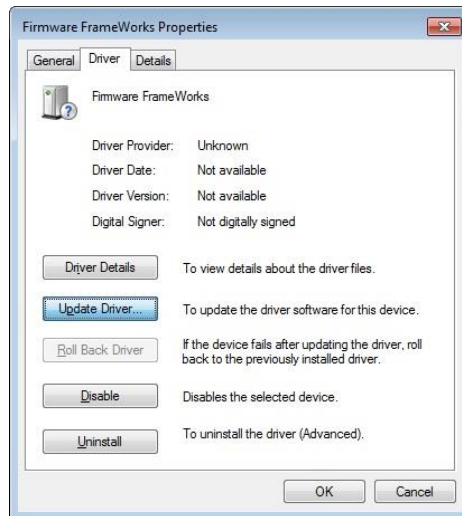# *The MotionMonitor xGen Hardware Guide: XSens IMU Device Configuration*

The following document outlines the steps required to configure and collect from an XSens System that is connected to The MotionMonitor xGen computer via a USB connection. The XSens MT Software Suite must first be installed on the computer before hardware are configured within The MotionMonitor xGen.

1. Power on the XSens Awinda station and connect it to the computer. The device should automatically be recognized. If it is not, right-click on the unrecognized device in the device manager and select Properties. Go to the Driver tab and select Update Driver. Then, select "Browse my computer for driver software" and browse to the XSens drivers. If the device is still not recognized after this process, contact a Client Support Engineer for assistance.

2. Start The MotionMonitor xGen and go to the Hardware node in the Setup Components window. Add an Xsens device from the Add button in the parameters panel at the bottom of the Components window or by right clicking the Hardware node and adding the device through the cascading drop list.
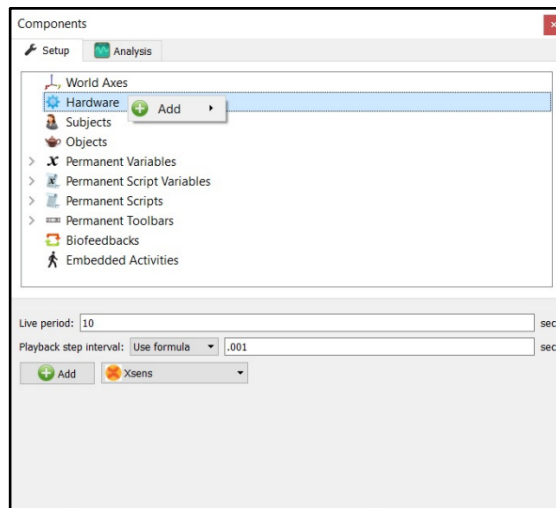
3. Click on the XSens device to bring up the XSens parameters panel. If running MTw Generation 1 sensors, select "Generation 1" from the Hardware generation drop-list and enter your hardware Serial key. If running MTw Generation 2 sensors, select "Generation 2" from the drop-list and leave the Serial key field empty. If multiple Awinda stations are connected to your system, click the "Add Awinda" button to add these additional devices. Specify a unique Awinda channel number for each Awinda device. Please refer to our "Configuring XSens RF Channels" or "Configuring XSens with Delsys Trigno" guides for instructions on how to select the appropriate RF channel for your environment.
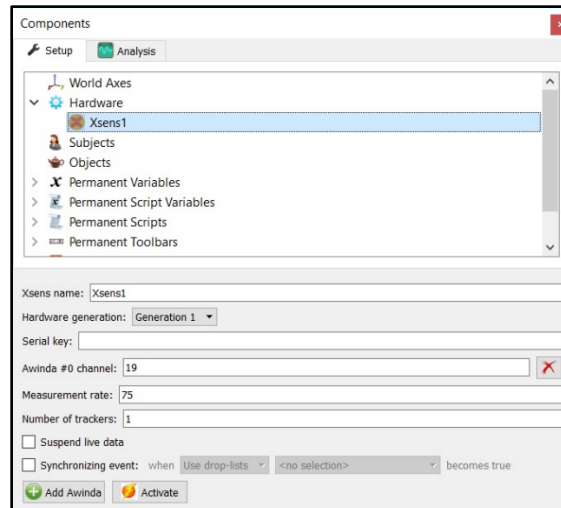
For setting the measurement rate, see the table below. The Number of trackers should match the number of MTw sensors that are being activated.

