



Continuous Analog Troubleshooting Guide

For the Plexon MAP System

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Introduction and Terminology

Plexon's Multichannel Acquisition Processor (MAP) is a system that thresholds and sorts continuous data into discontinuous spike waveform segments. This system is often paired with a continuous analog digitization system for sampling field potential or other analog data (EEG, eye coil signals, etc.). These continuously sampled signals are acquired synchronously with the discontinuous spikes.

Over the years the hardware needed to continuously acquire signals with the MAP has changed. However, the principle behind how the system is synchronized to the MAP system, along with the most frequent causes for errors, has remained the same. This document will attempt to address the most common errors and get you familiar with the components of common continuous A/D configurations.

General information is in the RASPUTIN manual:

<http://www.plexon.com/assets/pdf/RASPUTINV2Manual.pdf>

The section specific to continuous analog recording hardware configurations is here:

<http://www.plexon.com/assets/pdf/ContinuousSignalRecording.pdf>

Hardware Components

At minimum a continuous data acquisition subsystem has three pieces:

- 1) National Instruments PCI or PXI card.
- 2) Breakout board attached to that card.
- 3) Timing cable that goes from the TIM board on the MAP to a plug on the breakout board.

This general rule isn't broken in any configuration, but the specific parts can change. There are several different models of National Instrument cards compatible with the MAP system, and there are a few revisions of breakout board that have come along over the years.

Chassis

Sometimes the National Instruments card will be housed in an external chassis instead of inside the PC. This is common in cases where more than one (and certainly greater than two) analog boards are required. Those boards are identified as PXI instead of PCI. Even if the board is housed in an external chassis, the breakout board & timing cable are still required. The timing cable will plug into a special board in the chassis (SCLK) instead of directly into the breakout board.

High Frequency

Field potential data or eye coil signals generally don't need to be digitized at a rate higher than 1 kHz (the MAP default for continuous data acquisition). If you want to digitize signals with higher frequency components (e.g. spikes/wideband) the digitization rate has to be increased. The National Instruments board supplied by Plexon can support a 1 kHz data acquisition rate across all channels. However, increasing the acquisition rate decreases the number of channels that can be reliably acquired. See the chart in the RASPUTIN manual in section 11.4.1.1 for more information.

A/D boards in a chassis don't need special considerations for high-frequency digitization.

Digitizing at a rate higher than 20 kHz or using more than one continuous A/D board requires a special type of TIM board in the MAP. This board has an increased clock frequency and a different type of timing cable connector (and different timing cable).



The Yellow Wire

MAP systems shipped prior to 2009 that have A/D boards in the PC will require timing cables with a yellow wire on them that plug into the XS1 BNC on the TIM board.

