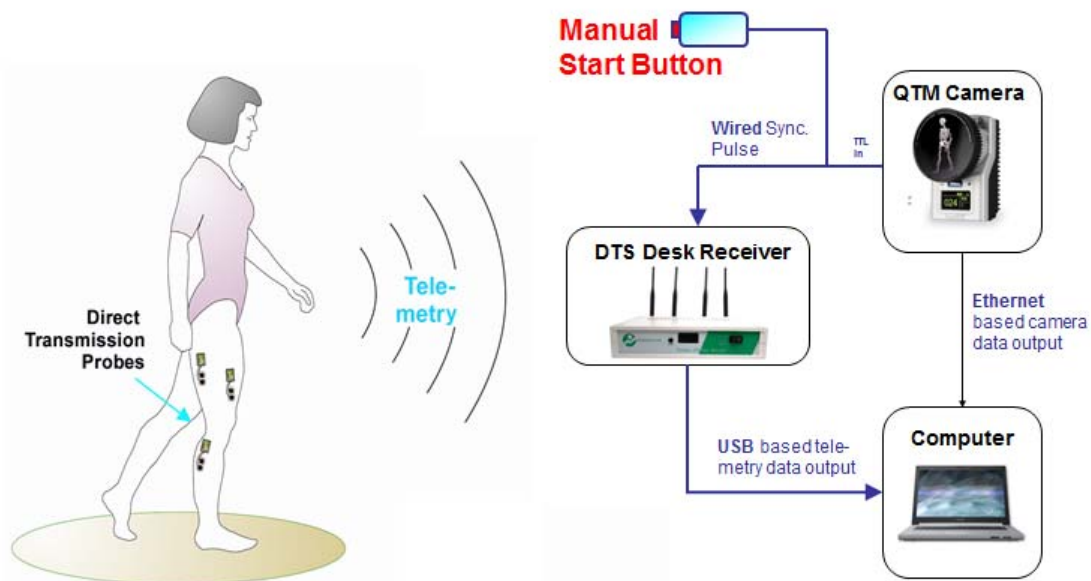


QTM/Noraxon EMG - Telemetry Installation for DTS Desk Receiver – Version v6 Aug. 2013

Overview Scheme:



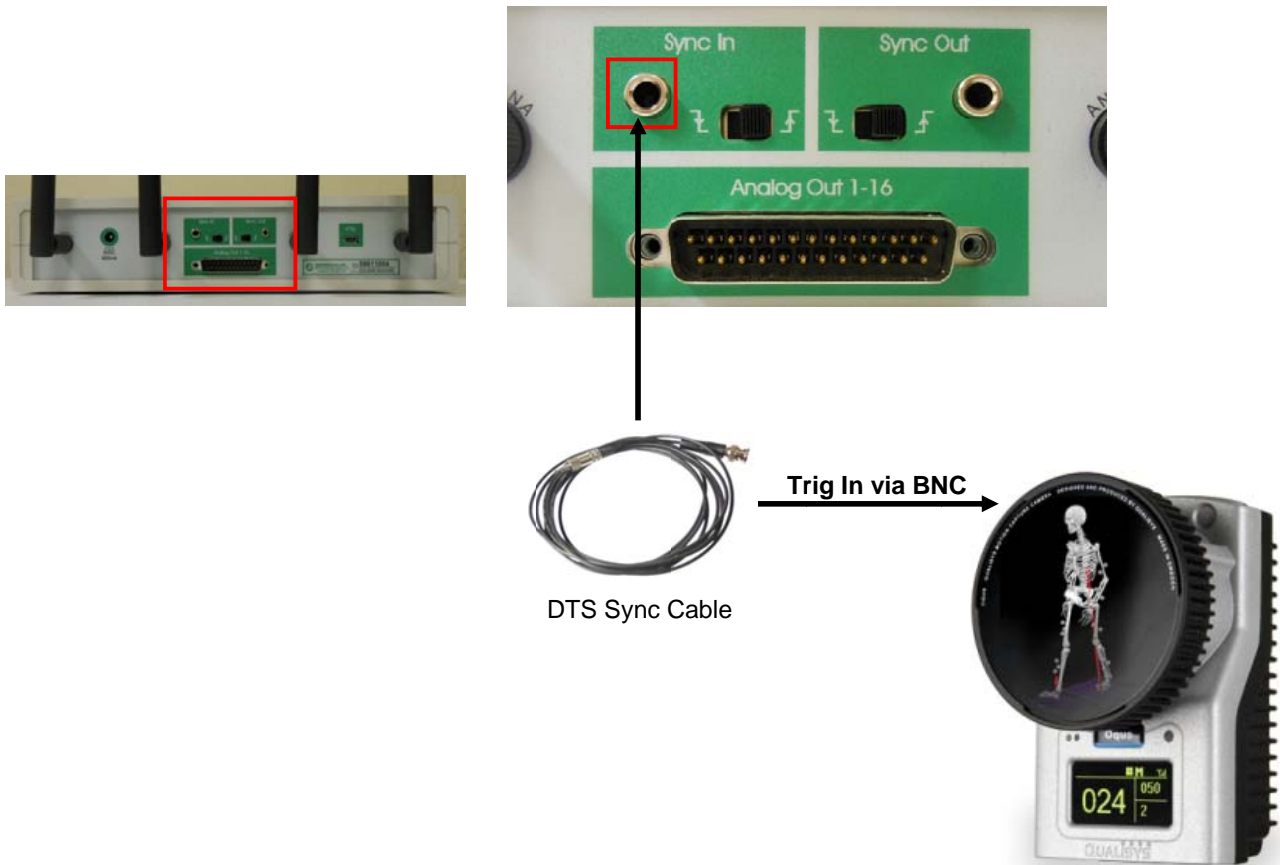
A) Prepare the system and PC for the integration

Recommendation: Check the Noraxon telemetry system using Noraxon Software prior to starting this step

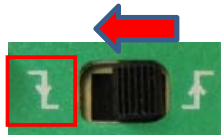
1. Before connecting the Noraxon hardware to the PC – insert the installation CD of any MyoResearch XP or MR3 software Edition (Data Acquisition, Essential, Clinical, Basic or Master Edition) and operate a full installation procedure (see quick installation tutorial for Noraxon software)
2. Connect the Noraxon desk receiver system to the PC and confirm the Noraxon USB driver installation routine is operating correctly (confirm the PC recognizes the Noraxon device plugged into the USB port)
3. Make a test recording with the Noraxon software to confirm the telemetry system is operating properly
4. Once the system is operating successfully, close the Noraxon software and continue with section B)
5. Leave the Noraxon DTS desk receiver connected to the PC and turned on
6. Confirm that all DTS transmission probes are out of the charger and slowly blinking green

B) Connect the DTS Sync Cable

1. Connect the DTS Sync cable to **Sync In** port on the back side of the DTS desk receiver to the **Trig In** port of the first Qualisys camera:



