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Synchronizing Xsens Systems with Qualisys Tracker Manager

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 Qualisys as slave.....	5
4.1 Start and Stop a recording	5
4.1.1 Qualisys Track Manager	5
4.1.2 MVN Analyze	5
4.2 Clock Synchronization	7
4.2.1 Qualisys Track Manager	7
4.2.2 MVN Analyze	7
5 Qualisys as Master and MVN as slave	9
6 Using the Link System.....	9

1 Synchronization Workflow

1. Perform the calibration on both systems.
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.

Before starting the recording, make sure that both systems are calibrated. Also, before starting the recording in Qualisys, make sure that the calibration in MVN has already being done.

Due to internal communication procedures the Qualisys system always starts 20ms seconds after receiving an input trigger signal.

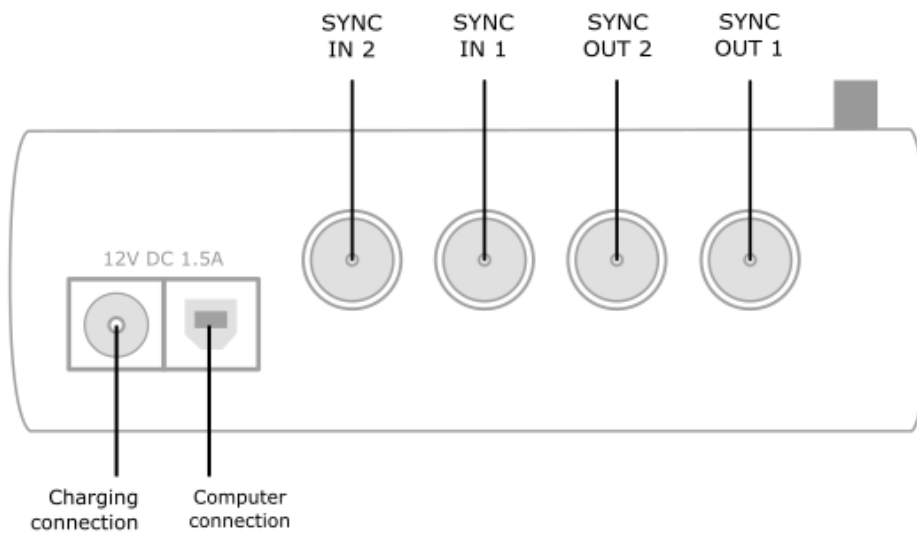
This document is written to synchronize the Xsens Awinda system. However, most of the steps performed in the MVN software are the same for the MVN Link system. You can see the differences in the setup of the system in the last chapter of this document "Using MVN Link to synchronize".

2 Required Hardware

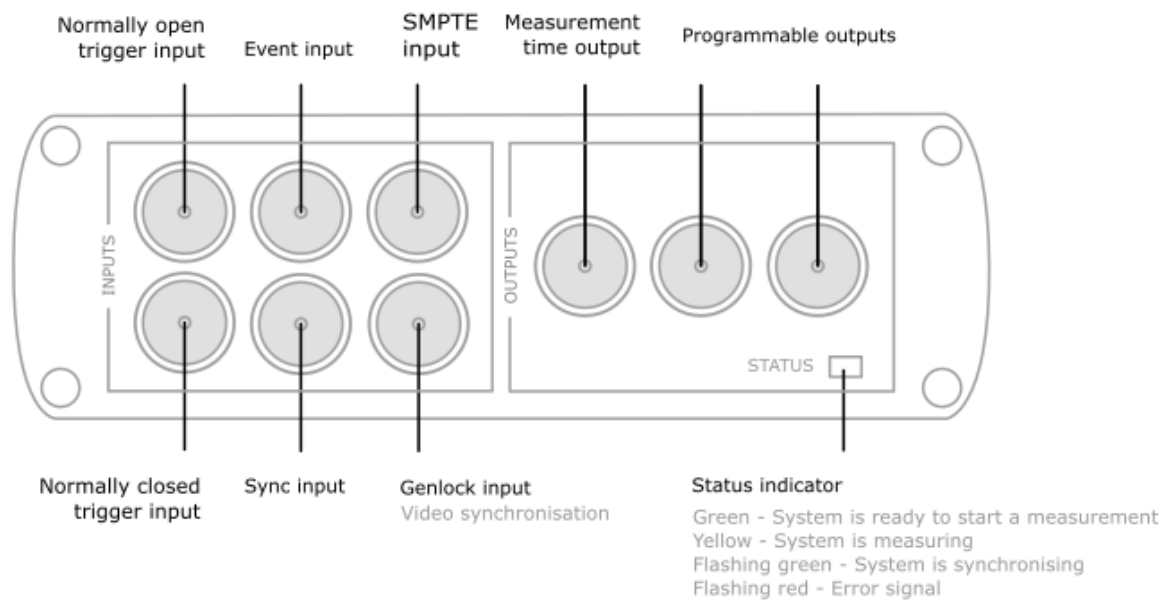
Qualisys Hardware	Xsens Hardware
<ul style="list-style-type: none"> Qualisys system Sync Unit  <p>Figure 1 - Qualisys Sync Unit. 9 BNC ports. Inputs: Open trigger, Closed trigger, Event, Sync, SMPTE, Genlock. Output: Measurement time, Programmable.</p>	<ul style="list-style-type: none"> MVN Awinda or 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"> 2 BNC-BNC cables 	

