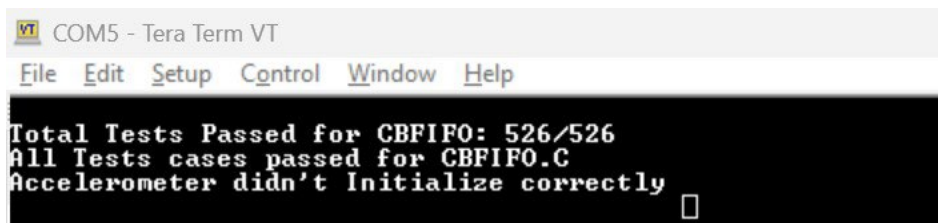# Test Plan and their Results

1) **Automated Tests**

    Automated Tests are being Performed in the Debug configuration while building the Program. The tests are being performed on the following Modules in the Program.

    - Accelerometer and I2C - (If the Accelerometer doesn't make the SDA pin in the I2C Bus low, a Negative Acknowledgement is received which indicates that the Accelerometer is not responding, and we display a Failure Message on the UART followed by glowing the RED LED on the FRDM. If Bus Contention Exists because of multiple master, the same issue can come up.

    - CBFIFO along with UART is getting Tested as well by checking Enqueue and Dequeue Operations.
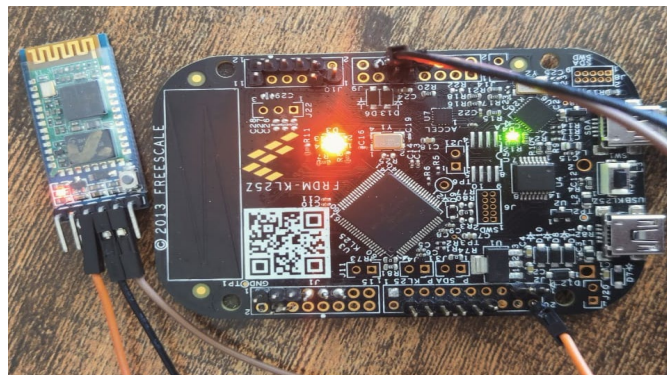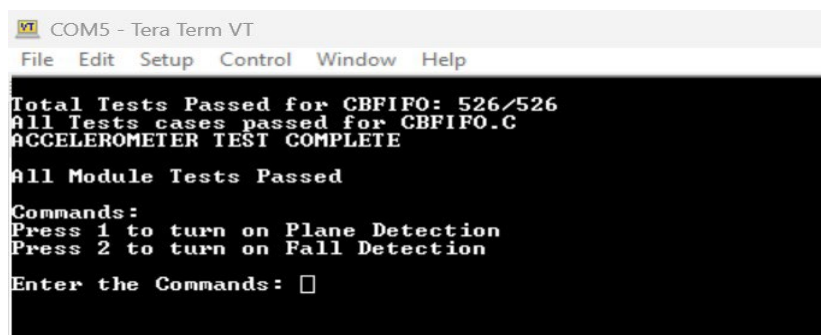

Fig: Accelerometer Test didn't pass

Fig: Error LED ON

In the above example, the i2c was not initialized and the Accelerometer was called resulting in this error.

2) **User Interface**

If all the Module Tests are passed, then the above message is displayed on the UART. This is followed by the commands I have programmed. So, let's press 1 and start with the Plane Detection.

3) Flat Plane Detection (Happy and Corner Cases)

During Plane Detection, the LED on the GPIO connected to PortD, Pin 1 is OFF. When the Board is placed on any elevated surface/ground which is not skewed, the Blue LED turns on and a message is displayed on the Serial Terminal through UART0 that a flat surface was detected. This was done using the Roll and Pitch functions from the Accelerometer.
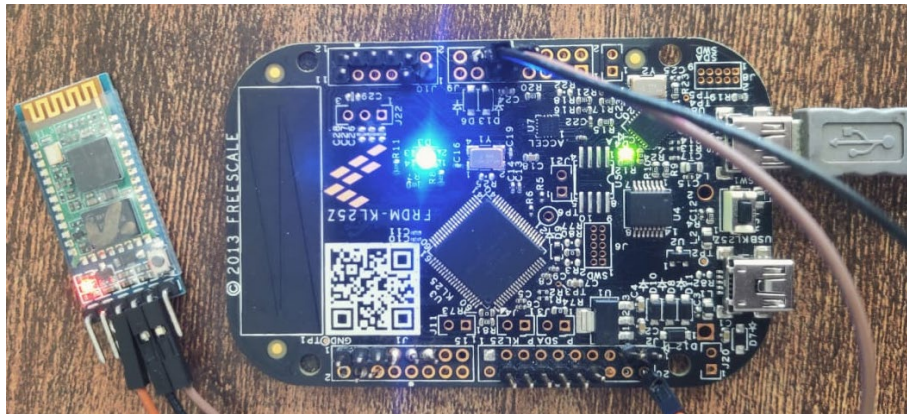