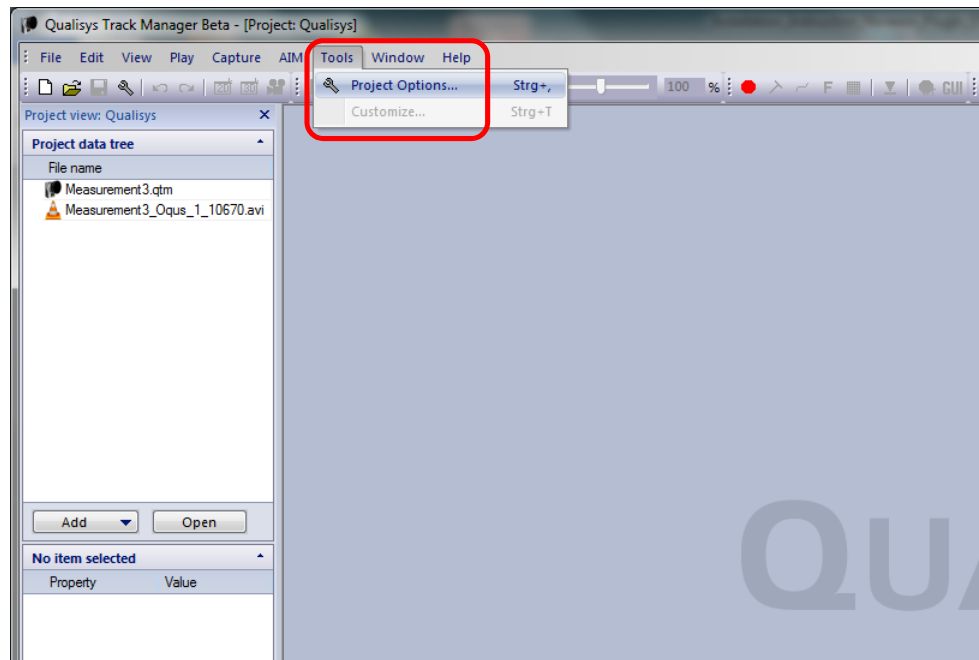
2. Switch the polarity of the Sync In port on the DTS desk receiver to the falling edge (high to low) by moving the switch to the left side



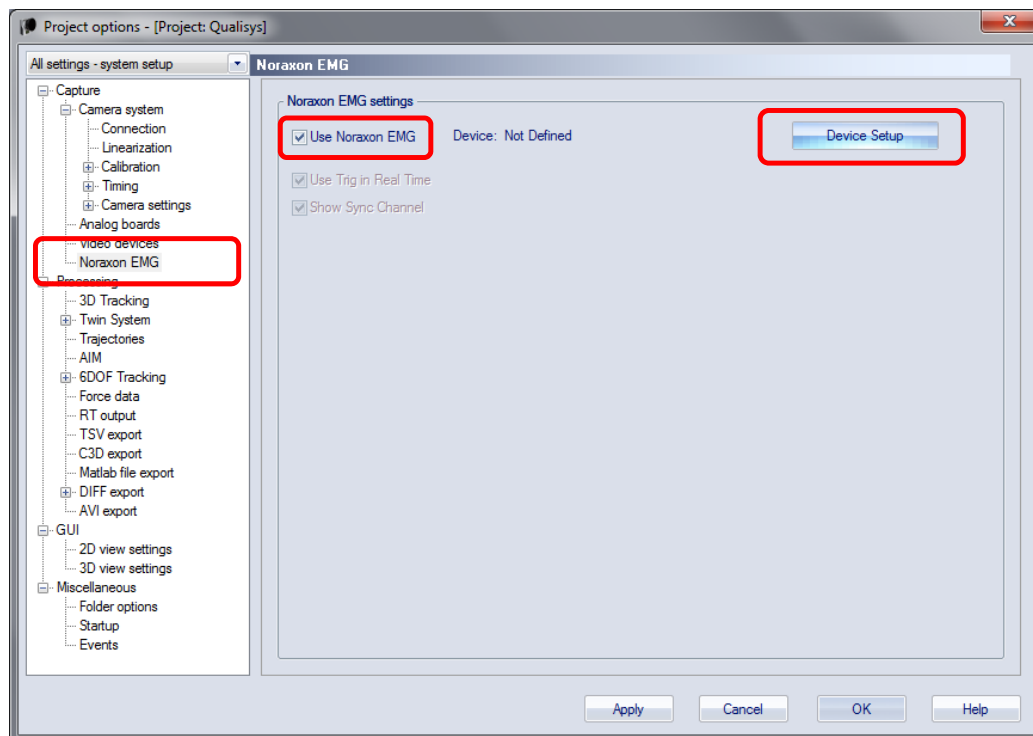
Note: The Noraxon telemetry system uses a BNC T-coupling that allows the connection of both the DTS Sync cable and the manual trigger cable of the QTM System to the same **TTL in** port of the dedicated QTM trigger camera.

C) Prepare QTM software

1. Under the Tools drop down menu open the **Project Options**:

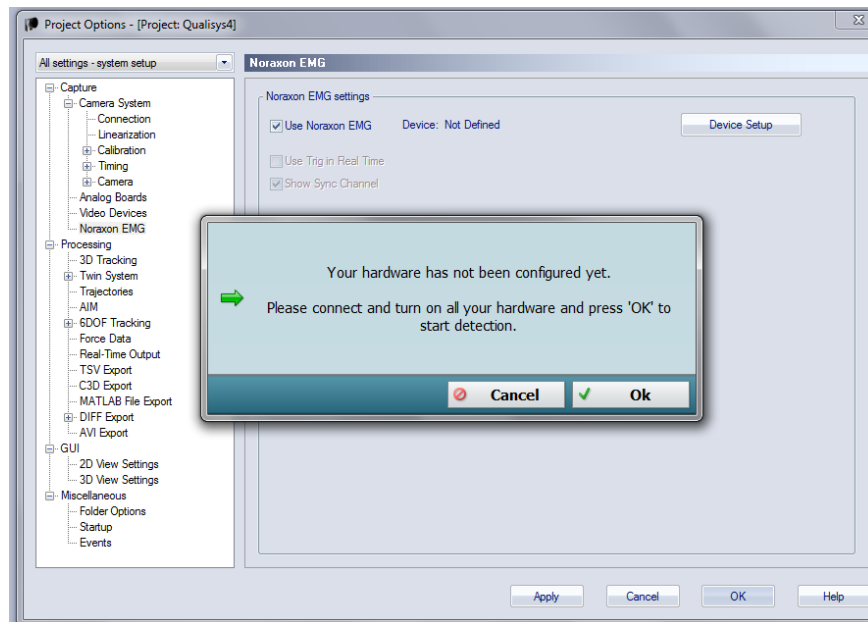


2. Select **Noraxon EMG** to open the Noraxon EMG settings and check **Use Noraxon EMG** and click again on **Device Setup**:

