Introduction

The introduction of wireless sensor EMG systems such as the Delsys Trigno has spawned varieties of novel approaches to research performed in the field. The freedom achieved by removing the sensor wires has obvious benefits when observing dynamic movements. Additionally, and perhaps more interestingly is the ability for the EMG sensors to be placed across multiple subjects, something which is not easily achieved in traditional tethered systems. With these new possibilities in mind, the need for increasing the number of available sensors occasionally arises. This document describes two simple approaches to connecting multiple Trigno Systems and obtaining appropriately synchronized data.

Connecting Multiple Base Stations to EMGworks (Option 1)

Figure 1: Cross-Over Trigger Cable shown connecting two Trigno Base Stations.

In order to acquire the data from multiple Trigno systems into EMGworks, the software must define a Primary Unit ("master") to control the other systems in the network ("slaves"). With this a approach the built-in triggers of the systems can be used to precisely synchronize all the data. It will be necessary to connect the Trigno Base Stations with the "Cross-Over Trigger Cable", as shown in Figure 1. The cable has no particular signal direction, and thus either end can be connected to either Base Station. The EMGworks software will automatically define the Primary ("Master") Base Station, and the Secondary ("Slave") Base Station. Note that in this configuration the use of external Triggers for controlling System(s) from other devices are disabled.

When multiple Trigno systems are connected to the USB port, EMGworks will automatically configure each Base Station's communication frequencies. This first time this occurs the sensors will need to be paired.

When two systems are connected to EMGworks, the Sensor Status Console is expanded to include all available sensors. Each System however can retain configuration settings independently from the other connected systems. For example, one could set accelerometer ranges to ±1.5 g on the first System and ±6 g on the second System.

The configurable real-time plotting display in EMGworks is capable of displaying many signal traces at once as shown in Figure 3. In this case, all 128 traces from two Trigno Systems are shown on one screen in real time, with the X, Y and Z accelerometer signals of one sensor overlaid on one plot.

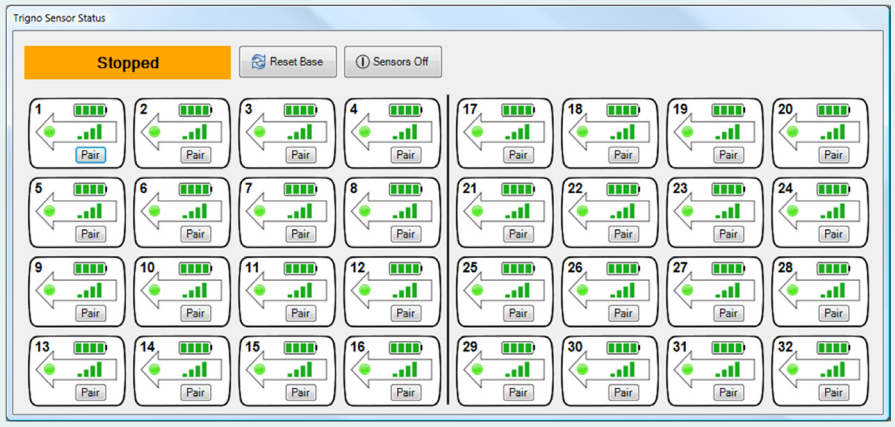

Figure 2: The Sensor Status Console in EMGworks expanded for two Trigno Systems.

