

# **Operational Description**

## **1. WiFi Transceiver / Main Processor – CC3200**

This processor runs the WiFi connection, as well as performing most other tasks in the system.

- Receives data from accelerometer/gyroscope/magnetometer combo chip over SPI
- Runs the algorithms that analyze motion and measure jump height
- Monitors the debounced pushbutton output of the pushbutton on/off controller
- Measures the battery voltage via an onboard ADC
- Communicates with the CC2540 via UART to coordinate comms with the outside world, as well as power-down of the system via the pushbutton on/off controller
  - o Is aware of not only its own connection status via WiFi, but also of the connection status of the Bluetooth Low Energy radio managed by the CC2540
  - o Will choose to send data via its own radio if connected, or via the CC2540 for transmission over BLE if there is an active connection to that radio instead

## **2. Bluetooth Low Energy Transceiver / Auxiliary Processor – CC2540**

This processor primarily runs the Bluetooth connection, as well as performing some data buffering and storage (both volatile and, to a lesser degree, non-volatile).

- Monitors the debounced pushbutton output of the pushbutton on/off controller
- Communicates with the CC3200 via UART to coordinate comms with the outside world, as well as power-down of the system via the pushbutton on/off controller

## **3. WiFi RF Section**

WiFi RF signals are sent and received by the CC3200 via a single-ended 50-ohm interface. A 50-ohm transmission line connects the CC3200 to a bandpass filter (TDK Corporation DEA202450BT-1294C1-H), which interfaces via a “Pi” matching network to a ceramic chip antenna (Taiyo Yuden AH316M245001-T). Frequency of operation is from 2.412 to 2.472 GHz.

## **4. Bluetooth Low Energy RF Section**

Bluetooth RF signals are sent and received by the CC2540 via a balanced (differential), non-standard impedance interface. This is connected to a balun (Johanson 2450BM15A0002E) for conversion to an unbalanced, 50-ohm transmission line that interfaces via a “T” matching network to a ceramic chip antenna (Johanson 2450AT07A0100T). Frequency of operation is from 2.4 to 2.4835 GHz (including guard bands).

## **5. Sensor Chip - Accelerometer/Gyroscope/Magnetometer Combo**

The CC3200 communicates with the 3-axis accelerometer/gyroscope/magnetometer chip via the SPI bus (which is run at 4 MHz).

## **6. OLED Display**

The OLED is controlled by the CC3200 via the SPI bus (which is run at 4 MHz).

## **7. Pushbutton On/Off Controller**

This versatile part facilitates the “long press on/long press off/longer press forced (hardware) reset” functionality for the system’s pushbutton, as well as providing debouncing, under-voltage lockout protection for the battery, power enabling/disabling, and power-on-reset. It’s connected directly to the battery, and also gates power to the system’s voltage regulators via a mosfet for power enabling/disabling.

## **8. Power**

When charging, the device takes in power via the VERT charger from a 5V USB source. This connects via a Li-Ion charge management chip to the battery.

The battery is connected to:

- The CC3200 via a resistive voltage divider in order to sense the battery voltage
- The pushbutton on/off controller
- The mosfet that the pushbutton on/off controller closes (or opens) to enable (or disable) power to the system’s two voltage regulators:
  - o A boost regulator that supplies power to the OLED at 7.5 volts
  - o A buck voltage regulator that supplies power to the rest of the circuit at 3.14 volts