16 – 01 – 2020

Synchronising Xsens Systems with Noraxon TeleMyo

Step – by – step manual

Table of Contents

1 Synchronization Workflow

The steps described below show how to make it possible for Xsens Awinda or Sync Station to send a signal (Awinda / Sync Station is Sync OUT and Noraxon is Sync IN) and how to receive the synchronization signal (Noraxon is Sync OUT, Xsens Awinda / Sync Station is Sync IN).

1. Perform the calibration and get both systems fully set.
2. Set the specifications for synchronization in both systems and connect sync cable(s)
3. Start the recording on the slave software. The slave software will wait for a trigger from the Master software to start recording.
4. Start the recording on the Master software. Then, both systems will start recording at the same time.
5. Stop recording on the master software. Then both systems will stop recording at the same time.

Depending on the type of synchronization performed different specifications are required for both systems. A detailed explanation of the different characteristics according to the desired synchronization are described below.

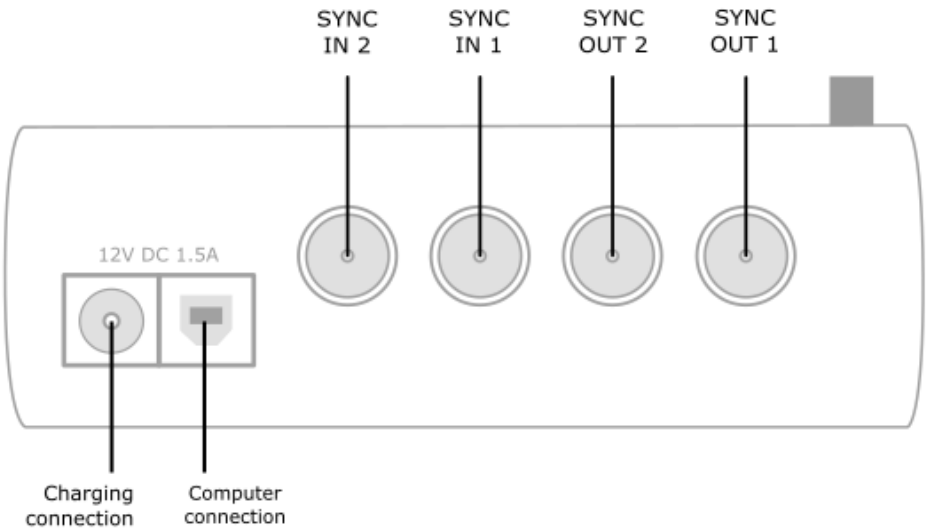
This document is written to synchronize the XSens Awinda system. However, most of the steps performed in the MVN software are the same for the MVN Link system. You can see the differences in the setup of the system in the last chapter of this document “Using MVN Link to synchronize”.

2 Required Hardware

Noraxon Hardware	XSens Hardware
• Wireless EMG transmitters • 1 TeleMyo DTS (plus antenna)	• MVN Awinda or MVN Link • Awinda station
	
Figure 1 – Noraxon Telemyo DTS	Figure 2 - Awinda Station. 4 BNC ports: SYNC IN 1, SYNC IN 2, SYNC OUT 1, SYNC OUT 2.
• 1 TeleMyo mini-receiver (to use Noraxon as Master)	
• BNC – BNC cables	

3 Hardware connections scheme

Awinda Station/Sync Station



The Xsens Awinda and Sync Stations have four BNC connectors, with two Sync IN and two Sync OUT possibilities. These hardware connections are shown in Figure 1.

3.1 Sync IN

The Sync IN ports are for a third party device to send a signal to the Awinda or Sync Station. The Awinda or Sync Station can detect polarity changes on the input lines. When a trigger is detected on one of the input lines, the Awinda or Sync Station can be configured to perform a specific action.

3.2 Sync OUT

Sync OUT enables the Xsens system to send a trigger pulse via the Awinda or Sync Station to third party hardware. As with Sync IN, a combination of events are possible, based on a number of parameters.

3.3 Pulse Polarity

A trigger may be a rising or falling edge, as illustrated in the figure below.

Figure 3 - Polarity: Rising/ falling edge (Sync IN) or positive / negative pulse (Sync OUT).

Sync Hardware Options on Noraxon Telemyo DTS

Figure 4 - Noraxon Telemyo DTS.

