EMG Logger Android Application

User's Guide

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1 Important Information

1.1 Intended Use

The Trigno EMG Logger Android Application is a software application to be used with the Trigno Wireless Biofeedback System. The function of the app is to provide visual feedback from the Trigno Biofeedback System with minimal user interaction during data acquisition. The app is designed to work exclusively with the Trigno Biofeedback System and is not intended to be used in diagnostic or safety-critical applications.

The Trigno™ Wireless Biofeedback System is a battery-powered biofeedback device that enables researchers and clinicians to acquire EMG and related signals from subjects for biofeedback and research purposes. They are intended for relaxation training and muscle reeducation. Interpretation of the EMG and supporting signals by a qualified individual is required.

Please refer to the Trigno Wireless Biofeedback System User Guide for additional important information.

1.2 Technical Service and Support

For information and assistance, please visit:

www.delsys.com

Contact us:
E-mail: support@delsys.com
Telephone: (508) 545 8200

1.3 Android Device Requirements

- Android 6.0 and above.
- Bluetooth 4.1 and above.
- Recommended phone:
  Samsung Galaxy S9+
  (SM-G965U1)

1.4 BLE Accessories

- Optional Polar Heart Rate Chest Strap, model H10

2 Application Overview

The Trigno EMG Logger is an android phone application created by Delsys to allow data acquisition, real-time biofeedback, and operation of the Trigno™ Wireless Biofeedback System via a mobile device. The app is designed to provide a user-friendly Trigno experience by communicating with sensors directly using a Bluetooth communication protocol.

This guide provides an overview of the application features and instructs the user on how to interact with the application and the Trigno hardware.

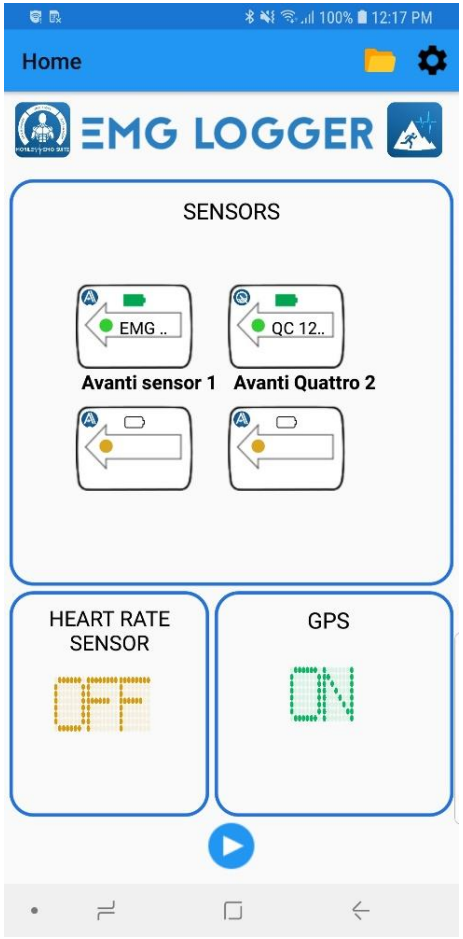

Figure 1: EMG logger App Home Page

4 Home Screen

4.1 Sensors

Click to access sensor list, and to re-scan for sensors.

4.2 Heart Rate Sensor

Click "Off" to connect a Polar H10 heart rate sensor via BLE. Once connected the Heart Rate Sensor will show live heart rate data. When connected, the app will store heart rate sensor data along with Trigno Sensor data.

4.3 GPS

Click to toggle between On and Off state of GPS. If toggled ON, GPS will be collected and stored in the files during data collection.

4.4 Application Settings

Click the wheel icon in the status bar open the applications settings page.

4.5 File Browser

Click the folder icon to go to File browser.

4.6 Play button

Click the Play button to start data logging.

