PDA36AU
PDA Software v1.0.0

User Guide



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Chapter 1 Introduction

1.1 Description

The PDA Software functions as a two-channel oscilloscope, allowing the user to read the photodetector signal and an analog input signal to the detector, in addition to adjusting the trigger and gain settings. The user can use the two-channel oscilloscope in Live, Record, or Playback Mode. Playback Mode allows the user to save data to an external file and read the data from a previously saved file.

Chapter 2 Software Setup

2.1 Software Requirements

The minimum requirements for running the PDA Software are:

- USB 2.0 or Higher Port, Type-A
- Operating System: Windows® 10, or 11 (64-bit)
- Windows SDK 10.0 or Higher
- .NET Framework 4.6.2 or Higher

2.2 Software Installation

The installation package is available from the **PDA36AU webpage** for users to download. The installation includes two components: the PDA36AU Control Software and the libusbK driver, as shown in Figure 1.

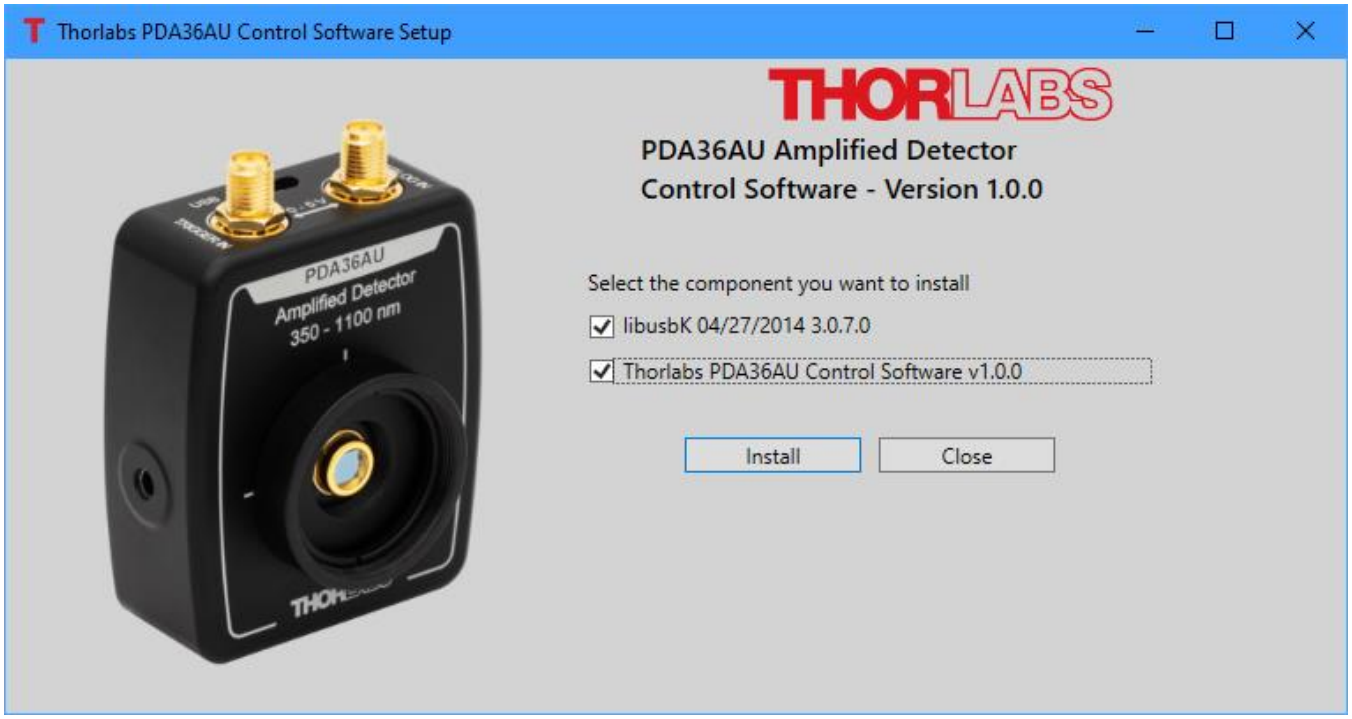


Figure 1 PDA36AU Control Software Installation

The first time the software is installed, both of the components must be installed. The setup checks if another version of the selected component was previously installed. If another version exists, the new installation cannot be completed until the previous version is removed. The application executable and dependencies (DLLs) are installed in C:\Program Files (x86)\Thorlabs\TL_Devices\PDA36AU.

