SYNC1500 Quick Start Guide

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1 | Overview

This quick start guide document is intended to get you up and running quickly in connecting and operating the SYNC1500 clock/trigger driver unit with multiple PX14400 or PX1500 digitizer units for synchronized data acquisition operations.

For this operation, an external trigger is supplied to the SYNC1500. The SYNC1500 provides a common clock to each digitizer's external clock input along with a synchronized trigger to each digitizer's external trigger input. In this way, the data acquisition will be synchronized across the active input channels for the multiple connected digitizers.

The SYNC1500 can support up to a maximum of 5 connected PX14400 or PX1500 digitizers.

The SYNC1500 is factory configured to operate with either the PX14400 family digitizer model **OR** the PX1500 family digitizer model. It is **NOT** possible to use a single SYNC1500 unit with a connected mix of PX14400 and PX1500 digitizers. It is possible to use a single SYNC1500 unit with different configuration models within the same digitizer model family (e.g. SYNC1500 with PX1500-4 and PX1500-2).

It is possible for the SYNC1500 and PX14400 or PX1500 digitizers to operate together while physically installed in separate systems; assuming that all required cable connections can be made between devices and all required software can be run from each system.

For more detailed product and software information, please refer to the following supplied manuals that are distributed with each product model media:

- Signatec SYNC1500 Operators Manual
- Signatec PX14400 Operators Manual
- Signatec PX14400 Scope Application Manual
- Signatec PX1500 Operators Manual
- Signatec PX1500 Scope Application Manual

Note that this document is intended for use with:

- SYNC1500-6 Hardware Revision 2 or later
- PX14400 Hardware Revision 2 or later
- PX1500 Hardware Revision 2 or later

Signatec product hardware revision numbers can be identified in two ways:

1.) The assigned serial number of the product will begin with the number of the hardware revision. Product serial numbers are physically labeled on the product and are also displayed within the provided Signatec Windows software application for the product.

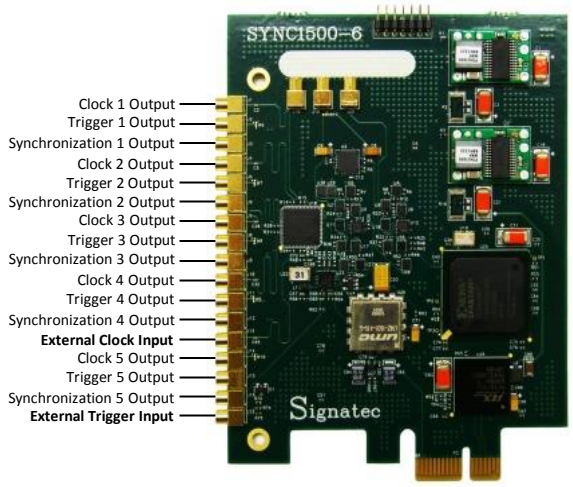
2.) The assigned hardware version number of the product will begin with the number of the hardware revision. Hardware version numbers are factory programmed into the product EEPROM and are displayed within the provided Signatec Windows software application for the product.

2 | Hardware Setup

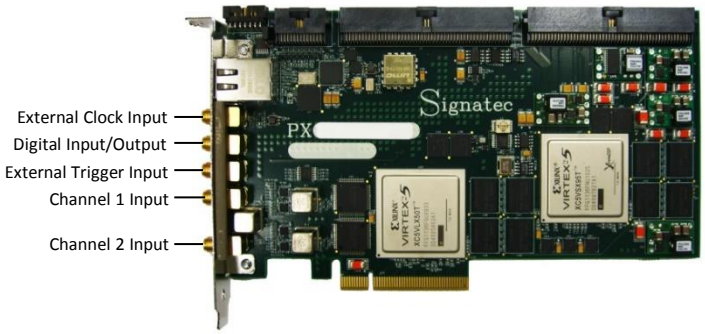
2.1 Signal Connections Identification

The following table identifies the location and description detail of each product model's signal connections. Note that each product model's bracket will have abbreviated labeling for the identified signal connections shown in this table.

SYNC1500 Clock/Trigger Driver



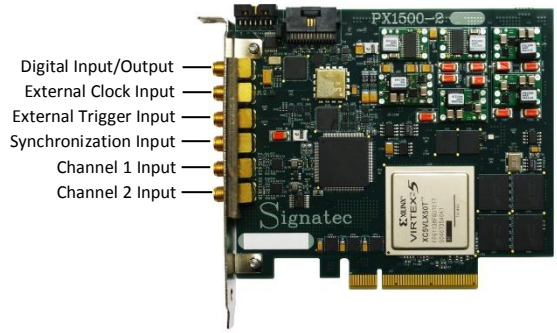
PX14400 Digitizer



Note:

Digitizer may not exactly match above image depending on model configuration. However, identified SMA connectors are the same across all PX14400 digitizer model configurations.

