

1 Synchronising Xsens MTw Development Kit in MT Manager with the Delsys Trigno EMG System

The steps described below show how to configure the Xsens Awinda Station to send an output trigger signal (Sync Out) to the Delsys Trigno EMG system, and how to configure the Station to receive an input trigger signal (Sync In) from the EMG System.

1.1 Sync hardware options on the Xsens Awinda Station



Figure 1: Xsens Awinda Station showing the four BNC connections for synchronisation purposes

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

1.1.1 Sync IN

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

1.1.2 Sync OUT

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

1.1.3 Pulse polarity

A trigger may be a rising or falling edge as illustrated below.

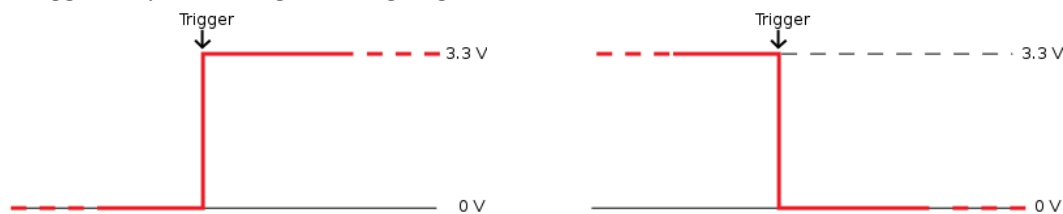






Figure 2: Polarity: Rising / falling edge (sync in) or positive / negative pulse (sync out).

1.2 Sync hardware options on Delsys Trigger Module



Figure 3: Delsys Trigger Module with four BNC connectors and two push buttons for sync in and out

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.

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’.

2 Sync IN: Awinda Station



2.1 Hardware requirements:

Delsys Hardware	Xsens Hardware
<ul style="list-style-type: none"> • Delsys Trigno System • Delsys Trigger Module (DTM) 	<ul style="list-style-type: none"> • MTw • Awinda Station

Both systems require cables to connect to each other (with BNC connectors at each end) and a USB cable to connect to the PC.

2.1.1 Hardware connections

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

- Connect one BNC connector from Sync IN 1 of the Awinda Station to the DTM, green shaded box, “Start Output” . Ensure that the pulse polarity matches the setting in MT Manager. 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 Station to the DTM, red shaded box, “Stop Output” . Ensure that the pulse polarity matches the setting in the MT Manager. 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.

2.2 Software Setup: MT Manager

To set up the synchronisation configuration in MT Manager, go to >Options >Synchronisation Configuration.

Sync In Line 1	Sync In Line 2
<ul style="list-style-type: none"> • Select Start Recording • Check the box for Line 1 • Polarity: Rising Edge • Trigger Once: Uncheck • Skip first = 0 • Skip factor = 0 	<ul style="list-style-type: none"> • Select Stop Recording • Check the box for Line 2 • Polarity: Rising Edge • Trigger Once: Uncheck • Skip First = 0 • Skip Factor = 0

Set up the wireless configuration in MT Manager.

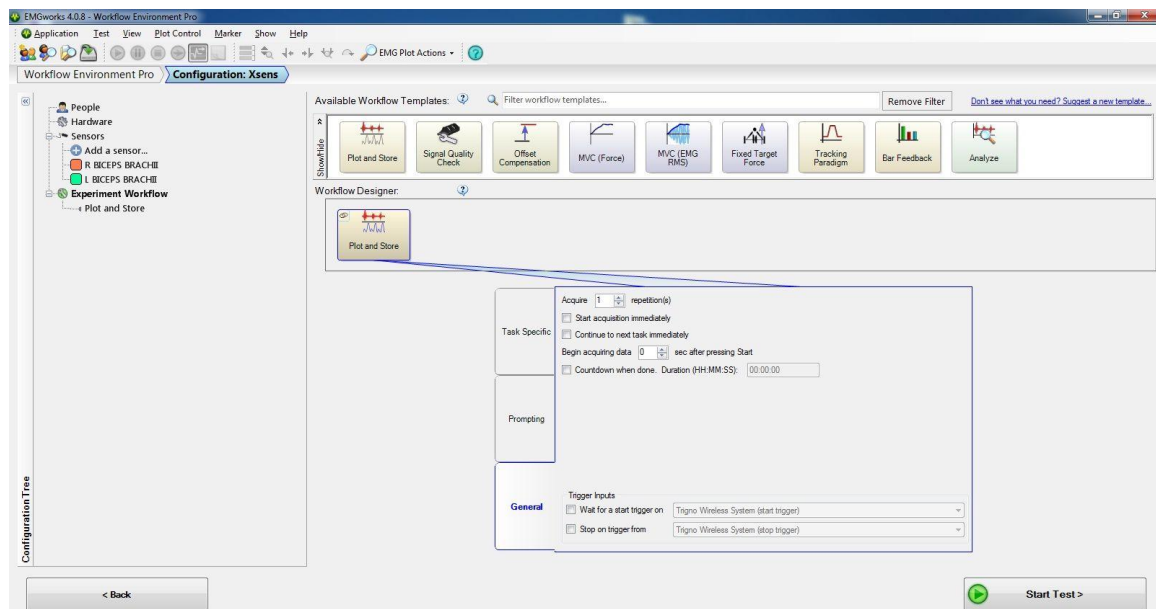
To initialise recording, click the Record button.

The normal red dot icon will change to a pause symbol, indicating that the MT Manger is waiting for an external pulse.



Figure 4: Record button in MT Manager. a) before clicking b) after clicking, with sync-in activated.