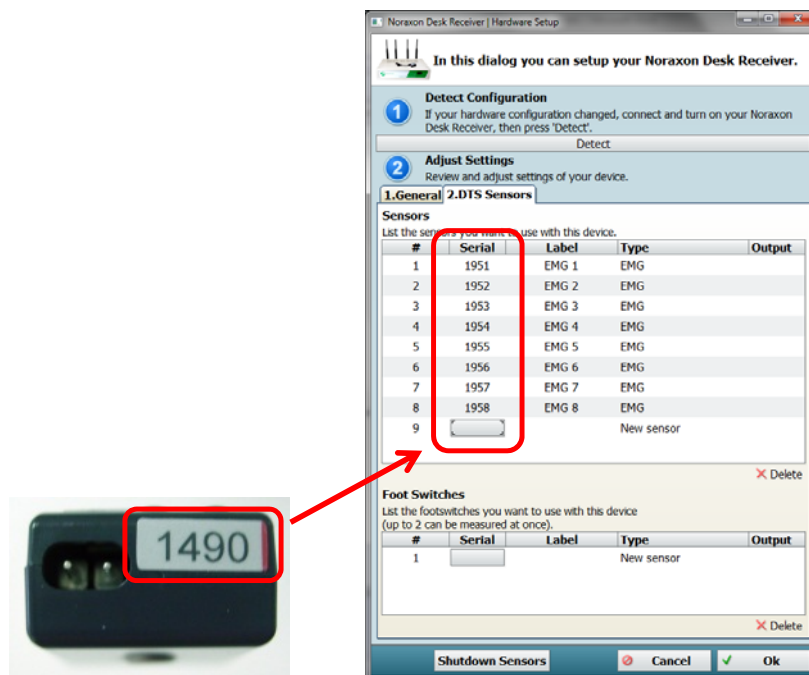


3. Check **Device Setup** Settings:

The **Hardware Setup** menu will appear - click on **OK** to start the automatic hardware detection:



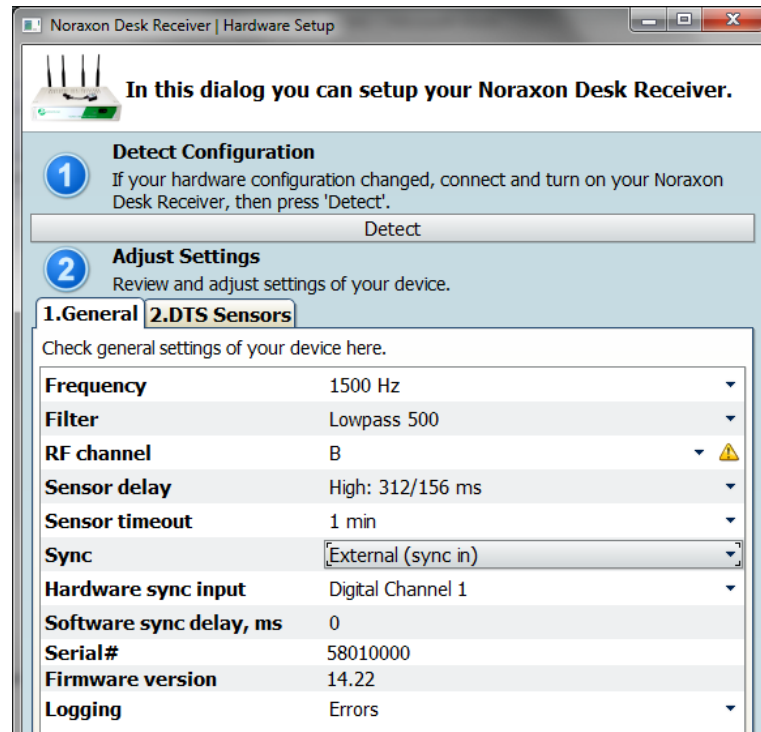
The Noraxon Desk Receiver will automatically be detected and the next setup screen will present the user with a DTS sensor assignment table. Enter all EMG or other sensor transmission probe ID numbers in the **Serials** column in the correct pre-labeled channel line. The serial numbers can be found on the top side of each sensor:



Note: The system will automatically detect the sensor type by its serial number (e.g. EMG, acceleration, foot switch type).

In the Label column the user can rename each transmission probe/channel.

When done, click on the **1.General** tab to enter the recommended standard settings:



Frequency = 1500 Hz – suitable for all surface EMG recordings and other biomechanical sensors

Filter = 500 Hz – low pass filter applied to surface EMG sensors

(the alternative settings 3000 Hz frequency and 1500 Hz low pass filter are meant to be used for fine recordings only)

RF = B to G – the Wifi channels used for signal transmission. In very busy (high traffic) WiFi conditions it may be necessary to try another RF (radio frequency) channel (see Desk receiver hardware manual for more details)

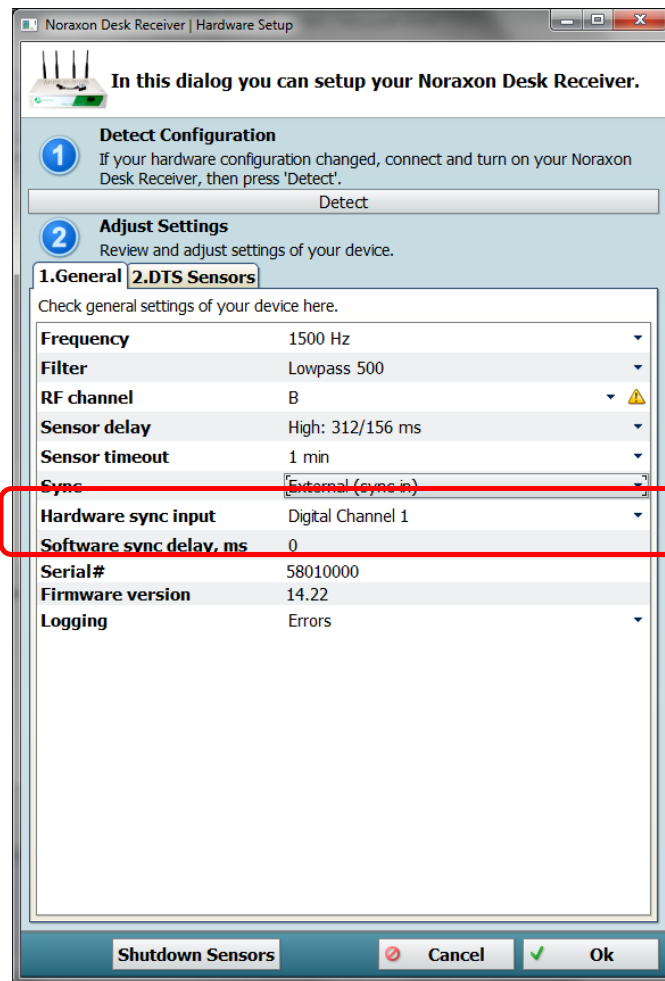
Sensor delay = high 316/156ms – the higher the delay the more stable is the signal transmission

Sensor time out= 1min – during this interval any transmission probe can rejoin the recording in case it left the transmission range