PX1500-2 Digitizer



Note:

Digitizer may not exactly match above image depending on model configuration. However, identified SMA connectors are the same across all PX1500-2 digitizer model configurations.

PX1500-4 Digitizer

Note:

Digitizer may not exactly match above image depending on model configuration. However, identified SMA connectors are the same across all PX1500-4 digitizer model configurations.

2.2 SYNC1500 Cabled Connections to Digitizers

The SYNC1500 is typically supplied with 3-foot length (36 inches / 914.4 mm) 50Ω RG-316 MMCX straight male plug to SMA straight male cables in sufficient quantity to connect each digitizer unit ordered with the SYNC1500.

The MMCX plug ends of the supplied cables should be pushed straight into the MMCX connectors on the SYNC1500. The SMA male ends of the supplied cables should be aligned and tightened to the SMA connectors on the digitizer cards.

For synchronizing multiple PX14400 or PX1500 digitizers, the SYNC1500 must drive 2 of the SMA inputs of each connected digitizer: the External Clock Input (**CLOCK**) and the External Trigger Input (**TRIGGER**).

To connect the 1st digitizer unit:

- Connect the SYNC1500 Clock 1 Output (**CLK 1**) to the 1st digitizer External Clock Input (**CLOCK**).
- Connect the SYNC1500 Trigger 1 Output (**TRIG 1**) to the 1st digitizer External Trigger Input (**TRIGGER**).

To connect the 2nd digitizer unit:

- Connect the SYNC1500 Clock 2 Output (**CLK 2**) to the 2nd digitizer External Clock Input (**CLOCK**).
- Connect the SYNC1500 Trigger 2 Output (**TRIG 2**) to the 2nd digitizer External Trigger Input (**TRIGGER**).

To connect the 3rd digitizer unit:

- Connect the SYNC1500 Clock 3 Output (**CLK 3**) to the 3rd digitizer External Clock Input (**CLOCK**).
- Connect the SYNC1500 Trigger 3 Output (**TRIG 3**) to the 3rd digitizer External Trigger Input (**TRIGGER**).

To connect the 4th digitizer unit:

- Connect the SYNC1500 Clock 4 Output (**CLK 4**) to the 4th digitizer External Clock Input (**CLOCK**).
- Connect the SYNC1500 Trigger 4 Output (**TRIG 4**) to the 4th digitizer External Trigger Input (**TRIGGER**).

To connect the 5th digitizer unit:

- Connect the SYNC1500 Clock 5 Output (**CLK 5**) to the 5th digitizer External Clock Input (**CLOCK**).
- Connect the SYNC1500 Trigger 5 Output (**TRIG 5**) to the 5th digitizer External Trigger Input (**TRIGGER**).

NOTE: It is **NOT** necessary to supply any connections to the SYNC1500 card's Synchronization Output (SYNC) channels, as these connections are **NOT** required for Revision 2 based hardware products.

2.3 SYNC1500 Cabled Connection to External Trigger Source

The SYNC1500 is typically supplied with a single 4-foot length (48 inches / 1219.2 mm) 50Ω RG-316 MMCX straight male plug to BNC straight male plug cable for use in connecting an external trigger source to the SYNC1500.

The MMCX plug end of the supplied cable should be pushed straight into the MMCX connector on the SYNC1500. The BNC straight plug end of the supplied cable should be aligned and tightened to the BNC connector of the end user's equipment that will be providing the external trigger source.

An external trigger source (from end user's provided equipment) must be connected to the SYNC1500's External Trigger Input. This supplied trigger source will then be broadcasted to all of the connected PX14400 or PX1500 digitizer units in a synchronous way.

To connect the external trigger source:

- Connect the external trigger source output (from end user's provided equipment) to the SYNC1500 External Trigger Input (**TRIG IN**).

2.4 Digitizer Cabled Connections to Acquisition Input Sources

Signatec PX14400 or PX1500 digitizers are typically supplied with 4-foot length (48 inches / 1219.2 mm) 50Ω RG-58 SMA straight male to BNC straight male cables in sufficient quantity to connect each digitizer's analog channel inputs.

The SMA male ends of the supplied cables should be aligned and tightened to the SMA connectors on each of the digitizer card's analog input channels. The BNC straight plug end of the supplied cables should be aligned and tightened to the BNC connectors of the end user's equipment that will be providing the analog input source signal for each digitizer analog input channel.

