INTRODUCTION

This section provides information about the standard acquisition, triggering, and measurement features of the PXD Series Digitizer. LeCroy PXD digitizers are IVI compliant which means that the structure of commands for setting up, capturing, and reading out waveforms follows the structure defined in Section 4 of the IVI Foundation specification (www.IVIfoundation.org). It is recommended that you review this section prior to programming the PXD modules. Detailed descriptions of LeCroy commands are included in the Driver Help file.

ACQUISITION MODES

The Digitizer has three modes of operation: NORMAL, RIS (Random Interleaved Sampling), and Sequence. These are defined as follows:

Normal

In Normal mode, the Digitizer will input the signals during a specified time window and create a data array with the digitized data, which can be read out by the controller. The user programs the number of points as well as the time window to be digitized on repetitive signals. LeCroy PXD Digitizers come with 256 kpoints of memory as standard. For storing longer single-shot signals, optimal memory of 4 Mpoints or 8 Mpoints/channel can be added. The maximum sample rate is 2 GS/s, and will vary depending on the specific model and the time window setting.

RIS – For Higher Sample Rates

RIS (Random Interleaved Sampling) is an acquisition technique that allows effective sampling rates higher than the maximum single-shot sampling rate. It is used on repetitive waveforms with a stable trigger. The maximum effective Digitizer sampling rate of 50 GS/s can be achieved with RIS by making 100 single-shot acquisitions at 500 MS/s. The bins thus acquired are positioned approximately 20 ps apart. The process of acquiring these bins and satisfying the time constraint is a random one. The relative time between ADC sampling instants and the event trigger provides the necessary variation, measured by the timebase to 5 ps resolution.

The Digitizer requires multiple triggers to complete an acquisition. The number depends on the sample rate: the higher the sample rate, the more triggers are required. It then interleaves these segments to provide a waveform that is up to 50x faster than the single-shot sampling rate. However, the real-time interval over which the Digitizer collects the waveform data is much longer, and depends on the trigger rate and the amount of interleaving required. The digitizer is capable of acquiring approximately 40,000 RIS acquisitions per second.

Segment 1

Segment 2

Segment 3

Final capture
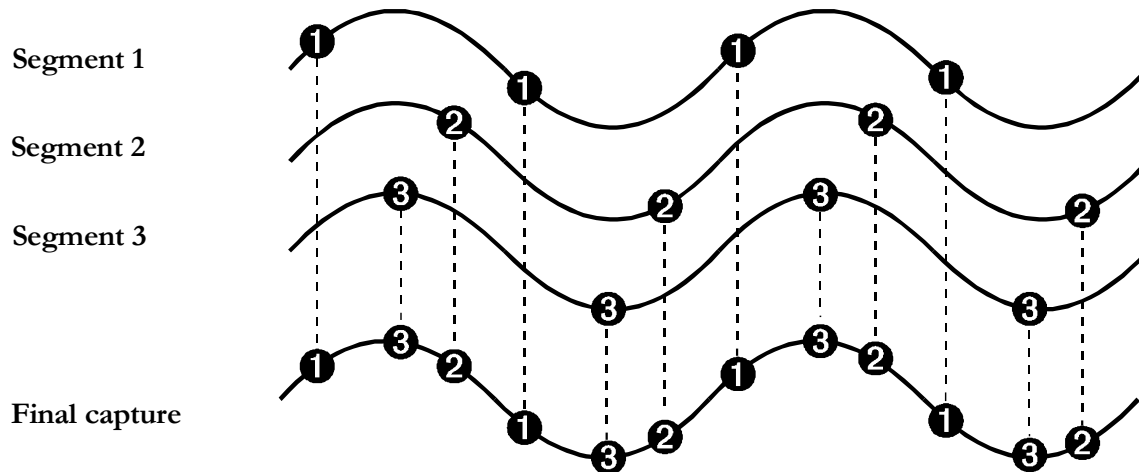
Sequence – Working With Segments

In sequence mode, the complete waveform consists of a number of fixed-size segments acquired in single-shot mode. Select the number of segments to be captured, then select each segment individually. Each trigger fills a new segment.

