



# MAX-ECG-MONITOR

## User Guide

*UG6732; Rev 0; 5/18*

### Abstract

This user guide provides an introduction to and overview of the Maxim MAX-ECG-MONITOR. The document details the major functions of the device, useful features, and how to use it in conjunction with an Android device and the Movesense Showcase app.

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## Safety

### Meaning of Symbols



**WARNING:** is used in connection with a procedure or situation that may result in serious injury or death



**CAUTION:** is used in connection with a procedure or situation that will result in damage to the device



**NOTE:** is used to emphasize important information



**TIP:** is used for extra tips on how to utilize the features and functions of the device.

### Safety Precautions



**WARNING:** Only for recreational use.



**WARNING:** Always consult your doctor before beginning an exercise program. Overexertion may cause serious injury.



**CAUTION:** Do not apply solvent of any kind to the product, as it may damage the surface.



**CAUTION:** Do not apply insect repellent on the product, as it may damage the surface.



**CAUTION:** Do not knock or drop the product, as it may get damaged.



**NOTE:** These products and services are intended for recreational use only and are not meant for medical purposes of any kind.

## Introduction

The MAX-ECG-MONITOR is targeted toward users interested in evaluating the new MAX30003 electrocardiogram (ECG) device. The wearable chest-strap device (developed jointly with Suunto®) allows an immediate evaluation of the MAX30003 by providing ECG waveform, heart-rate detection, accelerometer, and other motion-sensing data that can be exported to storable files. The device runs on Suunto's Movesense® open development environment and allows users to customize their motion-sensing solutions to meet the needs of their unique fitness applications.

## Operating the ECG Monitor

### Power On/Off

The MAX-ECG-MONITOR turns on automatically when it detects a heartbeat through the electrodes. A red LED flashes on the top of the monitor to indicate that it is on.

The monitor automatically powers off when no heartbeat is detected across the electrodes (e.g., when the device is not worn).

### Wearing the ECG Monitor

To put on the ECG monitor:

1. Snap the monitor into the chest strap connector.
2. Moisten the strap electrode areas with water or electrode gel.
3. Adjust the strap length to fit tightly but comfortably around your chest below the chest muscles with the Maxim logo facing out.
4. Ensure the moist electrode areas are firmly pressed against your skin.
5. For applications where more secured mounting is desired, use the adhesive electrodes (red) instead of the chest strap.



Detach the monitor and rinse the chest strap under running water after every use. Dry the strap and electrodes. Sweat and moisture left on the electrodes can keep the device on unnecessarily and reduce battery life.



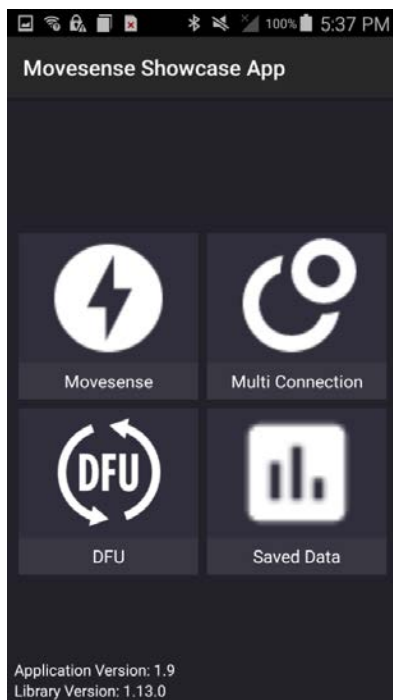
The adhesive electrodes are for single-time use and may be left on the skin up to a few days. More supplies can be ordered from [www.maximintegrated.com](http://www.maximintegrated.com).

## Movesense Showcase App

The MAX-ECG-MONITOR can be paired with an Android®-based device, such as a phone or tablet, for viewing and logging data through the Movesense Showcase app. This section describes how to install the app, how to connect the ECG monitor to the Android device, and how to use it.