3 | Configuration for SYNC1500 with PX14400 Digitizers

The configuration and operation of both SYNC1500 and PX14400 devices are conducted from their respective software applications:

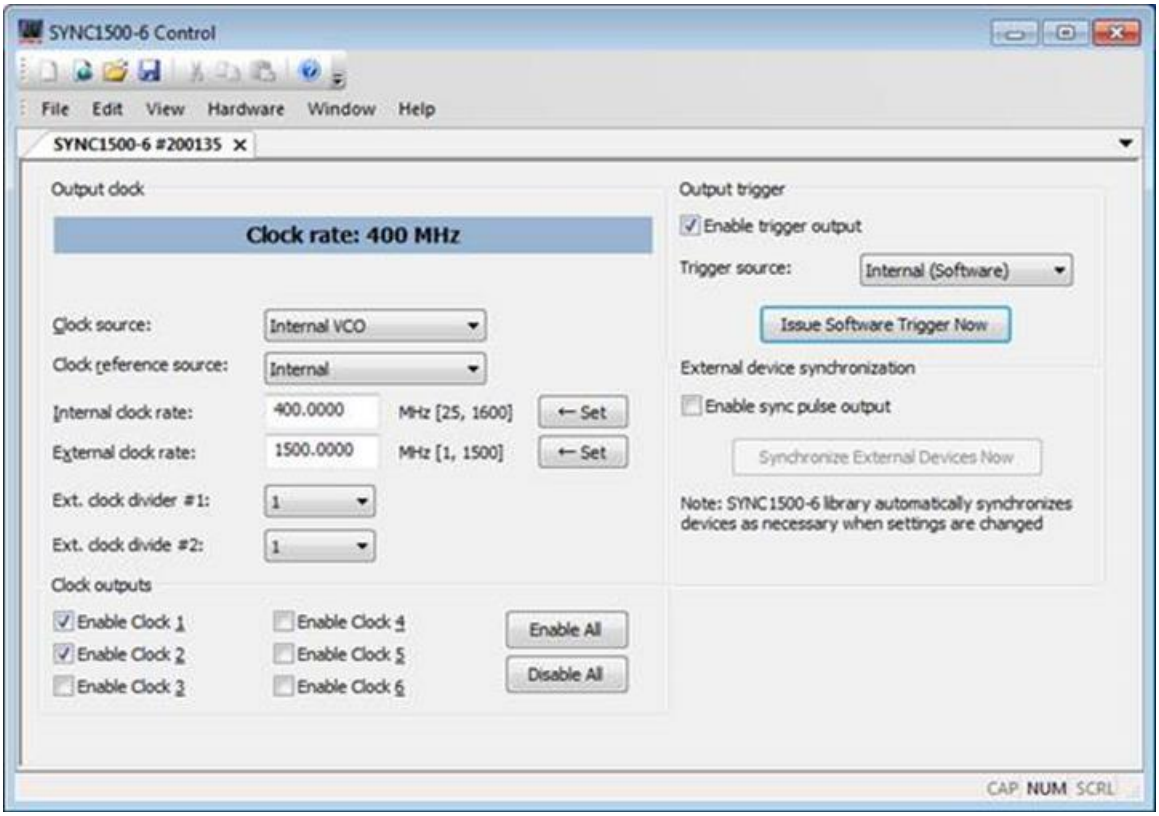
- Signatec SYNC1500 Control Application
- Signatec PX14400 Scope Application

3.1 | SYNC1500 Control Application Settings

The SYNC1500 card needs to be configured using the SYNC1500 Control Application software. Basic SYNC1500 card configuration involves making the following selections in the main software control panel:

Software Item	Item Selection
Clock source	Select option to specify: **Internal VCO**
Clock reference source	Select option to specify: **Internal**
Internal clock rate	Enter targeted clock rate value. **NOTE:** Valid clock rate value ranges for use with the PX14400 are 20 MHz (minimum) to 276 MHz and 309 MHz to 400 MHz (maximum). The range of 277 MHz to 308 MHz is an un-settable range for the PX14400.
Clock outputs	In this section, place a checkmark for each SYNC1500 clock output that is physically cable connected to each PX14400 card's clock input.
Output trigger	In this section, place a checkmark in the box to enable trigger output. For the trigger source setting, select option to specify: **External**. The external trigger source (from end user's provided equipment) must be physically cable connected to the SYNC1500's External Trigger Input for this setting. Alternatively, the trigger source setting can be selected for the option to use an Internal (Software) based trigger. An internal software based trigger is useful for operational testing when an external trigger source is not available. When selected, the Issue Software Trigger Now button is enabled and will issue a software trigger when clicked.

The image below shows a typical SYNC1500 Control Application settings configuration for use with 2 PX14400 cards utilizing a 400 MHz internal clock rate and internal software trigger:



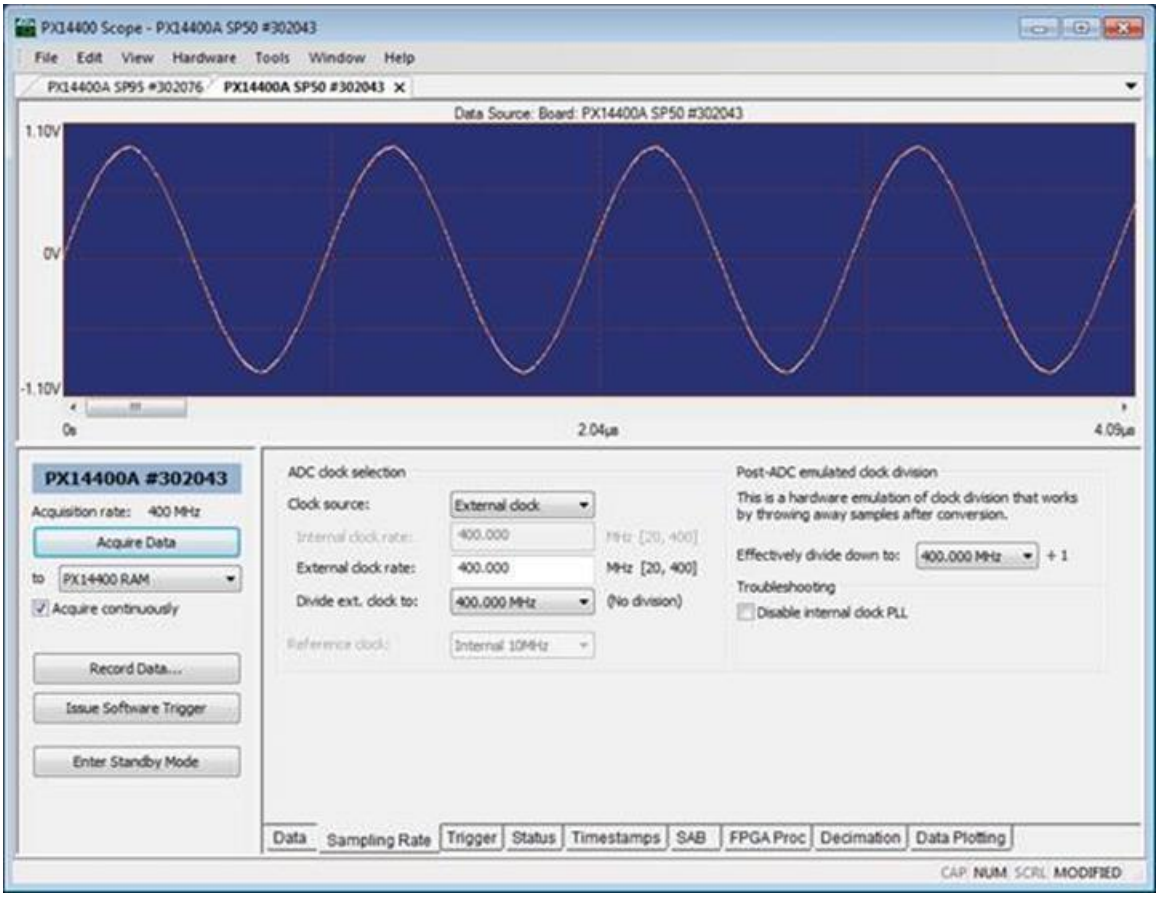
3.2 | PX14400 Scope Application Settings

The PX14400 cards need to be configured using the PX14400 Scope Application software. PX14400 card configuration for use with SYNC1500 operation requires making the following selections:

On the **Sampling Rate** tab interface for <u>each</u> connected PX14400 card:

Software Item	Item Selection
Clock source	Select option to specify: **External clock**
External clock rate	Enter the external clock rate value that exactly matches the targeted SYNC1500 output clock rate value (as specified in the SYNC1500 Control Application).

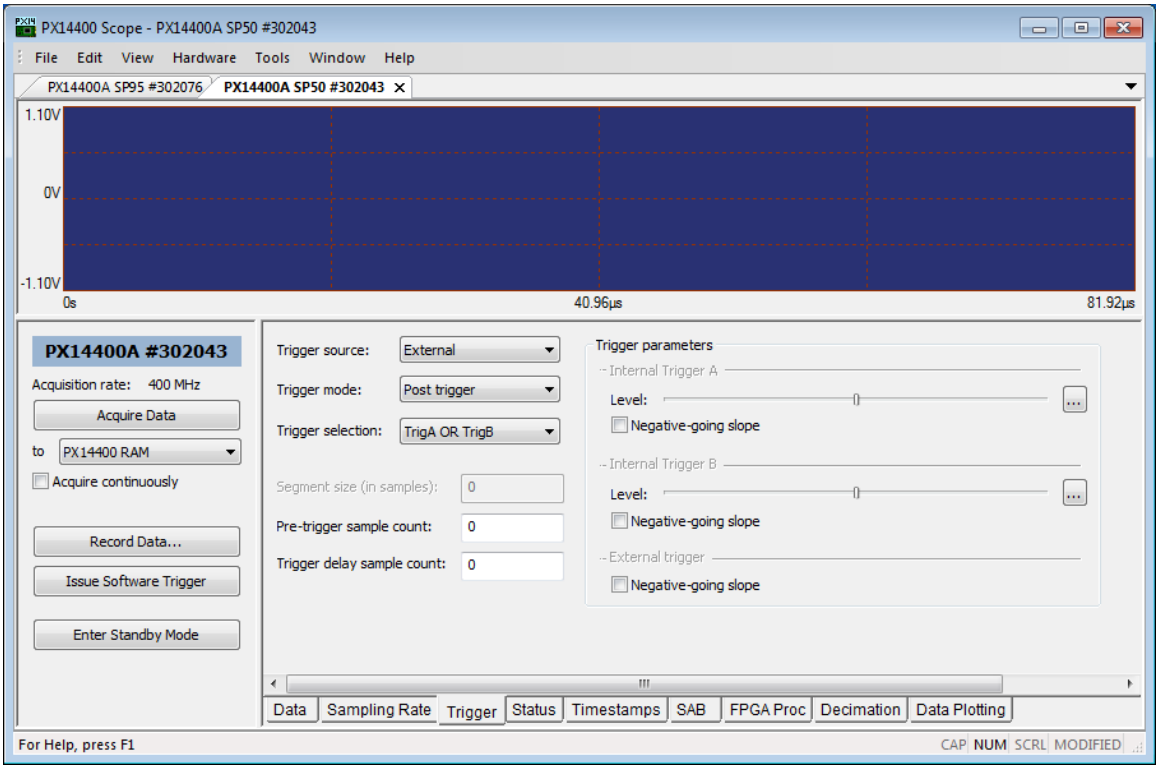
The image below shows the Sampling Rate tab interface in the PX14400 Scope Application with the proper settings configuration for use with the SYNC1500 with a specified external clock source setting and, in this example, a matching 400 MHz external clock rate. Note the two PX14400 tab selectors towards the top of the Scope Application that is used to select each PX14400 card with serial number identification. Each PX14400 card must be selected and have the same specified settings configuration applied in the Sampling Rate tab for each card.