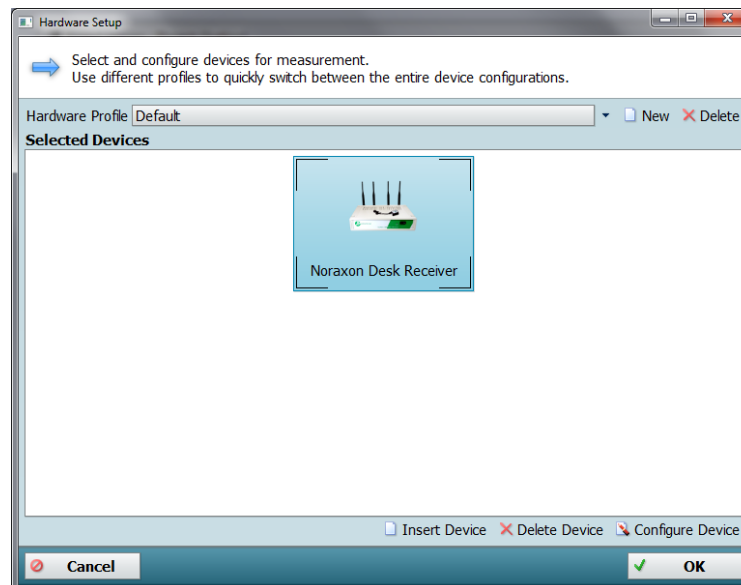
Sync = External (sync in) – important setting to allow that QTM triggers the EMG system correctly

Hardware sync input = Digital channel 1 – important for the correct operation of sync

Software sync delay, ms = 0 – necessary for correct sync operation



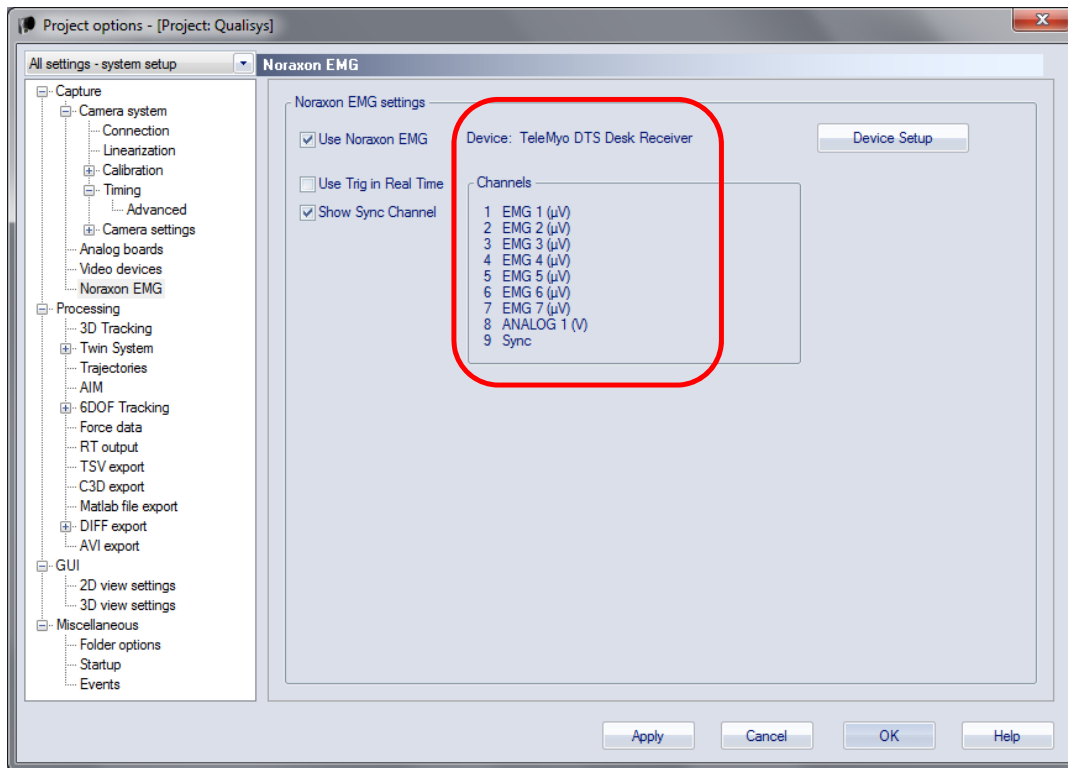
The desk receiver is now installed and ready to be used with the QTM Software. The final screen before leaving the Device Setup Menu should look like this:



Note: QTM can only access one device at any given time so the Noraxon Desk Receiver should be the **ONLY** device in the hardware setup. All other devices must be deleted.

4. Click on OK to go back to **QTM's Project options** screen.

The Project Options screen should now display the DTS desk receiver with all assigned DTS transmission probes and their channel number:

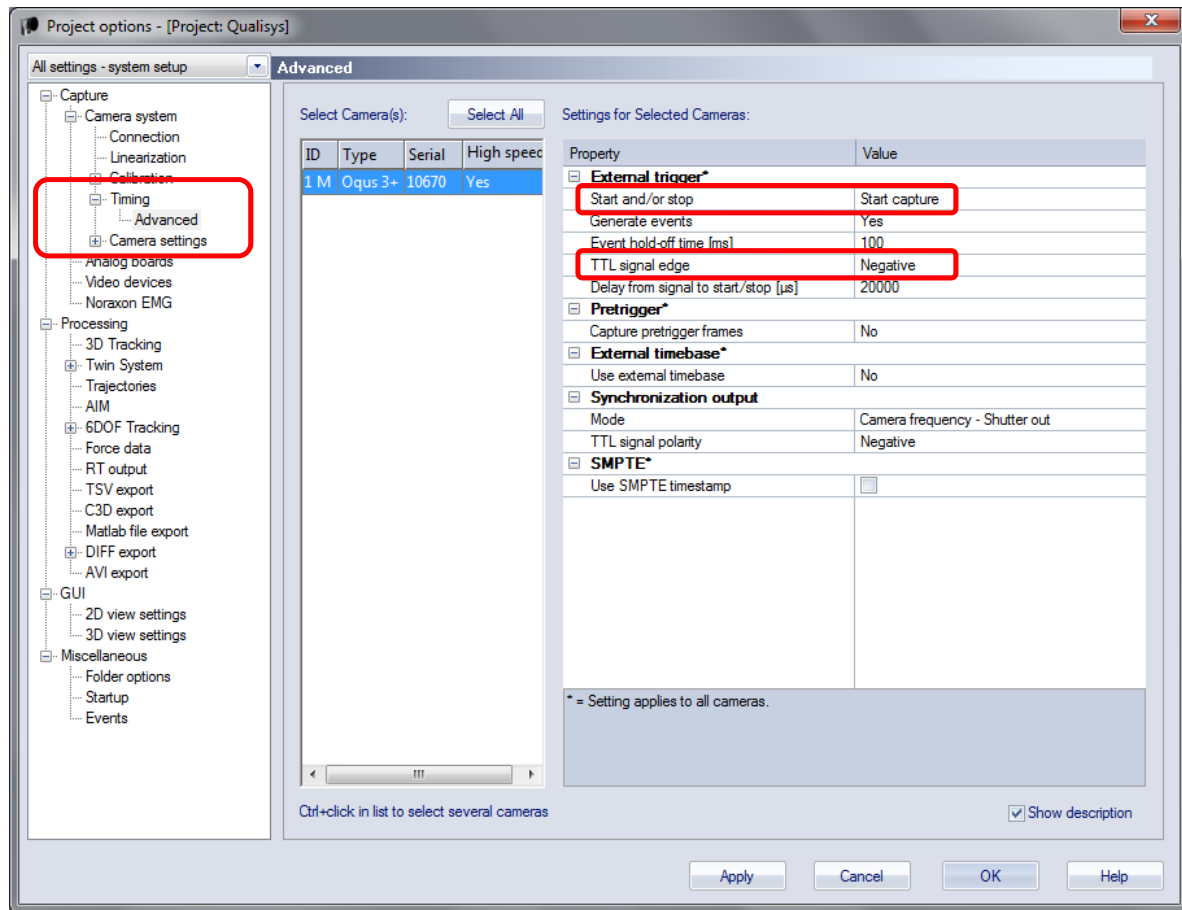


Trig in Real Time is NOT needed for standard recordings and can stay unselected.

