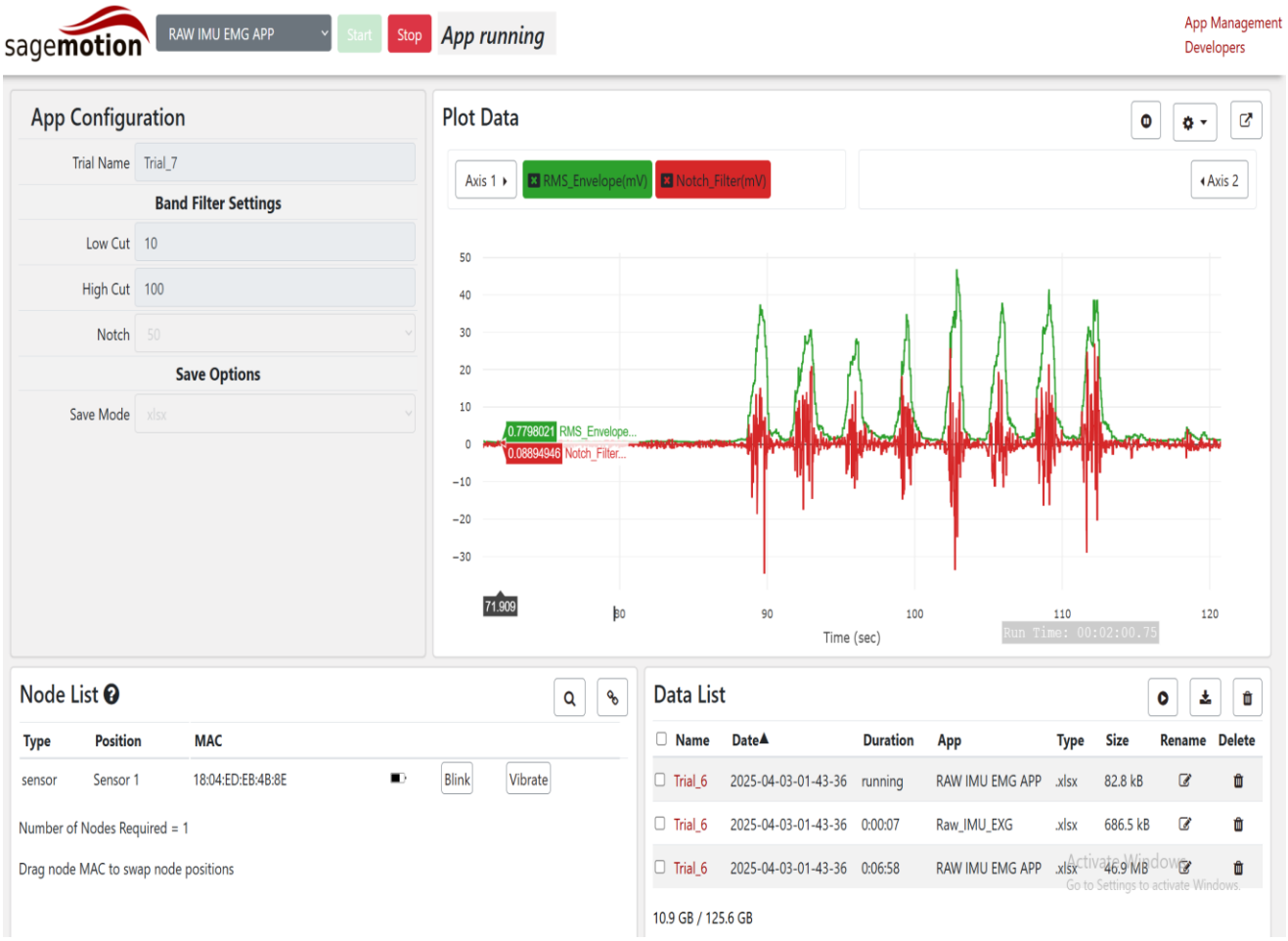
App Guide

RAW IMU EMG APP

SageMotion
Wearable Biofeedback System



sagemotion

Table of Contents

Components

Hub

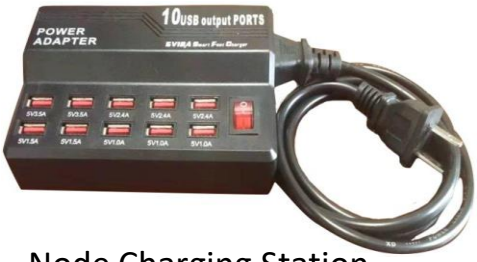
Nodes *(8x)*

Battery

Node Straps: *Medium (8x), Short (4x), Long (2x)*

Cable A *(10x)*
-Connect Hub to Battery
-Charge Nodes & Battery

Cable B *(optional use)*
-Connect Hub to Computer



Node Charging Station

EMG Bluetooth Receiver

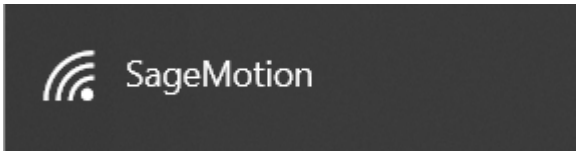
EMG Electrode

EMG Module

Wirelessly Connect to Computer or Cellphone

1) Connect Cable A to Battery and to Hub

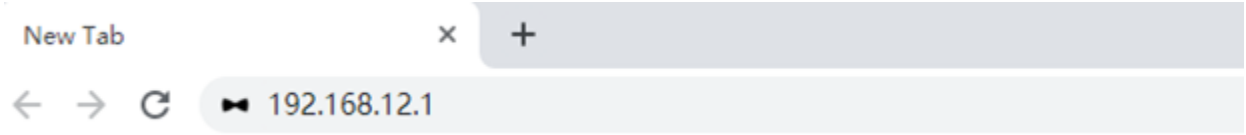
2) On Computer/Cellphone, Connect to Wi-Fi: “SageMotion”



Note 1: Need to wait for up to 1 minute for “SageMotion” to appear in Wi-Fi list. If it doesn’t appear, try turning the Wi-Fi off and then on again on the computer/cellphone.

Note 2: Hub is connected after clicking “Connect” even if in Windows it shows “Connecting” or “No internet, open”.

3) On Computer/Cellphone, in Chrome Address Bar, Go To http://192.168.12.1



[Note] If Computer Doesn’t Have Wi-Fi: *plug in Cable B to the Hub and to the ethernet port of your computer, then in chrome address bar, go to* ***http://192.168.137.1***

RAW IMU EMG APP

The Raw IMU EMG App simultaneously collects raw data from an Inertial Measurement Unit (IMU) and an Electromyography (EMG) sensor.

1) Connect the EMG Bluetooth Receiver to the Hub using a USB cable by inserting the receiver's USB plug into the Hub's USB port.