On the **Trigger** tab interface for **each** connected PX14400 card:

Software Item	Item Selection
Trigger source	Select option to specify: **External**

The image below shows the Trigger tab interface in the PX14400 Scope Application with the proper settings configuration for use with the SYNC1500 with a specified external trigger source setting. Note the two PX14400 tab selectors towards the top of the Scope Application that is used to select each PX14400 card with serial number identification. Each PX14400 card must be selected and have the same specified settings configuration applied in the Trigger tab for each card.



4 | Configuration for SYNC1500 with PX1500 Digitizers

The Signatec PX1500 Scope Application software can be used to configure and operate BOTH the SYNC1500 and PX1500 devices.

4.1 | PX1500 Scope Application Settings

The PX1500 Scope Application software must first be configured so that it knows which PX1500 devices are connected to which SYNC1500 outputs. This is done with the following steps:

1.) In the menu bar at the top of the PX1500 Scope Application, select the "Hardware" menu item and then select the sub-menu item "External Synchronization Device Manager…". This will open the External Synchronization Device Manager window for managing SYNC1500 configuration settings.

2.) In the "External synchronization devices:" window on the left, select a listed SYNC1500 device to target the configuration settings for that specific SYNC1500 device.

3.) In the "Selected SYNC1500-6 device settings" section on the right: for each SYNC1500 output # device channel that is connected to a PX1500 device, select the appropriate targeted PX1500 device in the corresponding drop down menu.

4.) Then select the "Close" button to exit out of the External Synchronization Device Manager window.

Next, the PX1500 cards need to be configured for use with SYNC1500 operation by making the following selections:

On the **Sampling Rate** tab interface for the PX1500 card, make the following selection:

Software Item	Item Selection
Clock source	Select option to specify: **External clock**

On the **Trigger** tab interface for the PX1500 card, make the following selection:

Software Item	Item Selection
Trigger source	Select option to specify: **External**

Each connected PX1500 card must have the above settings specified. The fastest method to apply the same settings made for one PX1500 card to the remaining available PX1500 cards is to right-click on the identified PX1500 tab serial number of the card just configured and then select "Apply Board Settings to All Other Cards" from the pop-up menu; this operation may take a few seconds to complete.

All the PX1500 cards are now configured to use the supplied external clock and trigger from the SYNC1500.

Next, the targeted clock rate to be used for the operation should be applied on the PX1500 **Sampling Rate** tab interface:

Software Item	Item Selection
External clock rate	Enter the desired targeted external clock rate value to be used for the operations. **NOTE:** The valid clock rate value range for use with the PX1500 is from 200 MHz (minimum) to 1500 MHz (maximum). Any time the external clock rate setting value is changed, the underlying software will automatically configure the clock rate of the SYNC1500 and configure all connected PX1500 devices so they are aware of the new clock rate to be applied.

4.2 | PX1500 Manual SYNC Alignment Adjustment

Although the PX1500 cards will now all run on the same clock source, there still might be a current 1-to-8 sample shift between PX1500 cards. In order to eliminate this delay, a manual SYNC operation needs to be performed on **each** PX1500 card by following these steps with a special troubleshooting mode of the PX1500 Scope Application software:

CAUTION: Please take care when using the "Troubleshooting" mode interface. This "Troubleshooting" mode tab interface is intended for internal support operations and provides direct interfaces into the board. Improper use of the "Troubleshooting" tab may potentially cause damage to the board. Please only follow the steps provided below for use with the "Troubleshooting" tab.