3 Hardware connections scheme

Awinda Station



Qualisys Sync Unit



4 MVN Analyze as Master and Qualisys as slave

It is recommended to use MVN Analyze as master because the Awinda station sends a 3.3V signal while the Qualisys sync sends a 5V signal, which can damage the Awinda station. Also, it was tested, and the Qualisys Sync Unit can be triggered with a 3.3V signal.

4.1 Start and Stop a recording

4.1.1 Qualisys Track Manager

1. Connect the BNC cable with the normally closed (NC) trigger input port.
2. Set the following setting in Project Options -> Camera System -> Synchronization:

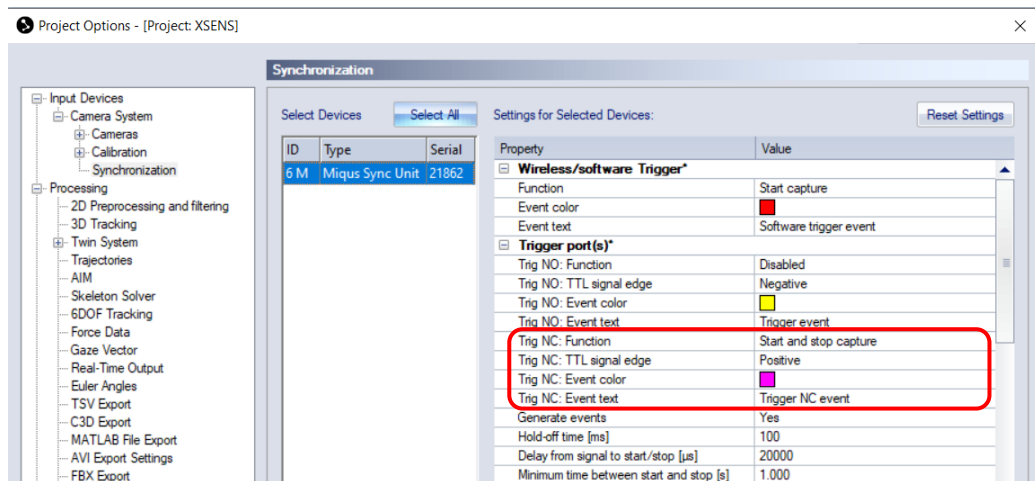


Figure 3 - Project options window in Qualisys Track Manager.

Note: In the Start Capture window make sure that the measurement time is longer than the recording you want to do or set the duration to "Continuous Capture". So, the recording can end when a stop input is received from the Xsens software. Only alter this if you have any other reason for the recording to stop at different times.

4.1.2 MVN Analyze

1. Connect the other end of the BNC cable into the OUT 1 port of the Awinda Station.
2. 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 1ms • Trigger once: uncheck 	<ul style="list-style-type: none"> • Out 1 • Polarity: Rising Edge • Skip Factor = 0 • Skip First = 0 • Pulse width 1ms • Trigger once: uncheck