Note: It is recommended the **Show Sync Channel** option is selected. Later in the signal monitoring, this will provide an additional control if the trigger signal was seen correctly by the QTM-system.

5. Timing Advanced Settings

In the Projects Options screen, click on **Timing /Advanced** in the left navigation bar of Project Options:



Check that all default settings are set to the entries shown above. It is especially important the **External trigger** entry is set to **Start capture** and that the **TTL signal edge** is set to **Negative**.

D) How to prepare an EMG recording in QTM

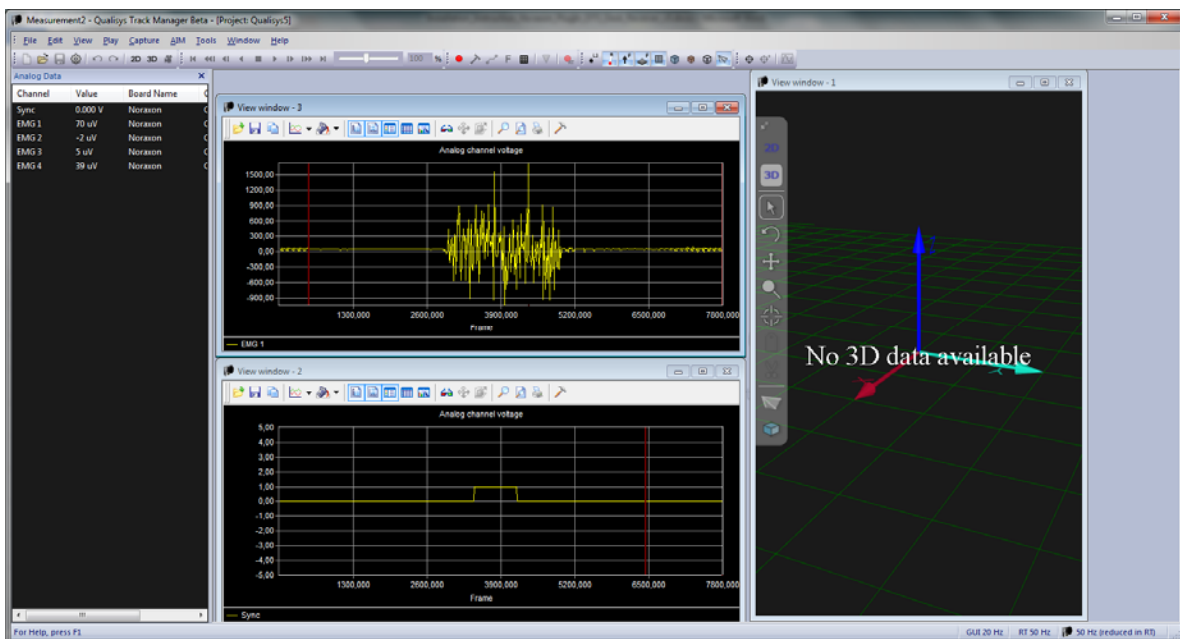
1. Prepare skin and apply electrodes

Shave and clean the skin according to guidelines given in the **ABC of EMG booklet** (<http://noraxon.com/books-and-pamphlets>) and attach electrodes to the subject.

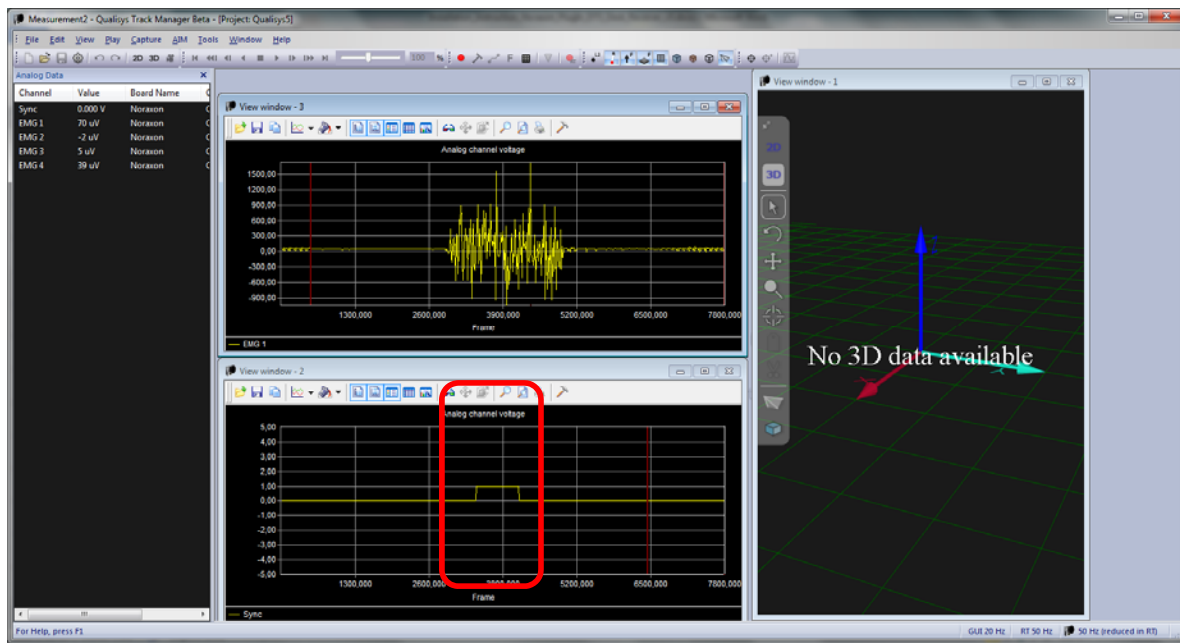
2. Start the hardware

Connect all DTS transmission probes to the electrodes and affix them to the proper location on the skin by using the double sided adhesive tapes. Make sure that each probe is slowly blinking green which indicates they are in ready mode.