Universal Timing Cable

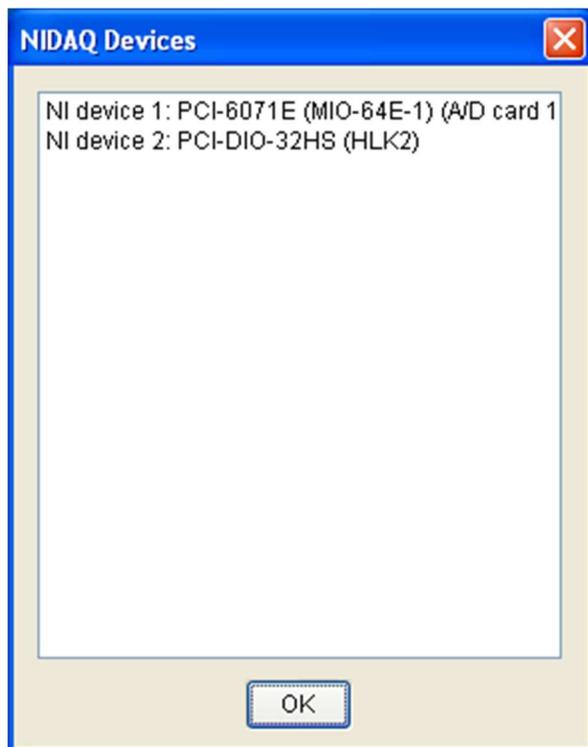
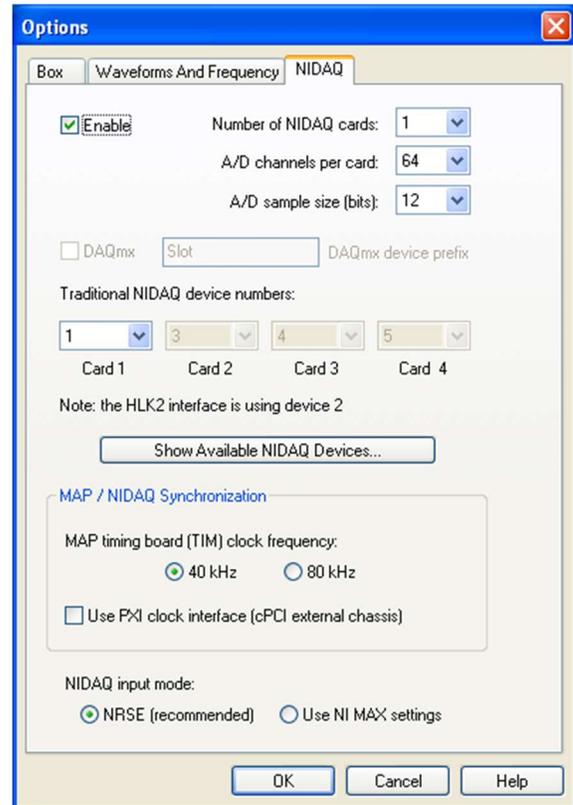
In 2009 a new cabling system was created to reduce the amount of cable variations. The universal timing cable uses an adaptor that plugs into the TIM board. The cables that plug into the adaptor can be used to deliver CinePlex timing, external chassis timing, or timing for one A/D board in the PC. Multiple A/D boards in the PC will still require the special TIM board with the 9 pin plug and can't use the universal timing cable system. The universal timing cable system will work with MAP boxes shipped prior to 2009 if the yellow wire is attached to the input adaptor.

The specifics of every continuous A/D hardware configuration are beyond the scope of this document. Review the RASPUTIN manual or contact Plexon support if your configuration isn't covered in the manual.

Software Components

Server needs to be aware of how many continuous A/D cards you have, what their device numbers are, their bit depth, and how the timing signal is delivered. NIMAX (National Instruments Measurement and Automation Explorer) is the National Instruments tool for viewing installed analog boards. This is typically found under Start->Program Files->National Instruments.

This is a straightforward process of matching device numbers listed in NIMAX (under the Traditional NIDAQ Devices header) with the devices listed in the NIDAQ tab of the Server options.



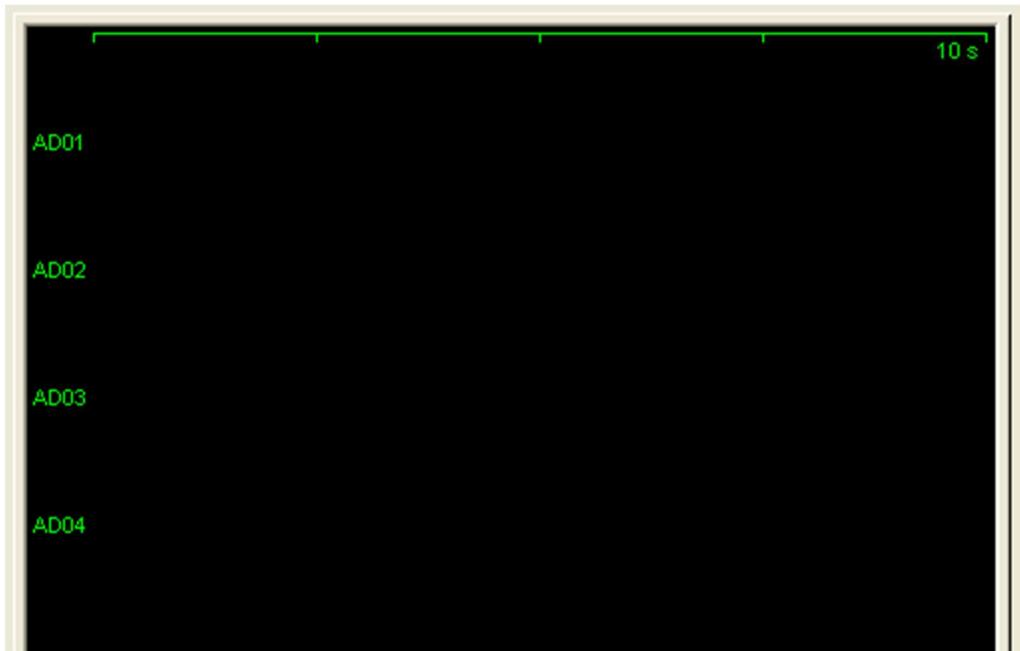
RASPUTIN 2.6.0 and later has a button in the NIDAQ tab called “Show NIDAQ Devices” that should prevent the extra step of opening NIMAX to view the devices.