The TeleMyo™ 2400T Direct Transmission System (DTS) directly transmits data from the electrode or sensor site to a belt worn receiver.

Figure 5 - Noraxon Telemoyo Mini-Receiver.

The TeleMyo™ 2400R G2 Mini Receiver is an optional accessory item for the portable TeleMyo 2400T G2 Transmitter System. It is TTL compatible, facilitating sync inputs and outputs.
For more detailed information, see the TeleoMyo user manual.

4 MVN Analyze as Master and as Noraxon TeleMyo slave

4.1 Start and Stop a recording

4.1.1 Hardware connections

- In addition to the normal MTw hardware setup, connect the BNC connector from the TeleMyo DTS to Sync OUT 1 on the Awinda Station.
- Connect the USB connection between the TeleMyo DTS and the PC.
- When switched on, the DTS will display “USB ready”.

4.1.2 Software Setup Noraxon MyoResearch

The example given below is for is gait analysis, measuring the medial gastrocnemius, tibialis anterior, semitendinosus and the rectus femoris. For an 8-Channel EMG system, Channel 9 is selected as the synchronisation line in the Noraxon MyoResearch Software. If a 16 channel system is in use, this is the 17th channel.
Return to the main menu, under >Measuring Options, go to >Recording Options, then>Triggering tab.

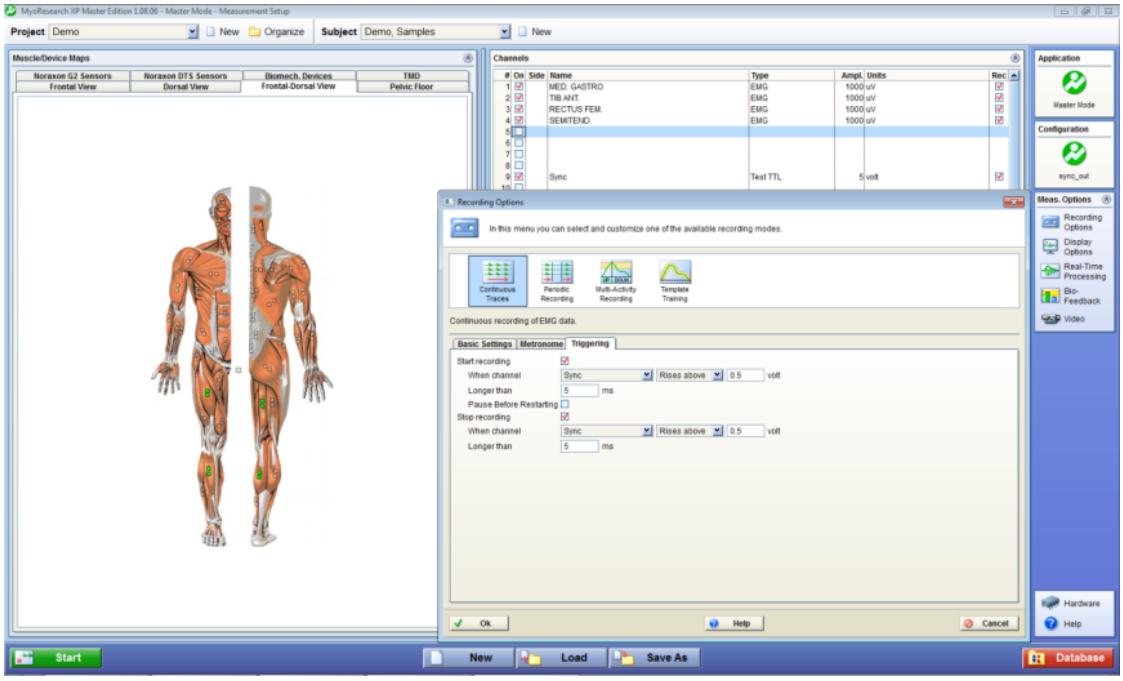


Figure 6 - Noraxon "Recording Options" screenshot.

Check the check box beside “Start Recording”;

- Go to the drop down menu beside “When Channel”, select “Sync”;
  - Select Rises Above (ensure that this is also the direction indicated on the mini-receiver);
  - Input e.g. 0.5V
  - Longer than 5ms

- Repeat settings for Stop Recording.
- Navigate further through the software.

The Noraxon software initialises the EMG signals.

