



16 – 01 – 2020

Synchronising Xsens with the Delsys Trigno EMG System

Step – by – step manual

Table of Contents

1 Synchronization Workflow	2
2 Required Hardware	3
3 Hardware connections scheme.....	4
4 MVN Analyze as Master and as Delsys Trigno slave.....	6
4.1 Start and Stop a recording	6
4.1.1 Hardware connections	6
4.1.2 Software Setup Delsys EMG works Acquisition	6
4.1.3 Xsens Software.....	7
5 Delsys Trigno as Master and MVN Analyze as slave.....	8
5.1 Start and Stop a recording	8
5.1.1 Hardware connections	8
5.1.2 Delsys EMGworks Acquisition Software	8
5.1.3 XSens Software	9
6 Using the Link System.....	10

1 Synchronization Workflow



The steps described below show how to configure Xsens systems to control start and stop of a recording of the Delsys Trigno EMG system, and how to configure the Delsys Trigno EMG system to control start and stop of a recording in an Xsens system.

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.

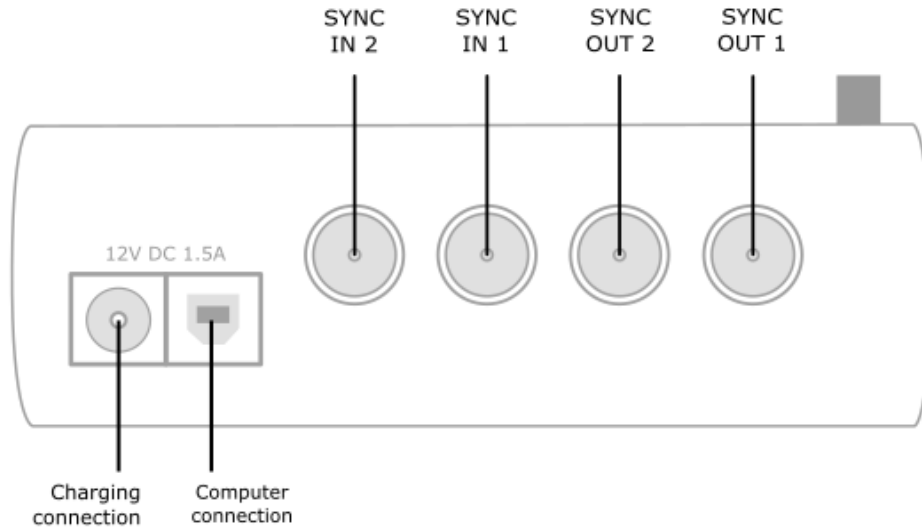
This document is written to synchronize the XSens Awinda system. However, most of the steps performed in the MVN software are the same for the MVN Link system. You can see the differences in the setup of the system in the last chapter of this document "Using MVN Link to synchronize".

2 Required Hardware

Delsys Trigno EMG Hardware	XSens Hardware
<ul style="list-style-type: none">• Delsys Trigno System• Delsys Trigger Module (DTM)  <p>Figure 1 – Delsys Trigno module</p>	<ul style="list-style-type: none">• MVN Awinda or MVN Link• Awinda station  <p>Figure 2 - Awinda Station. 4 BNC ports: SYNC IN 1, SYNC IN 2, SYNC OUT 1, SYNC OUT 2.</p>
<ul style="list-style-type: none">• BNC – BNC cables• A 5V-3.3V SMD level translator is advised.	

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.

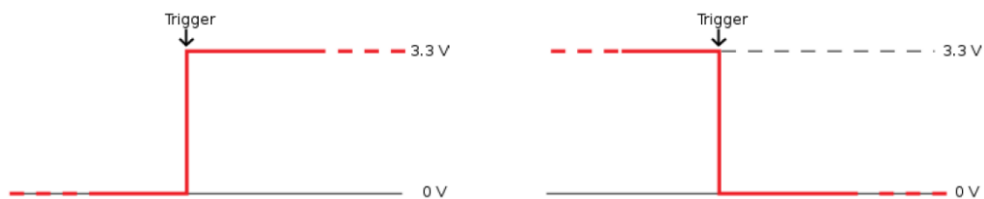






Figure 3 - Polarity: Rising/ falling edge (Sync IN) or positive / negative pulse (Sync OUT).