Sequence offers a number of unique capabilities. With it, dead time is limited between trigger events for consecutive segments. The Digitizer can capture in fine detail complicated sequences of events over large time intervals, while ignoring the uninteresting periods between the events. Time measurements can be made between events on selected segments using the full precision of the acquisition timebase.

Trigger time stamps of 1 ns resolution are given for each of the segments in the Text & Times Status menu. Each individual segment can be read out by the controller.

The Digitizer uses the sequence timebase setting to determine the capture duration of each segment: 10 x time/div. The digitizer uses this setting — with the desired number of segments, maximum segment length and total available memory — to determine the actual number of samples or segments, and time or points.

Segment 1   Segment 2   Segment 2

Trigger   Trigger   Trigger
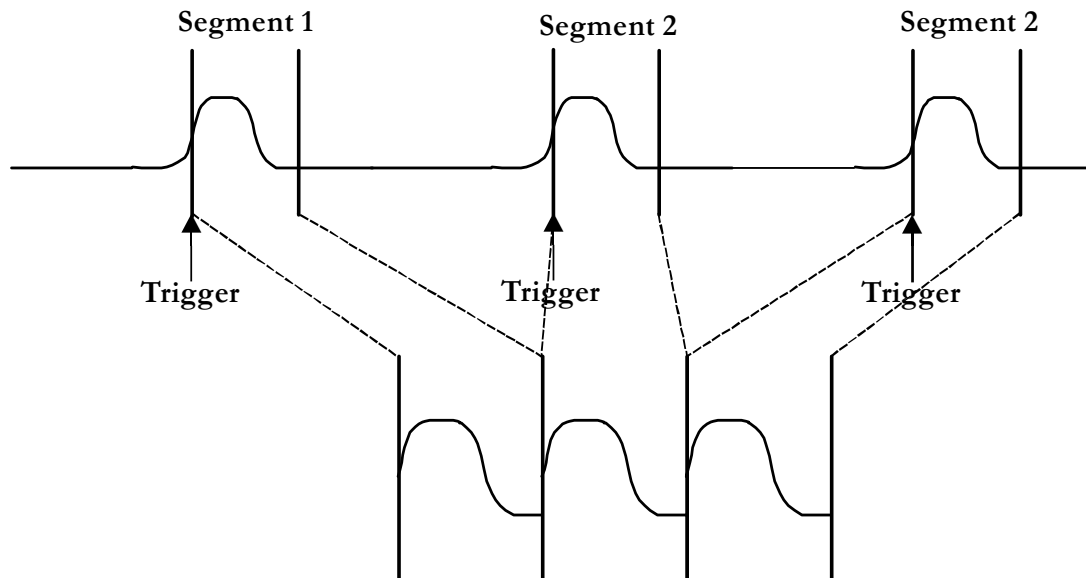
TRIGGER MODES

In all acquisition modes, capturing the signal requires an edge trigger or a trigger generated from the controller. An edge trigger occurs when the trigger crosses the specified trigger level with the specified slope. Trigger setup is IVI compliant and is shown in example programs on the PXD-CD.

PXD IVI CAPABILITY

Group Name	Supported
Base	Yes
Continuous Acquisition	Yes
SampleMode (RIS)	Yes
Average Acquisition	Yes
Trigger Modifier	AUTO and NORMAL Trigger
Interpolation	No
TVTrigger	No
RuntTrigger	No

GlitchTrigger	No
WidthTrigger	No
AcLineTrigger	No
WaveformMeasurement	No
MinMax Waveform	No
ProbeAutoSense	No
AutoSetup	No

For more information and for LeCroy specific extensions see the header file
c:\Vxipnp\WINNT\include\LcPXDIxxx.h, which contains all the instrument driver declarations.

