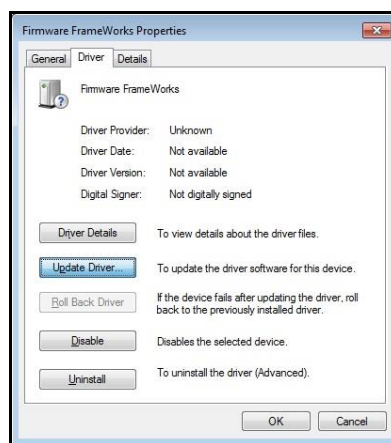


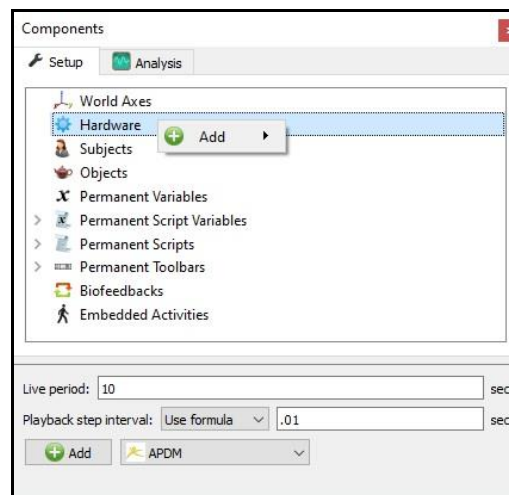
## **The MotionMonitor xGen Hardware Guide: APDM IMU Device Configuration**

The following document outlines the steps required to configure and collect from an APDM System that is connected to The MotionMonitor xGen computer via a USB connection. The APDM Motion Studio Software must first be installed on the computer before hardware are configured within The MotionMonitor xGen. This guide was revised and is intended to be run with version 3.75.5 of The MotionMonitor xGen or later.

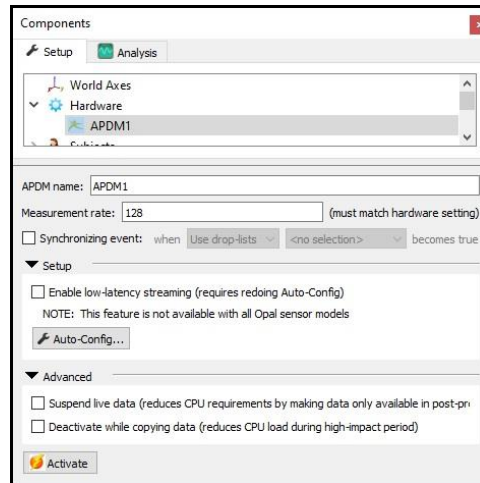
1. Power on the Opal Docking Station, with the Opal sensors docked, and connect it and the Access Point to the computer. The device should automatically be recognized. If it is not, right-click on the unrecognized device in the device manager and select Properties. Go to the Driver tab and select Update Driver. Then, select “Browse my computer for driver software” and browse to the APDM 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 APDM 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. The MotionMonitor xGen is required to be run as an Administrator when using APDM Opal sensors. Note: Installers 3.74 or later have a high graphics preference that is not compatible with APDM. Thus, you may *delete the Graphics performance preference by right clicking on the desktop and selecting Display Settings → Then click on the Graphics settings link and remove the Graphics performance preference for The MotionMonitor xGen Application.*

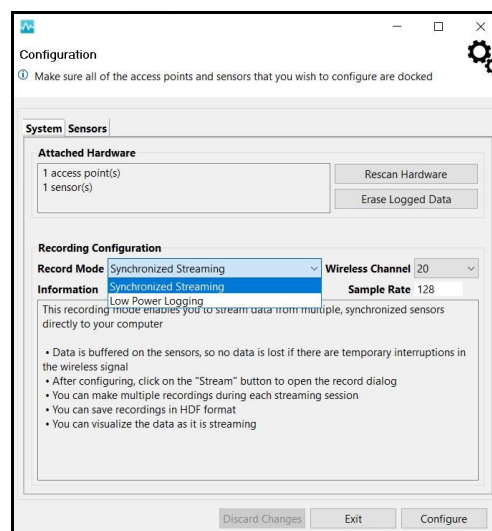
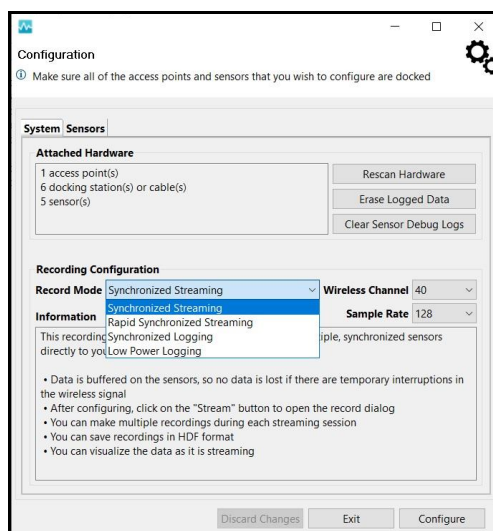