Sync hardware options on Delsys Trigger Module

The Delsys Trigger Module (Figure 3.) can be used for Primary/Secondary triggering and Independent-Signal Triggering. The four BNC connections on the Delsys Trigger Module allow:

-  Start Trigger In – Starts data collection upon receiving a TTL pulse.
-  Stop Trigger In – Stops data collection upon receiving a TTL pulse.
-  Start Trigger Out – Outputs a +5V pulse to commence data collection.
-  Stop Trigger Out – Outputs a +5V pulse to stop data collection.

Important note: As indicated above, the signal coming from the Delsys hardware is 5V. The Xsens Awinda and Sync Stations accept up to 3.3V. To prevent damage to the Awinda or Sync stations it is advised to use a 5V-3.3V / 3.3V-5V SMD level translator.

The Delsys Trigger Module also allows the pulse polarity to be chosen (rising or falling edge) and a choice of pulse widths (75 ms or 150 ns).

For a more information on the Delsys Trigger Module please refer to the Delsys 'Trigger Module User's Guide'.

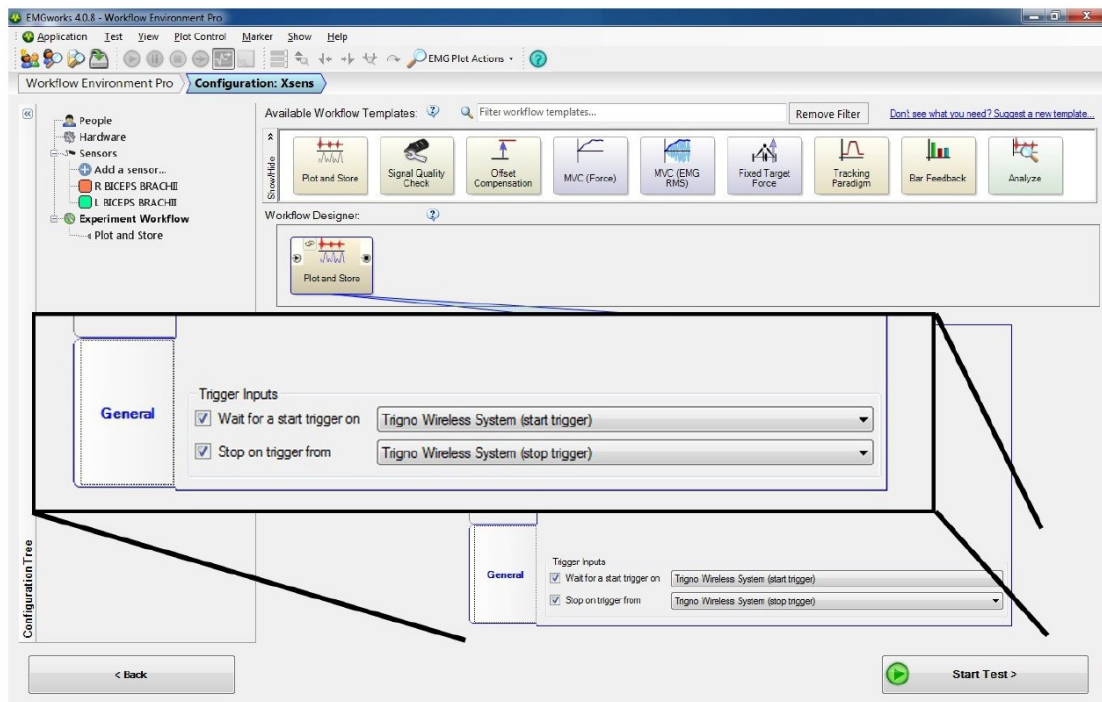
4 MVN Analyze as Master and as Delsys Trigno slave

