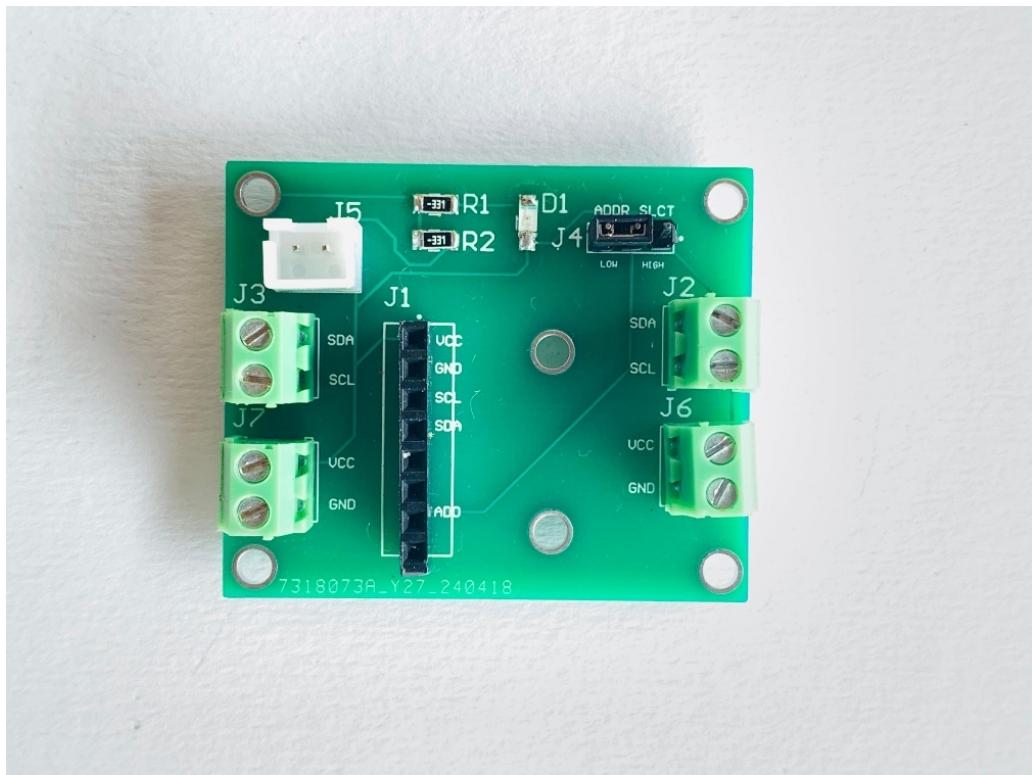


Figure 2.3: Soldered Sensor Module PCB - Top

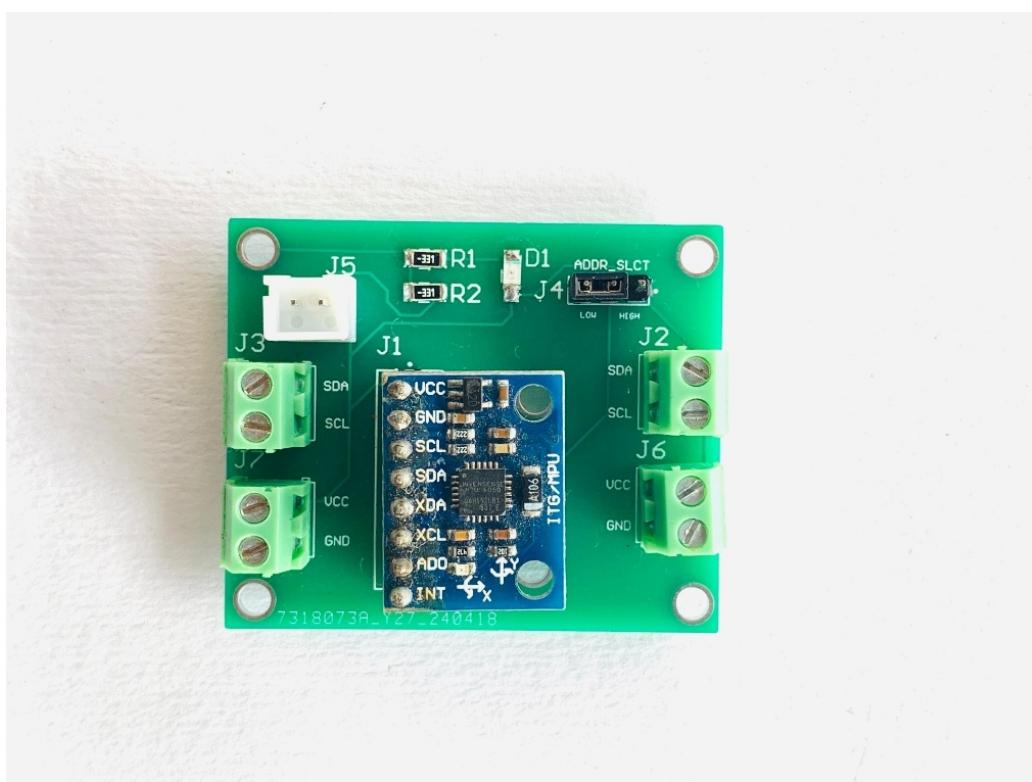


Figure 2.4: Soldered Sensor Module PCB - Top (MPU6050 Sensor attached)