- Click on the APDM1 device to bring up the APDM parameters panel. Specify the name for the APDM device, if you wish to change it. This name will display at the top of the hierarchy when selecting data from the APDM device through the drop-list selections for defining variable expressions and does not need to be changed.



The Measurement rate must be set to 128 Hz. Up to 6 Opal sensors can be sampled at 128Hz from a single Access Point and a maximum of 1,600 samples per second can be performed with a single Access Point. The Sample Rate configured within the APDM Motion Studio application should also be set to 128Hz.

The auto configuration button under the Setup node needs to be performed any time the physical sensor configuration is changed. Follow the software prompts when performing a configuration and wait for all devices, including the Access Point and Opal Sensors, to blink green synchronously before proceeding. For devices that support low-latency streaming, this check box can be enabled to support this mode. The easiest way to confirm if your hardware supports this mode is to check the Record Modes available within Motion Studio. If Rapid Synchronized Streaming is an option, then your device supports this mode, and it is recommended to be used in order to minimize transmission latency with your Opal sensors.



When performing a configuration, pay attention to the sequence and order that sensors are placed into the docking station prior to the process. The sequence determines the order that the sensors are streamed into The MotionMonitor XGen.

To maintain a consistent streaming order during configurations, it is best practice to undock all sensors briefly, then redock them one at a time in the desired streaming order starting at the USB and power plug side of the docking station. Sensor 1 into Slot 1, Sensor 2 into Slot 2 and so on.



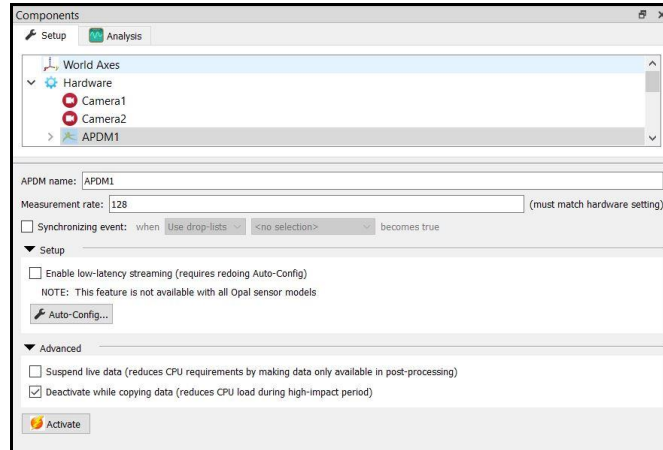
For those who have access points with screen displays, you may visually check the order of the sensors before proceeding. The top sensor listed will be Sensor1 the next sensor down will be Sensor2 etc. Only the sensor number and order are streamed into The MotionMonitor. If the sensors are configured with a different order the sensors number may change and may affect the pre-defined variables and graphs.



If a configuration is performed through Motion Studio, such as when the Wireless Channel is updated, it subsequently does not need to be performed in The MotionMonitor xGen, unless hardware changes, such as the number of sensors used, have been made. Only Synchronized streaming modes are supported with The MotionMonitor xGen.