4.1 Start and Stop a recording

4.1.1 Hardware connections

- Connect one BNC connector from Sync OUT 1 of the Awinda or Sync Station to the DTM, green shaded box, "Start Input" →. Ensure that the pulse polarities match. For the purpose of this example, select a positive rising pulse.
- Connect the other BNC connector from Sync OUT 2 of the Awinda Station to the DTM, red shaded box, "Stop Input" →. Ensure that the pulse polarities match. Again, for the purpose of this example, select the positive rising pulse.
- Power on the Delsys Trigger Module.

4.1.2 Software Setup Delsys EMG works Acquisition



1. Create a new, or open an existing test configuration.
2. Go to Experiment workflow;
3. Click and drag the "Plot and Store" template to the "Workflow Designer";
4. Click the tab "General"
5. Enable "Wait for trigger start on".
 - a) Ensure the "Trigno Wireless System" is selected from the drop down.
 - b) A small arrow will appear on the left hand side of the "Plot and Store" template.
6. Enable "Stop on trigger from"

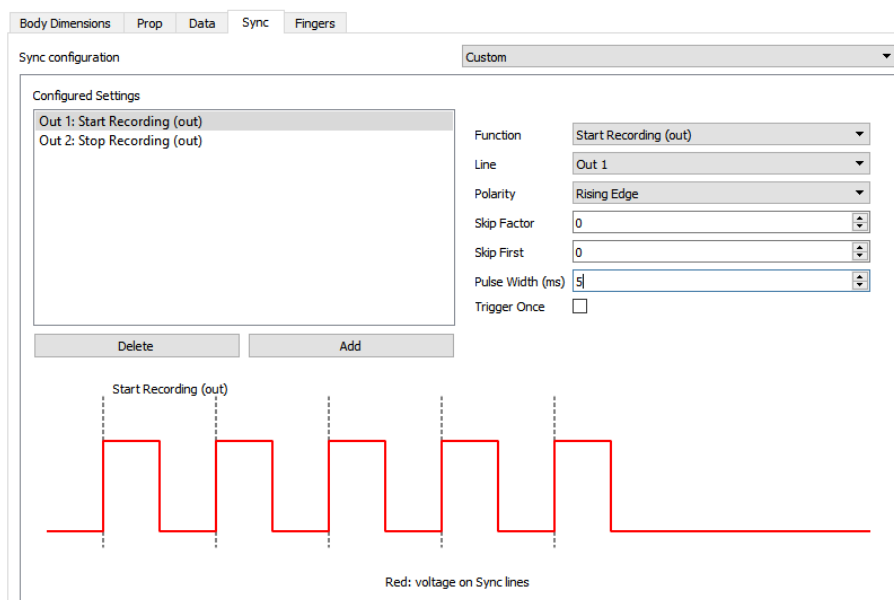
- a) Ensure the "Trigno Wireless System" is selected from the drop down.
- b) A small square will appear on the right hand side of the "Plot and Store" template.
7. Click Start Test;
8. Click run Task;
9. Click Start
10. The screen will show "Recording Started". No EMG traces will appear until the recording
 1. command is given in Xsens software.
11. Click Record in Xsens software to control start and stop of recording of both systems.

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)
<ul style="list-style-type: none"> Out 1 Polarity: Rising Edge Skip Factor = 0 Skip First = 0 Pulse width = 5ms Trigger once: uncheck 	<ul style="list-style-type: none"> Out 2 Polarity: Rising Edge Skip Factor = 0 Skip First = 0 Pulse width = 5ms Trigger once: uncheck