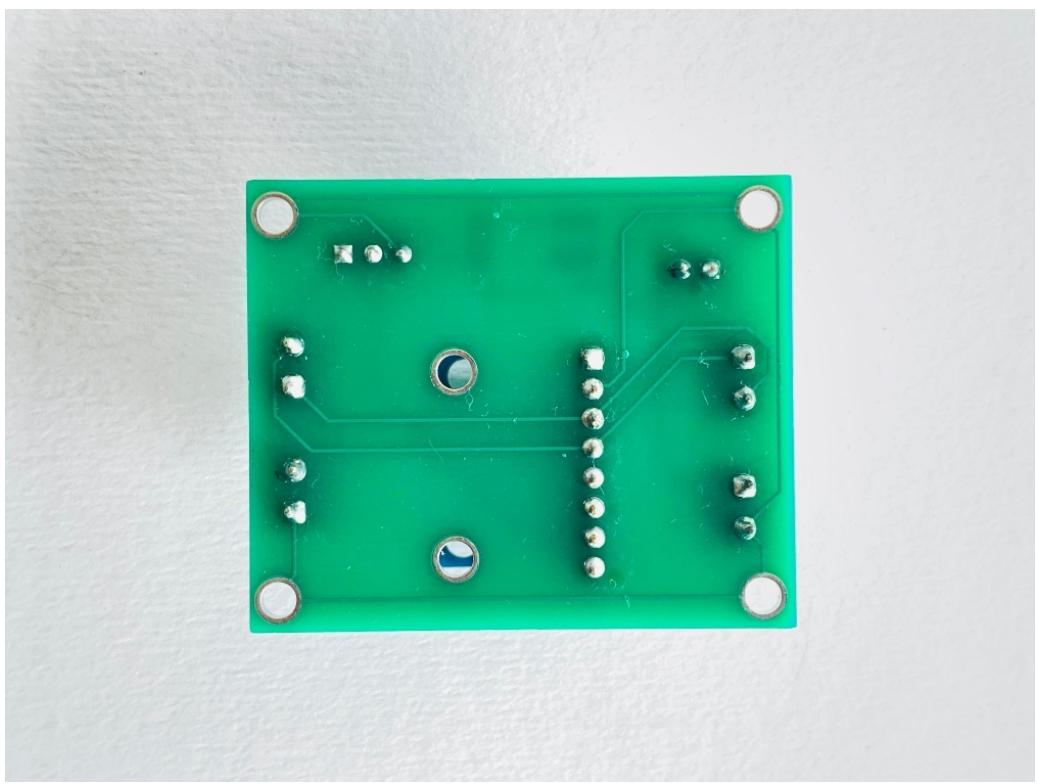


Figure 2.5: Soldered Sensor Module PCB - Bottom

## Chapter 3

# Photographs as Evidence for PCB Testing

### 3.1 PCB for the Main Controller

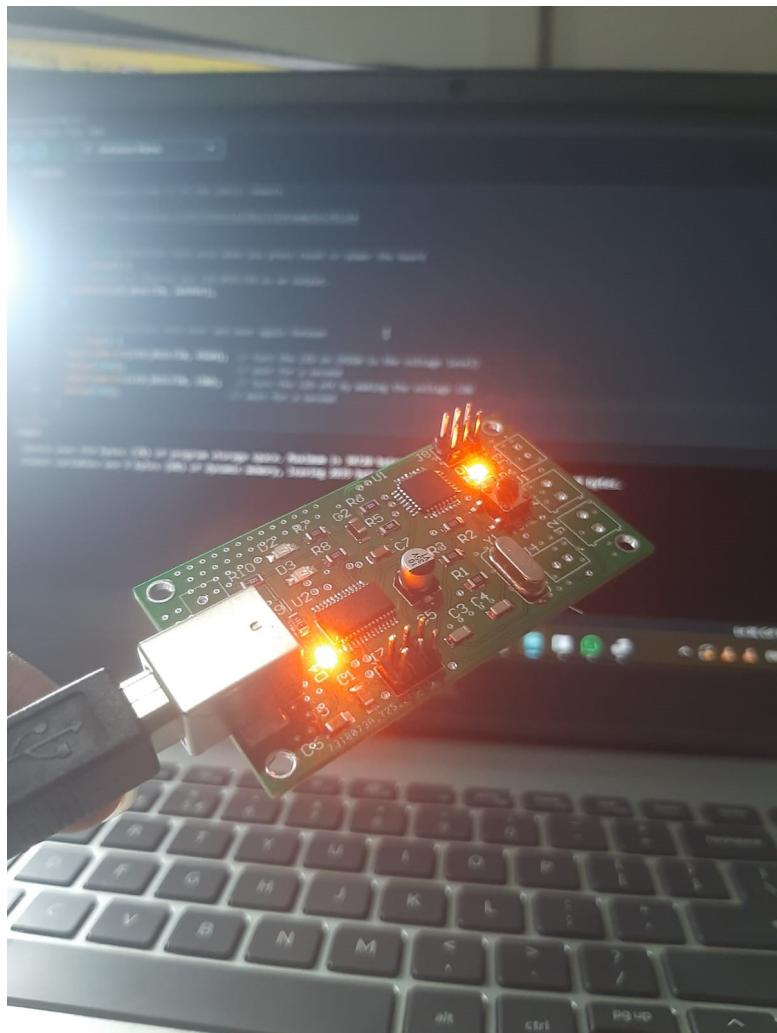


Figure 3.1: Working of the PCB for the Main Controller

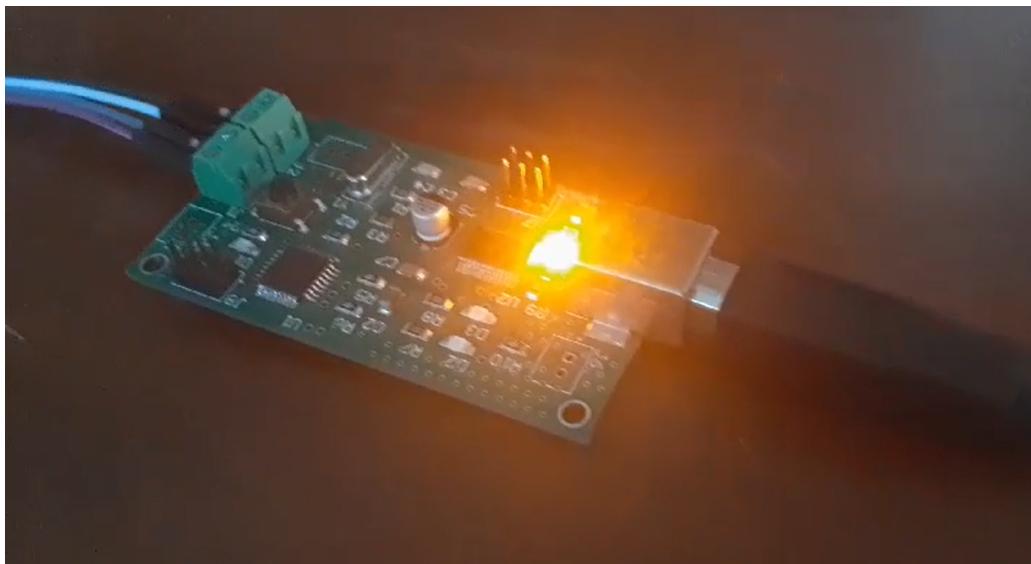


Figure 3.2: Working of the Connected PCB for the Main Controller

### 3.2 PCB for the Sensor Module

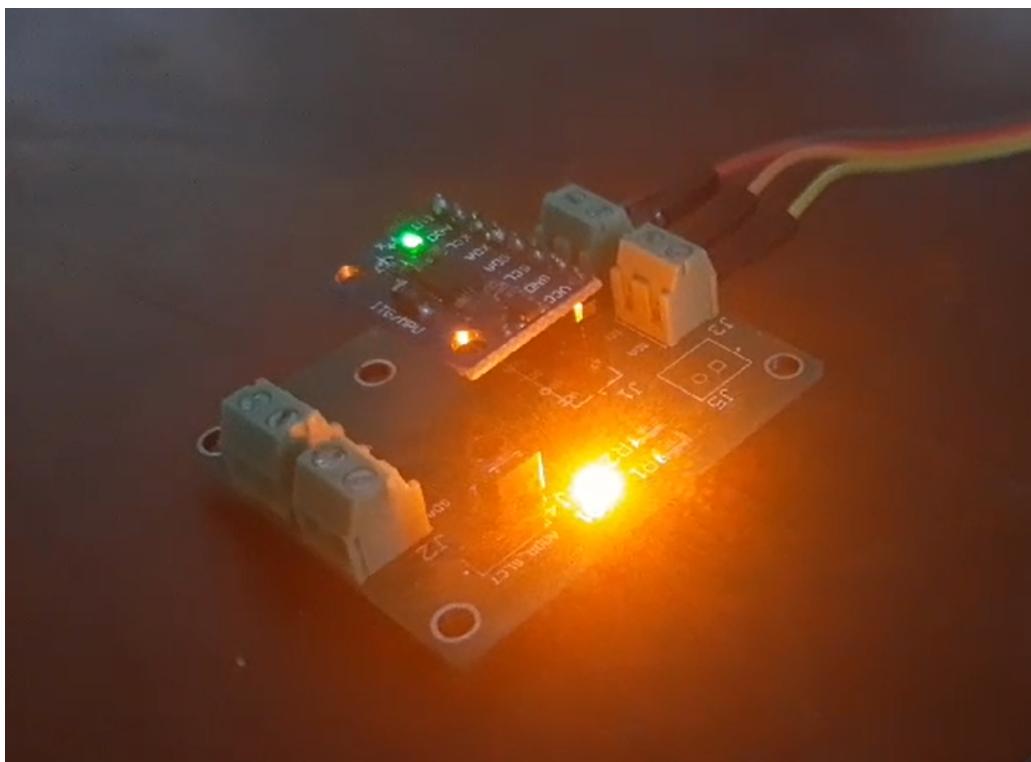


Figure 3.3: Working of the PCB for the Sensor Modules

### 3.3 Integrated System Testing

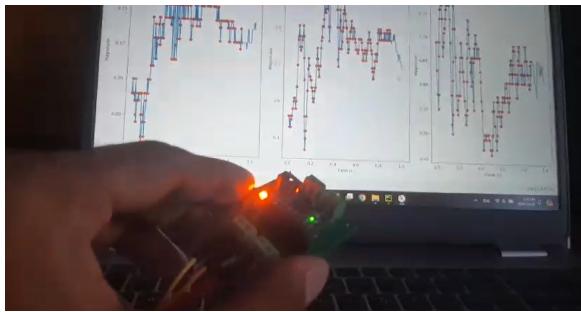


Figure 3.4

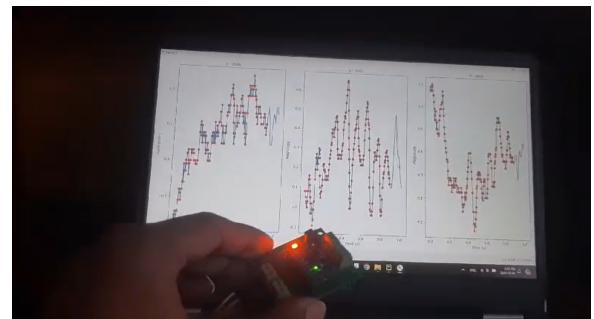


Figure 3.5

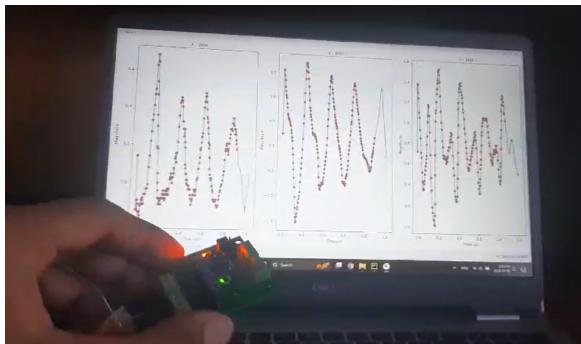


Figure 3.6

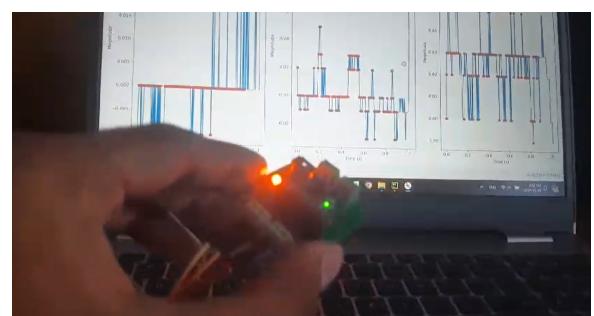


Figure 3.7

The above images show some steps during our **initial testing** of the **integrated system** with software.

Figures 3.4, 3.5, 3.6, and 3.7 show how the system is picking up movements of hand (mimicking vibrations), and plotting them in the computer screen with anomalies in red.

- Figure 3.4 - Sensor picking up and plotting random movements of hand.
- Figure 3.5 - Sensor picking up and plotting random movements of hand.
- Figure 3.6 - Sensor picking up and plotting periodic oscillatory movement of hand.
- Figure 3.7 - Sensor picking up and plotting movements of hand.

**This proves the PCB is working as expected and can be used to sense vibrations in the actual setup and send these data to the computer correctly.**