2.3 Software Basics

After installing the PDA36AU control software, a shortcut icon is added to the desktop. The PDA36AU application can be started by double-clicking the desktop icon 

. Figure 2 shows the PDA36AU application prior to connecting a PDA36AU device.

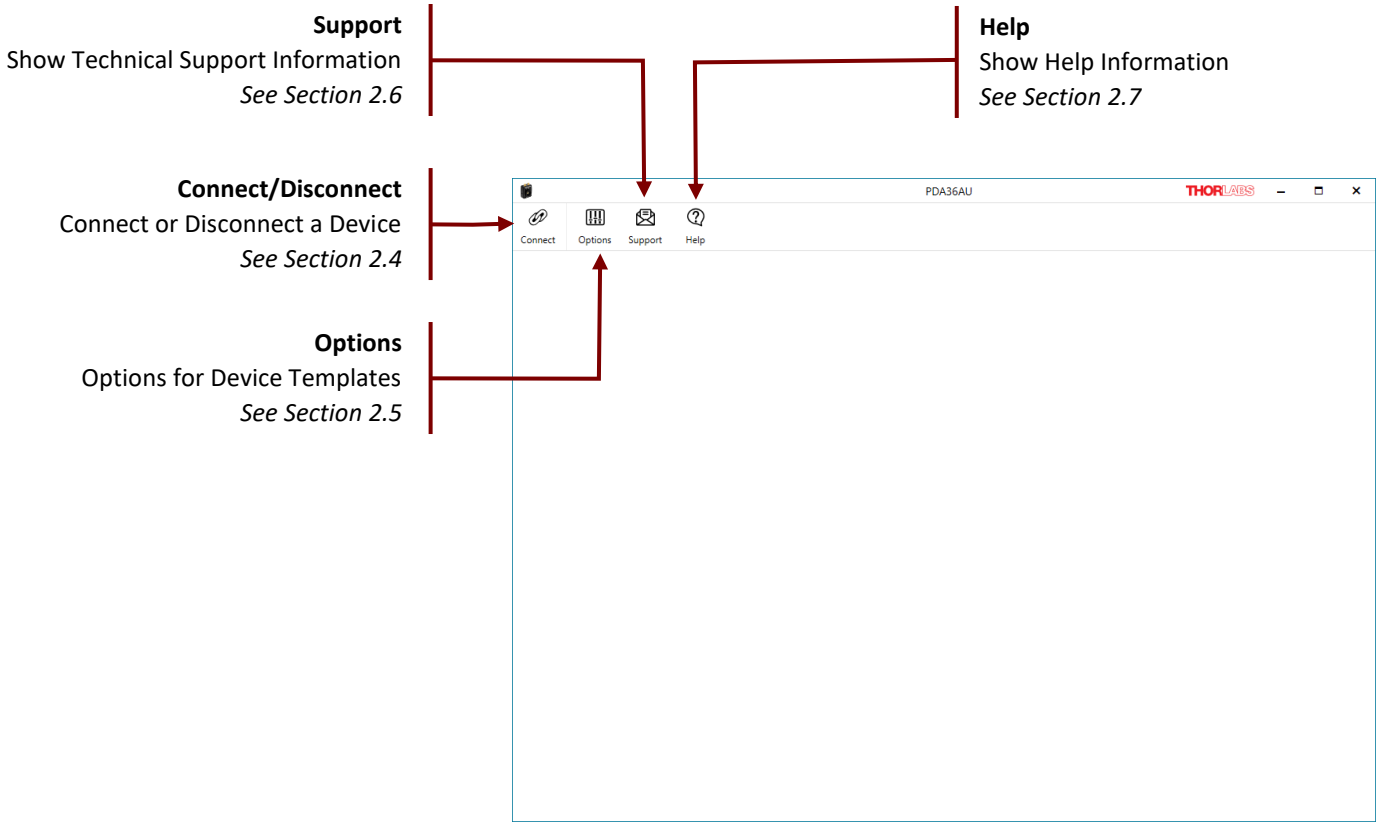


Figure 2 PDA36AU Application Main Window

2.4 Connect / Disconnect

Allows the user to connect or disconnect the PDA36AU detector in the application. See Figure 3.