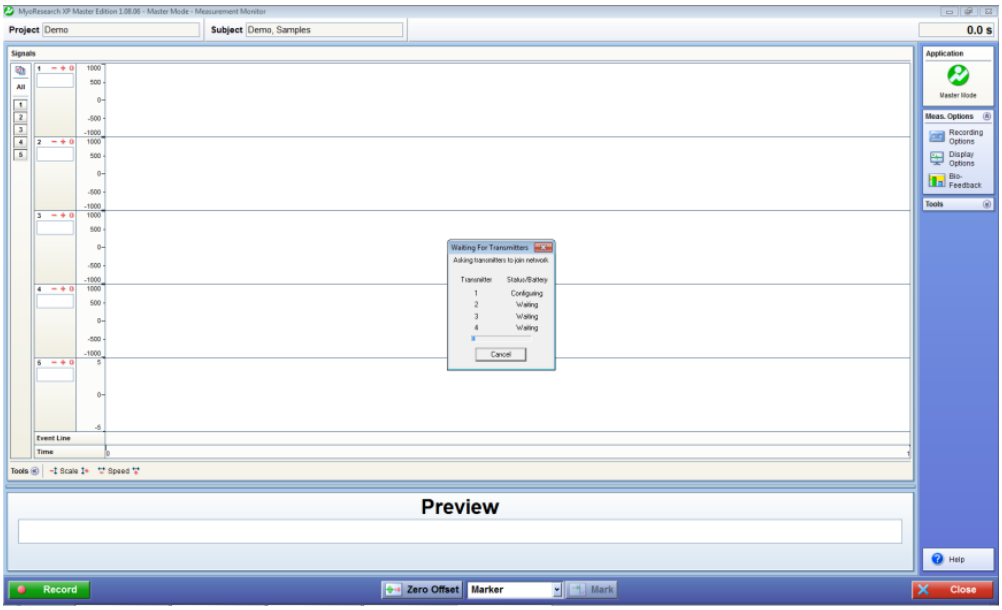


Figure 7 - Noraxon system ready to begin recording.

When this screen is reached, click record, on the bottom left hand side of the screen on the Noraxon software.

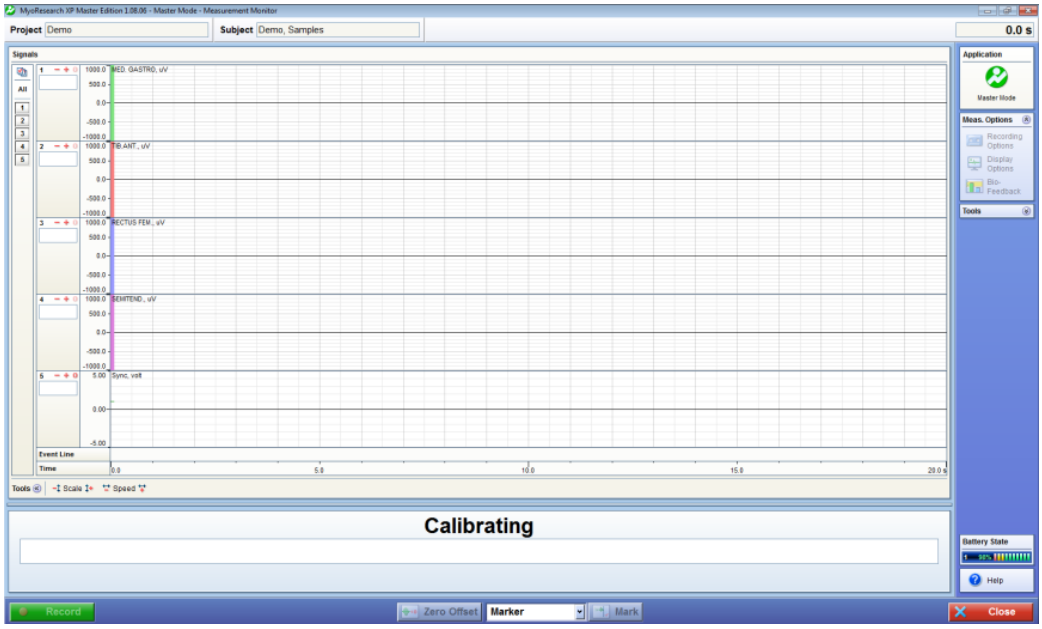


Figure 8 - Following “Record” command, system calibrates and waits for trigger input.