## Chapter 4

# Photograph of the Physically Built Enclosure/ Functional (Mechanical) Parts

### 4.1 Enclosure for the Main Controller



Figure 4.1: Base Top



Figure 4.2: Lid Bottom



Figure 4.3: Main Controller - Opening for the USB Port

## 4.2 Enclosure for the Sensor Module



Figure 4.4: Module Top



Figure 4.5: Module Front



Figure 4.6: Module Top

#### 4.3 Port - Connection between Modules



Figure 4.7: Connector and Cable

## Chapter 5

# Photograph Showing the System Integration

### 5.1 External Connections

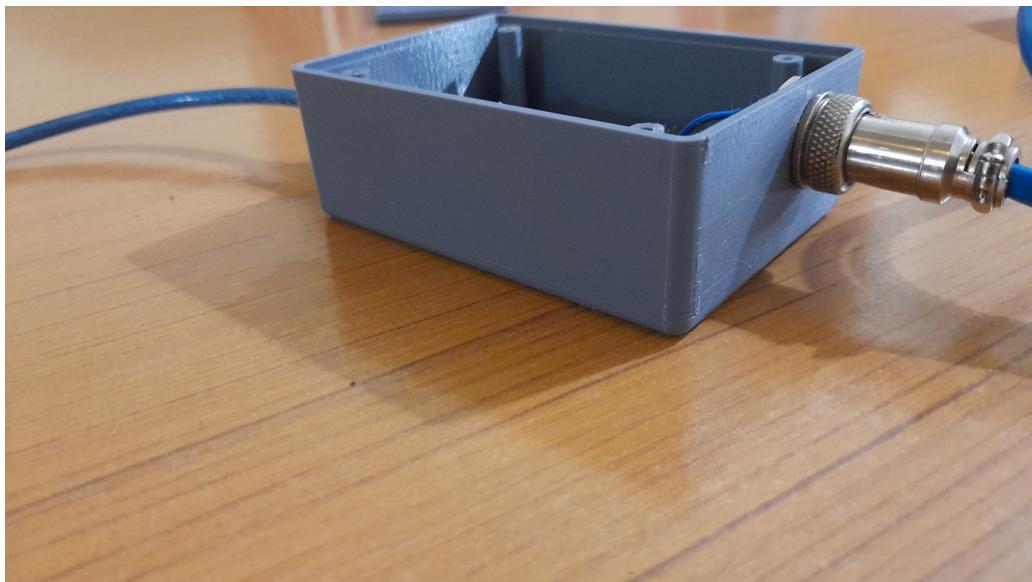


Figure 5.1: External Connectors

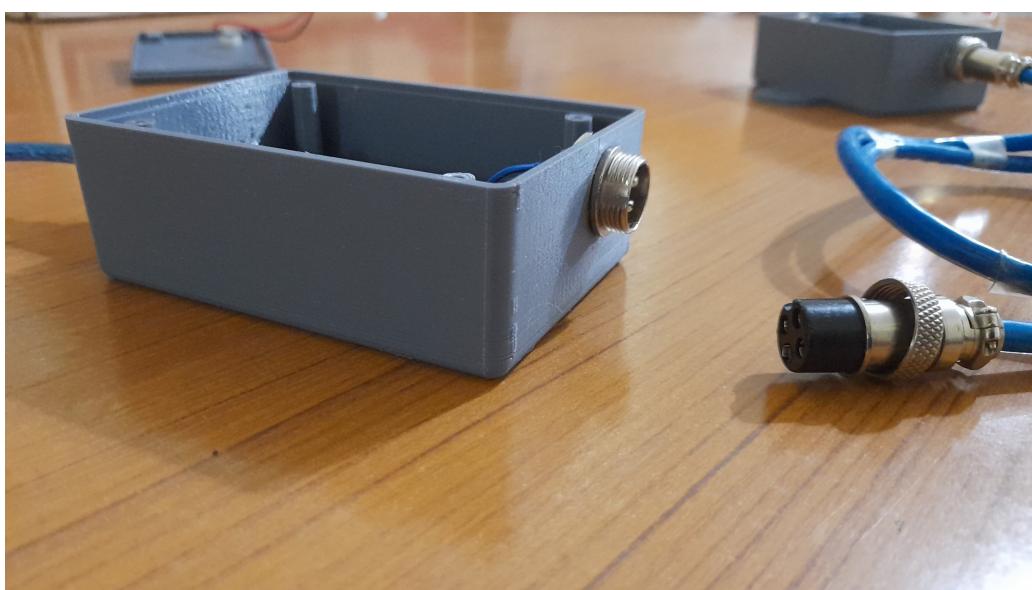


Figure 5.2: External Connectors