5 Delsys Trigno as Master and MVN Analyze as slave

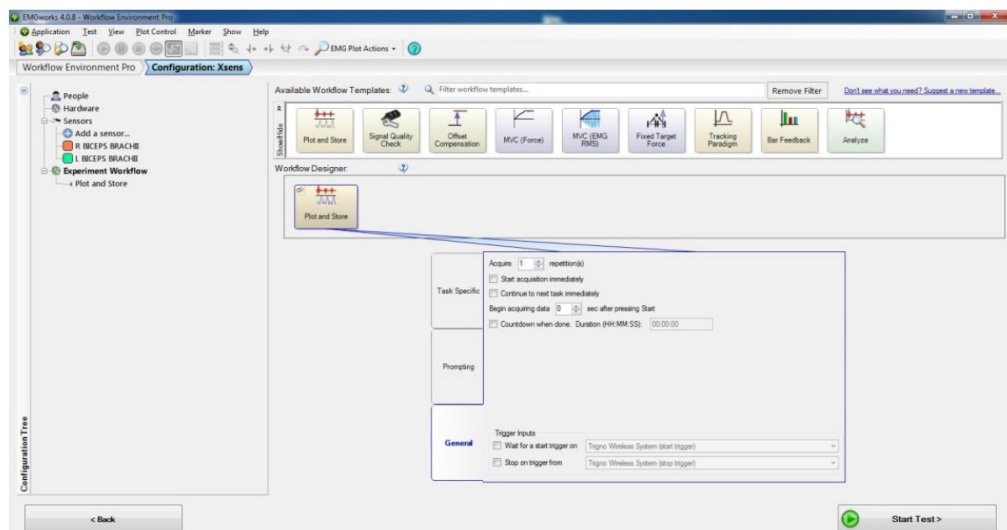
5.1 Start and Stop a recording

5.1.1 Hardware connections

In addition to the normal hardware setup, configure both systems as follows:

- Connect one BNC connector from Sync IN 1 of the Awinda or Sync Station to the DTM, green shaded box, "Start Output" . Ensure that the pulse polarities matches. For the purpose of this example, use a positive rising pulse. Ensure that the short pulse (150ns) is selected.
- Connect Sync IN 2 of the Awinda or Sync Station to the DTM, red shaded box, "Stop Output" . Ensure that the pulse polarities match. Again, for the purpose of this example use positive rising pulse. Ensure that the short pulse (150ns) is selected.
- Power on the Delsys Trigger Module.

5.1.2 Delsys EMGworks Acquisition Software



1. Create a new, or open an existing test configuration.
2. Go to Experiment workflow;
3. Click and drag the "Plot and Store" template to the "Workflow Designer";
4. Click Start Test;
5. Click run Task;
6. Click Start.

Both Delsys EMGworks and the Xsens system will start recording. Note that in this case EMGworks will automatically initiate a Start Output Trigger.

5.1.3 XSens Software

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

Strat recording (in)	Stop Recording (in)
<ul style="list-style-type: none"> • In 1 • Polarity: Rising Edge • Skip Factor = 0 • Skip First = 0 • Delay = 0 ms • Trigger once: uncheck 	<ul style="list-style-type: none"> • In 2 • Polarity: Rising Edge • Skip Factor = 0 • Skip First = 0 • Delay = 0ms • Trigger once: uncheck