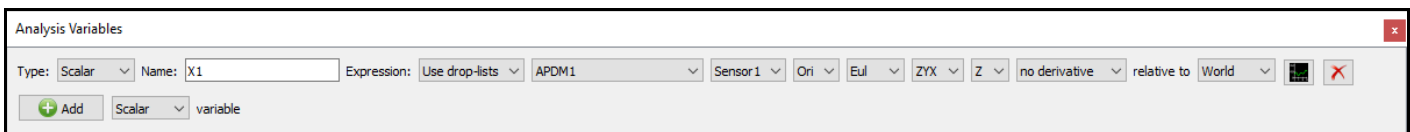
The suspend live data checkbox will suppress any data from the APDM device from being displayed in graphs or used in any equations. However, the data would immediately be available and presented in a recorded activity. This is a means for limiting the computer resources being used while running in the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

The deactivate while copying data check box will reduce the CPU load while copying data, this setting is highly recommended for users who are collecting longer trials. Note, that once the data has finished copying into an activity file the APDM system will reactivate. Then, you may interact with the new activity or continue with a recording. This functionality will persist for any activity that is opened while the APDM device is activated. If you are reviewing several activities, you may choose to deactivate the APDM until you are ready to collect data again.

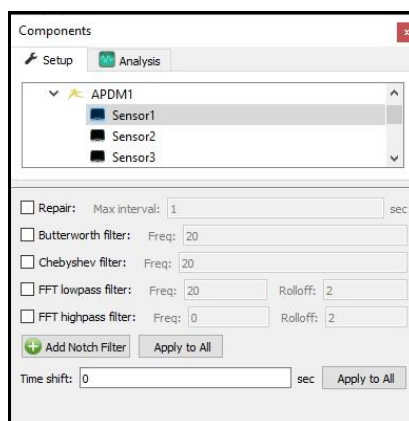


- Prior to activating the Opal sensors, undock all the sensors and wait for all sensors and the access point status lights to flash synchronously green. Click on the “Activate” button in the parameters panel or the “Activate/Deactivate Hardware” toolbar icon to activate the APDM hardware. To deactivate the sensors, click the deactivate button. For single Opal V2 sensor configurations, the APDM hardware device will not enter a deactivated state until the Opal sensor is tuned off or placed in the Docking Station.
- Sample data definitions for APDM sensors are displayed below.

The following image shows an Euler rotation sequence relative to the World axes for an APDM Opal sensor.



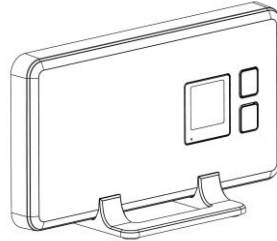
Smoothing parameters can be enabled or disabled at any time through the node for Opal sensors under the APDM Hardware device in the Setup Components tab, as shown below.



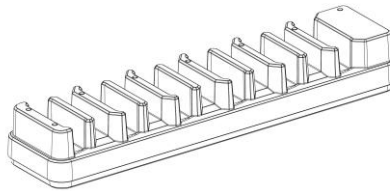
## **APDM Hardware**

An APDM system consists of an Access Point, Docking Station and Opal Sensors.

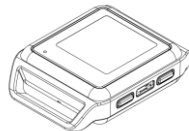
The Access Point connects to the computer via USB cable and has an LED to indicate the operating state of the device next to the screen interface.



The docking station connects to the computer via USB cable and requires a separate power cable. The USB cable needs to be connected to the computer when performing a new Configuration.



The Opal sensor has an LED and screen interface (for V2 sensors) to indicate the operating state and other important information for the device.



The transmission range for an Opal sensor can be up to 30m when there is a line of sight between the Opal sensor and Access Point and 10m indoors, both depending on radio transmission noise in the environment.

When docked, the Opal sensors stop recording, stop broadcasting, and start charging their batteries. Once fully charged, the batteries will enter a trickle charge mode to keep them topped off. It is recommended that sensors be charged for 1 to 3 hours to provide a full charge to the battery. A fully charged battery can provide up to 8 hours battery life while streaming data.

In daily use situations, it is sufficient to simply dock your sensors when not in use. For periodic usage, it is best to power off all system components for storage and transport. This can be done by docking the sensors and clicking the “Power Off” button in the APDM Motion Studio application menu. The sensors will power down the next time they are undocked. V2 Opal sensors can also be powered off directly through the onboard sensor buttons. To power off the Access Point, simply shut down your computer or unplug the access point from your computer when the hardware is not actively streaming.

The MotionMonitor xGen has been confirmed to be compatible with APDM systems using Motion Studio version 1.0.0.201903301338 and Opal V2 firmware version V2-STM-20190315122131. Updates beyond these versions have not been confirmed to be supported.

Support for V2 Opal sensors was added in The MotionMonitor xGen version 3.52.5.0.