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# Synchronising Xsens Systems with GAITRite pressure mat

Step – by – step manual

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# 1 Synchronization Workflow

The steps described below show how to configure the GAITRite's pressure mat 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.

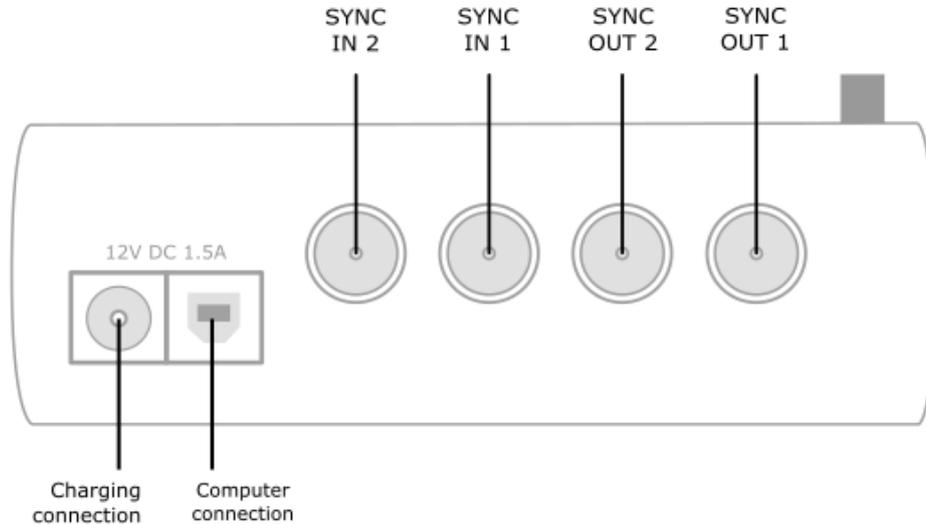
This document is written to synchronize the XSens Awinda system. However, most of the steps performed in the MVN software are the same for the MVN Link system. You can see the differences in the setup of the system in the last chapter of this document "Using MVN Link to synchronize".

## 2 Required Hardware

GAITRite Hardware	XSens Hardware
<ul style="list-style-type: none"><li>• GAITRite pressure mat system</li><li>• Coax connector</li></ul>	<ul style="list-style-type: none"><li>• MVN Awinda or MVN Link</li><li>• Awinda station</li></ul>  <p>Figure 1 - Awinda Station. 4 BNC ports: SYNC IN 1, SYNC IN 2, SYNC OUT 1, SYNC OUT 2.</p>
<ul style="list-style-type: none"><li>• BNC – BNC cables</li></ul> 	

### 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.

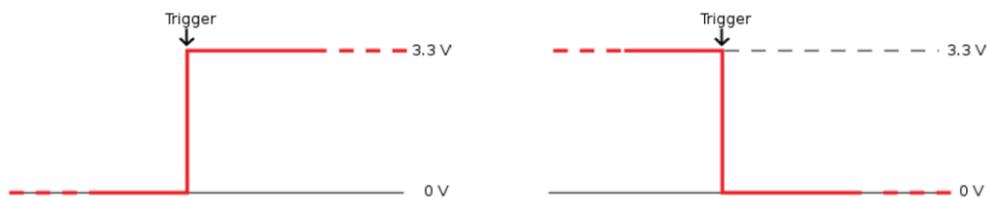


Figure 2 - Polarity: Rising/ falling edge (Sync IN) or positive / negative pulse (Sync OUT).

## 4 GAITRite as Master and MVN Analyze as slave

### 4.1 Start and Stop a recording

#### 4.1.1 Hardware connections

To synchronise the Xsens system with GAITRite pressure mat, the Xsens system must be enabled as the slave. Connect the BNC connector to the GAITRite sync box and to SYNC IN 1 of the Awinda or Sync Station.

#### 4.1.2 GAITRite Software

In GAITRite software, click "Start walking", wait for the paused record button in Xsens software to become the depressed red dot, indicating that recording has commenced.

Instruct the subject to walk across the pressure mat. Upon reaching the other side, GAITRite software stops recording and simultaneously triggers Xsens software to stop recording. At this point, the record button in Xsens software will now have the blue pause symbol on top, indicating that it is waiting for an external trigger again.

#### 4.1.3 XSens Software

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

Start recording (in)	Stop Recording (in)
<ul style="list-style-type: none"><li>• In 1</li><li>• Polarity: Falling &amp; Rising Edge</li><li>• Skip Factor = 0</li><li>• Skip First = 0</li><li>• Delay = 0 ms</li><li>• Trigger once: uncheck</li></ul>	<ul style="list-style-type: none"><li>• In 1</li><li>• Polarity: Falling &amp; Rising Edge</li><li>• Skip Factor = 0</li><li>• Skip First = 0</li><li>• Delay = 0ms</li><li>• Trigger once: uncheck</li></ul>

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

## 5 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.

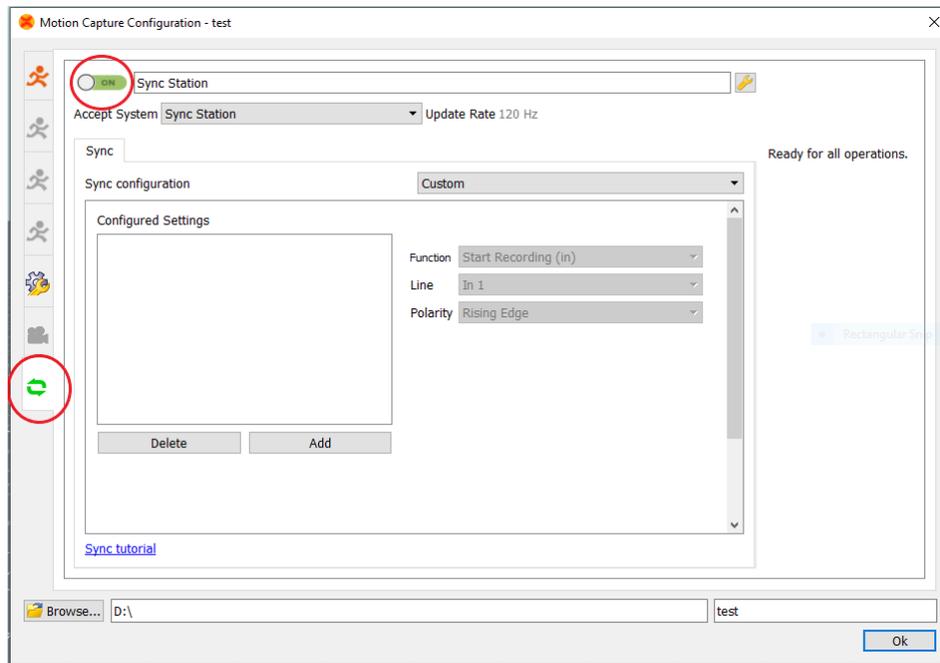


Figure 4 - Motion Capture configuration window in MVN Analyze. Indications to activate the Awinda station as sync station with the Link system.

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.