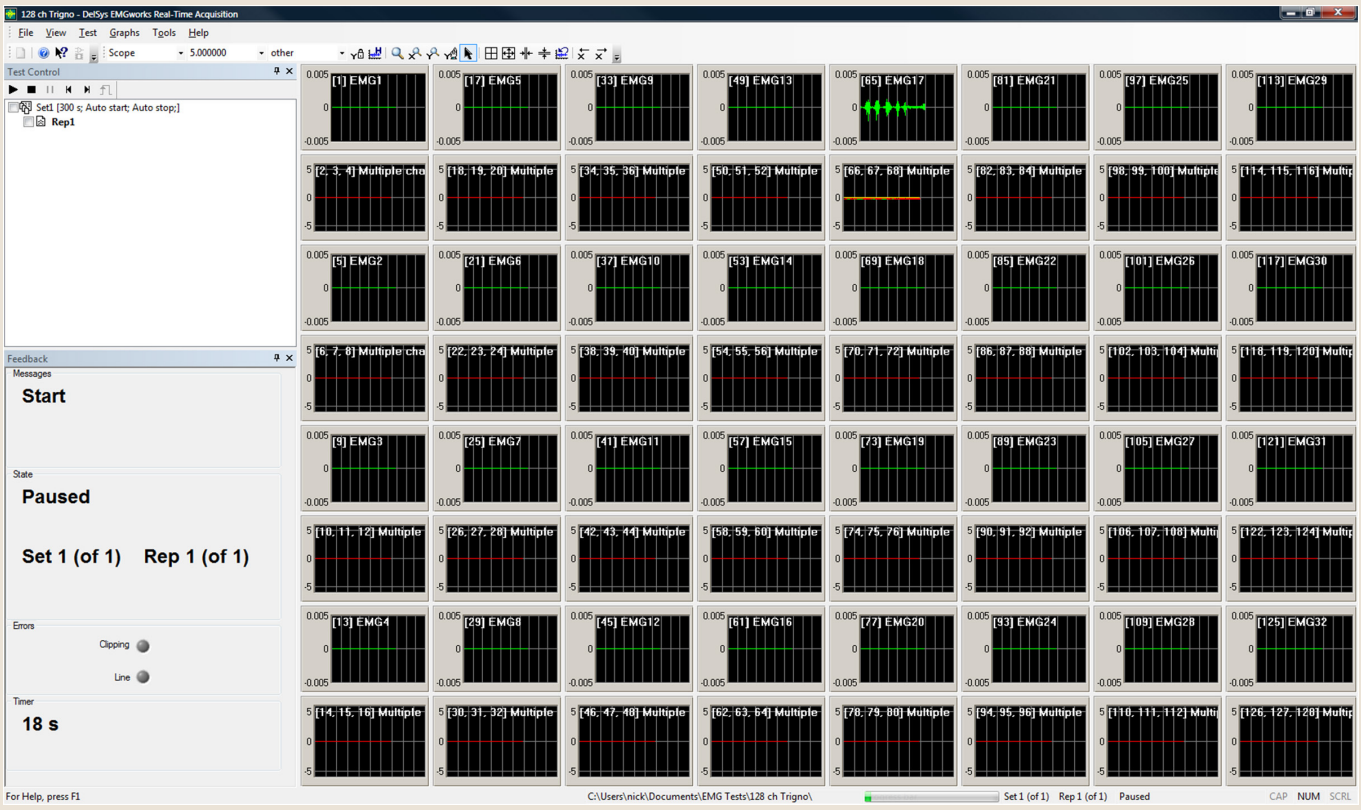

Figure 3: Plotting 128 channels of real-time data from two Trigno Systems in EMGworks. Each sensor's accelerometer data are overlaid in one plot.

Using the Analog Outputs from Multiple Base Stations (Option 2)

The ±5V Analog Output signals are easy to access and simple to connect to data acquisition system inputs. All 64 channels from each Trigno System are available in real-time. Each system's outputs are delayed by precisely 48.0 ms, which must naturally be considered during data analysis. Note, however, that no inter-channel skew exists within one system or across several systems, thus guaranteeing that all channels are always synchronized. No triggering considerations are necessary when using the Analog Output approach. Trigno analog outputs can connect directly to National Instruments data acquisition devices with A/D cables. Alternatively screw terminal blocks or BNC patch panel accessories can be used to achieve virtually any connection requirement.

Figure 4: A typical connection of the Trigno Analog Outputs to a multichannel Data Acquisition device. All data are generated in real-time and do not suffer from inter-channel skew or latencies.