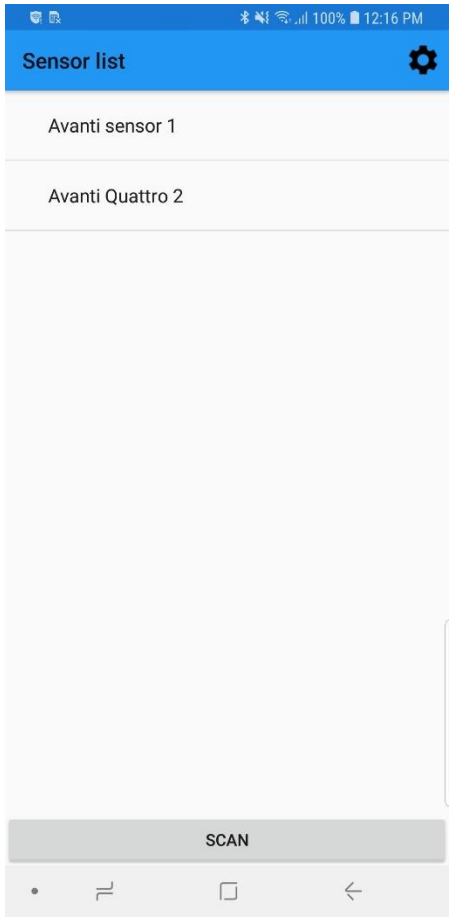

Figure 2: Sensor List on the Homepage

5 Sensor List

Click the Sensors field on the home page to access Sensor list. Pull down on the sensor list to scan/rescan for Trigno sensors. Alternatively, you can also click “Scan” button to scan for Trigno Sensors.

The Sensor List will auto populate with sensors nearby, and by default will name the sensors as “Avanti sensor N”. Sensors can be renamed from the Sensor Settings dialog.

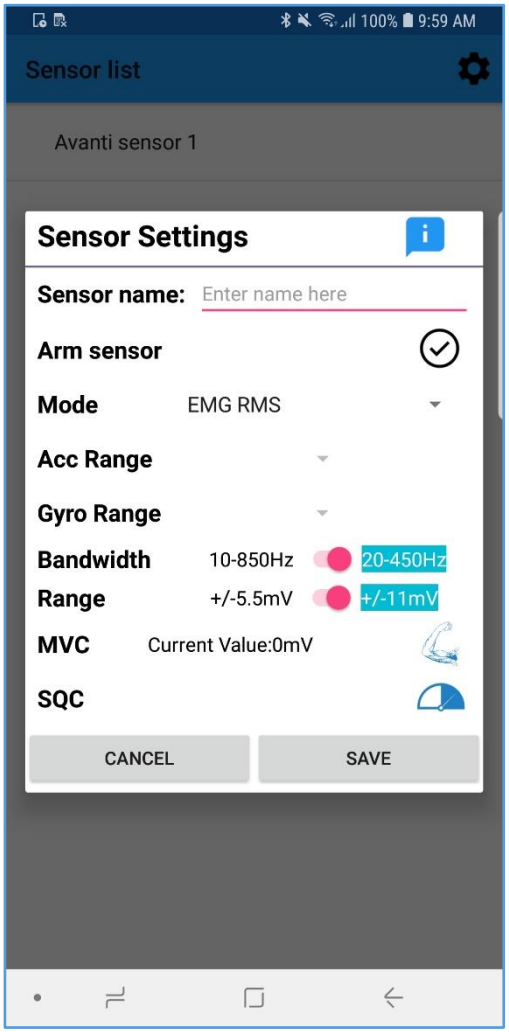

Figure 3: Sensor Settings dialog box

6 Sensor Settings

Click any sensor item from the sensor list to launch the sensor settings dialog box. The sensor's LED will start blinking white when in settings dialog box for identification purpose.

Select the checkbox next to any sensor to include it in data collection.

6.1 Mode

Select sensor mode in the dropdown list.

Please see Appendix I for more details on sensor modes.