USB cable inserted into the hub USB port

Type-C end of the cable inserted into the Bluetooth Receiver

2) Turn on the IMU node(s) using the button on the side.

Green LED (power and wireless connection)
-**ON:** Power on, wirelessly *connected* to hub
-**OFF:** Power off
-**Blinking:** Power on, wirelessly *disconnected* to hub

Red LED (visual interface)
-**ON:** Sync failure, switch node off then on again
-**OFF:** Normal operation
-**3 Blinks:** Triggered from blink button in interface
-**1-4 Blinks on start**: Percentage of battery life. 1 blink is 0-25%, 2 blinks is 25%-50%, 3 blinks is 50%-75%, and 4 blinks is 75% -100%

Yellow LED (battery)
-**ON:** Battery is charging
-**OFF:** Battery is full (cable plugged in) or charging cable is unplugged
-**Blinking:** Battery malfunctioning

3) EMG module status

Blue LED Bluetooth Reciever (power and wireless connection)
- **Bluetooth Receiver ON:** Power on, wirelessly *connected* to EMG
-**Bluetooth Receiver OFF:** Power off
-Bluetooth Receiver Blinking: Power on, disconnected from EMG (Turn the EMG on)
-**EMG light ON Blinking** : EMG powered On, not paired/connected
-EMG light Off and Receiver stable ON: connected
-EMG light Off and Receiver Blinking: not paired, EMG turned off

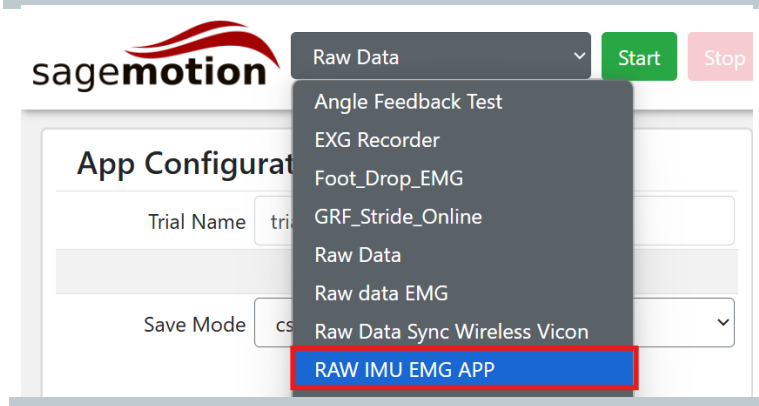
RAW IMU EMG APP

The Raw IMU EMG App simultaneously collects raw data from an Inertial Measurement Unit (IMU) and an Electromyography (EMG) sensor.