4.1.3 Xsens Software

Initialize the synchronization setting of the Xsens software using the following settings.

1. In the Configuration window, in the Sync tab you should select:

Strat recording (out)	Stop Recording (out)
• Out 1 • Polarity: Rising Edge • Skip Factor = 0 • Skip First = 0 • Pulse width = 10ms • Trigger once: uncheck	• Out 1 • Polarity: Rising Edge • Skip Factor = 0 • Skip First = 0 • Pulse width = 10ms • Trigger once: uncheck

5 Noraxon TeleMyo as Master and MVN Analyze as slave

For the Xsens system to receive synchronization commands from Noraxon TeleMyo, the TeleMyo mini-receive is needed.

5.1 Start and Stop a recording

5.1.1 Hardware connections

For this set up a BNC connector is required at the Xsens end and a Jack connector at the
Noraxon end. An easy solution is to use a cable with two BNC coax connectors at each end, and a BNC to Jack convertor for connecting the BNC to the Noraxon hardware. USB cables are required to connect each system to the PC.

Note that if the signal received by the Xsens Sync or Awinda Station is 5V, a 5V-3.3V SMD level translator is advised to prevent damage to the Station.

Set up the hardware of the Noraxon system as follows:

- USB port of TeleMyo mini-receiver to USB of PC.
- Connect jack connector to Sync OUT port of TeleMyo mini-receiver to BNC connection Sync
- IN 1 of Awinda Station.
- Manual trigger pulse, jack connector to Sync IN port of TeleMyo mini-receiver.
- Connect the external antenna to the TeleMyo DTS.
- When successfully connected and switched on, the TeleMyo DTS will display “WiFi ready”.

5.1.2 Noraxon MyoResearch Software

Based on the output settings described for Xsens software the settings for Noraxon MyoResearch software can remain the same. The difference is that instead of the trigger pulse coming from the record button in the Xsens software this now comes from the manual button connected to the TeleMyo mini-receiver. Additionally, the mini-receiver should be set up as follows:

- Go to the hardware menu;
- Select the TeleMyo mini-receiver from the list of icons;
- Select: settings;
- Select: Configure;
- Ensure that the wireless sync is “External Pulse” and Input Range is ±5V.
    - Note that a 5V pulse can cause damage to the Awinda or Sync Station. For this reason a a 5V-3.3V SMD level translator is advised to prevent damage to the Station.

The rest of the software setup is the same as described above. However, instead of clickingRecord in Xsens software, one should click the hardware trigger supplied by Noraxon, to generate a manual trigger to both systems.

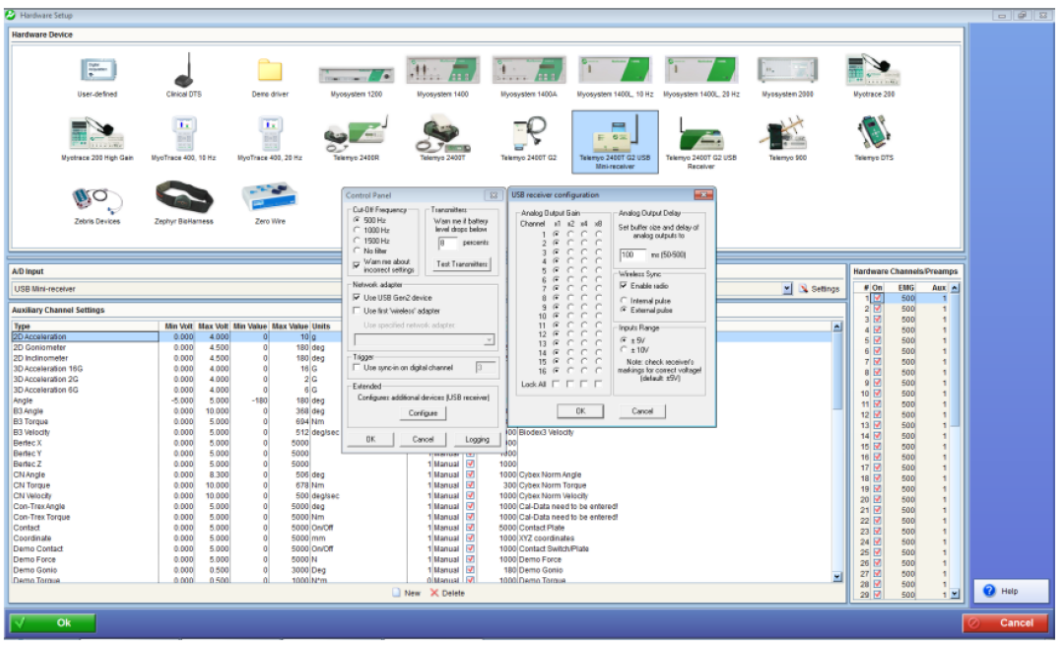


Figure 9 - Configuration of TeleMyo mini-receiver in Noraxon MyoResearch software.