## PXD SERIES DIGITIZER QUICK START APPLICATION SOFTWARE
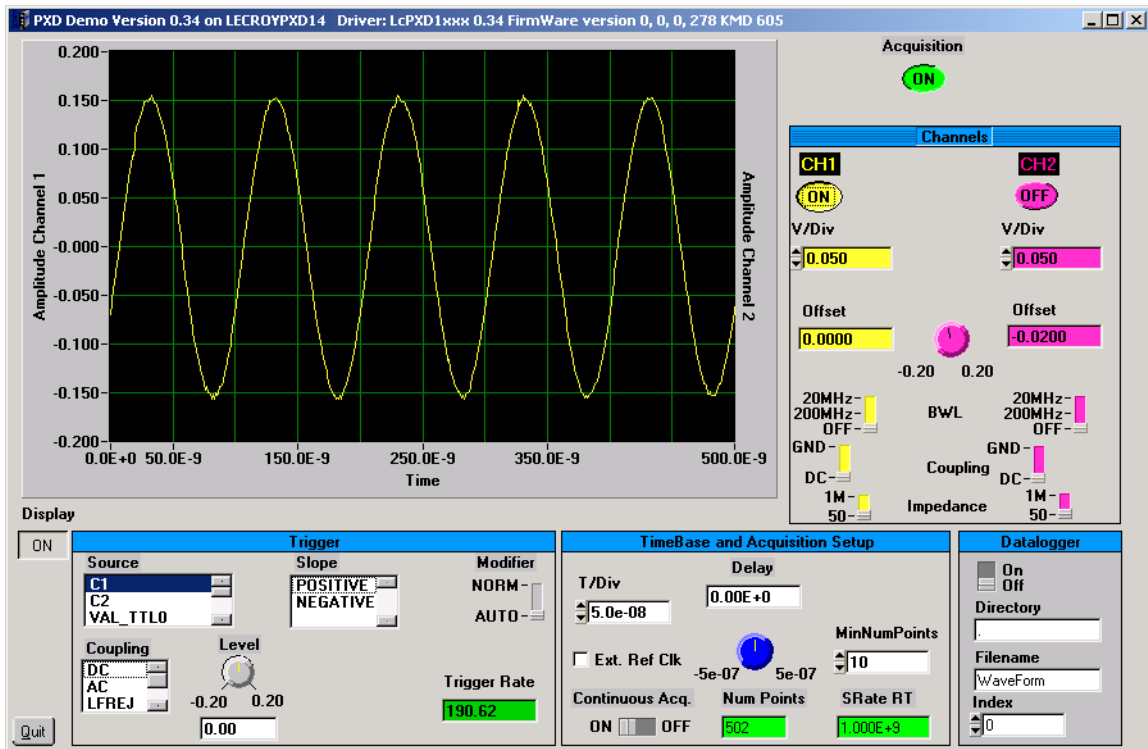
The Quick Start Application software provides an efficient way to view and verify PXD module performance. The simple control panel allows for amplitude adjustment, memory depth and triggering, and a simple logging function. It is intended as a verification tool to ensure that the module installation has been completed.

PXD Series Digitizer

SOFT FRONT PANEL

The Digitizer Quick Start Application software has the following features for one to four channel modules:

- Graphic display with independent vertical axis for each digitizer input channel

- Acquisition section including autosetup and reset

- Channels section with independent control of probe attenuation, Volts/Div, Offset, Bandwidth limit, and coupling

- Timebase section including Time/Div, Delay, and acquisition type as well as indicators for the number of points per acquisition and the sample rate

- Trigger section with source, coupling, slope, type, and level selectors

- Data Logger section to store waveforms to hard drive
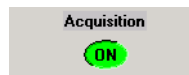
Acquisition: The "Acquisition" indicator is green when data is being acquired and red when the acquisition is stopped.
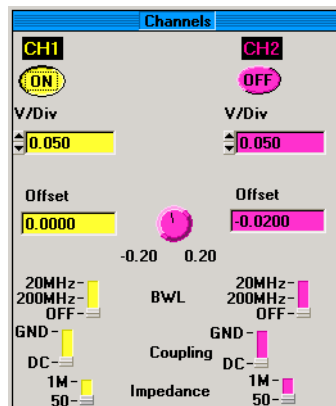
HINT: Typing values in the Offset fields is easier than using the knob.