4) Turn on the EMG Module (Skip if already performed)

1. Click the button once to turn the EMG node on
2. If successful, it should start blinking
3. After a few seconds, it would go into low power mode and light will turn off but the EMG sensor would still be ready to pair with the reciever

5) Select RAW IMU EMG APP

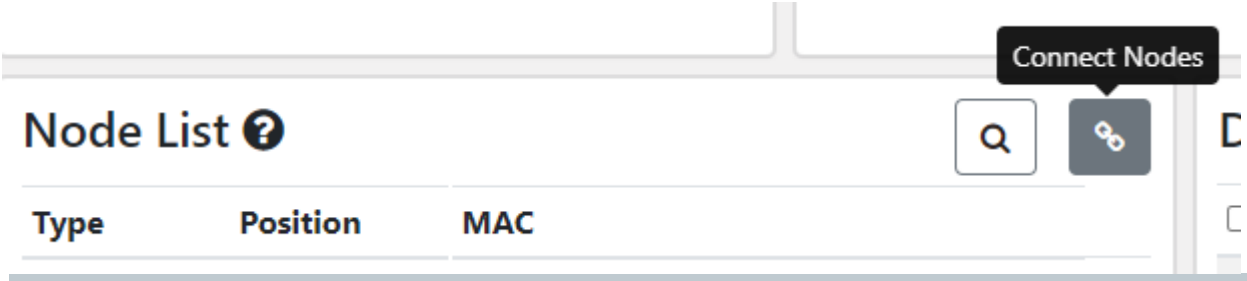


1. When the app is selected, the EMG node light should blink rapidly switching between red and blue for 1 second, indicating successful connection

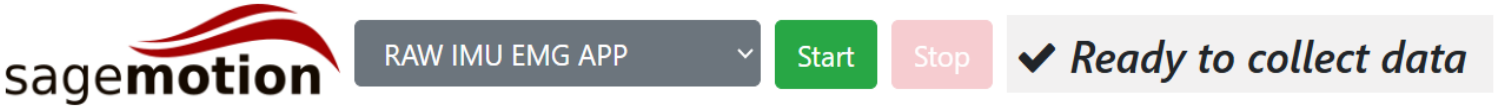
6) Click the magnifying glass to search for IMU node

RAW IMU EMG APP *(cont.)*

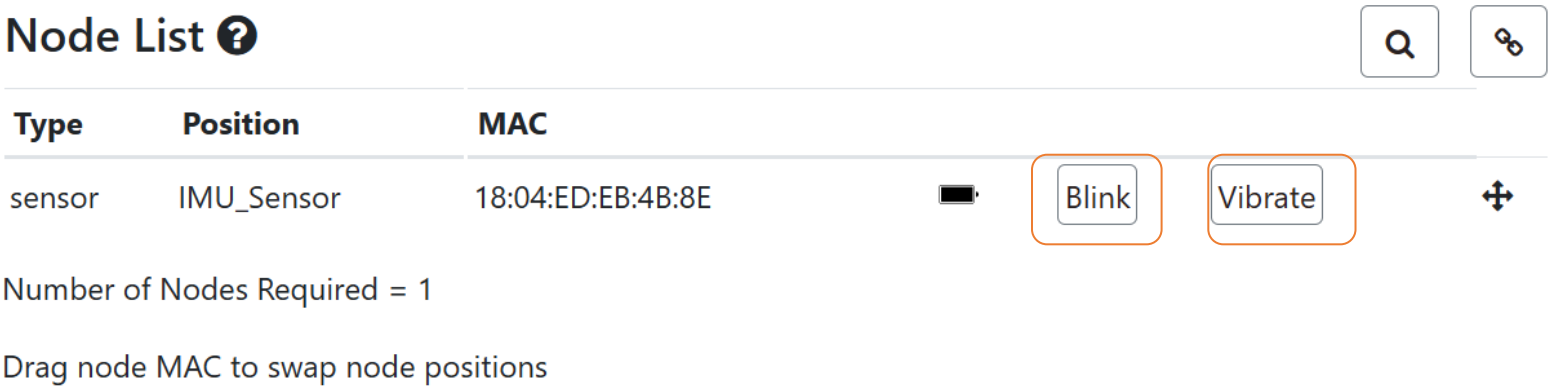
7) Click the chain icon button to connect