### Installing the App

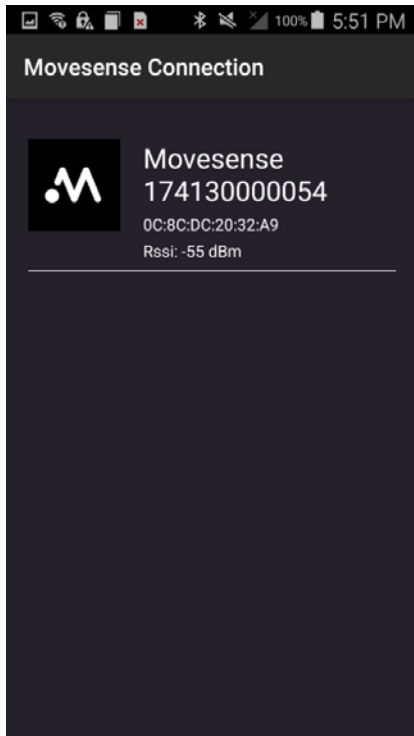
1. Save the provided .apk file to a location that you can access by phone (for example, to the phone memory if you have a file browser or to Dropbox®).
2. Open the file, which prompts the user to install the Movesense Showcase app. The main screen of the app is as shown below. The version of Movesense Showcase is shown at the bottom left of the screen.



## Connecting to an ECG Monitor

To connect to a device:

1. Select the Movesense icon in the app—devices available for connection are then displayed (see figure below).



2. Select the appropriate device to connect. The connection can take 10 seconds to 30 seconds to establish.

## Using the App

### *Sensor Measurements*

After a successful connection, a list appears to show all available measurement applications. The list does not fit on one screen, so scroll down to reveal the complete list (see screenshots below, result split in two images).

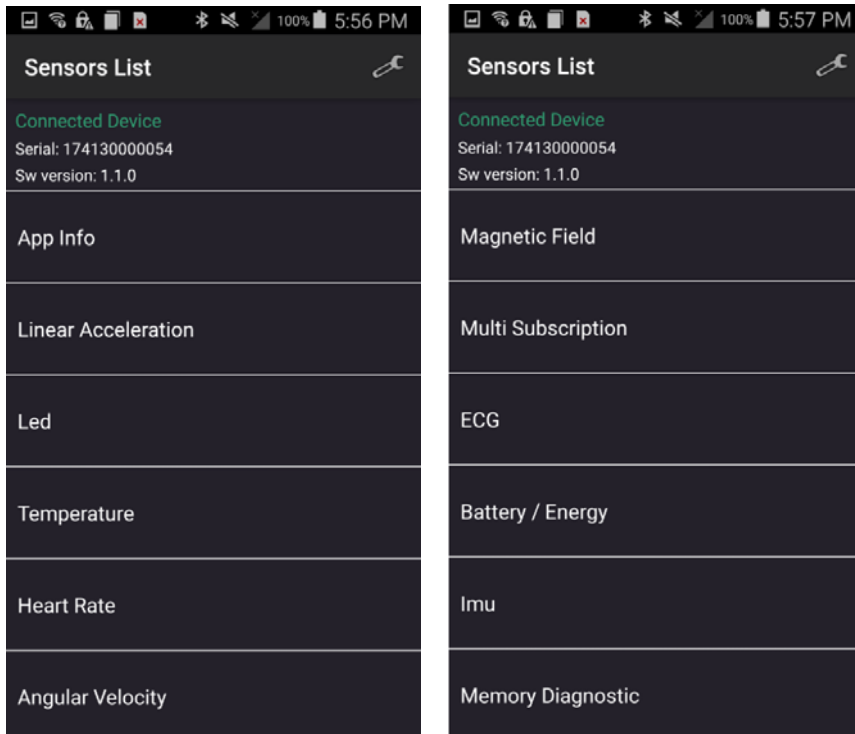


Figure 1. Complete list of sensor measurements.



A high-level description of each sensor measurement is summarized in the table below.