6.2 Acc Range

If the inertial component is selected via the sensor mode, use the Acc Range dropdown to configure the accelerometer sensitivity.

6.3 Gyro Range

If the inertial component is selected via the sensor mode, use the Gyro Range dropdown to configure the gyroscope sensitivity.

6.4 Bandwidth

Use the Bandwidth toggle switch to configure the input bandwidth of the sensor from narrow (20-450Hz) to wide (10-850Hz) bandwidth.

6.5 Range

Use the Range toggle switch to configure the input range of the sensor from low (+/- 5.5mV) to high (+/-11mV) range.

6.6 MVC

Displays the current MVC value for the sensor. Click the MVC icon to collect a new value.

6.7 SQC

Click the Signal Quality Check icon to launch the Signal Quality Check dialog to inspect the sensor signal prior to data collection.

6.8 Sensor Info

Press the “I” button to get sensor info

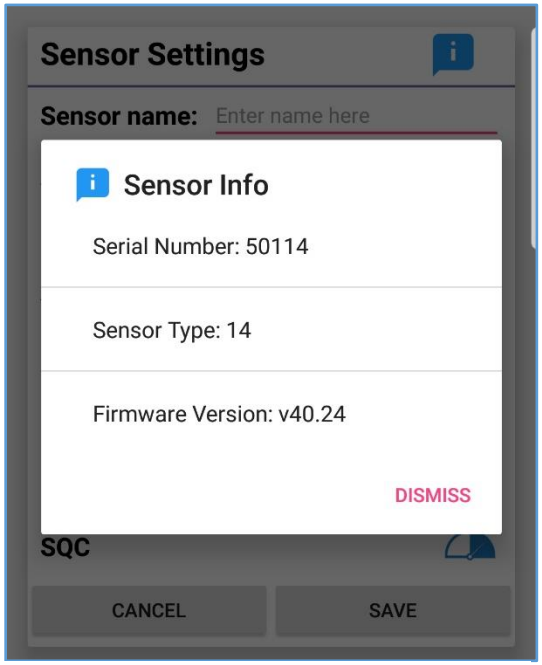

Figure 3a: Sensor info dialog

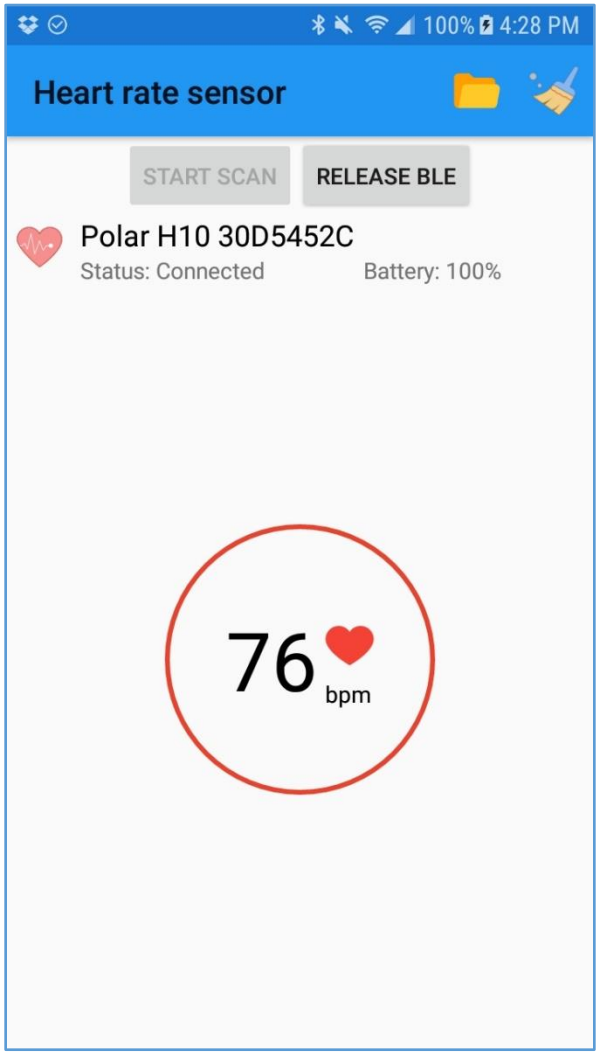

Figure 4: Heart rate sensor page

7 Heart rate sensor page

Click the button “Start Scan” to scan and connect to Polar H10 heart rate sensor. Click the button “Release BLE” to disconnect heart rate sensor.