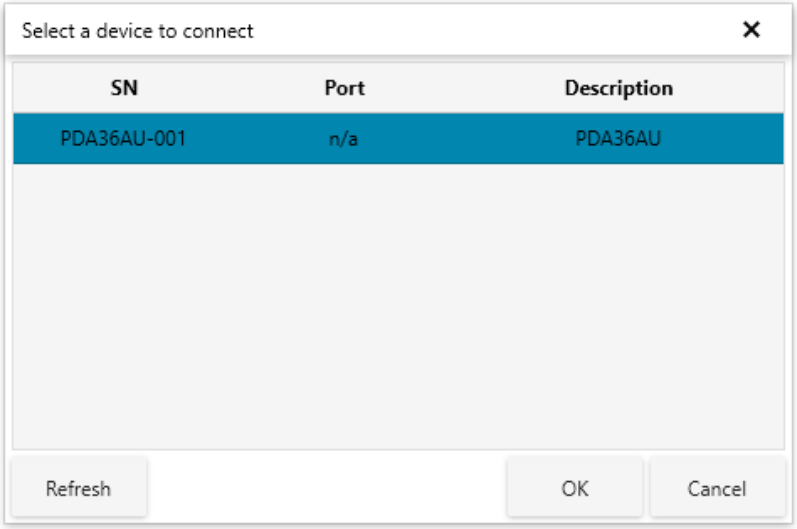


Figure 3 Connect Window

2.5 Options

Opens an options window, as shown in Figure 4.



Figure 4 Options Window

2.6 Support

Brings up the Support window, showing technical support contact and log information.