3. Activate the **Analog Data** display mode in QTM, click on an EMG channel by using the right mouse button, select **Plot/Voltage** and create a real time monitor window for each EMG channel
4. Check all EMG signals in the Analog Data real time monitor by letting your subject contract and relax each muscle:

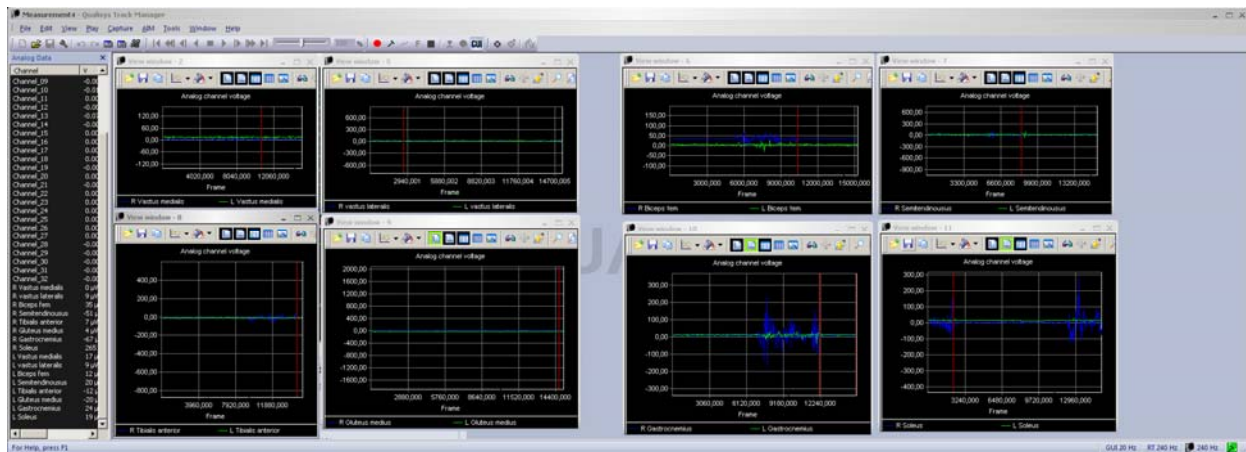


5. Create a channel screen for the sync signal using the method above. This allows the user to check if the Sync signal (falling down from High to Low) was received correctly by the system. Each press of the manual sync button will produce a TTL Sync:



6. Store this screen arrangement layout by using the top menu; clicking **Window\Save Layout\<number>** (1 – 5 is available) for future use. If possible, use two PC monitors for a clearer view of the signal screens.

Alternative screen arrangement with two monitors:



Now the user can switch between the main kinematic screen and EMG monitor screen by pressing the **CTRL <number>** at any time.

E) Perform a measurement

1. Press the red capture button in the Top Menu of QTMs main screen menu to enter the measurement setup settings:

Start capture

Capture period

10 seconds, 2400 Marker frames at 240 Hz

☐ Stop on button only

Capture delay and notification

☐ Use capture delay. Delay the capture 5 seconds.

☒ Use sound notification on start and stop

Marker real time frequency while capturing

☐ Marker capture frequency

☒ Reduced real time frequency: 50 Hz

☐ No real time while capturing (frees up resources)

Note: The frequency specified is a maximum value - the real frequency may be a lot less due to system limitations.

Automatic capture control

☒ Save captured and processed measurement automatically

Folder: C:\Documents and Settings\Administrator\Skribbord Browse ...

Name: test emg ☐ Add a counter starting at: 7

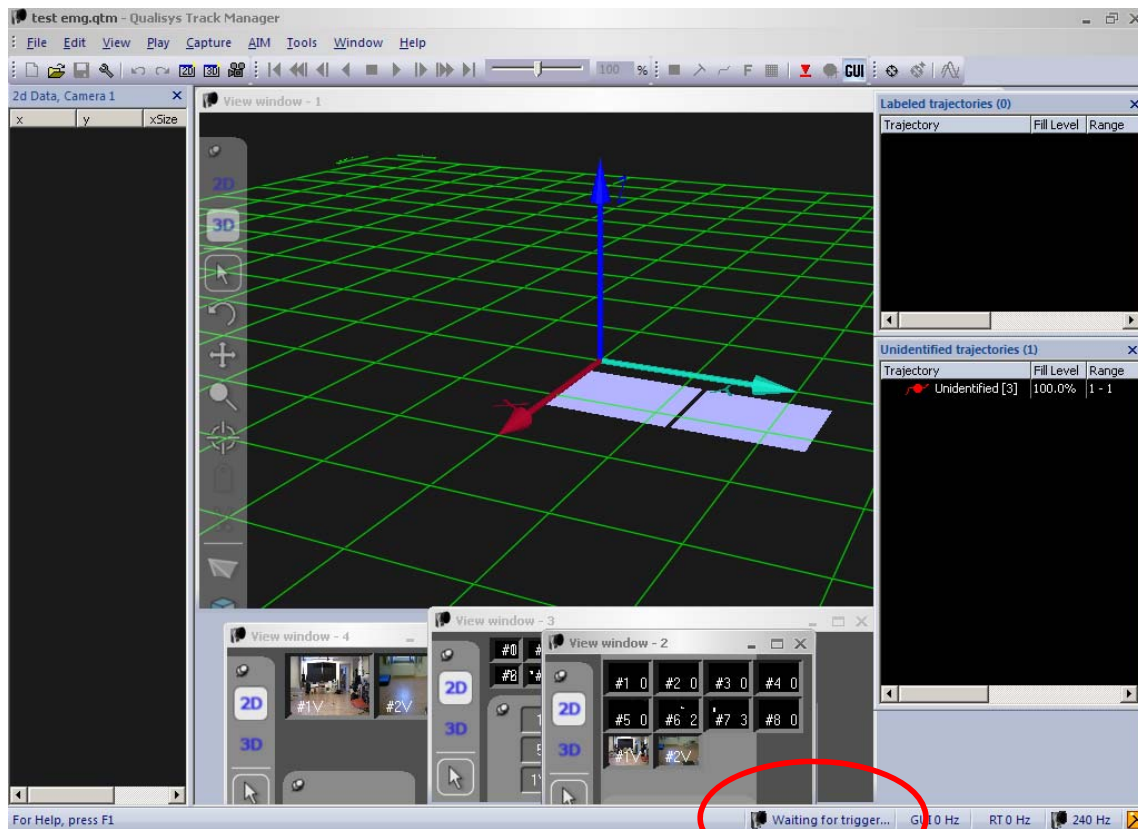
☐ Batch capture (automatic capture restart)

Camera system settings:

Item	Setting
⚠ Analog acquisition	Enabled
⚠ External trigger	Measurement starts by external trigger
● Marker frame rate	240 Hz
● Buffer mode	Immediate
● Marker type	Passive markers
● Marker discrimination	Default
● Pretrigger	No pretrigger frames