5.1.3 XSens Software

1. In the Configuration window, in the Sync tab you should select:

Strat recording (in)	Stop Recording (in)
• In 1 • Polarity: Rising Edge • Skip Factor = 1 • Skip First = 0 • Delay = 0 ms • Trigger once: uncheck	• In 1 • Polarity: Rising Edge • Skip Factor = 1 • Skip First = 1 • Delay = 0ms • Trigger once: uncheck

To initialize recording, click the record button.
The normal red dot icon will change to a pause symbol, indicating that the software is waiting for an external pulse.

Figure 11 - Record button. a) before clicking, b) after clicking, with sync-in activated.

Figure 10 - Motion Capture Configuration window in MVN Analyze. Setting on the sync tab.

6 Using the Link System

To use the XSens Link system instead of the Awinda system you need to have an Awinda Station. Then you should activate the Awinda station in the "Motion Capture Configuration window" by turn on the bottom on the sync station configuration tab. In this tab you can find all the details described above.

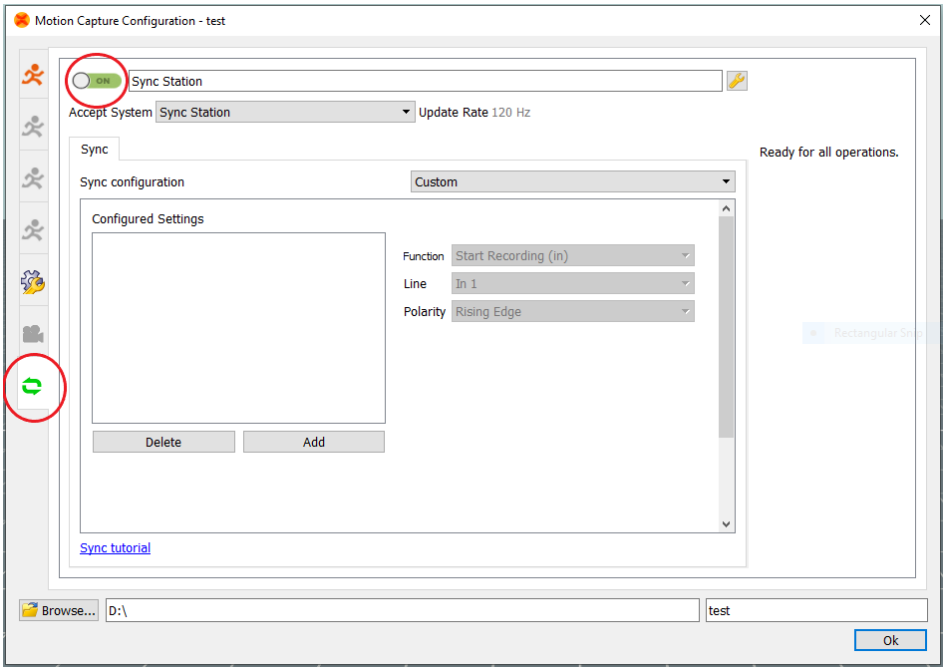


Figure 12 - Motion Capture configuration window in MVN Analyze. Indications to activate the Awinda station as sync station with the Link system.

Note: When using the Xsens Link system, which has an output rate of 240Hz, you will still need to use an Awinda Station to send synchronization signals. As our Awinda station has a maximum frame rate of 120Hz, you will realise that the maximum frame rate that the output signal will have is 120Hz. Practically, this entails that every other frame of Xsens will be synchronize with the frame of the other party system. This still gives an optimal synchronization between both systems.
If you would like to have both systems with the same sampling frequency you should downsample the file while export. To do so follow the following steps:

- Go to "File" tab - > "Export"
- Select the format you would like to export the data
- Click "Show options" and select the right "Exporter frame skip (for downsampling)" value.