The following tables list the supported measurement rates for the number of MTw sensors/Awinda station:

MTw Generation 1	
Number of Sensors	Max Measurement Rate (Hz)
1	120
2	100
4	75
6	60
12	40
18	30

MTw Generation 2	
Number of Sensors	Max Measurement Rate (Hz)
5	120
9	100
10	80
20	60

The suspend live data checkbox will suppress any data from the XSens device from being displayed in graphs or used in any equations. However, the data would immediately be available and presented in a recorded activity. This is a means for limiting the computer resources being used while running in the Live Window.

4. Click on the "Activate" button in the parameters panel or the "Activate/Deactivate Hardware" toolbar icon to activate the Xsens hardware. The software will attempt to connect to the number of MTw sensors specified above. Turn on the XSens sensors by removing them from the Awinda Base Station and pressing the ON button if they do not start blinking on their own.

When powering on and activating, place the sensors on a flat surface if possible and avoid fast movements and sources of distortion, such as metal, electronics and motors. If any sensors enter standby mode and stop blinking, gently move the sensor to wake it up.

5. Sample data definitions for XSens sensors are displayed below.

The following image shows the Acceleration data relative to the World axes and an Euler rotation sequence relative to the World axes for an XSens sensor with SN T00B410B7.

Smoothing parameters can be enabled or disabled at any time through the node for XSens sensors under the XSens Hardware device in the Setup Components tab, as shown below.
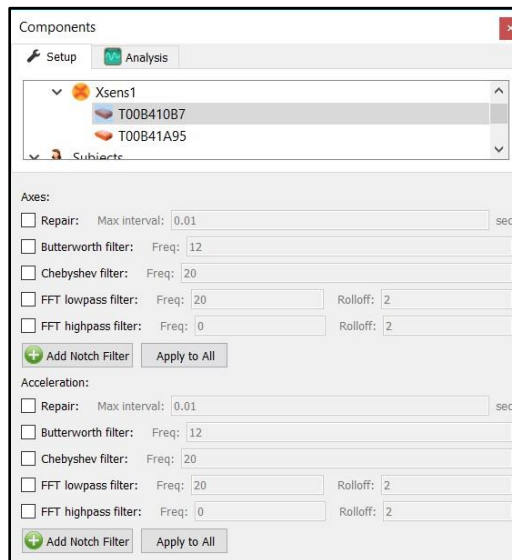

Technical Note:

- The Accelerometer readings were changed in version 2.63. Data recorded in prior versions will report the acceleration in the local coordinate system for the IM sensor and includes the acceleration due to gravity. Data recorded in subsequent versions report the acceleration in the World reference frame and does not include the acceleration due to gravity.

XSens Hardware

An XSens system consists of MTw motion tracking sensors and a receiving station or dongle that communicates with the sensors and transmits data from the sensors to a computer.
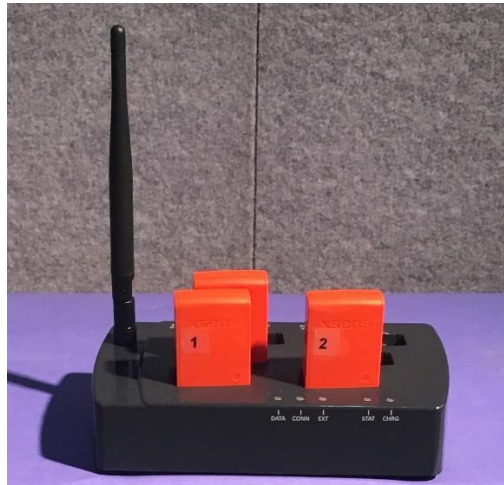
Pictured above is an Awindia Docking Station with (3) MTw Awinda 3DoF sensors. The Awinda Docking Station charges the sensors when docked.

Pictured above is an Awinda 3DoF motion tracking sensor. The LED on top of the sensor indicates the status of the device. A micro USB connector for charging and power button are located on the front side of the device. Note: Only MTw Generation 2 sensors have a power button on the device.