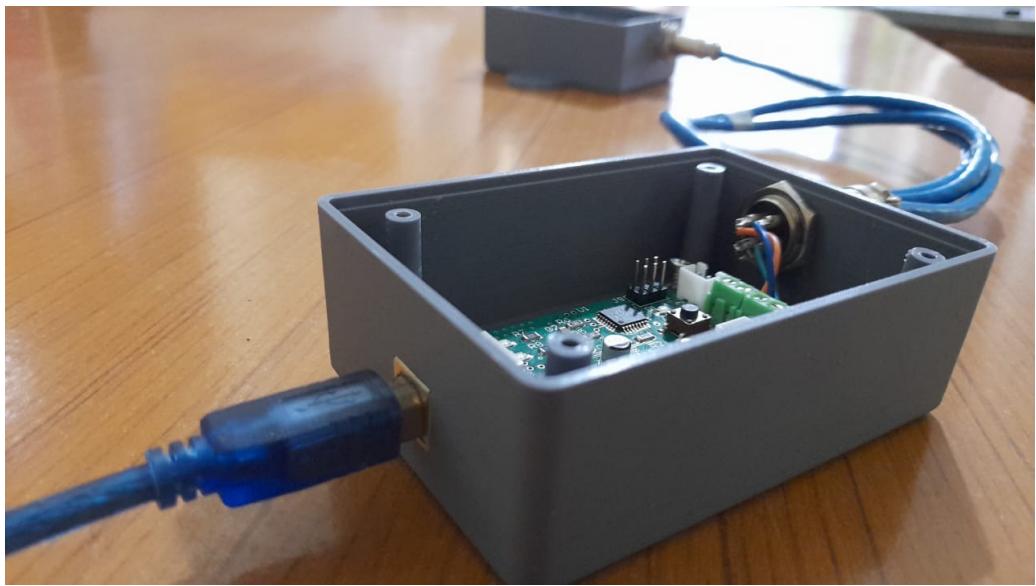


Figure 5.3: External Connectors - USB Type B

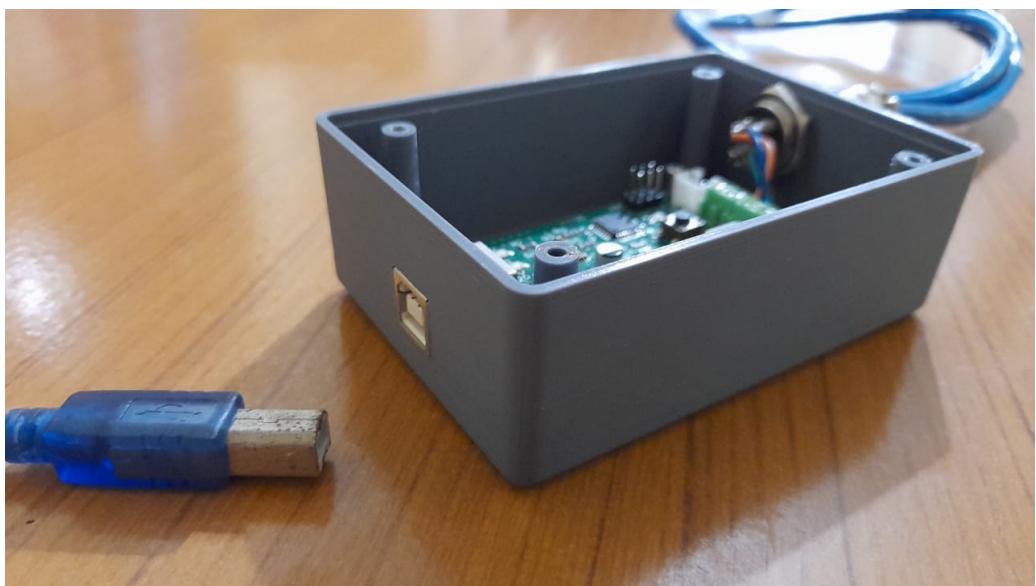


Figure 5.4: External Connectors - USB Type B

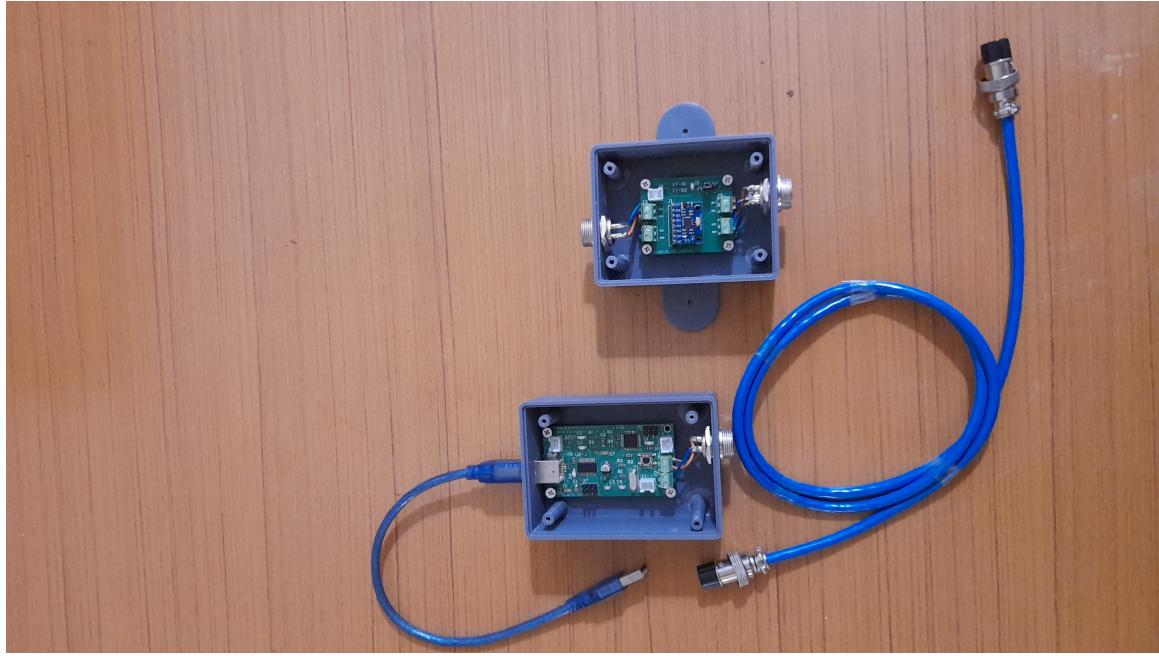


Figure 5.5: System as a Whole - Top View



Figure 5.6: System as a Whole - Top View - with Lids