8) “Ready to collect data” Will Appear after Node Connection Complete

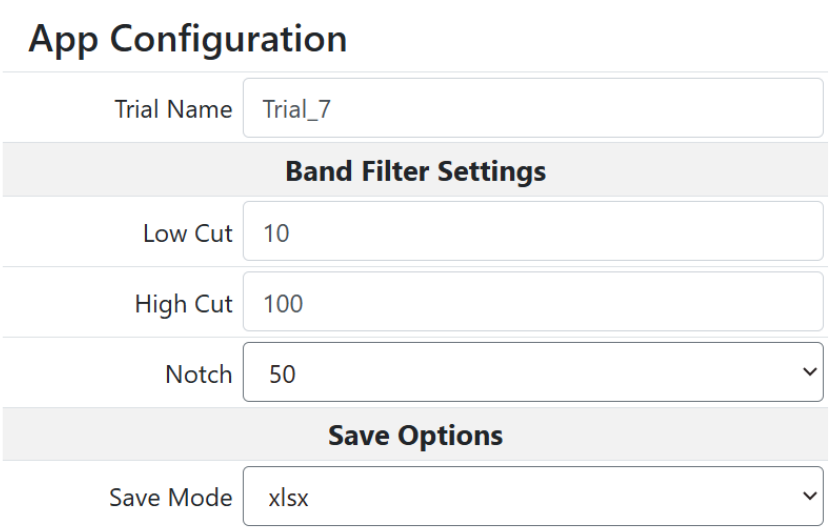


9) Click “Blink” or “Vibrate” to Test Connection.



RAW IMU EMG APP *(cont.)*

10) App Configuration / Filter Settings



1. Trial Name: Enter the desired name.
2. Filter Settings:

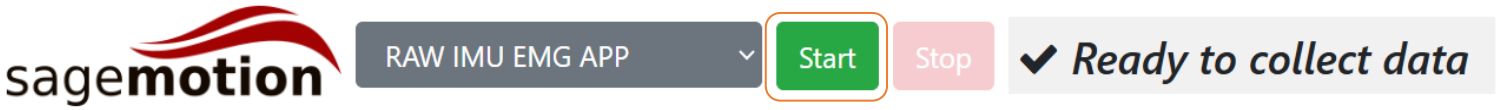
✓ **Low Cut:** EMG data below this frequency is removed.
- *Standard Surface EMG:* 20 Hz is commonly used to eliminate motion artifacts.
- *Fine Motor Control or Fatigue Analysis:* A lower cutoff of 10–20 Hz may be considered.

✓ **High Cut:** EMG data above this frequency is removed.
- *Standard Surface EMG:* 450 Hz is typical for capturing most muscle activity.
- *High-Dynamic or Detailed Analysis:* A high cutoff of 450–500 Hz might be more appropriate.

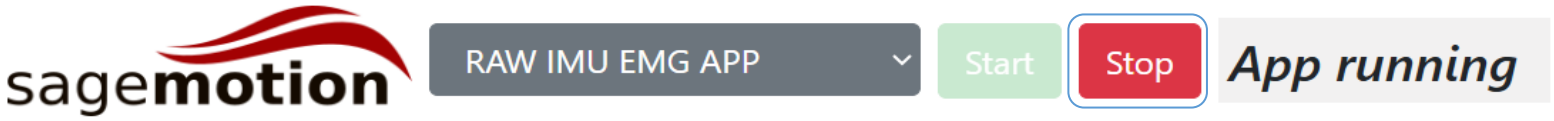
✓ **Notch:** It is the AC power frequency, where you live, Set to 50 Hz or 60 Hz (usually 60 Hz in the US).

3. Save Options: Choose CSV, XLSX or h5 to save the app configuration settings.

11) Click “Start” to Start Running App



12) After training, click “Stop” to stop the app



RAW IMU EMG APP *(cont.)*

Description of Data in Downloaded File

Time (s): time since trial start

SensorIndex_IMU_Sensor: index of raw sensor data

AccelX/Y/Z_IMU_Sensor(m/s^2): raw acceleration data

GyroX/Y/Z_IMU_Sensor(deg/s): raw gyroscope data

MagX/Y/Z_IMU_Sensor(µT): raw magnetometer data

Quat1/2/3/4_IMU_Sensor: quaternion data

Sampletime_IMU_Sensor: timestamp of each sensor

Package_IMU_Sensorpackage number of each sensor

Raw_EMG(mV): Raw electromyography (EMG) signal measured in millivolts before any filtering is applied.

Bandpass_Filter(mV): EMG signal after it has been processed using a Butterworth bandpass filter to remove unwanted frequencies.

Notch_Filter(mV): EMG signal after the application of a notch filter to remove power line interference (commonly set at 50 or 60 Hz i.e. it is based on the AC power frequency in your area).

RMS_Envelope(mV): The root mean square (RMS) envelope of the processed EMG signal, providing a smoothed representation of the signal's amplitude.