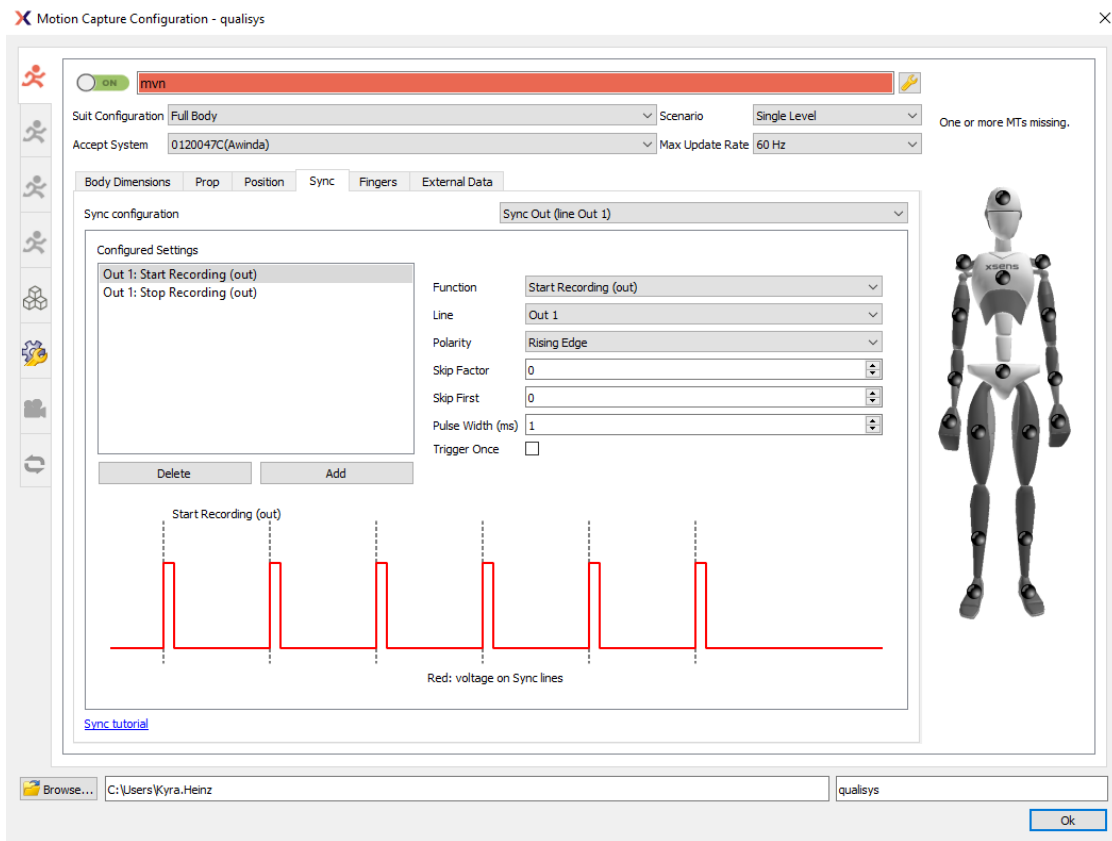


Figure 4 - Motion Capture Configuration window in MVN Analyze. Setting on the sync tab.



Figure 5 - Connection with BNC-BNC cable scheme to Start and Stop a recording.

4.2 Clock Synchronization

Triggering both systems simultaneously ensures a synchronized start, but on long measurements it is possible that there is a small temporal drift between the systems over time due to slight differences in the clocks of each system. This can be avoided by using the clock of the Awinda station as the master clock for the complete system.

4.2.1 Qualisys Track Manager

1. Keep the connection described on section "1.1 Start and Stop a recording", to start and stop the recording.
2. Connect a BNC cable with the SYNC input port in the Sync Unit.
3. Set the following setting in Project Options -> Camera System -> Synchronization