1.) Exit out of the PX1500 Scope Application software. Note that all applied PX1500 settings will still remain intact as long as the system is not power cycled or re-booted.

2.) Locate the desktop icon shortcut for the PX1500 Scope Application software. Right-click on the PX1500 Scope Application shortcut and select "Properties" from the pop-up menu to open the shortcut's properties window. Select the "Shortcut" tab and then in the "Target" text box, append the existing target path with the **"/unsafe**" attribute at the end of the path as follows for example:

Target Path = "C:\Program Files\Signatec\PX1500\PX4Scope.exe" **/unsafe**

Click "OK" to exit the shortcut properties window.

3.) Now open the PX1500 Scope Application software again. With the "/unsafe" attribute added, you will now notice a new "Troubleshooting" tab interface shown in the PX1500 Scope Application software.

4.) Verify that all of the applied PX1500 settings are still correct with the Sampling Rate tab's clock source setting set to "External clock" with the desired external clock rate value entered, and with the Trigger tab trigger source setting set to "External".

5.) Now go to the "Troubleshooting" tab and click the "**Synchronize ADCs Now**" button located on the far bottom right-hand side. Then click the "**Reset DCMs Now**" button. Repeat this step for each connected PX1500 card in the system.

6.) Now the PX1500 cards are ready to receive the trigger event from the SYNC1500 and repeating triggers should always be on the same position.

These steps aligns the clock and the ADC FIFO's so all have the exact same latency on processing samples as well as processing trigger pulse.

NOTE: A future software release will automate this operation so that use of these troubleshooting tab steps will no longer be required.

5 | Taking Synchronized Acquisitions

Once all PX14400/PX1500 acquisition cards have been setup, the PX14400/PX1500s are ready to take acquisitions. Turn on the external trigger source if it is not powered yet (the external trigger source must be connected to the TRIG_IN input of the SYNC1500 card).

To confirm that all the acquisition settings are sound and the cables connected properly, take an acquisition by pressing the "**Acquire (and Display) Data**" button located on the left hand side control panel of the PX14400/PX1500 Scope application software. Acquired data should display on the scope panel screen right away if the trigger source is sending triggers to the SYNC1500 and all the acquisition settings and cable connections are correct. Walk through the PX14400/PX1500 cards and acquire data on all of them to make sure the system is operating normally.

Once the PX14400/PX1500 cards are setup to work with the SYN1500 they can be used independently and many settings can be adjusted before taking acquisitions: acquisition size, number active channels, trigger mode and trigger settings, etc. When doing synchronized recordings using multiple cards, the number of active channels, trigger mode and trigger settings, etc. will probably be identical for all the cards used in the recording; though it is not necessary.

NOTE for PX1500: If all the PX1500 cards are taking data properly, then the Workspace can now be saved selecting "Save Workspace As …" from the File Menu. This workspace file will contain all the PX1500 cards' settings, even if different for each card, and configure each PX1500 automatically when opened again later.

NOTE for PX14400: The PX14400 Scope Application software does not currently have the option to save an entire workspace. However, each individual PX14400 card's settings can be saved by selecting "Save Board Settings As…" from the File Menu. The individual PX14400 card settings can then be re-applied by using these saved settings file in the PX14400 Scope Application software later.

See the PX14400/PX1500 Scope Application Manual for more details on Scope Application software features.

6 | Taking Synchronized Recording Sessions

A recording session will continuously stream acquisition data from the PX14400/PX1500s to a targeted data storage system for signal data recordings.

Before starting a recording session it is recommended to verify that all the cables are connected properly and the setup of the PX14400/PX1500 cards is correct by taking acquisitions as described in Section 5.

To start a recording session press the "Record Data …" button located in the control panel on the left-hand side of the PX14400/PX1500 Scope Application. The Recording window will open with options to: select which PX14400/PX1500s will be recorded, set the destination file for each card, and set the duration of the recording based on amount of data to record in samples or a specific time in milliseconds.

The PX14400/PX1500 digitizer devices, in the device listing, will all be selected by default for the recording operation.

In the 'Destination file' box, specify a destination target file name and path for the recorded data. Note that you can select the open folder icon to open a Windows file dialog box to browse to an appropriate target location where to save the data file with a specified file name. The targeted destination location should be specified to target a high-speed storage device to support the fastest data streaming rates possible.

The Recording type option should always be selected to "**Acquire data directly to the host PC, buffering with device RAM**". This recording type option is used to record one long continuous stream of data (or one long continuous stream of discrete data segments if in segmented mode) in which the device RAM is used to buffer the data during recording. This is the most common type of data recording.

The duration of the recording is determined by the settings in the 'Recording duration' group box. There are currently three types of duration supported.

- Infinite - Recording goes on indefinitely until manually stopped by the operator or targeted storage space has been exhausted.