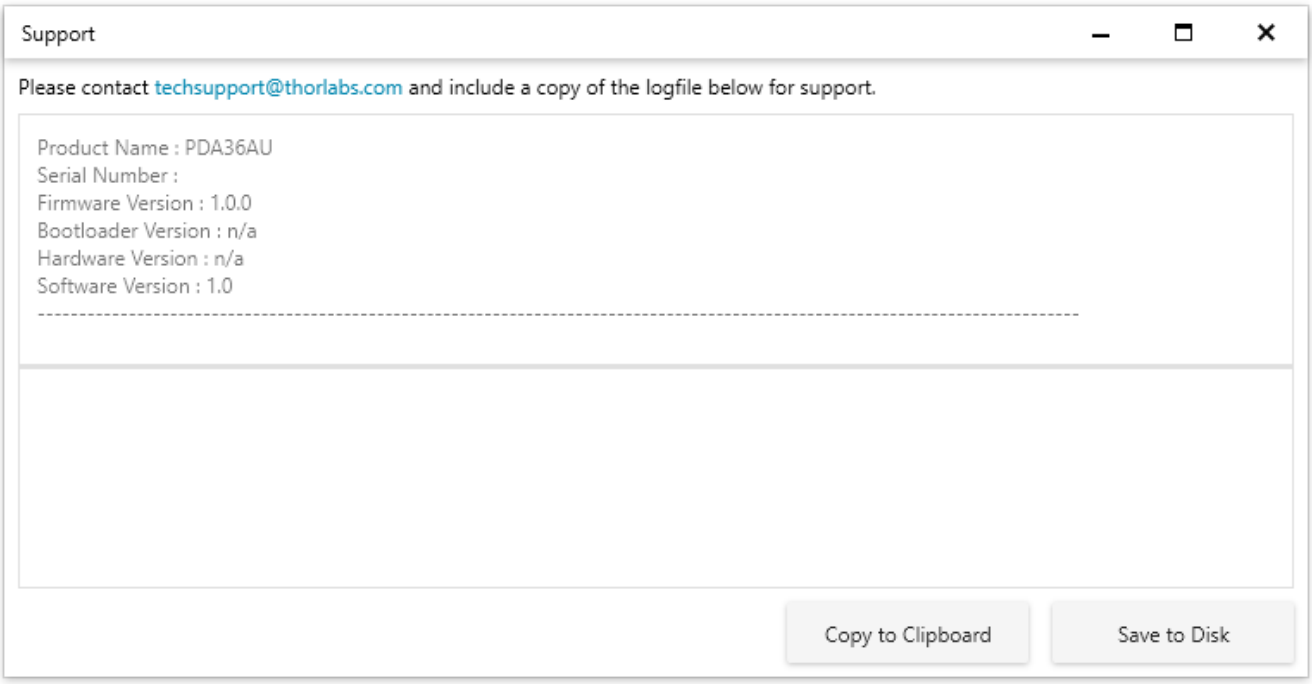


Figure 5 Support Window

2.7 Help

Opens the Help window, which contains the product name, software version, device image, link to the user manual, SDK, and license documents.

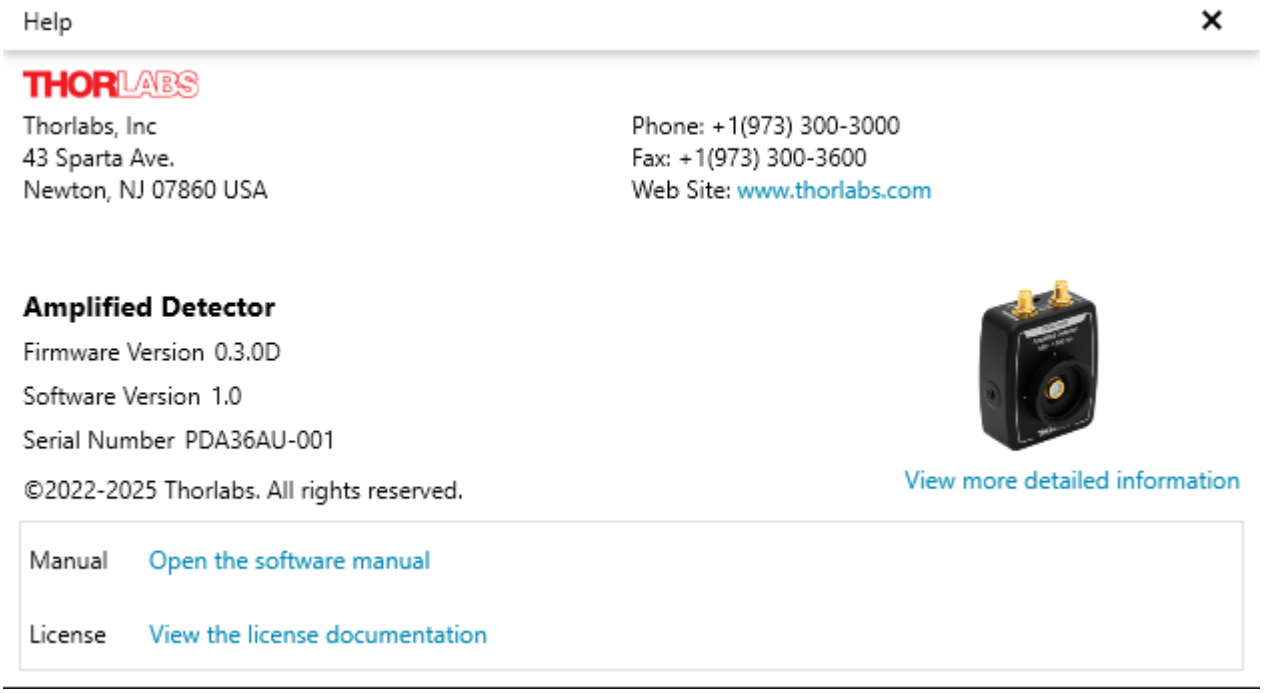


Figure 6 Help Window

Chapter 3 Software Operation

After connecting a PDA36AU device, the PDA36AU application main software window is loaded, as shown in Figure 7.