Once connected, a live heart rate bpm will be shown.

Currently, only the Polar H10 heart rate sensor is supported in the app.

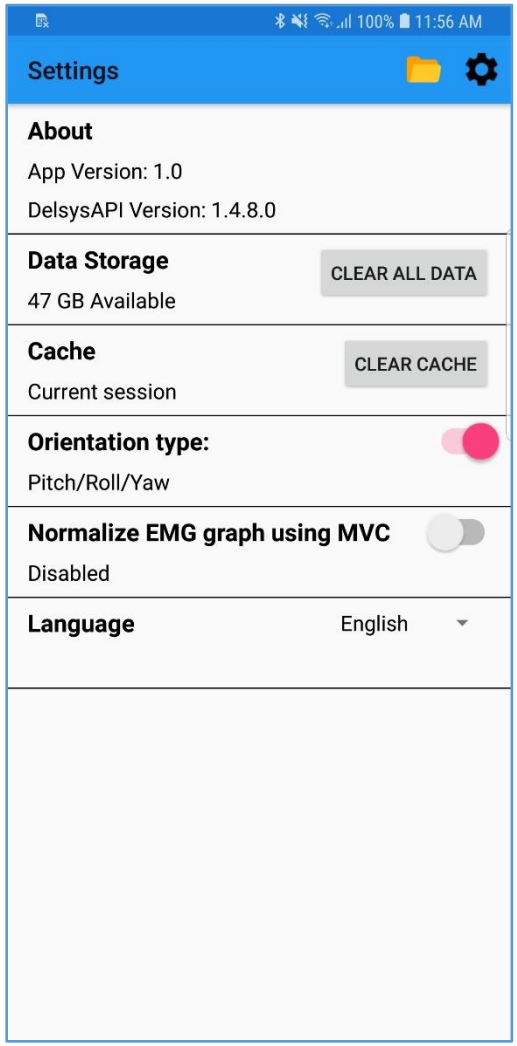

Figure 5: EMG Logger app settings

8 Application Settings

8.1 About

Displays the version number of the EMG Logger Android Application, and the version numbers of components used to build the app.

8.2 Data Storage

Displays the amount of storage available on the tablet. Use the "Clear All Data" button to permanently delete all Trigno data files.

8.3 Cache

Click "Clear Cache" to remove all stored settings and alias names for Trigno Sensors.

8.4 Orientation Type

Orientation data can be stored as Quaternions or as Degrees in a Pitch/Roll/Yaw format. Use this option to switch between data types. By default, Pitch/Roll/Yaw is selected.

8.5 Normalize EMG graph using MVC

This option will enable or disable normalization of the EMG graph from the sensor in Summary screen. If toggled ON, Summary screen will display a normalized EMG graph based on the MVC value stored for that Trigno sensor.

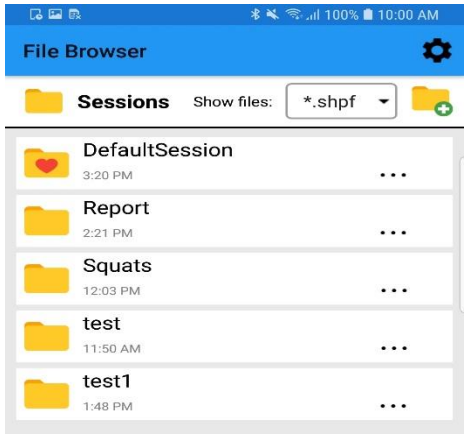

Figure 6: Example of multiple folders in file browser.