- This much - Records the amount of data specified, per PX1400/PX1500 device. Note: gibi-, mebi-, and kibi- prefixes denote 1073741824 (2^{30}), 1048576 (2^{20}), and 1024 (2^{10}) respectively.

- By time (in milliseconds) - Converts the given time into an equivalent sample count (which is a function of acquisition rate) and then records that much data. It should be noted that the specified time value entered is the entire time period of recorded data, not including the time to wait for a trigger event.

Regardless of the recording duration type selected, a recording may be manually stopped by clicking the 'Stop Recording' button on the Recording window after the data recording has started. All files are normally saved and closed when a recording is stopped this way.

The 'Display snapshot of recording data' is generally selected by default. The 'Display snapshot of recording data' will result in a snapshot of the current recording data being displayed in the plot area of the Scope application. By default, an 8192 point snapshot will be obtained roughly once a second. Selecting 'Snapshot Options' will open a dialog that can be used to control the size and frequency of the recording data snapshot.

Once all recording parameters have been set, a recording is started by clicking the 'Begin Recording' button. The Scope application and underlying PX14400/PX1500 library/driver code will manage all aspects of the recording.

The 'Recording statistics' group contains current recording statistics that include:

- Elapsed time – The current total amount of time that has occurred since the start of the recording.

- Amount recorded – The current total amount of data that has been recorded from all active devices and all active number of channels since the start of the recording. Note that the individual device amount recorded is detailed in the 'State' column in the device listing table.

- Throughput – The current total averaged data throughput per second from all active devices and all active number of channels since the start of the recording. Note that the individual device data throughput is detailed in the 'State' column in the device listing table.

- Recording progress bar for concrete-length recordings.

See the PX14400/PX1500 Scope Application Manual for more details on Scope Application software features.

6.1 | General Considerations for Recording Sessions

There are a few items to keep in mind when setting up a synchronized recording of multiple PX14400/PX1500s:

- Verify that the total data throughput rate per card is kept at or below the maximum sustained PCIe data rate of the digitizer card model specification:

    - PX14400 = Maximum PCIe sustained data streaming rate is 1.4 GB/s (or 700 MS/s; 2 bytes per sample for 14-bit data). This is the total maximum data rate shared across all active input channels per card.

    - PX1500 = Maximum PCIe sustained data streaming rate is 1.4 GB/s (or 1.4 GS/s; 1 byte per sample for 8-bit data). This is the total maximum data rate shared across all active input channels per card.

- Note that the maximum supported sampling rates for data streaming recordings is also dependent on the host PC workstation and the targeted high-speed storage system for the recordings. A FIFO overflow error message during a conducted data recording may indicate that the host PC and/or targeted storage system is not capable of sustaining the high-speed data rates. In which case, the targeted sampling clock rate setting should be reduced to a lower value until a suitable rate can be found that the system can sustain.

  Signatec provided Sig-Station based systems are high-performance PC workstations designed specifically for integrating Signatec advanced instruments and maximizing their operational performance to support the highest sampling rates possible for data streaming recordings for the targeted application.

- If no data is recorded or the throughput of the recording is very low it may be caused by a bad external trigger source or no trigger present. An unused trigger output of the SYN15000 can be connected to an oscilloscope to verify that the triggers are present. The trigger outputs of the SYNC1500 card are LVPECL,

so the oscilloscope input must be set to 50 ohms or termination must be provided in some other fashion for the trigger to display properly.

- When a recording is started, the software will walk through the PX14400/PX1500 cards arming one by one in sequence, but an armed card will start its acquisition as soon as it receives a trigger (even if the rest of the cards are not armed yet). If the PX14400/PX1500 cards are setup to do segmented acquisitions, this early trigger condition will result in the triggered card(s) acquiring some segments in the front of the recording (one segment per trigger compared to unarmed cards).

  Care must be taken to guarantee that the trigger source equipment (the one providing triggers to the SYNC1500) is powered up (or enabled) **AFTER** all PX14400/PX1500 cards have been armed; that is, arm the external trigger source/hardware only after pressing the "Begin Recording" button, unless you know that the first trigger won't occur anytime soon.

6.2 | View Previous Data Recording Files

The PX14400/PX1500 Scope Application can be used to open and view previously saved data recording files on the "Data Plotting" tab.

On the "Data Plotting" tab, the 'Clear All' button, when clicked, will remove all existing displayed data plot sources from the Scope plot area. This includes displayed PX14400 RAM data, recording snapshots, and external files.

The 'Add…' button, when clicked, will allow the operator to select a saved data file to plot in the Scope panel. When a file is selected, the Scope Application will check to see if a corresponding SRDC file is available and if present, data type and channel count will be obtained from the SRDC data.

The 'Remove Sel.' button, when clicked, will remove only the source of the data plot that is currently selected within the Plot Source listing table window.