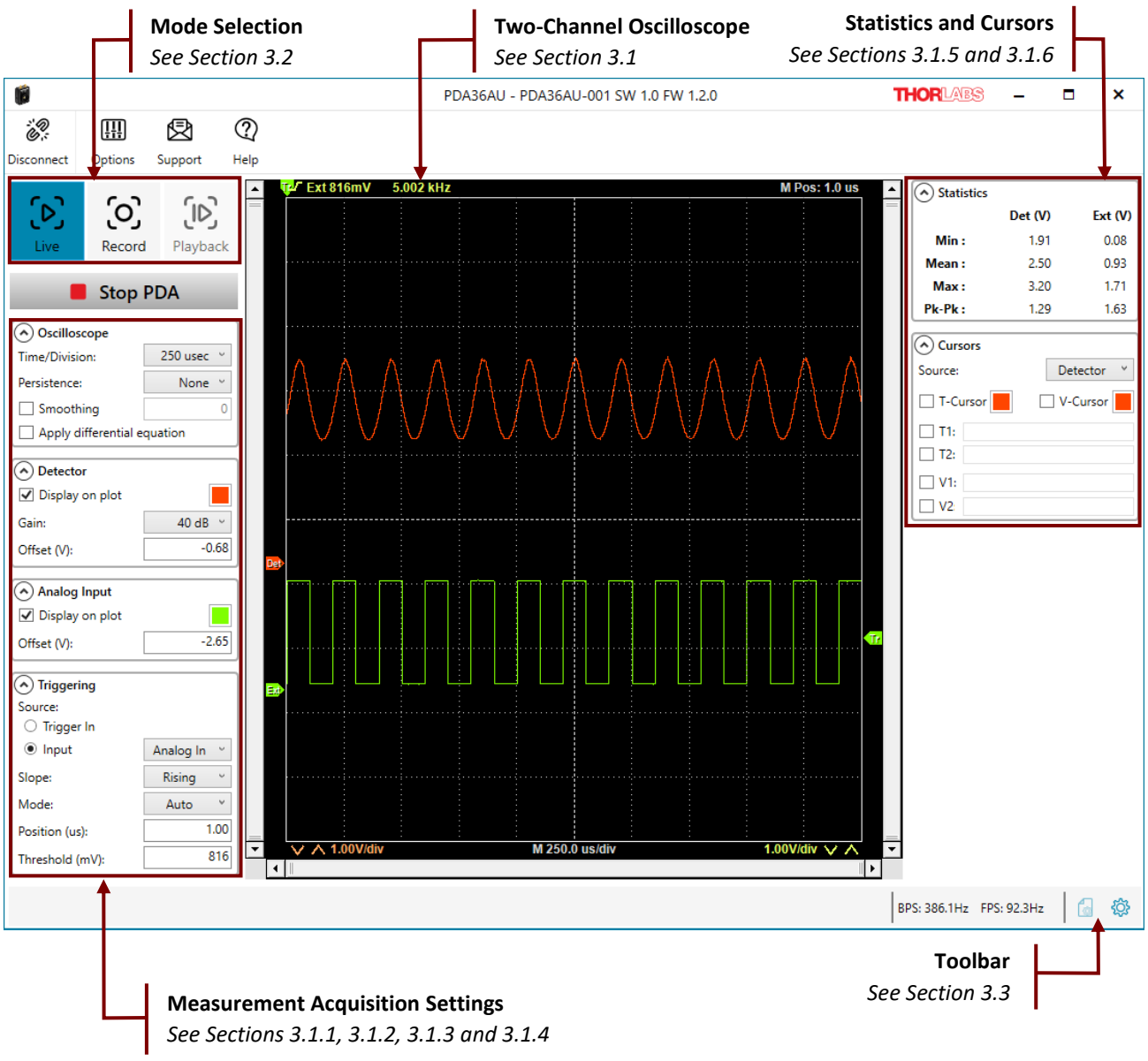


Figure 7 PDA36AU Main Software Window in Live Mode

3.1 Virtual Two-Channel Oscilloscope

The PDA36AU software uses a virtual two-channel oscilloscope to graphically display the input signals' time-domain waveform, as shown in Figure 8. It's also a tool to determine the characteristics of the signals, such as the amplitude and frequency.