MTw LED Indications:

When docked, the LED blinking will indicate the status of the battery. Quick blinking indicates a low battery level and a slower blinking indicates a higher battery level.

When undocked, the LED will blink on/off while scanning for an Awinda receiving station or dongle radio connection. If no radio connection or change in magnetic field (movement of the sensor) has been detected (approximately 25 seconds) the sensor will go into stand-by mode and the LED will turn off. Gently lift of move the sensor to exit stand-by mode.

Awinda Station Status LEDs:

The Awinda Station LEDs are described below, from left to right, as seen in the picture above.

DATA: Indicates the status of data transmission. Green indicates that the system is in measurement mode and that data are streaming to the computer. The LED should be this only after successfully activating the hardware. Red indicates that the system is in recording mode. The LED will be this color while a recording is in progress. The LED is off when the hardware has not been activated.

CONN: Indicates the status of the RF connection. Green indicates that the RF has been enabled. The LED will blink Green only after successfully activating the hardware. The LED is off when the hardware has not been activated.

EXT: Indicates the Status of an external connection. A Green LED indicates that there is an external connection. This LED should be off while in use with The MotionMonitor xGen system.

STAT: Indicates the Status of the Awinda Station. A Red LED indicates that the USB is not connected or that there is an error. An Orange light indicates that there is a USB connection to the computer. A Green light indicates that the USB cable is connected and that an application (The MotionMonitor xGen or MT Manager) is connected to the Awinda Station.

CHG: Indicates whether the Awinda Station is connected to a power source. A Green light indicates that the device is connected to a power supply.

Before activating or after deactivating the LED colors on the Awinda station should be (black = OFF):
DATA, CONN, EXT, STAT, CHG

While Activating the LED colors on the Awinda station should be (black = OFF):
DATA, CONN (blinking), EXT, STAT, CHG

When Activated the LED colors on the Awinda station should be (black = OFF):
DATA, CONN (blinking), EXT, STAT, CHG

While Recording:
DATA, CONN (blinking), EXT, STAT, CHG

Powering on the sensors

From an Awinda Station that is connected to a power supply or from a micro USB connection, disconnect the MTw sensor. The sensor should automatically power on. From a powered off state, hold the button on the bottom of the sensor for 1 second to turn it on, or connect it to an Awinda station that is receiving power or micro USB cable connected to a computer or power supply and then disconnect it (power cycle).

Shutting down the sensors

Hold the power button on the sensor for approximately 5 seconds.

Alternatively, connect the sensor to an Awinda Station or micro USB cable connected to the computer and go to MTManager.
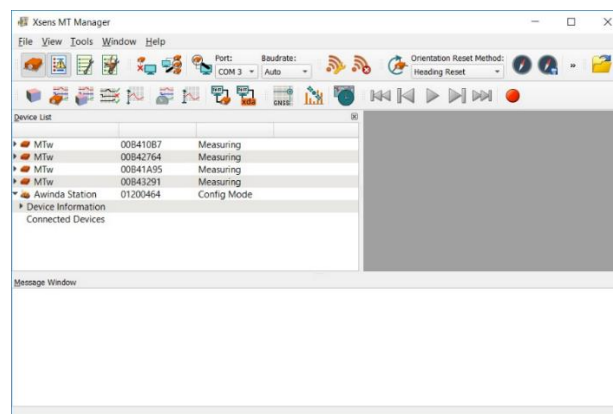
From the Tools menu, select the Power Off > All Devices menu option. Note, only devices that are connected and listed in the Device List will be powered off. If the power is cycled to a docked or otherwise connected MTw sensor after it has been powered off, it will be turned back on as described in the Powering on the sensors section.
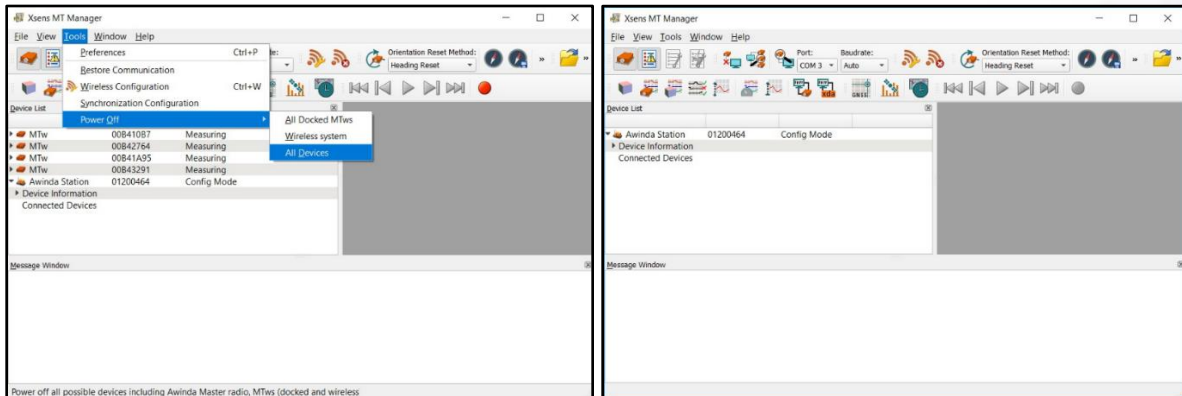

