<u>The MotionMonitor xGen Hardware Guide:</u> USB based Noraxon EMG Device Configuration

The following document outlines the steps required to configure and collect data from a Noraxon EMG unit that is connected to The MotionMonitor computer via a USB connection. The USB device must first be installed on the computer before it is configured within The MotionMonitor xGen. Before beginning, ensure that the Noraxon drivers, supplied by your Client Support Engineer, are saved on the computer. **Note:** The driver and settings for your Noraxon USB device may vary from the Noraxon Ultium system what was used in this guide. However, the procedures that follow are generally the same across all Noraxon USB devices. The MotionMonitor xGen version 3.71.1.0 incorporated Noraxon SDK version 1.7.91.0 and added support for Ultium EMG accelerometer and IMU data as well as various SmartLeads including the BioMonitor SmartLead. All IMU data streamed through the SDK is raw data only, there is no fusion algorithm or calibration process applied to this data.

 Power on the EMG unit and connect it to the computer. Launch the Windows Device Manager. Go to Start| Control Panel| Device Manager. Right click on the Noraxon Receiver under Other Devices and select properties.

📩 Device Manager	_	×
File Action View Help		
> 🕳 Disk drives		 ^
> 🔙 Display adapters		
> 🖬 Firmware		
> 🐺 Human Interface Devices		
> 📹 IDE ATA/ATAPI controllers		
> 🚡 Imaging devices		
> 🦕 Intel(R) Dynamic Platform and Thermal Framework		- 1
> 🔤 Keyboards		
> 🔲 Memory technology devices		
> II Mice and other pointing devices		
> Monitors		
> 💭 Network adapters		
✓ I [™] Other devices		
Noraxon Rec		
> Ports (COM & LF Update driver		
> 🖻 Print queues Disable device		
> Processors Uninstall device		
> Security devices		
> Jacobia Scan for hardware changes		
> Software compo Properties		
> Software devices		
> 🐗 Sound, video and game controllers		
> 🍇 Storage controllers		
> 🏣 System devices		
> 🏺 Universal Serial Bus controllers		
		~
Opens property sheet for the current selection.		

2. Go to the General tab and select Update Driver. Select "Browse my computer for driver software."

Noraxon	Receive	r Propert	ies			\times
General	Driver	Details	Events			
?	Noraxo	on Receiv	er			
	Device	etype:	Othe	r devices		
	Manufa	acturer:	Unkr	nown		
	Locatio	on:	Port_	#0002.Hu	ib_#0001	
Devic	e status					
The	drivers fo	r this devi	ice are n	ot installed	I. (Code 28)	^
There	e are no	compatibl	e drivers	for this de	vice.	
To fir	nd a drive	er for this	device, c	lick Upda	te Driver.	
						~
					Update Dr	iver
					OK	Cancel

 In the next window, use the Browse button to browse to the folder where the drivers are stored. Click Next. Depending on your computer security settings, you may be prompted by Windows Security to give permission to install the Noraxon driver. If prompted, click "Install".

		~
←	Update Drivers - Noraxon Receiver	
	Browse for drivers on your computer	
	Search for drivers in this location:	
	C:\^TMM_Current Install Folder\Noraxon V Browse	
	Include subfolders	
	→ Let me pick from a list of available drivers on my computer This list will show available drivers compatible with the device, and all drivers in the same category as the device.	
	Next Canc	el

4. Once the device is installed you will receive a notice that Windows has successfully installed the driver software.

		×
~	Update Drivers - Noraxon Device	
	Windows has successfully updated your drivers	
	Windows has finished installing the drivers for this device:	
	Moraxon Device	
	Clos	e

5. Return to the Device Manager and confirm that the "Noraxon Device" is listed under the Universal Serial Bus controllers. If the device is not recognized and listed below, contact a Client Support Engineer for assistance.



6. Start The MotionMonitor xGen and go to the Hardware node in the Components Setup tab. Add a Noraxon 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.

Components		
🖌 Setup 🛛 Analysis		
, World Axes	^	
🗸 🔅 Hardware		
> 🤌 Noraxon1		
> 🊨 Subjects	~	
	_	
Noraxon name: Noraxon1	٦	
Nuclear of descents of	4	
Number of digital inputs: 1		
Synchronizing event: when Use drop-lists		
▼ Setun	_	
🖌 Configure		
✓ Advanced		
✓ Live data decimation: Factor: 60		
Suspend live data (reduces CPU requirements by making data only available in post-processing		
🥩 Activate		

The number of channels and number of digital inputs that will be collected should be specified here, although the number of channels will be updated according to what has been configured in the Noraxon Hardware Setup tabs accessed through the "Configure" button. Digital devices include items like the Sync signal connected to the Ultium Dash Receiver. In the example shown above, 4 EMG channels will be activated, and 1 digital input is configured.