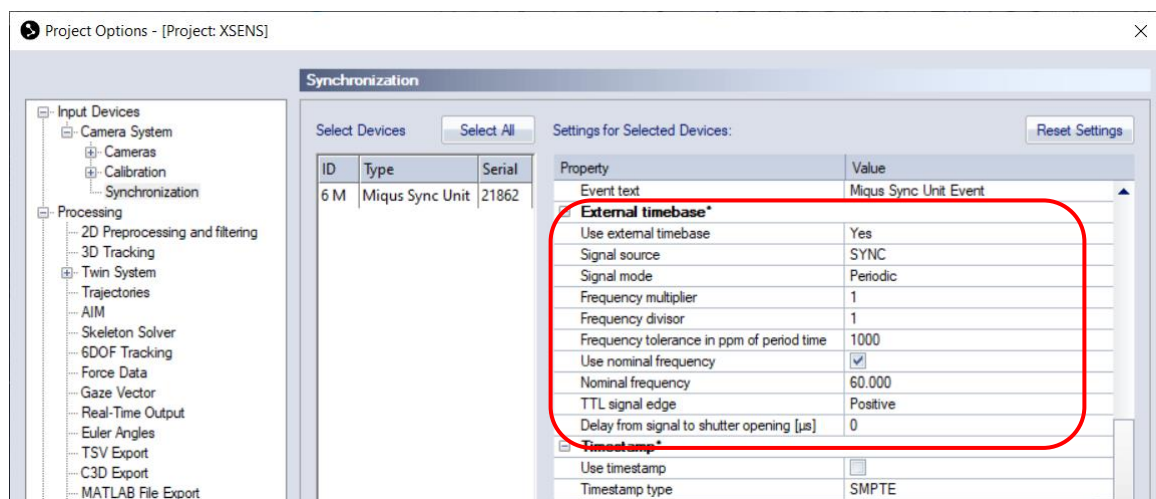


Figure 6 - Configurations in project options window in the Qualisys Track Manager to set the clock synchronization.

Notes:

- Use "Frequency multiplier" if you want to run the camera system at a higher frame rate than the Xsens sensors.
- It is recommended to activate "Use nominal frequency" and enter the capture frequency used by the Xsens sensors (Awinda system: Full body/upper body 60 Hz, lower body/lower body with sternum 100Hz, Link System: 120Hz).
- Be aware that Qualisys might take about 60 s to start preview the first time you are using the settings. Qualisys will display a log window with a progress bar.

4.2.2 MVN Analyze

1. Keep the connection described on section "1.1 Start and Stop a recording", to start and stop the recording.
2. Connect the other end of the BNC cable with the OUT 2 port in the Awinda Station.
3. In the synchronization tab (Figure 4) add the setting "Interval Transition Measurement". Please see Figure 7 for additional visualization.

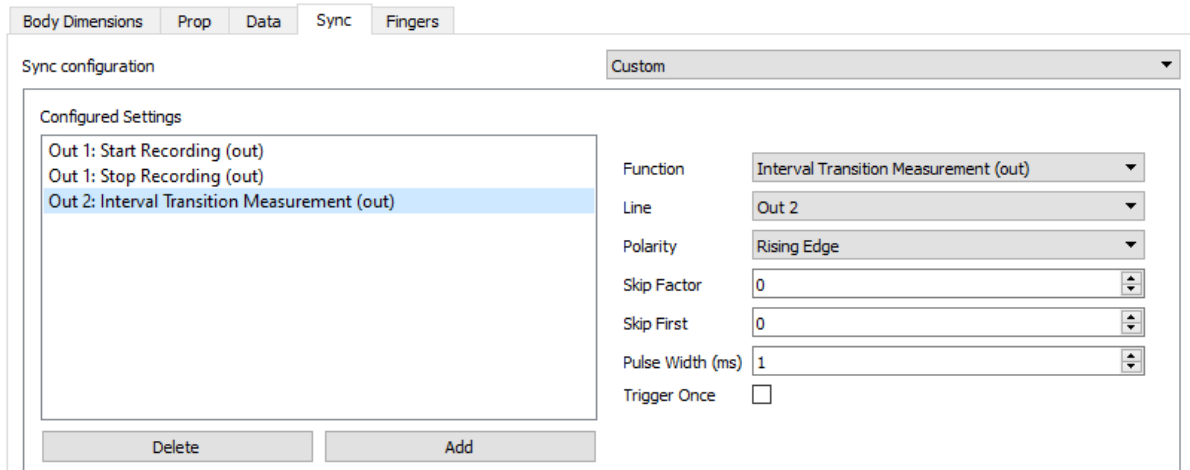


Figure 7 - Motion Capture Configuration window. Setting to add interval transition measurement.