If everything is set up correctly you will see the analog channels in the Activity Display. Analog channels are activated by either selecting them in the Analog Channels tab and clicking on Update Server, or having them selected before clicking on “Start”. Remember – if you add channels or change the gain you have to click on “Update Server” for the changes to happen.

Troubleshooting

Missing Timing Signal

If you can see the channel names for your analog signals in the Activity Display but don't see traces sweeping from left to right then your A/D system is not receiving timing information. The “zero line” can sometimes hide the trace (if it's at zero) so it's helpful to turn it off (right click menu).



If the A/D board is a PCI card inside of the PC the first thing to do is check to make sure the cable connecting the A/D board to the breakout board is plugged in.

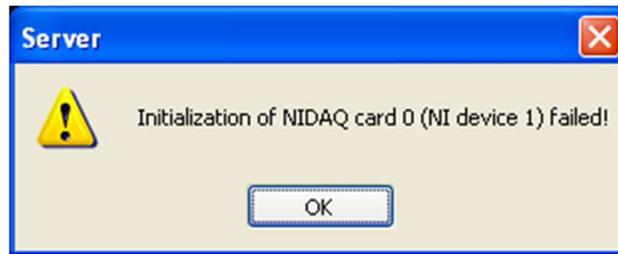
Check to make sure that the timing cable is plugged into the TIM board, the yellow wire (if necessary) is plugged into XS1, and the other end of the timing cable is plugged into the correct port on the breakout board. Remember that if your A/D board is in a chassis you don't plug the timing cable into the breakout board – you plug into the special timing card in the chassis.

Click “Update Server” again to see if your timing signal is being recognized.

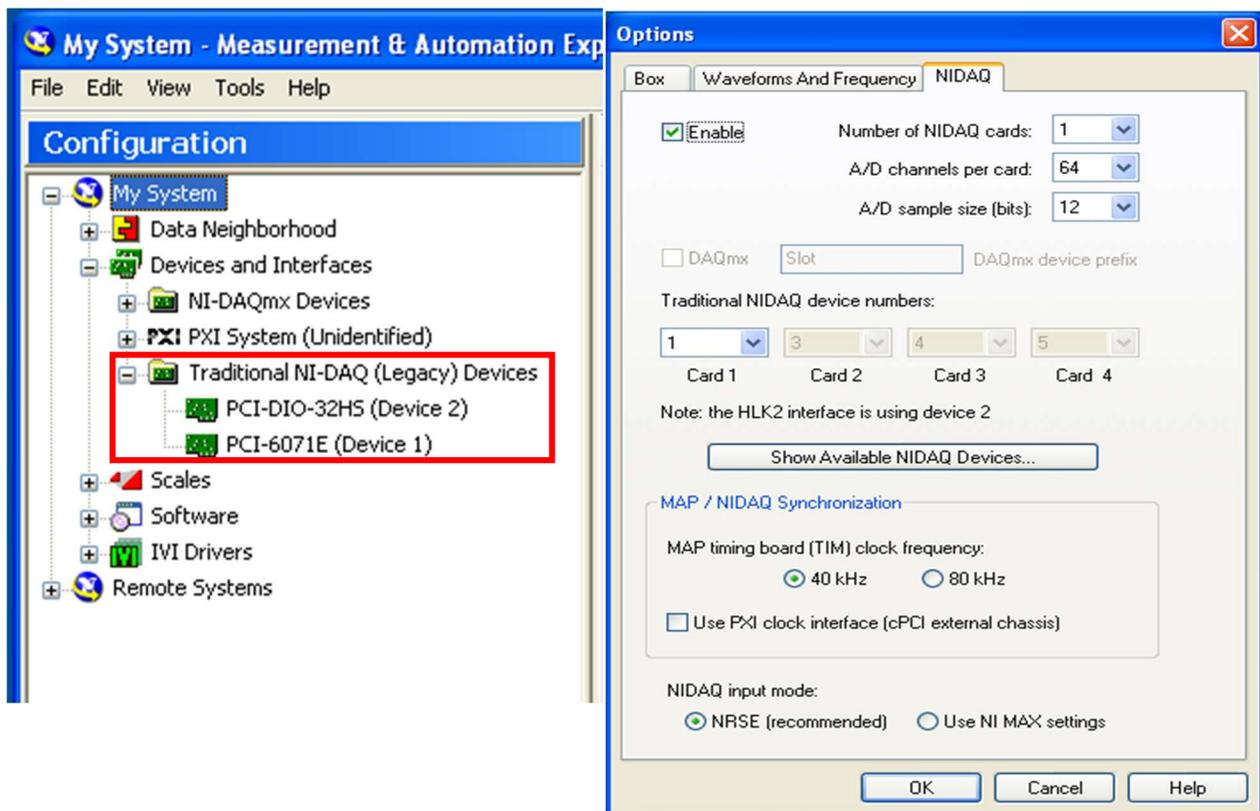
Server version 2.6.0 and above has functionality for verifying that the timing signal is correct. It will warn you if one isn't being received (and it's obvious when it's not). Server will warn you if the frequency is incorrect and suggest how to change the settings.