Options ... Cancel Start

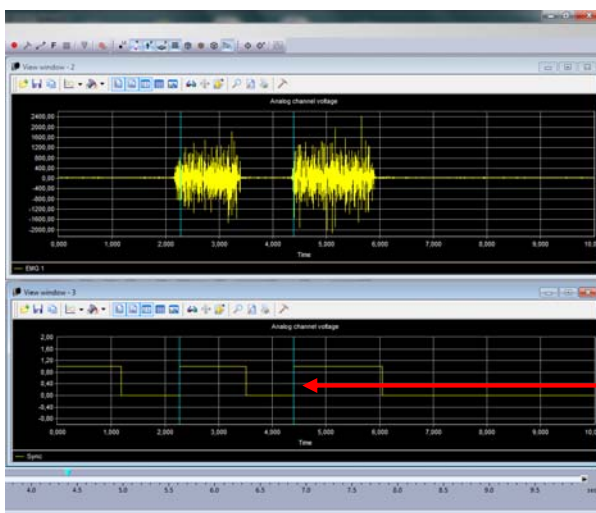
2. Adjust all the desired settings related to the kinematic tracking setup (EMG needs no special setting here)
3. Press **Start** to continue and enter the measurement screen:



If there is any problem with the access to EMG telemetry, QTM will give an immediate warning. If set up successfully accessed the user should see **Waiting for trigger....** in the lower status line of the menu screen

4. Press the manual start trigger button and record/store the data

After recording and saving press **CTRL <number>** to reload EMG signal test screen. Check on all EMG monitor channels to determine if the EMG and Sync Signal were acquired correctly. Please refer to **ABC of EMG** booklet for more information on how to check EMG signal quality.



Baseline noise and noise to signal ratio

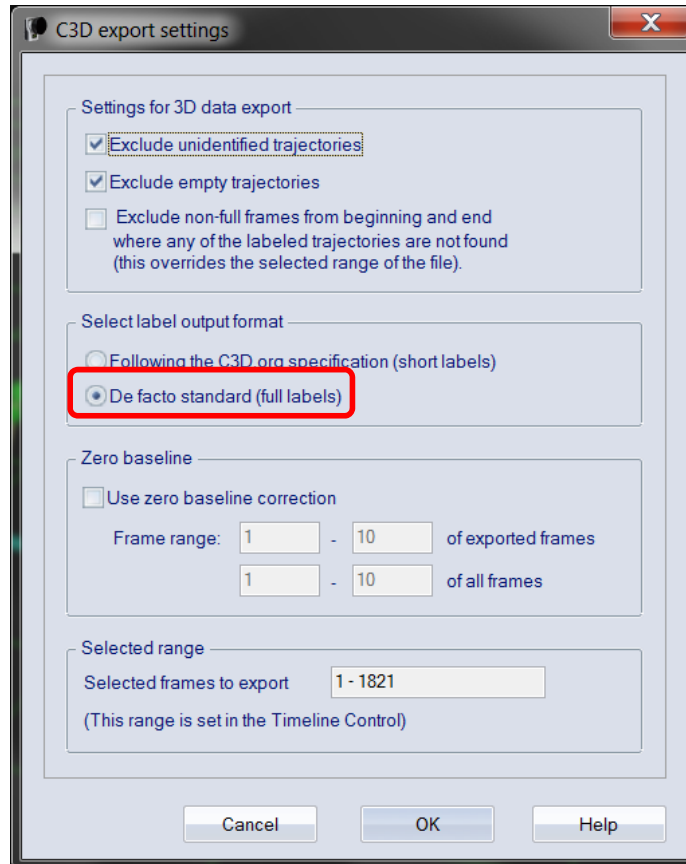
Note: Baseline offsets are okay and will later be correctly via High pass filter at 10 or 20 Hz.

Is the yellow sync channel in alignment with the blue event trigger?

F) How to export EMG from QTM to MyoResearch XP or MR3 analysis software

To operate EMG specific processing it may be beneficial to export EMG data to Noraxon's powerful EMG processing software package MyoResearch XP or MR3.

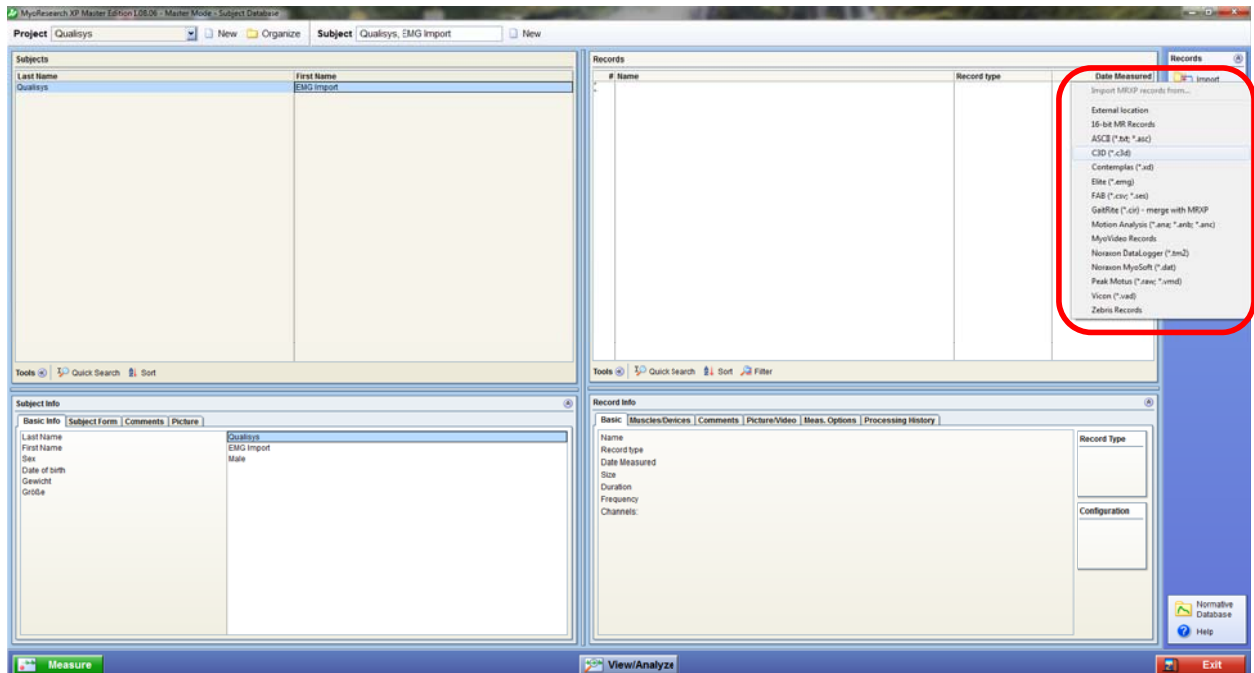
1. Click on **File/Export** to open the export dialog. In the C3D export settings menu select the label output format **De facto standard** (full labels):