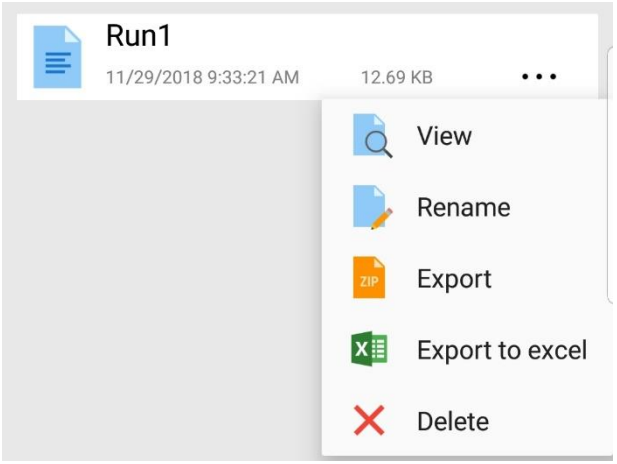

Figure 7: Ellipsis options in file browser.

9 File Browser

The file browser allows the user to create folders for managing their data collection sessions, and to export data via various file sharing services.

To select a file or folder, long press on the file or folder row.

9.1 Navigation Bar

Click the Ellipsis button to reveal a small drop down list which have the following functionalities:

Set the current Session as the default file storage location. Use this to change which Session the data are being saved to.

Delete currently selected File or Session.

Click to rename a Session or a File.

Add a new Session to current directory.

Click to export the File/Session as a zipped file

Click to view the summary of the selected file.

Click to export shpf file to xlsx file

9.2 Exporting Data

Select a file and click on the “Export” button to export. Files and folders are compressed before sending. Next, select an export method from the

Android System dialog. Files are saved as .shpf and can be converted to .hpf files using the Delsys File Utility on a Windows PC.

9.3 Show Files

Click the drop down menu item to filter the files between .shpf, .xlsx, .pdf or All.

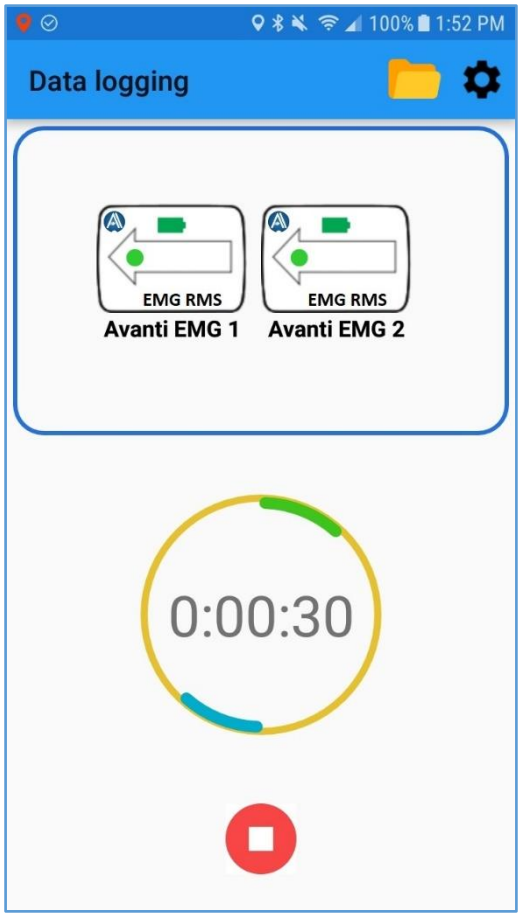

Figure 8: Datalogging Mode

10 Datalogging Mode

Click the play button on the homepage to enter the data logging mode.

10.1 Sensor Status

Shows the status of active streaming sensors.

If the Polar heart rate sensor is connected, a live heart rate bpm will be displayed.