Initialization of NIDAQ card failed

Server will pop up an error message with a description of which NIDAQ card it attempted to initialize but failed.



This error is most commonly caused by having a device number set incorrectly in Server. Check the A/D board device numbers in NIMAX or the NIDAQ device viewer in Server and match the settings in Server.



If the settings are matched then reboot and try again.

NIDAQ32.DLL not found

If Server insists that a file called nidaq32.dll isn't found then the A/D and MAP connection isn't going to work at all. This means the Traditional NIDAQ drivers aren't installed on the PC. Contact Plexon support (support@plexon.com) for instructions.

Voltages in file not correct

The “Preamp Gain” column in the Analog Channels tab doesn't set gain like “NI Gain” does. The values in this column represent the total gain before the signals get to the breakout board and is calculated by multiplying the headstage gain and the preamp gain together. Most of the time this is 1000x because systems are shipped with a 20x headstage paired with a 50x preamp, or a 1x headstage paired with a 1000x preamp. This isn't always true (especially with older systems). It's important to set the value correctly because this is how the system calculates what the voltage of the signal at the headstage input is (that is to say, before all the gain stages).

1	A/D Frequency:	1000			
2	Update Server				
3	Channel Number	Name	NI Gain	Enable	Preamp. Gain
4	1	AD01	1	<input checked="" type="checkbox"/>	1000
5	2	AD02	1	<input checked="" type="checkbox"/>	1000
6	3	AD03	1	<input checked="" type="checkbox"/>	1000
7	4	AD04	1	<input checked="" type="checkbox"/>	1000

If you're sending in a signal from an eye position system or any other signal not behind an amplifier then you want to set this value to 1.

Remember that the input voltage range of the A/D boards is +/-5 volts. Any signal greater than +/- 5 volts will cause the A/D to clip.

View Analog Devices doesn't populate with devices

If the “View Analog Devices” button doesn't show any devices then open NIMAX and verify the devices are there. Restart Server and the devices will show up. This sometimes happens after adding/removing an NI device.

How to use NI MAX to verify timing and start signals are being received

National Instruments Measurement and Automation Explorer (NI MAX) utility can be used to verify that the clock signal and start pulse are being received by the NI board.

This software has changed in appearance over the years, but the general usage should be the same as what is described below.

Start the MAP Server and SortClient software, and click Start in SortClient to begin data acquisition.

Open the NI MAX software. Select your NI MAP A/D device (typically will have 6071E or 6040E in the name). Click on “Test Panels”, which should be a button on the top row of the interface.

In the Test Panels window, select the “Counter I/O” tab.

The device used in this example is called “Dev 2” but be aware yours might have a different name. Substitute that name when appropriate.