2.3 Software Setup: Delsys EMGworks 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 Start Test;
5. Click run Task;
6. Click Start.

Both MT Manager and EMGworks will start recording. Note that in this case EMGworks will automatically initiate a Start Output Trigger.

3 Sync OUT: Awinda Station



3.1 Hardware requirements:

Delsys Hardware	Xsens Hardware
<ul style="list-style-type: none"> • Delsys Trigno System • Delsys Trigger Module (DTM) 	<ul style="list-style-type: none"> • MTw • Awinda Station

Both systems require cables to connect to each other (with BNC connectors at each end) and a USB cable to connect to the PC.

3.1.1 Hardware connections

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

- Connect one BNC connector from Sync OUT 1 of the Awinda Station to the DTM, green shaded box, “Start Input” . Ensure that the pulse polarity matches the setting in the MT Manager. 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 polarity matches the setting in the MT Manager. Again, for the purpose of this example, select the positive rising pulse.
- Power on the Delsys Trigger Module.

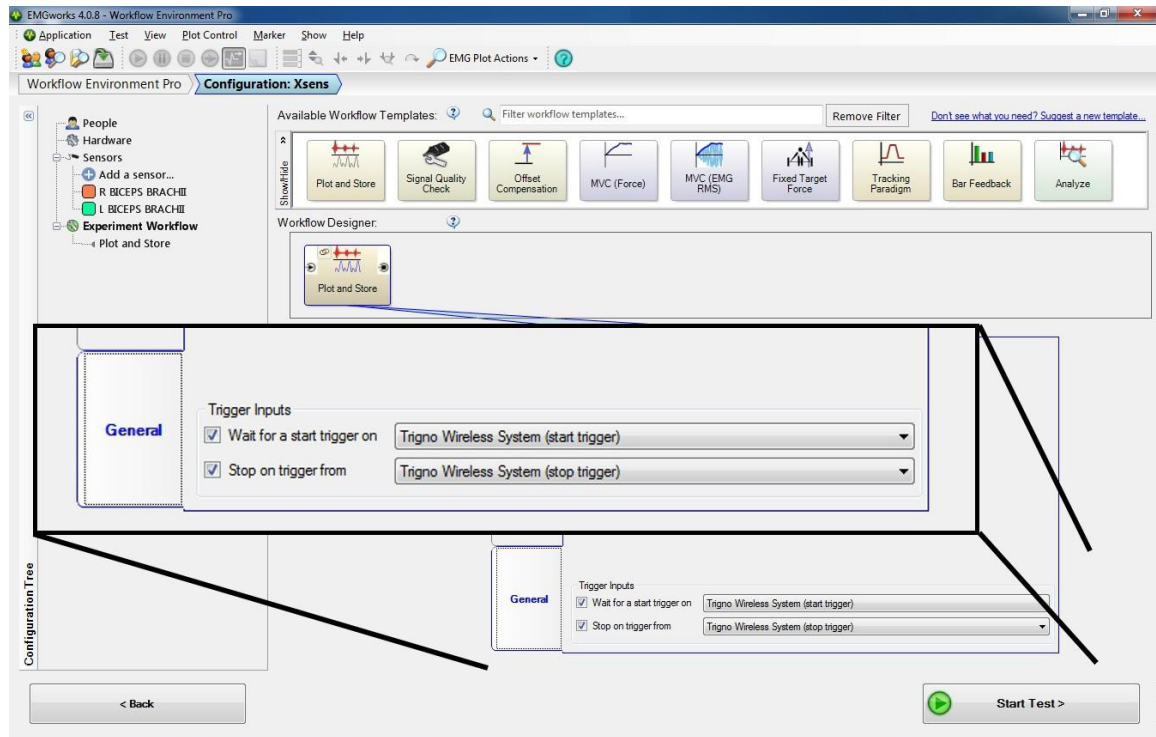
3.2 Software Setup in MT Manager

To set up the synchronisation configuration in MT Manager, go to >Options >Synchronisation Configuration.

Sync OUT Line 1	Sync OUT Line 2
Select Start Recording	Select Stop Recording
Check the box for Line 1	Check the box for Line 2
Polarity: Rising Edge	Polarity: Rising Edge
Trigger Once: Uncheck	Trigger Once: Uncheck
Skip first = 0	Skip First = 0
Skip factor = 0	Skip Factor = 0
Pulse width = 5 ms	Pulse width = 5 ms

- Set up the wireless configuration in MT Manager.

3.3 Software Setup Delsys EMGworks 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 command is given in MT Manager.

Click Record in MT Manager to control start and stop of recording of both systems.

4 Using the DTM as an independent trigger device

In addition to using the Delsys Trigger Module as a primary/secondary triggering device it can be used as an independent triggering device. This uses the two push buttons on the DTM to send both start and stop trigger pulses to both systems.

For this, the Xsens MTw system and the Delsys Trigno system should be set up to receive trigger pulses.

- Connect one BNC connector from Sync IN 1 of the Awinda Station to the DTM, green shaded box, “Start Input” . Ensure that the pulse polarity matches the setting in MT Manager. For the purpose of this example, select the positive rising pulse.
- Connect the other BNC connector from Sync IN 2 of the Awinda Station to the DTM, red shaded box, “Stop Input” . Ensure that the pulse polarity matches the setting in MT Manager. Again, for the purpose of this example, use a positive rising pulse.
- Power on the DTM.

For software setups, replicate Section 2.2 for the Xsens MTw and 0 for the Delsys Trigno.

- Use the DTM push button on the green side, beside the arrow icon. Both systems will start to record.
- Use the DTM push button on the red side, beside the square icon. Both systems will stop recording.