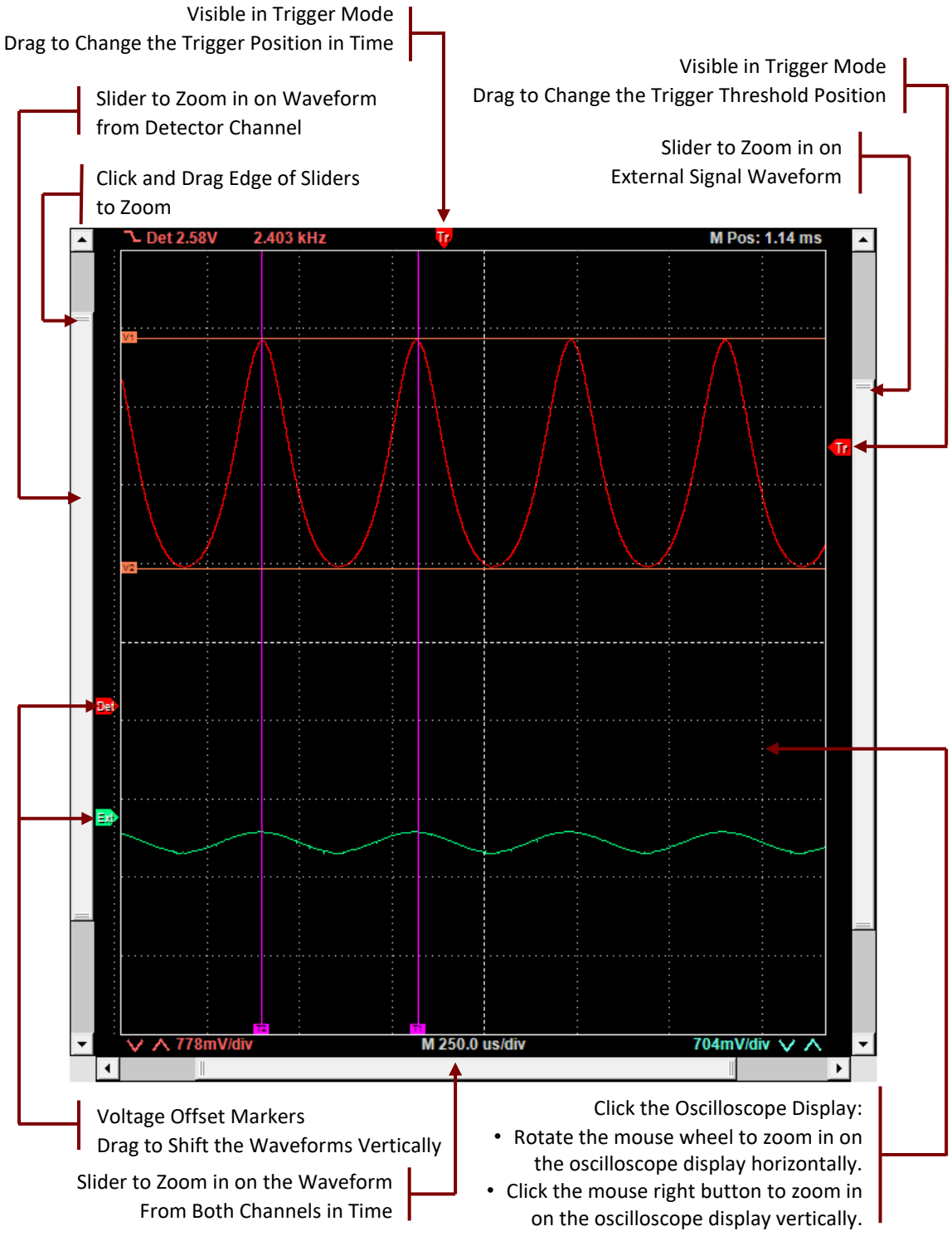


Figure 8 Virtual Two-Channel Oscilloscope

The Setting Control and Info panels surround the two-channel oscilloscope display, providing instant access to all the parameters.