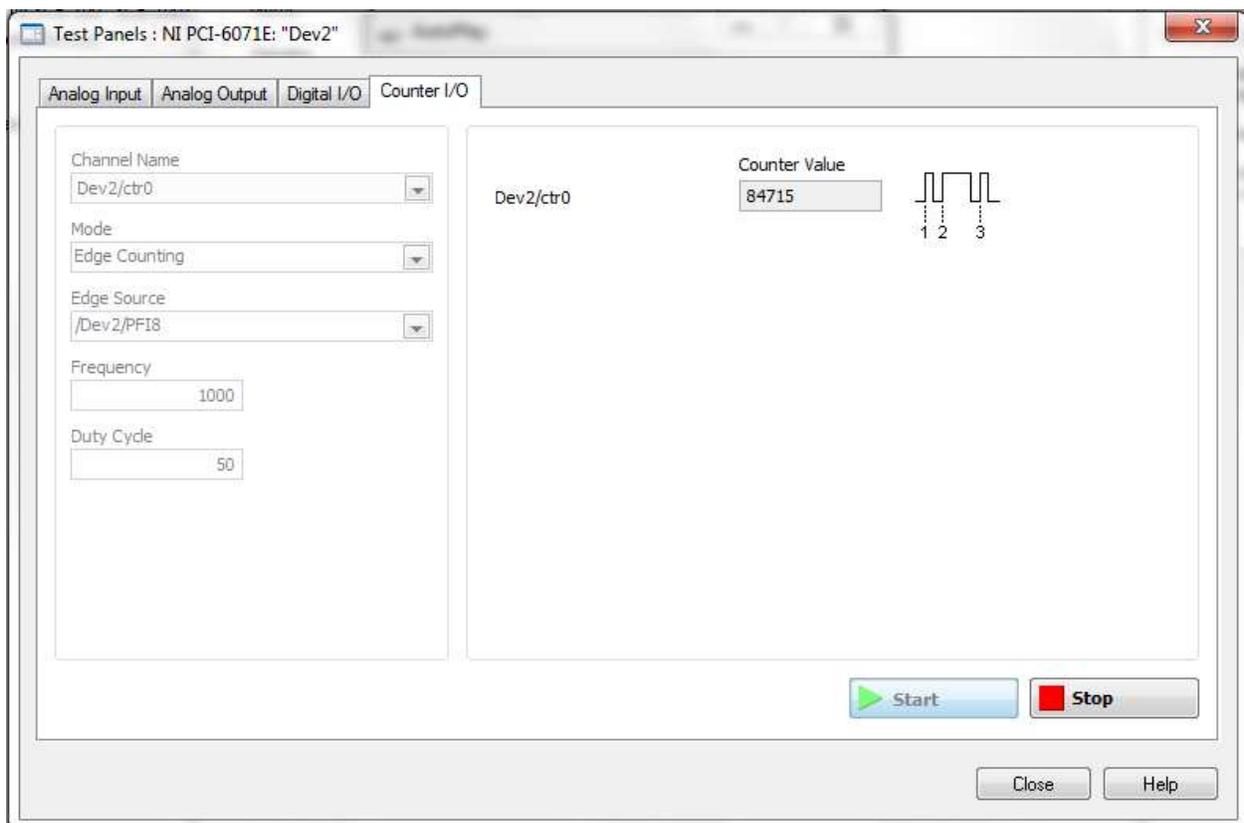
First check that the clock signal from the MAP TIM board is being received by doing the following.

Under “Channel Name” select “Dev2/ctr0”.

Under “Mode” select “Edge Counting”

Under “Edge Source” select “Dev2/PFI8”

Click the “Start” button in the Test Panel window. The “Counter Value” should begin to quickly increase in value. This verifies that the clock signal is being received.