CH1 and CH2: The channel 1 and channel 2 buttons are used to turn on and off channels 1 and 2. The color of the buttons matches the color of the trace.

V/Div CH1 and CH2: Set the volts per division for each input independently by using the **V/Div** arrows or by selecting a value from the **V/Div** field.

Offset CH1 and CH2: Set the Offset for each input independently using the **Offset** knob or by typing a value in the **Offset** field. The **Offset** knob will change color depending on the channel selected: yellow when channel 1 is selected and red when channel 2 is selected. These colors also match the trace colors in the graphics display.

Bandwidth Limit CH1 and CH2: To suppress high frequency noise on waveforms, limit the bandwidth of the digitizer by selecting a **20 MHz** or **200 MHz** filter. This function smooths the displayed waveform by blocking frequencies above the filter's limit.

Coupling CH1 and CH2: Each channel of the digitizer is set to **DC** coupling by default so that AC and DC signals appear on the display. Select **AC** coupling (in the Trigger control section) to view the AC signal only. Clicking the switch control toggles the selection.
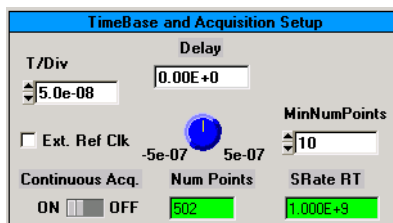

T/Div: The time per division is set by using the **T/Div** arrows or by selecting a value from the **T/Div** field. The Digitizer automatically adapts itself to use the maximum sampling rate whenever the timebase is changed.

Delay: Turn the **Delay** knob to adjust the horizontal position and the amount of pre-trigger, as desired.

Number of Points: This is an indicator that displays the number of points in each acquisition. This will vary automatically depending on the T/Div.

Sample Rate: This is an indicator that displays the sample rate for each acquisition. This will vary automatically depending on the T/Div.
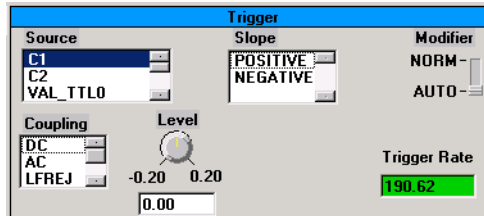
Source: The trigger source for the digitizer may be either of the input channels or the PXI Trigger and Star Trigger lines on the PXI backplane.

Coupling: This sets the trigger coupling for the input channels. **DC** is used when all the signal components (AC and DC) are coupled to the trigger circuit. When **AC** is selected, the signal is capacitively coupled, DC levels are rejected, and frequencies below 50 Hz are attenuated.

Level: Defines the source voltage at which the trigger circuit will generate an event.

Slope: Determines the direction of the trigger voltage transition used to generate a particular trigger event.

Modifier: In **NORM** mode the digitizer will acquire while there is a valid trigger. In **AUTO** mode the trace will automatically be displayed regardless of a valid trigger. When a valid trigger is present in Auto mode, the Digitizer will behave as if in Normal mode.
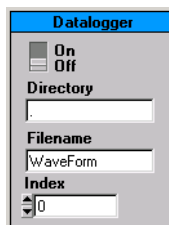
On/off: Turns datalogging on and off.

Directory: Sets the directory for storing waveforms. Entering a period sets the current directory of the Quick-Start Demo; entering another value (e.g., "Test 1") creates a new folder called "Test1" referenced from the current directory.

Filename: Sets prefix for the filename.

Index: An auto-incrementing index is appended to the filename. When the datalogger is turned on, and the program is in Continuous Acquisition mode, each waveform will be stored.

USING THE PXD SERIES DIGITIZER IVI INSTRUMENT DRIVERS

The CD-ROM includes several example programs written in LabWindows/CVI using the PXD Series IVI driver. Even if you are not using CVI, the ".c" files provide practical examples that will help you learn how to program the Digitizer.

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