The "Synchronizing event" Boolean condition can be specified for performing an active alignment of the Noraxon data stream with synchronous events from other hardware data streams. The synchronizing event used here must be defined from Noraxon data such as the Sync signal connected to the Ultium Dash Receiver.

Under the Advanced node, a decimation factor can be set for the EMG data. This is a means for limiting the computer resources being used while running in the Live Window by displaying only a fraction of captured data points in real-time. This does not affect the measurement rate as data will still be captured at its full resolution. If visualizing the EMG data in real-time is not desired, the suspend live data checkbox will suppress any data from the Noraxon device from being displayed in graphs or used in any equations. However, the data would immediately be available and presented in a recorded activity. **Note:** The Noraxon data stream will not be able to be displayed in a graph without enabling a Live data decimation factor. Data can be displayed at the full measurement rate in post processing.

Please follow the steps below for configuring the Noraxon device.

7. Click the "Configure" button under the Setup dropdown in the Noraxon parameters panel to access the Noraxon settings. The Noraxon Ultium should be displayed under "New Devices (detecting)" if this is the first time connecting to the device. Select the device and click "Insert" to add the device to your "Selected devices" list. Click the "Configure" button at the bottom of this Hardware Setup window to access the Noraxon Ultium settings. Make certain to also remove any other devices that may be listed under the Selected devices, such as previously used Noraxon devices or any of the Players, as these will interfere with the collection of data from your Noraxon device.



8. Select the measurement rate for the Noraxon Ultium device through the Sample Rate drop list. Specify the RF network, filters, and any other settings to the desired selection. Ensure that all sensors which will be used for data collection appear under the "General" tab. To establish connection to the sensors, select "Detect Sensors in Chargers" or manually input the senors using their serial number (found on the back of the sensor). During this process the sensors should still be connected to the docking station. Select "OK" once this process has been completed. The number of sensors listed in the Sensors tab displayed below should match the number of channels specified in the Noraxon Parameters panel in Step 6.

📧 Ultium Ha	ardware Setup			-		📧 Ultium Hardware Setup	<u> </u>		×	
Setup your Ultium in this dialog.						Setup your Ultium in this dialog.				
General /	Advanced					General Advanced				
Adjust gener										
Name		Ultin				RF network				
Serial#		8801	7006			Sample Rate	2000 Hz EMG / 200 Hz Motion			
Firmware	e version	8.93	(Update Requi	red)		Invert sync input (not common)				
Firmware	e update	Upd	ate Now			Insole Mode				
Sample F	Rate	2000	Hz EMG / 200) Hz Motion						
Use Nora	axon MyoS	ync 🗆				EMG high pass filter	10 Hz		~	
List the same						EMG low pass filter	500 Hz		~	
#	Serial	Label	Type		Scale	Always measure EMG impedance				
1	200ff	EMG 1	EMG			Enable EMG IMU accel				
2	2001	EMC 2	EMC			Enable EMG IMU gyro & mag				
2	200e6	EIVIG 2	EIVIG							
3	200te	EMG 3	EMG			EMG/Smartlead Analog output	Enabled			
4		EMG 4	EMG			EMG Analog output gain	x500 (5V = 10,000uV)			
5			New sensor							
	+ Dete	ct Sensors i	n Chargers 📃 –							
) Cancel	 ✓ 	Ok		⊘ Cancel ✓	Ok		

Auxiliary data can be enabled by placing a check in the box for "Enable EMG IMU accel" and "Enable EMG IMU gyro & mag" for sensors that support these capabilities. These settings can be saved as a profile to quickly switch between configurations with different general settings or number of sensors. Note, all IMU data streamed through the SDK is raw data only, there is no fusion algorithm or calibration process applied to this data. Also, if the "Enable EMG IMU gyro & mag" auxiliary data are enabled, EMG/Smartlead Analog output will automatically be disabled. The two selections cannot operate concurrently.

Some models of Noraxon sensors can also be shut down through a "Shutdown Sensors" button at the bottom of the tab in the Hardware Setup dialog. Other sensors can be powered off individually, sensor by sensor, or by pressing the power button on the Ultium DASH Receiver to power on/off sensors inserted into connected chargers.