**Table 1: Sensor Measurement Descriptions**

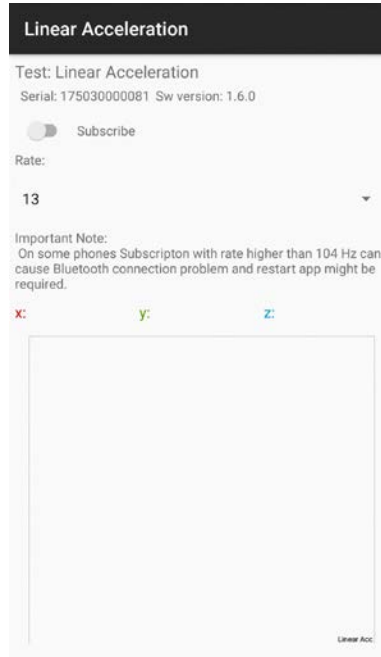
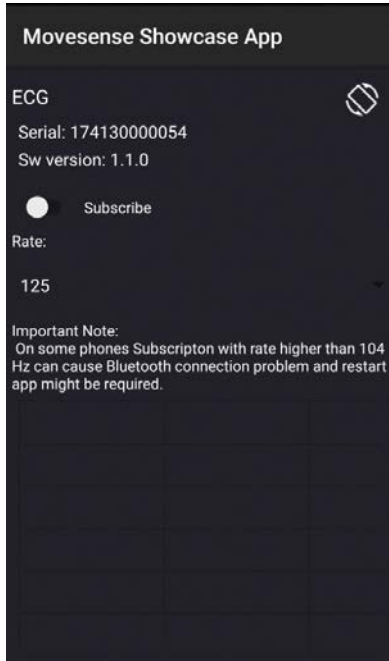
Measurement	Description
Connected Device	Serial number and firmware version of Movesense device
App Info	Name, version, and company provider for software application inside the Movesense device
Linear Acceleration	Acceleration force in $m/s^2$ (meters per second squared) along the x, y, and z axes, excluding the force of gravity
Led	Turn indicator LED on/off
Temperature	Temperature (in Kelvin) read by sensor inside Movesense
Heart Rate	Heart rate in (beats per minute)
Angular Velocity	Rate of rotation in (radian/s) around the x, y, and z-axes.
Magnetic Field	Magnetic field in (micro Tesla) along the x, y, and z-axes.
Multi Subscription	Three subscriptions to three measurement sensors simultaneously (Linear Acc + Magnetic Field + Angular Velocity); three sensors in 3 subscriptions
ECG	Measures and displays ECG chart; reported values are in units of count, which is proportional to a voltage
Battery	Displays status of battery usage
Imu	Single subscription to multiple measurement sensors simultaneously IMU6: 2 sensors (Linear Acc + Angular Velocity) in 1 subscription IMU9: 3 sensors (Linear Acc + Angular Velocity + Magnetic field) in 1 subscription
Memory Diagnostic	Diagnose memory by showing free stacks in memory for threads

## Enabling and Disabling Measurements

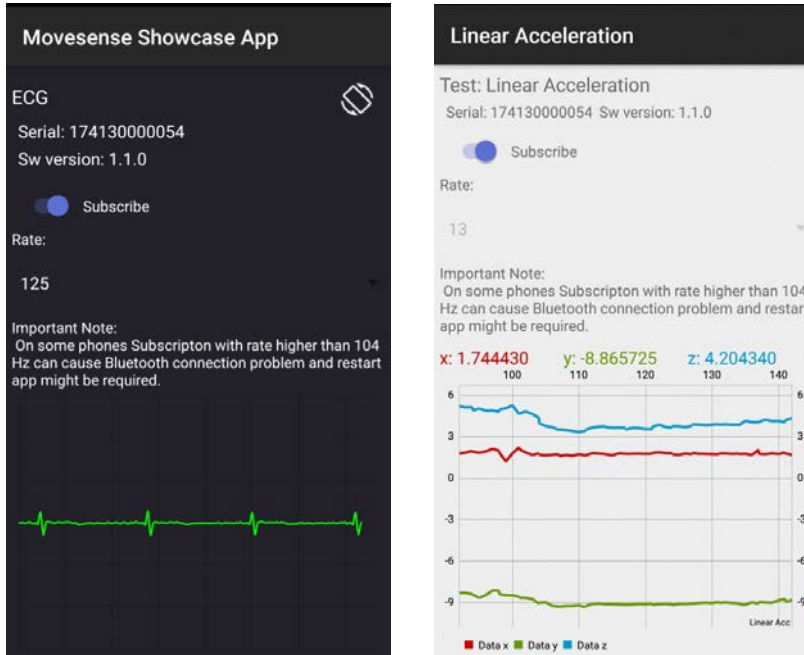
This section describes how to enable and disable sensor measurements. The examples are specifically for ECG and Linear Acceleration, but the other sensor measurements use the same procedure.

To enable/disable a measurement:

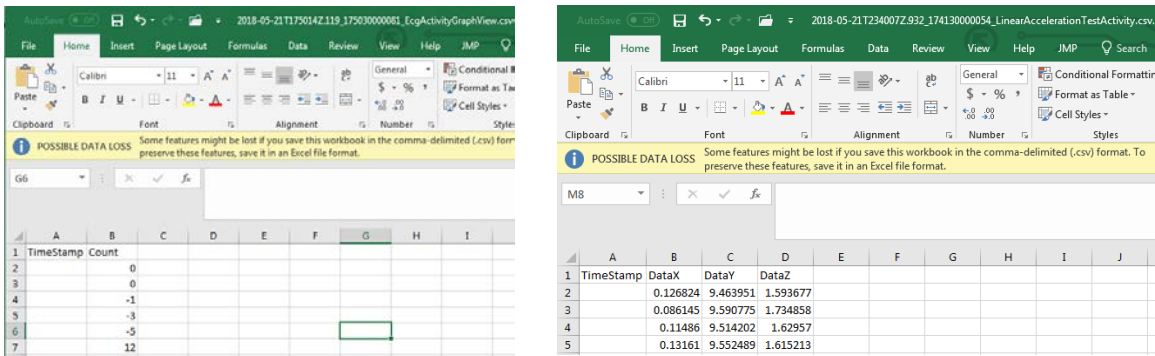
1. Select any of the sensor measurements described in the previous section. Below are examples of a selected ECG measurement window (left) and a selected Linear Acceleration measurement window (right).



- Slide the Subscribe radio button from left to right to activate the measurement application and start data collection. The button turns blue. Data is displayed at the bottom graph of the screen. Below are examples of an enabled ECG measurement window (left) and an enabled Linear Acceleration measurement window (right).



The data is also logged in a \*.csv file in the local \Movesense folder. The formats of the .csv files for the ECG (left) and Linear Acceleration (right) examples are shown below:



- To stop data collection, slide the radio button to the left. The button turns grey.

☰ If an error message regarding poor connection is displayed during measurement, check if the sensor has good contact with the skin.

☰ For ECG measurement, Maxim recommends a sampling rate of 128Hz or lower to ensure stable data streaming. A higher sampling rate can cause the app to fail for certain phone models. Choose different sampling rates by selecting the Rate button in the ECG measurement window.

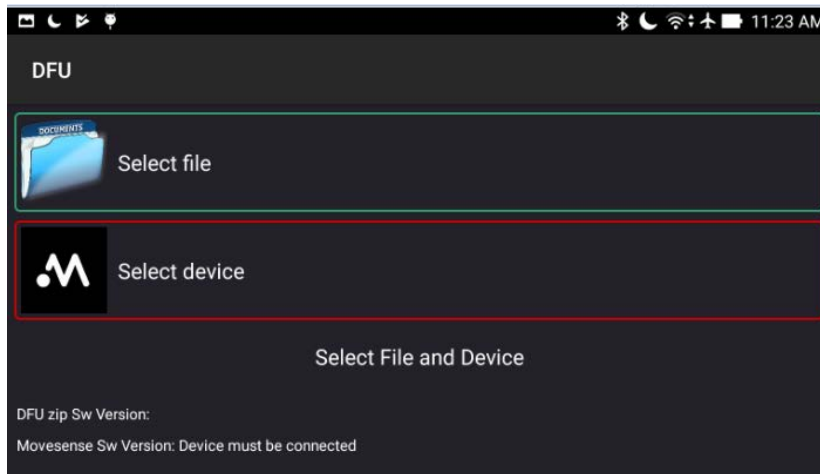
## Firmware

### Firmware Update

The MAX-ECG-MONITOR has pre-installed firmware (v1.1.0).

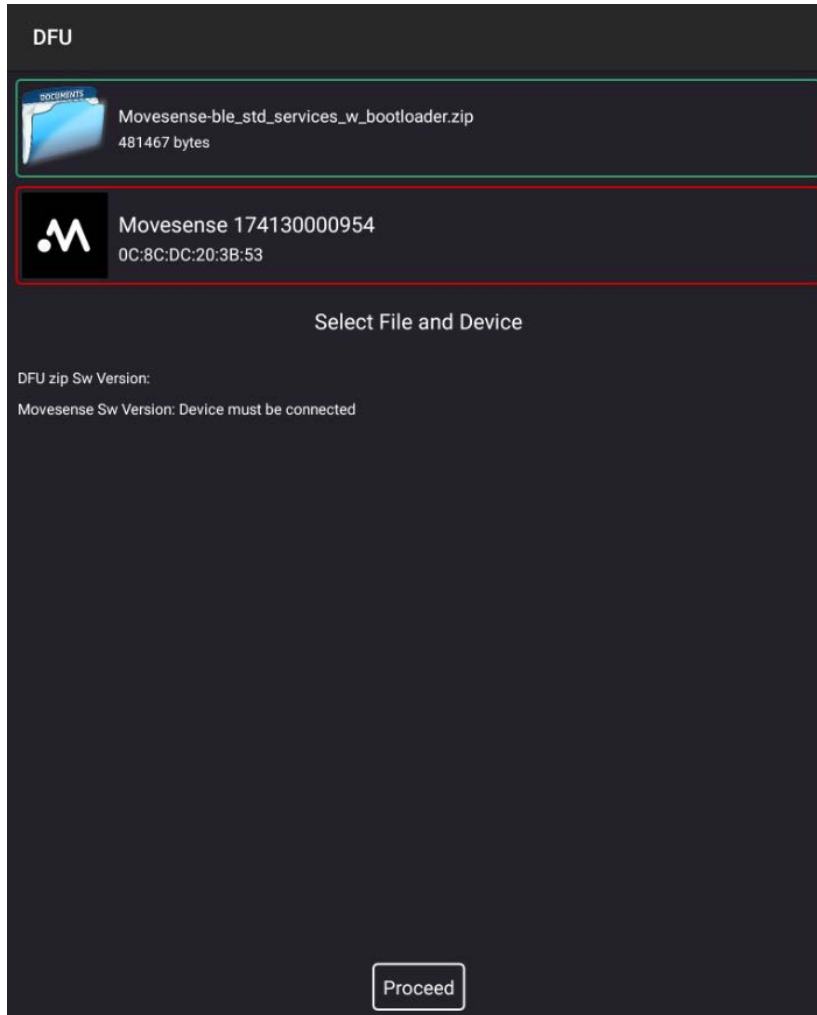
To upgrade to a newer firmware version:

1. Download the latest firmware version from [www.maximintegrated.com](http://www.maximintegrated.com).
2. Save the new bootloader file (\*.zip) in the local storage of the phone.
3. Select the DFU icon in the main screen (see Figure 1). The following window appears:



4. Choose Select File to select the .zip file from step 1.

5. Click Select Device to connect to the monitor to be upgraded. The following screen appears.



6. Select Proceed to upload firmware.

## Firmware Development

Movesense is an open development environment for motion sensing and allows users to customize the application inside the Movesense device by accessing a library repository.





For further information on customizing the application inside the Movesense monitor, refer to the following links:

<https://bitbucket.org/suunto/movesense-docs/wiki/Home>

<https://bitbucket.org/suunto/movesense-device-lib/src/master/samples/bin/debug/>

## Care and Support

### Handling Guidelines

-  Do not pull the sensor module straight off the connector. This can damage the belt connectors. Unsnap one side at a time.
-  The belt should be machine washed in 40°C after every two or three exercises. See the belt tag for further washing instructions. Sweat and moisture left on the electrodes can keep the device on unnecessarily and reduce battery life.
-  Do not machine wash the sensor module. Machine washing damages the module.
-  The adhesive electrodes are for single-time use and may be left on the skin up to a few days. More supplies can be ordered.

### Software Updates

Movesense Showcase App: Distributed as .apk file. The current release is v1.9.

The Movesense firmware can be updated over Bluetooth (DFU). The current release is v1.6.0. See to the *Firmware Update* section for instructions.

### Battery

The MAX-ECG-MONITOR uses a 3V lithium cell (CR 2025).

To replace the battery:

1. Remove the MAX-ECG-MONITOR from the connectors on the strap.
2. Open the battery cover.
3. Replace the battery.
4. Firmly close the battery cover.

## Reference

### Technical Specifications

- Weight: 9.4g/0.33oz (battery included)
- Diameter: 36.5mm/1.44in
- Thickness: 8mm/0.32in
- Operating temperature: -20°C to +60°C/-5°F to +140°F
- Storage temperature: -30°C to +60°C/-22°F to +140°F
- Water resistance: 30m/98ft (according to ISO 6425)
- Battery type: CR2025
- Transmission frequency: 2.4GHz (Bluetooth Smart)
- Manufacturer: Suunto Oy, Tammiston kauppatie 7 A, FI-01510 Vantaa FINLAND

### FCC Compliance

FCC identifier: RYP2458

Name of Grantee: Suunto Oy

Equipment class: Digital Transmission System

Notes: Multipurpose sensor module

FCC Rule Parts: 15C

Frequency Range (MHz): 2402.0-2480.0

Output Watts: 0.00071

This device complies with part 15C of the FCC Rules.

This device is approved for portable use with respect to RF exposure compliance.

Multi-transmitter, supporting simultaneous transmission configurations, have not been evaluated and shall be evaluated according to KDB Publication 447498 and §2.947(f), §15.31(h) and §15.31(k) composite system and §2.1 end product terms and concepts.

## Patent

This product is protected by pending patent applications and their corresponding national rights.

## Disposal of Device



Dispose of the device in an appropriate way, treating it as electronic waste. Do not throw it in the garbage.



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