The 'Source Info…' button, when clicked, will open up a property page that displays information on the currently selected data source within the Plot Source listing table window that is retrieved from the SRDC file including any detailed Operators notes.

6.3 | PX14400 Data Recording File Format

Signatec recorded data files are saved in a raw binary data format and contain only sample data within the file; there is no file header or additional information contained in the data file.

PX14400 Data files are identified with a RD16 (Raw Data 16-Bit) moniker with the '.rd16' file extension ending on the data file name.

Samples in .rd16 files are 16-bits in size; however, for recorded PX14400 14-bit data, only the lower 14-bits are relevant (the upper two bits will always be zero). The first two bytes of the file are the first data sample. For saved multi-channel acquisition data, the file's sample data will be in a sample-interleaved format; for example:

Ch1, Ch2, Ch1, Ch2, Ch1, Ch2, etc.

PX14400 data samples are little-endian (the native binary format for the x86 platform), unsigned 16-bit integral values. Since samples are unsigned, this means that sample values can go from 0 to 65532 (or FFFC in hexadecimal):

- A sample value of 0 is equivalent to the minimum input voltage.
- A sample value of 32768 (decimal) is equivalent to approximately 0V.
- A sample value of 65532 (decimal) is equivalent to the maximum input voltage range.

A general formula for converting a sample value to its corresponding input voltage is:

$V_s = -R/2 + ((S / 65532) * R)$

Where:

- V_s is the voltage for a particular sample
- R is the input volt range selection in peak-to-peak voltage
- S is the sample value.

So for a sample value of 8192 @ 1V input voltage range:

$V_s = -1/2 + ((8192 / 65535) * 1) = -0.375V$ or -375mV

As RD16 files contain only raw data, they can be imported into MATLAB. Note that the Signatec data samples are unsigned values. When reading the binary data into MATLAB, use "uint16" to import the data as unsigned 16-bit format. To center the data around 0 after the data is read in, subtract 32768 from each sample value.

See the PX14400 Operators Manual for more details on the PX14400 Acquisition Data Format.

6.4 | PX1500 Data Recording File Format

Signatec recorded data files are saved in a raw binary data format and contain only sample data within the file; there is no file header or additional information contained in the data file.

PX1500 Data files are identified with a RD8 (Raw Data 8-Bit) moniker with the '.rd8' file extension ending on the data file name.

Samples in .rd8 files are 8-bits in size. The first byte of the file is the first data sample. For saved multi-channel acquisition data, the file's sample data will be in a sample-interleaved format; for example:

Ch1, Ch2, Ch3, Ch4, Ch1, Ch2, Ch3, Ch4, Ch1, Ch2, Ch3, Ch4, etc.

PX1500 data samples are little-endian (the native binary format for the x86 platform), unsigned 8-bit integral values. Since samples are unsigned, this means that sample values can go from 0 to 255 (or FF in hexadecimal):

- A sample value of 0 is equivalent to the minimum input voltage.
- A sample value of 128 (decimal) is equivalent to approximately 0V.
- A sample value of 255 (decimal) is equivalent to the maximum input voltage range.

A general formula for converting a sample value to its corresponding input voltage is:

$V_s = -R/2 + ((S / 255) * R)$

Where:

- V_s is the voltage for a particular sample
- R is the input volt range selection in peak-to-peak voltage
- S is the sample value.

So for a sample value of 128 @ 500mV input voltage range:

$V_s = -(0.5)/2 + ((128 / 255) * 0.5) = \sim 0V$

As RD8 files contain only raw data, they can be imported into MATLAB. Note that the Signatec data samples are unsigned values. When reading the binary data into MATLAB, use "uint8" to import the data as unsigned 8-bit format. To center the data around 0 after the data is read in, subtract 128 from each sample value.

See the PX1500 Operators Manual for more details on the PX1500 Acquisition Data Format.

6.5 | Signatec Recorded Data Context (SRDC) File

The simple raw data binary file format of Signatec PX14400/PX1500 data recording files provides two primary advantages:

1.) First, it is extremely fast to write these files since data is written to the file exactly as it is received from the Signatec digitizer. If the underlying file system (e.g. a high-speed storage system) can keep up with the data rate, data can be streamed from the digitizer card to the file at the highest recording rate supported.

2.) Second, the generic non-proprietary file format of the data allows for other software applications to import and utilize the data easily.

Since the data recording files do not store any context information about the details of the data in the file, a second Signatec Recorded Data Context (SRDC) file is also created with the data recording file.

By default, SRDC files are generated by the PX14400/PX1500 Scope Application with the same file name of the recorded data file but with an added identified '.srdc' file extension ending and resides in the same targeted location path of the recorded data file.

A SRDC file is a small generated XML-based formatted file that contains information about the associated recorded data file that includes items such as channel count, input voltage range, sampling rate, source board, operator notes, or any other user-defined data.

SRDC files are easily read by any XML-aware software or text based editor software application.

See the PX14400/PX1500 Operators Manual for more details on SRDC file contents.