Checking sensor battery level

As described previously, the blinking pattern for a docked sensor will indicate the status of the battery. The battery level percentage for each sensor can also be determined by expanding the node for an MTw in the Device list within MT Manager, as shown below.
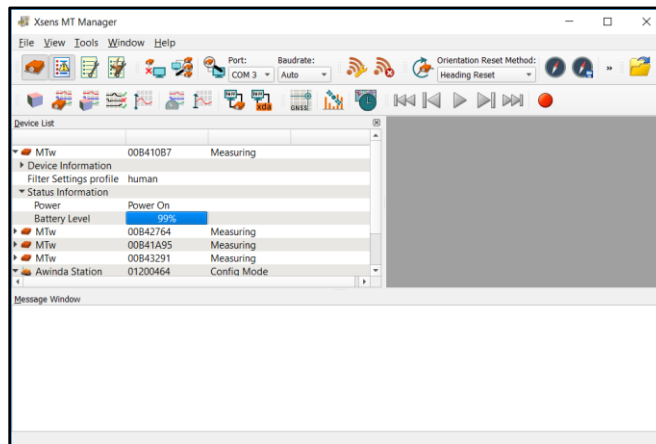
Checking sensor signal strength

Potential sources of 2.4 GHz radiation include Bluetooth, WiFi, walkie-talkies, etc
The stronger the signal strength the more reliable the connections and higher speeds are possible. Signal strength is represented in -dBm format (0 to -100). This is the power ratio in decibels (dB) of the measured power referenced to one milliwatt. That means the closer the value is to 0, the stronger the signal.

The signal strength for each sensor can be determined through the MT Manager application. Begin by clicking on the Wireless Configuration icon.
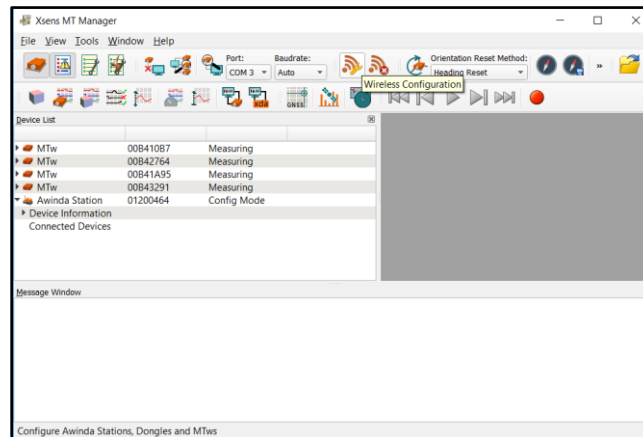
Select a channel for each Awinda device in the Wireless Masters list and click the Enable All Wireless Masters button. As the undocked sensors connect to the Wireless Masters, their signal strengths will be displayed. Selecting different wireless channels can result in different sensor signal strengths, based on potential sources of environmental interference.