10.2 Timer

This timer displays the time elapsed since Play button was activated on the homepage. The format of the timer is h:mm:ss

10.3 GPS status

The app will display a notification on the lock screen and notification center if GPS was toggled ON.

10.4 Stop button

Click the Stop button if to stop data collection.

10.5 Sensor Connection

If connection to any one of the Trigno sensors transmitting data is lost, the device will automatically attempt to reconnect for a period of 10 seconds. If reconnection is unsuccessful, the device will vibrate and stop data collection. Acquired data up to that point in time will be saved.

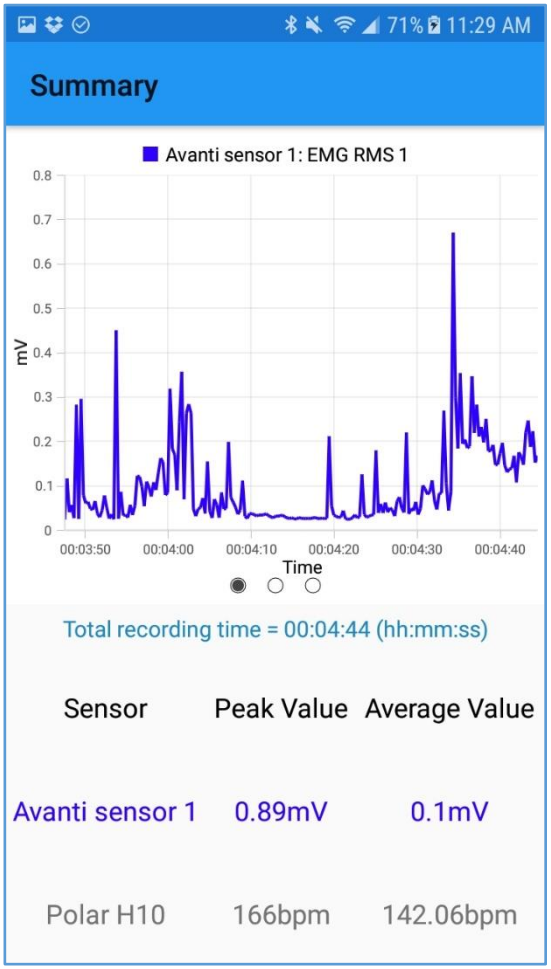

Figure 9: Summary screen

11 Summary

Click the stop button in the datalogging mode to go to Summary screen. Alternatively, the Summary for any file can be viewed in the file browser.

11.1 Graphs

Pinch to zoom on the plot area. Double tap to zoom out and reset the zoom.

Swipe right or left to switch between different graphs. Alternatively pressing the trailing dots can navigate directly to a graph.

If Normalization using MVC is enabled, the EMG values are normalized based on the MVC value of the sensor.

11.2 Heart rate summary

If the heart rate sensor was connected, the Summary screen will display a bpm graph along with other graphs.

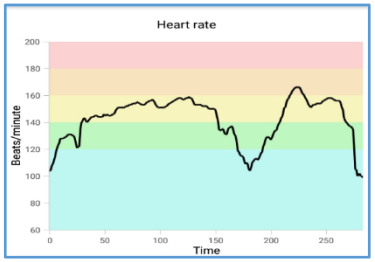

Figure 10: Heart rate plot in Summary screen

11.3 GPS summary

The green pin on the map displays starting point and the red pin displays the end point.