## 5.2 Main Controller Unit



Figure 5.7: Main Controller Unit - Top View - with Lid Containing LEDs

### 5.3 Sensor Unit

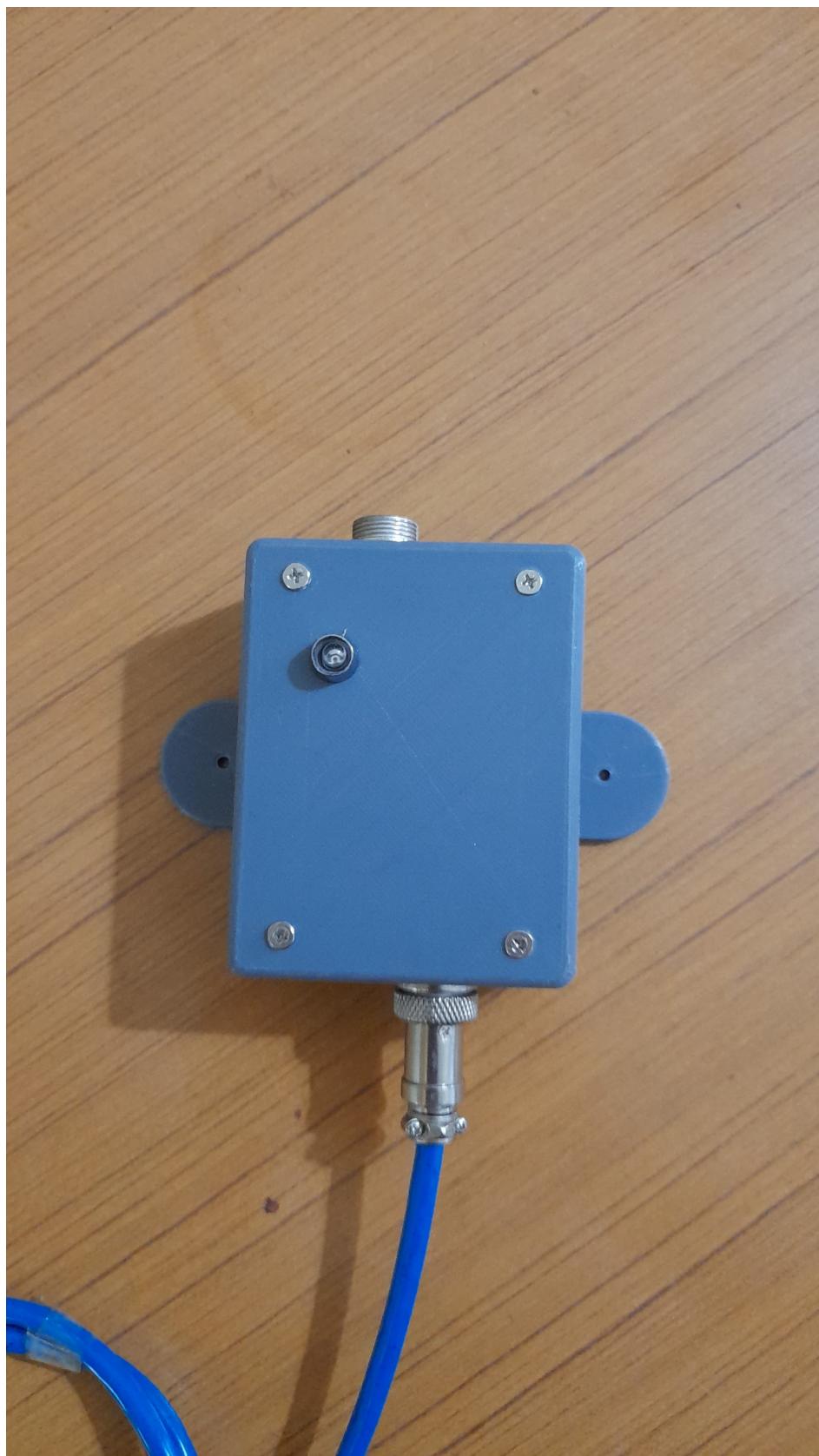


Figure 5.8: Sensor Unit - Top View - with Lid Containing LEDs

## 5.4 System Integration - Powered Up and Working Software

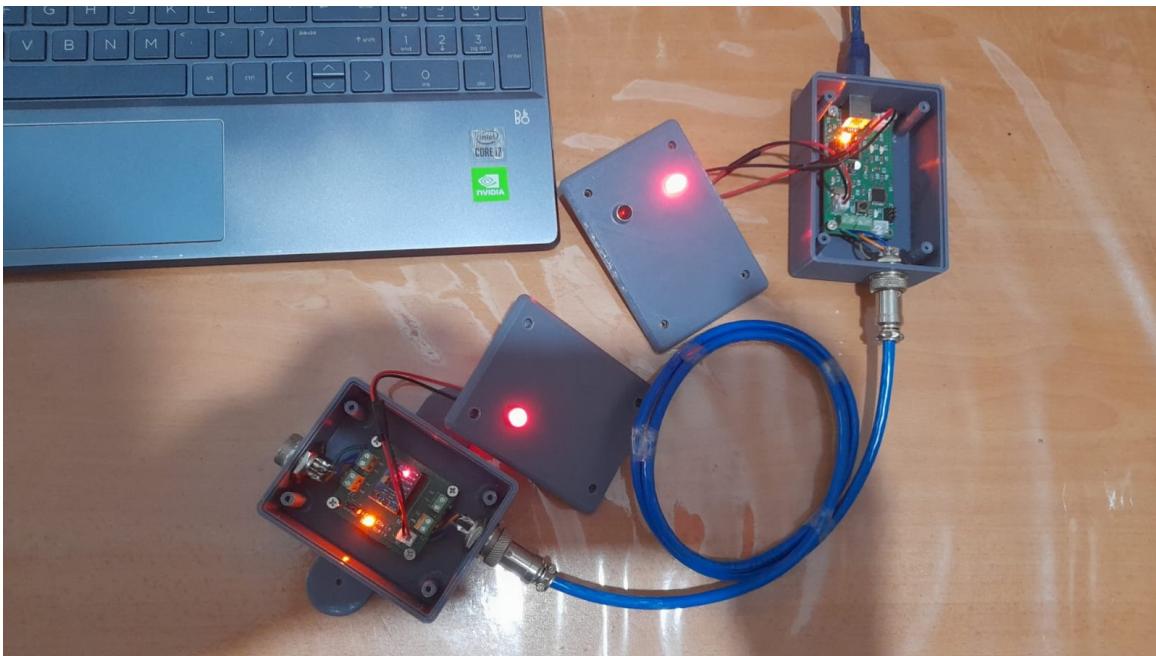