Click the "Activate" button in the Noraxon parameters panel or the "Activate/Deactivate Hardware" icon in the Setup toolbar to activate the Noraxon hardware. Smoothing parameters can be enabled or disabled at any time through the nodes for Channels listed under the Noraxon Hardware device in the Setup Components tab, as shown below. If changes are made in the Noraxon settings in steps 7 & 8, smoothing parameters may be reset. Following activation, the names of the channels received from Noraxon will be displayed along with their measurement rate when the channel is selected. **Note:** Versions prior to The MotionMonitor xGen version 3.71.1.0 scaled and displayed all Noraxon data as volts. Data are now displayed in the units received by Noraxon, which are also displayed in the parameters panel for each channel. **Note:** Some Noraxon devices require that the sensors be removed from the docking station prior to activation.

🖌 Setup 🛛	Analysis					
, World Ax	es					^
🗸 🔅 Hardware	e					
Y 🥝 Nora	xon1					
	- AnalogEr	mg1				
	 AnalogEr 	mg2				
	 AnalogEr 	mg3				
	AnalogEr	mg4				
	 Digital1 					
3 C.A.L.						1
> 🧟 Subjects						~
> 🔒 Subjects	2000					Y
> A Subjects Measurement rate:	2000					~
A Subjects Measurement rate: Units: uV	2000					Y
Subjects Measurement rate: Units: uV Repair: Max ii	2000 interval: 1					▼ sei
	2000 interval: 1 ir: Freq:	20				▼] sei
	2000 interval: 1 er: Freq: r: Freq:	20				▼ sei
Subjects Measurement rate: Units: UV Repair: Max i Butterworth filte Chebyshev filter FFT lowpass filte	2000 interval: 1 er: Freq: [er: Freq: [20 20 20	Rolle	off:	2	▼] sei
A Subjects Measurement rate: Units: UV Repair: Maxii Butterworth filte Chebyshev filter FFT loghpass filt FFT highpass filt	2000 interval: 1 ir: Freq: [ir: Freq: [ir: Freq: Freq: ter: Freq:	20 20 20 0	Roll	off:	2 2 2	v see

When the auxiliary data are enabled through the Hardware Setup window in step 8, the additional channels will be displayed as seen below. The example below on the left shows the available channels when "Enable EMG IMU accel" is enabled. Following the EMG signal for each sensor, the acceleration data will be listed in X, Y, Z order. Similarly, on the right below, the Gyro and Mag channels would follow each EMG signal for each sensor, listed in X, Y, Z order, in this instance with a cumulative count.

Components	x Components
🖌 Setup 🔤 Analysis	🗲 Setup 🔤 Analysis
Noraxon name: Noraxon 1 Number of channels: 16	→ AnalogMag5 → AnalogMag6
Number of digital inputs: 1 Supdronating event: when Use drop-lists of kno selections of becomes true Setup Advanced Activate	Norskon name: Newbor of dvarvelic: [50 Number of dvalue incut: [1

Within the Live workspace, individual channels can be disabled by unchecking them in the Noraxon parameters panel under the Noraxon device. When disabled, The MotionMonitor xGen will not receive streamed data for the specified channel. If using the Noraxon analog output module, the first 16 channels listed in the Noraxon parameters panel are what will be streamed out. The order in which data is streamed is based on the order they are listed here. Disabling a channel here will not prevent its data from still streaming out through the Noraxon analog output module.

9. The following image shows the Raw Voltage being defined for the first EMG channel. RMS Voltage, Raw Voltage, Voltage Mean Frequency and Mean Frequency can also be selected from the drop-list as well. RMS voltage calculates the RMS for the defined variable using the smoothing settings enabled for that Channel under the Setup Components Hardware node. Raw Voltage will always return the raw voltage, regardless of any enabled smoothing parameters. Voltage will report the voltage including any smoothing, if enabled. Also displayed are the variable definitions for the X acceleration channel of the first sensor and the Digital channel for the Sync signal connected to the Ultium Dash Receiver described in step 6.

Type:	Scalar	✓ Name	: EMG_1	Expression:	Use drop-lists \vee	Noraxon1	\sim	AnalogEmg1	 RawVoltage 	no derivative	/	×
Type:	Scalar	✓ Name	: EMG_1_Accel_X	Expression:	Use drop-lists $$	Noraxon1	~	AnalogAccelX1	RawVoltage	no derivative	/	×
Type:	Scalar	✓ Name	: Digital_1	Expression:	Use drop-lists 🗸	Noraxon1	~	Digital 1	v no derivative	~ 🔛 🗙		