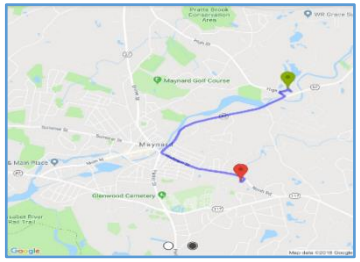

Figure 11: GPS in Summary screen

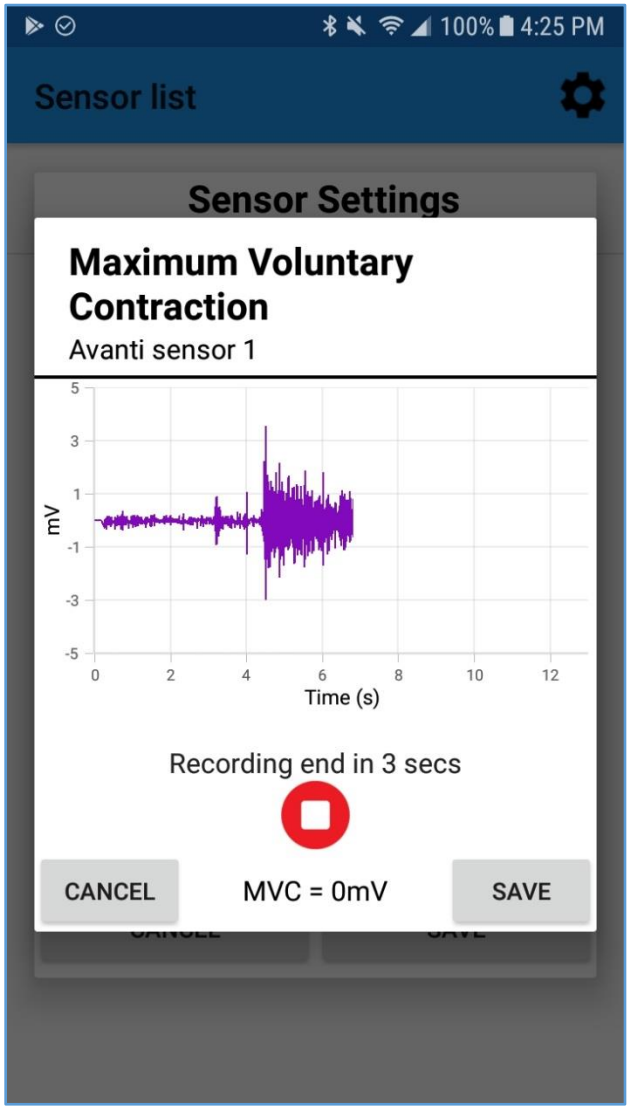

Figure 4: Maximum Voluntary Contraction Collection Dialog

12 Maximum Voluntary Contraction

This dialog allows the user to collect a maximum voluntary contraction (MVC) value from a given sensor. When collecting, EMG data are being streamed at 2000Hz, and the maximum RMS value is stored as the MVC value at the end of collection.

12.1 Saving the MVC Value

At the end of collection, the calculated MVC value is displayed at the bottom of the dialog.

Click cancel to abort the collection without saving the new value.

Click the Play button to collect the MVC again.

Click Save to exit and save the new MVC value.