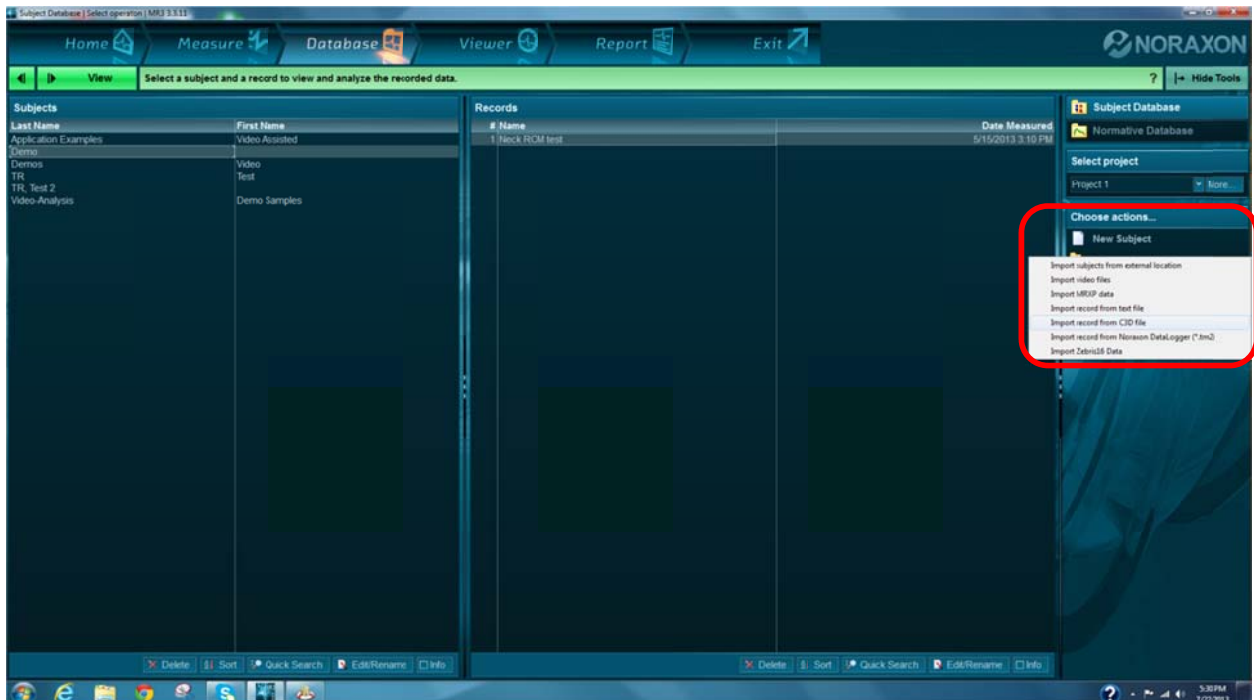
2. Press okay to close the export dialog box

3. Open the software package:

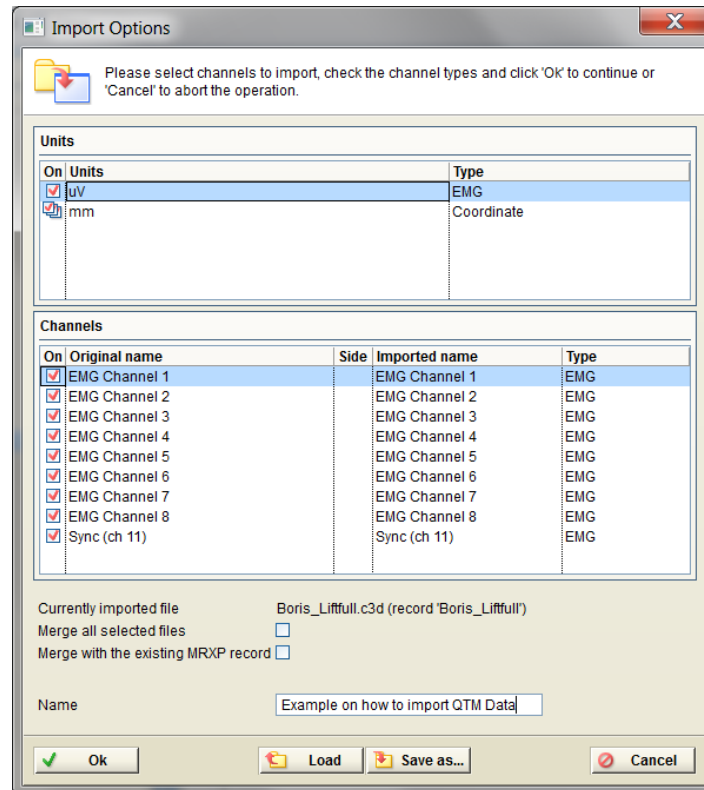
- a) In MyoResearch XP: create a Patient, click on the empty records list and select **Import/C3D** in the right tool bar:



- b) In MR3: Enter the Database tab, create a new Subject and select **Import/C3D** in the right tool bar:



4. Set a path to the C3D Export and select the desired file. Confirm the selection and open the C3D Import dialog:

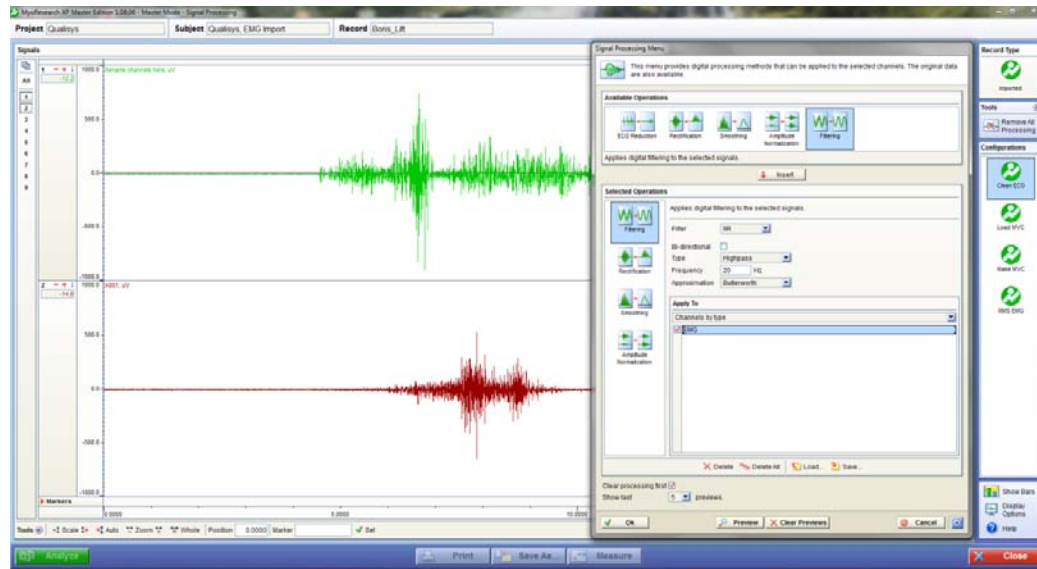


This menu allows you to create an import template with channel selection, channel names and units adjustments. In case several files were marked for import (hold CLTR button for multi-file selection), **Merge all selected files** will import all the selected files into one. This option is helpful if several strides have to be averaged in time normalized repetition cycles.

The function **Merge with existing MRXP** record is designed for setups where QTM data and EMG data were recorded on different PCs and need to be merged. This function requires a shared sync signal and exactly identical recording times.

Note: It is recommended to import at least one kinematic or kinetic signal (e.g., force plate) to be able to identify motion cycles.

Once imported, MR-XP and MR3's comprehensive Signal Processing capabilities and analysis functions can be applied to the EMG recordings:



The imported signals can then be viewed as a customized report.

Example: Customized EMG Gait Report