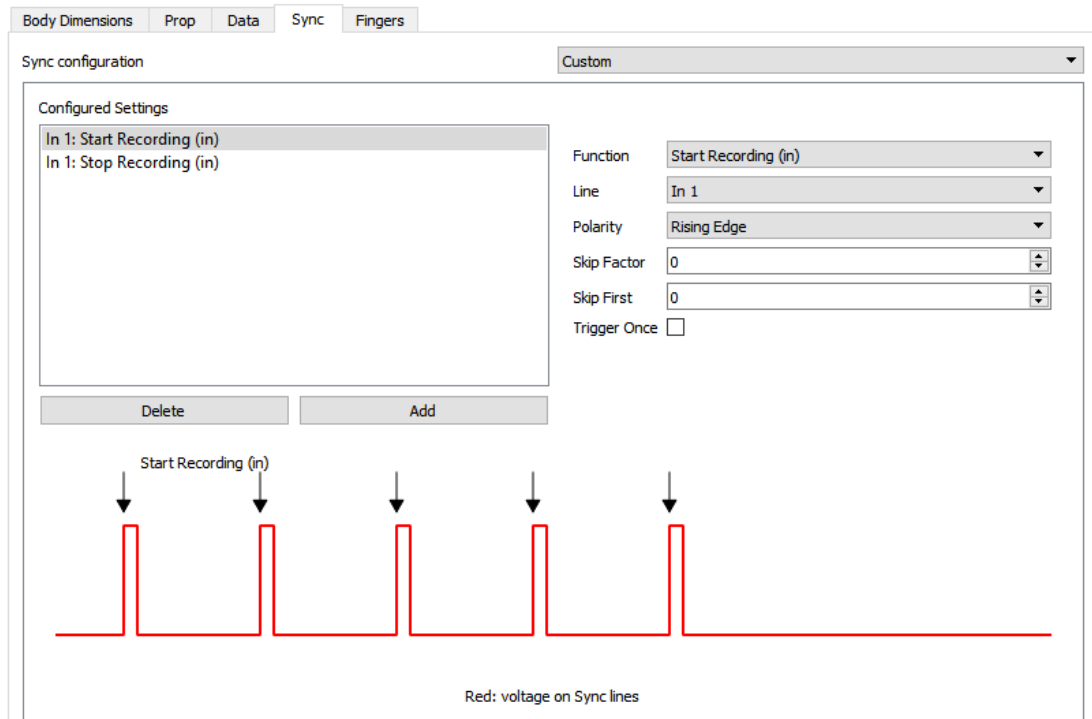


Figure 4 - Motion Capture Configuration window in MVN Analyze. Setting on the sync tab.

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

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.

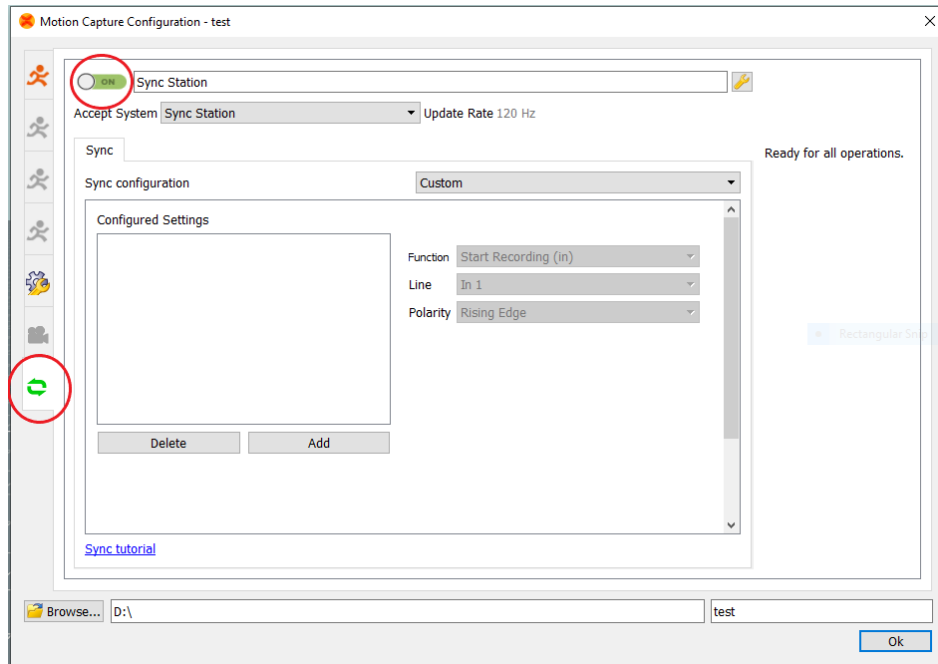


Figure 6 - Motion Capture configuration window in MVN Analyze. Indications to activate the Awinda station as sync station with the Link system.

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.