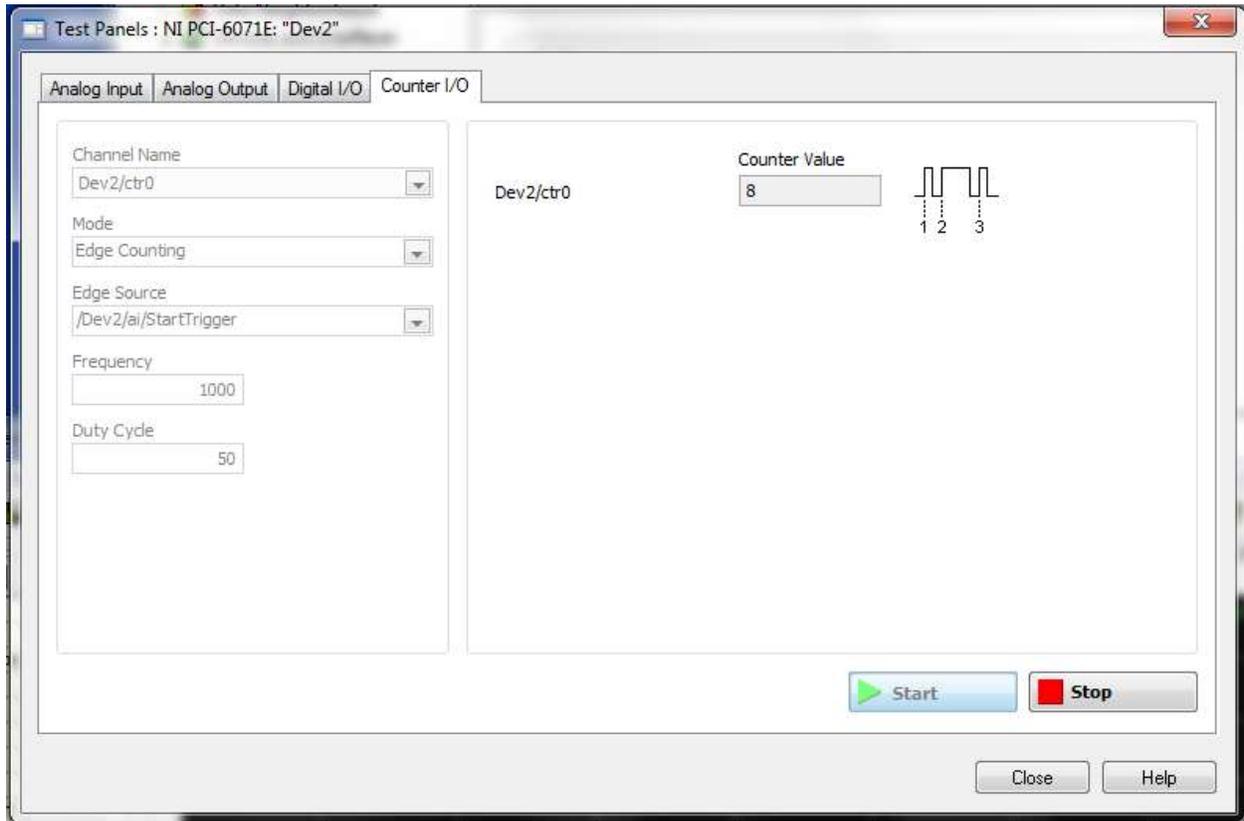
Next check that the “Update Server” signal from the MAP TIM board is being received.

Click the “Stop” button in the Test Panel window.

Under “Edge Source” select “/Dev2/ai/StartTrigger”.

Click the “Start” button in the Test Panel window. In the MAP SortClient, enable some analog channels and click on “Update Server”. The “Counter Value” should increase by 1 every time you click on “Update Server”. Click on it several times to make sure you

can consistently increase the counter value every time it is clicked. This verifies that the Update Server signal is being received.

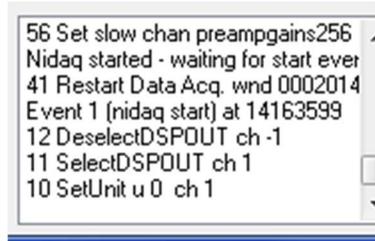


If either of these signals from the MAP TIM board are not being received by the NI board, the problem could be in the MAP TIM board, the cables going to the NI breakout board (SCB-68, SCB-100, PBOB, or CHUB), the cables going from the NI breakout board to the NI board, or the NI board itself. The next step is to use a function generator to probe the output of the MAP TIM board and timing cables. If you don't have the connector information for these boards and cables, contact Plexon support.

MAP Server message when clicking update server

When clicking "Update Server", the MAP Server message window should show a message that says "Nidaq started – waiting for start event" followed by "Event 1 (nidaq start) at". The latter message should include a value that represents the number of clock pulses received by the NI board up to that point.

Subsequent clicks of "Update Server" should show that value increase (since the clock should always be incrementing).



If this is not being displayed in the Server message window, the clock or start signals might not be successfully transmitting from the MAP TIM board to the NI A/D board.

Go through the section “How to use NI MAX to verify timing and start signals are being received” to verify the NI A/D board is receiving the signals.

Document History

April 1st 2011 – V1.0:

- Initial document creation

April 6th 2011 – V1.1:

- Added corrections and pictures

April 7th 2011 – V1.2

- Reworded areas, added clarification

December 21st 2021 – V1.3

- Added instructions for viewing clock and start pulse in NI MAX
- Added expected behavior in MAP Server message window