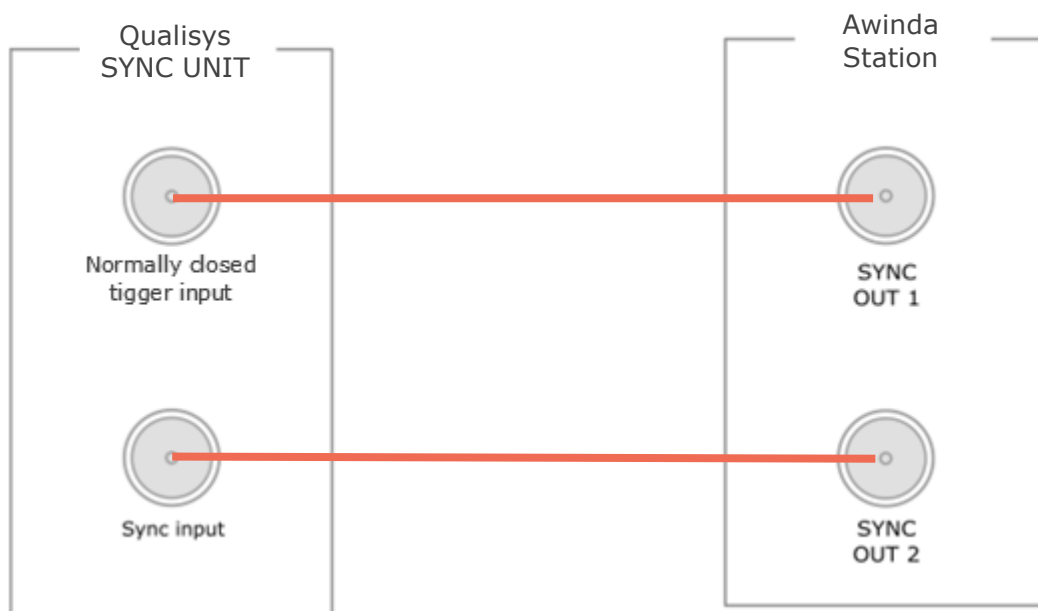


Figure 8 - Connection with BNC-BNC cable scheme to perform clock synchronization.

5 Qualisys as Master and MVN as slave

To use Qualisys as a master it is recommended to use a 5V/3.3V SMD level converter, in order to prevent damaging the Awinda station.

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.

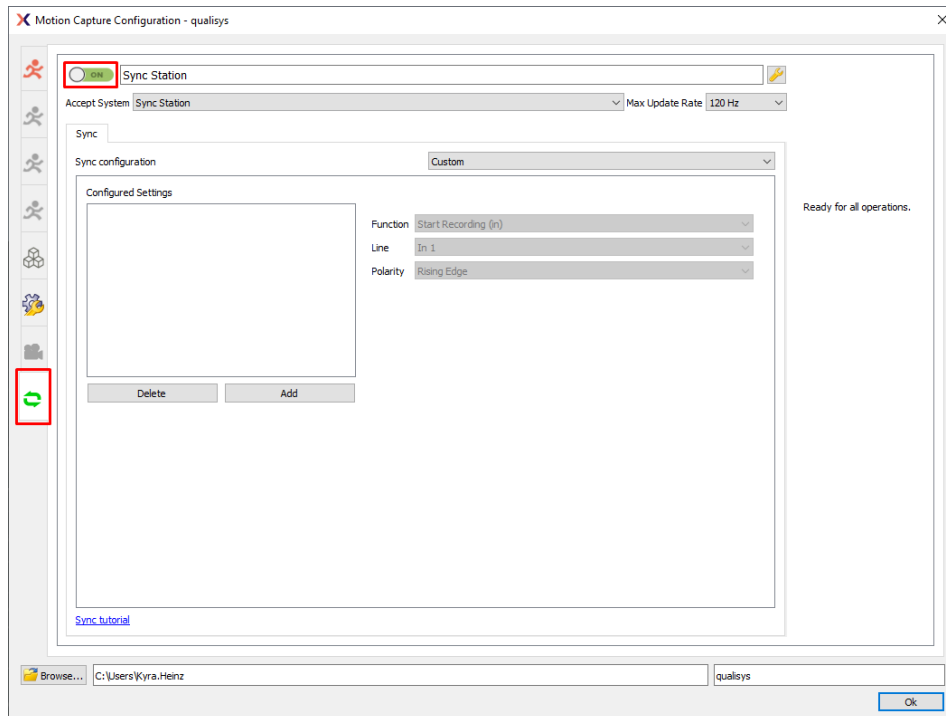


Figure 9 - Motion Capture configuration window in MVN Analyze. Indications to activate the Awinda station as sync station with the Link system.

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, the maximum frame rate that the output signal will have 120Hz. Practically, this entails that every other frame of Xsens will be synchronize with the frame of Qualisys. 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 exporting. 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 "Exporter frame skip (for downsampling)"
 - o For example: if you chose 120Hz in Qualisys and you are using the Xsens Link system, choose the exporter frame skip to 1.