Figure 5.9: Integrated System - Powered Up

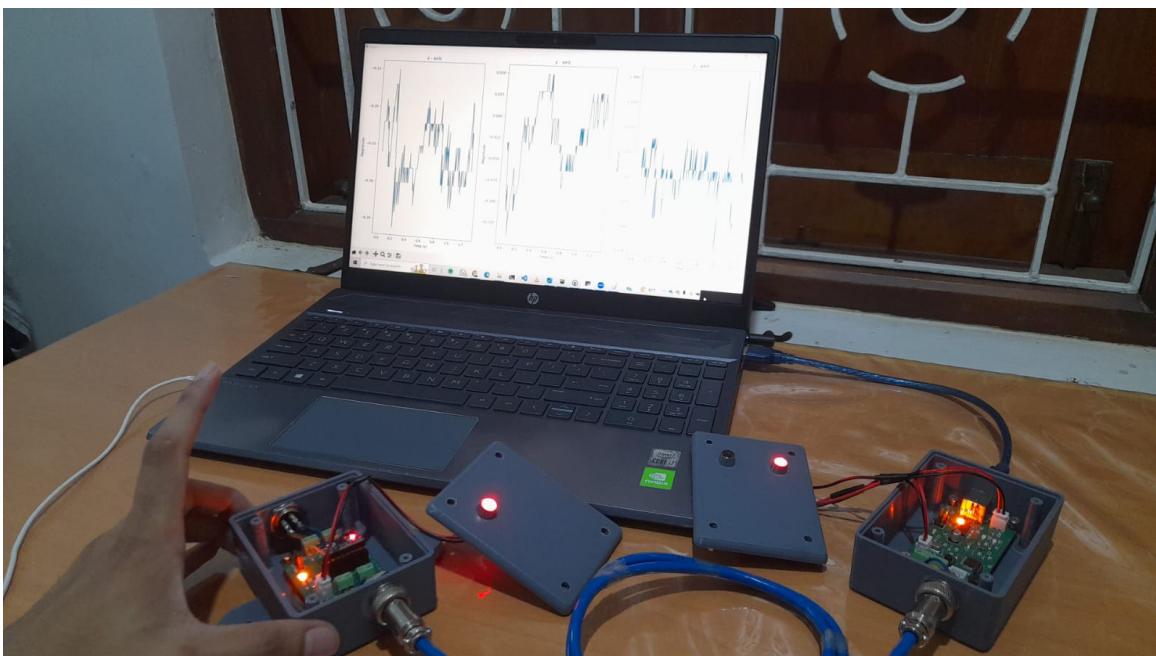


Figure 5.10: Integrated System - with Software

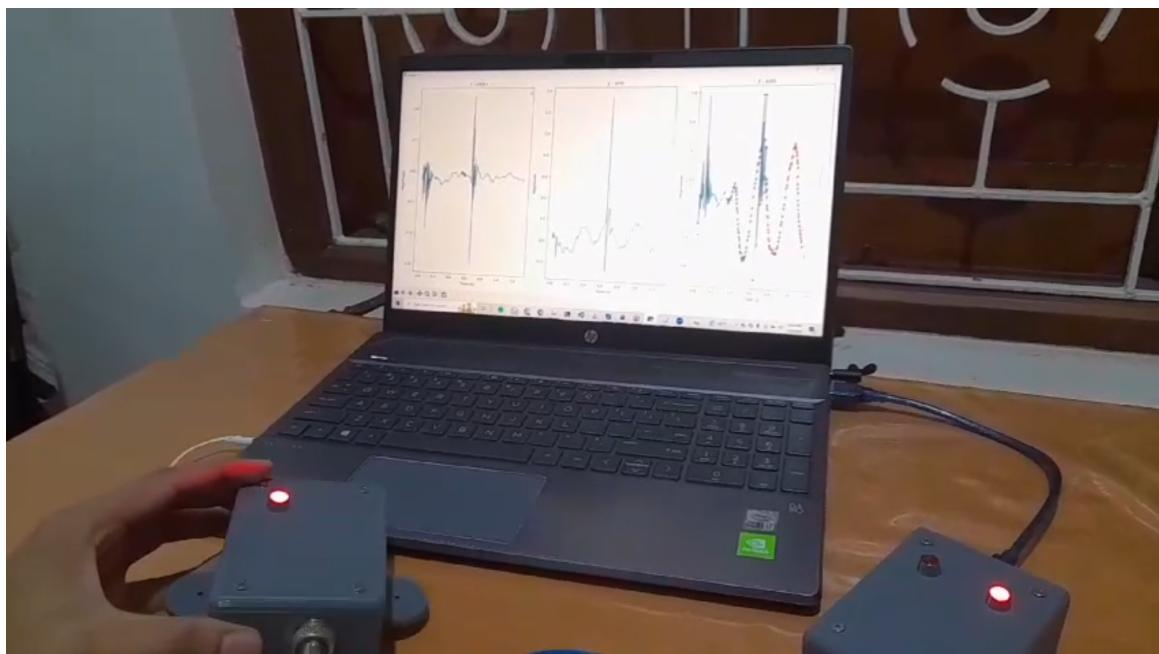


Figure 5.11: Integrated System - Software - Anomalies Detected

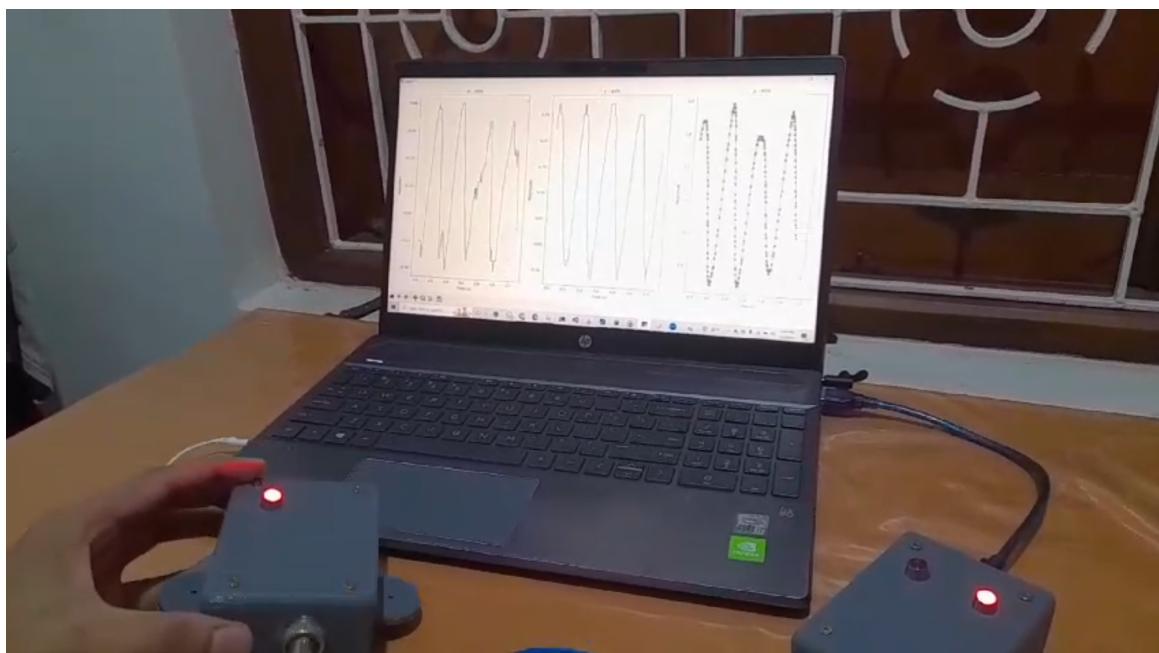


Figure 5.12: Integrated System - Software - No Anomalies