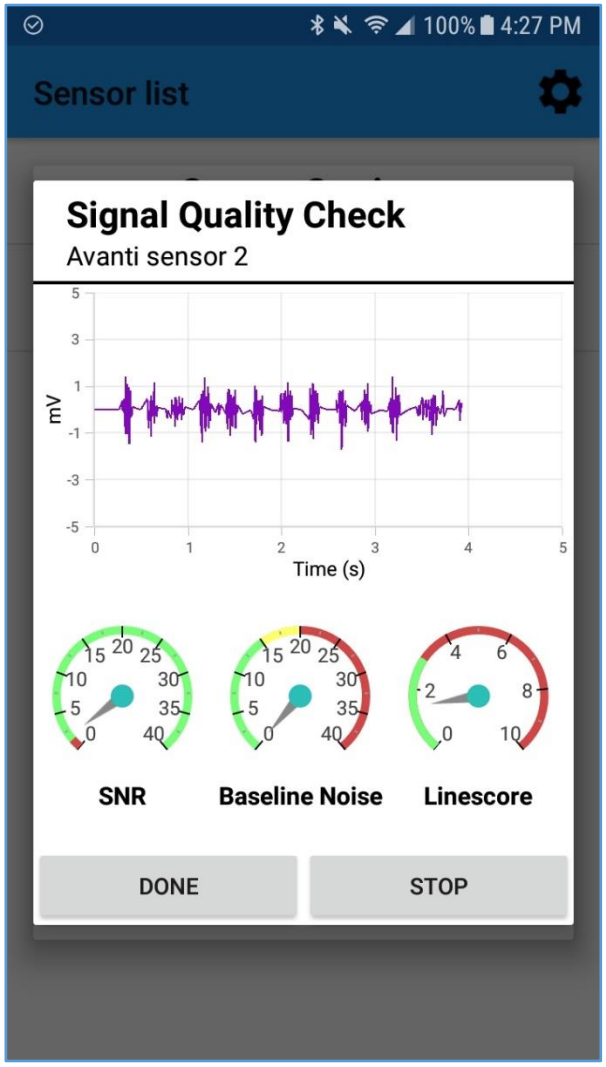

Figure13: Signal Quality Monitor Dialog

13 Signal Quality Monitor

The signal quality monitor is a tool for checking each sensor's signal quality, which can be affected by a variety of factors. For more information on how to improve signal quality, please visit the Delsys website.

The Signal Quality Monitor measures and displays four signal components:

13.1 Signal to Noise Ratio

The SNR is the amplitude of the EMG signal recorded during a muscle contraction relative to the electrical noise recorded when the muscle is not contracting.

13.2 Baseline Noise

The baseline noise represents the amplitude of the electrical signal that is recorded when the muscle is not contracting. It reflects the stability of the skin-electrode interface.

13.3 Line Score

The line interference is the electrical noise from power lines (50 or 60 Hz) and electrical devices that is present in almost all indoor environments and may contaminate the recording of EMG signals.

13.4 Clipping

Clipping occurs when the amplitude of the sEMG signal goes beyond the range that can be reliably recorded by the sensor technology. It may occur if the signal amplification is excessive or if the recording sensor is not properly attached to the skin.

14 Appendix I: Sensor Modes

Mode Name	Channels	Sample Rate	Details
EMG	EMG	1000Hz	
EMG RMS	EMG RMS	333.3Hz	125ms Window Width, 122ms overlap
IMU	ACC_x ACC_y ACC_z	133.3Hz	
	$GYRO_x$ $GYRO_y$ $GYRO_z$	133.3Hz	
	MAG_x MAG_y MAG_z	66.7Hz	
EMG + IMU	EMG	1000Hz	
	ACC_x ACC_y ACC_z	133.3Hz	
	$GYRO_x$ $GYRO_y$ $GYRO_z$	133.3Hz	
	MAG_x MAG_y MAG_z	66.7Hz	
EMG RMS + IMU	EMG RMS	333.3Hz	125ms Window Width, 122ms overlap
	ACC_x ACC_y ACC_z	133.3Hz	
	$GYRO_x$ $GYRO_y$ $GYRO_z$	133.3Hz	
	MAG_x MAG_y MAG_z	66.7Hz	
Orientation	$QUAT_w$ $QUAT_x$ $QUAT_y$ $QUAT_z$	66.7Hz	If Pitch/Roll/Yaw is enabled as orientation output type, these four channels are replaced with Pitch, Roll, and Yaw (3 channels)
EMG + Orientation	EMG	1000Hz	
	$QUAT_w$ $QUAT_x$ $QUAT_y$ $QUAT_z$	66.7Hz	If PRY is enabled as orientation output type, these four channels are replaced with Pitch, Roll, and Yaw (3 channels)
EMG RMS + Orientation	EMG RMS	333.3Hz	125ms Window Width, 122ms overlap
	$QUAT_w$ $QUAT_x$ $QUAT_y$ $QUAT_z$	66.7Hz	If PRY is enabled as orientation output type, these four channels are replaced with Pitch, Roll, and Yaw (3 channels)