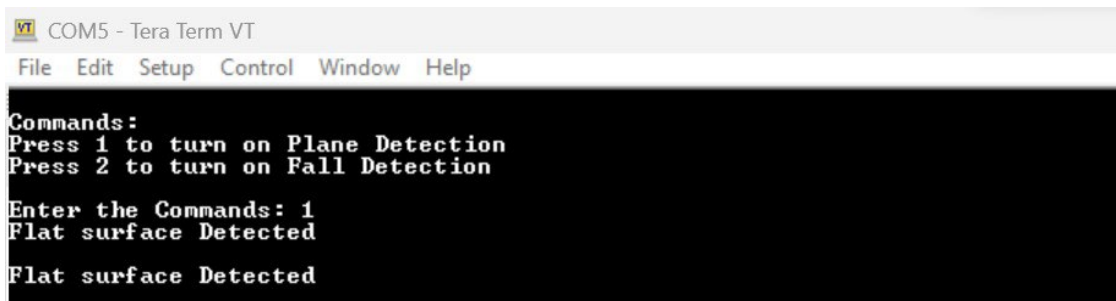Fig 3: Flat Plane Detected with Blue LED Indicator ON

Fig: UART message for Flat Plane Detection

Error Cases – To simulate an Error Case, the FRDM was placed on a chair that appears to be not inclined relative to the ground, but the FRDM using its accelerometer easily identified that and didn't detect the flat surface keeping the BLUE LED turned off.
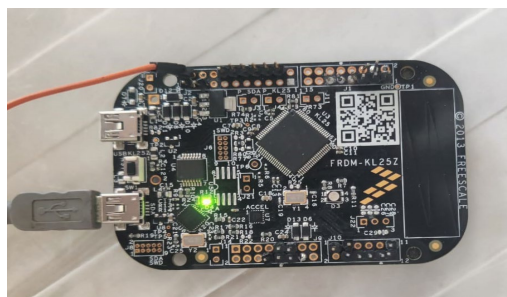

Fig: Plane Detection Error Case Detection

4) Fall Detection (Happy and Corner Cases)

When the User selects Fall_Detection, the controller checks if there is a sudden change in the sudden change in the Z-Axis. Whenever a Fall is Detected, the green LED on the FRDM glows up and the same is indicated on the UART Serial Terminal connected to it.
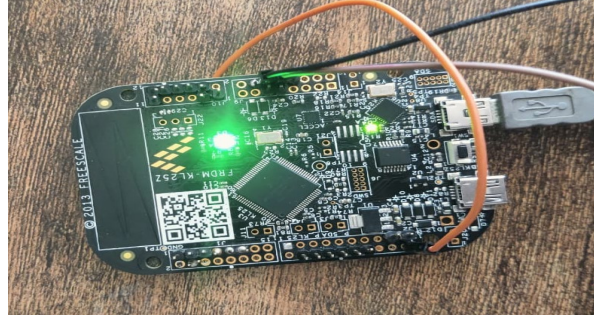

Fig: Fall Detected: Green LED Indicator

Fig: Fall Detected message on the terminal

Error Case – If the FRDM was dropped from a height of less than 500 meters, the LED doesn't glow up as it doesn't reach the threshold for the Z-axis, it is also because there is not enough time to detect that fall considering the timer placed for taking accelerometer data.

5) Bluetooth Communication

The UART1 was configured for Bluetooth communication as the UART0 was routed to the STDIO. The following data was seen when the Python program was run in the host computer at the com port automatically assigned to the Bluetooth Module by the computer while pairing.

However, it was not possible to decode the data using UTF-8 as the start condition for the message was not written possibly due to incorrect initialization of the UART1. The same is described in more detail in this video:

https://github.com/harshberiwal/PES_Final_Project/blob/main/Test%20Documentations%20%26%20Videos/Bluetooth_demo.mp4.