3.1.1 Oscilloscope Settings

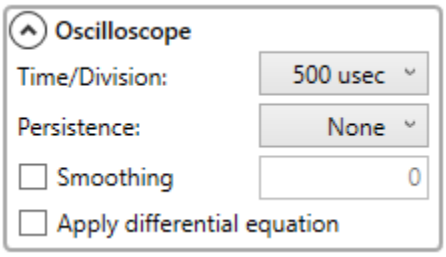


Figure 9 Oscilloscope Settings

- **Time/Division**

  Time/Division controls the horizontal scale, or the length of time that each grid square represents. It's used to calculate time spans, measurement periods, and frequencies. For example, if this setting is set at 1.0 ms, and shows one complete waveform of a signal over four squares, then the period of the waveform is 4.0 ms, or 0.004 s, giving a frequency of (1/0.004) = 250 Hz. If the user changes this setting to 500.0 µs, the user should see that the same waveform now takes eight squares to complete one full oscillation.

- **Persistence**

  The persistence feature allows users to view multiple waveforms on the same display simultaneously. This feature is useful for analyzing signals over time and identifying glitches that many subsequent triggers would overwrite.

- **Smoothing**

  The smoothing feature removes high-frequency noise from the signal to improve the signal-to-noise ratio. This feature allows users to focus on the signal and see trends in the data.

- **Apply differential equation**

  This option calculates the derivative of the signal, showing the rate of change of the original signal over time, by comparing the voltage at each sample point to the previous sample point, effectively highlighting sharp transitions or edges in the waveform.

3.1.2 Detector Settings

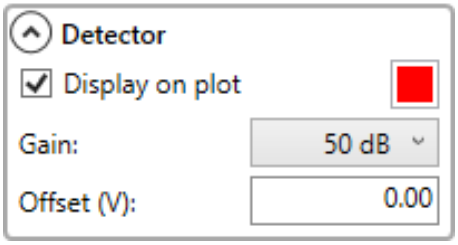


Figure 10 Detector Settings

- **Display on plot**

  This option allows users to display or hide the waveform from the detector channel. The user can also select the color for the detector signal waveform.

- **Gain (dB)**

  This is a number in decibels (dB) that the incoming signal from the detector channel is multiplied by. Gain dB = 20 x log(Gain). A gain of 1, or 0 dB, will have no effect. The range of the gain settings of the detector is from 0 dB to 70 dB. See the **PDA36AU Detector User Guide** for details on each gain setting.

- **Offset (V)**

  Offset allows users to shift the waveform from the detector channel vertically on the display.

3.1.3 External Signal Settings

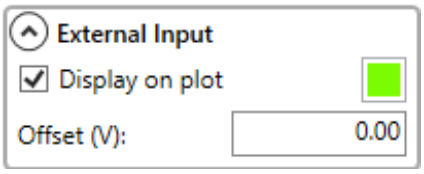


Figure 11 External Signal Settings

- **Display on plot**

  This option allows users to display or hide the waveform from the external channel. The user can also select the color for the external signal waveform.

- **Offset (V)**

  This setting allows users to shift a waveform from the external signal channel on the display.

3.1.4 Triggering Settings

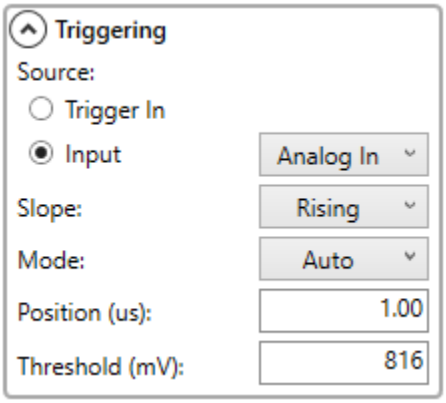


Figure 12 Triggering Settings

- **Source**

  This setting is to select the trigger source. Two options: Trigger In or Input. If the selection for the trigger source is Input, the user can select which signal to be used as trigger source, Analog In or Trigger In.

- **Slope**

  This setting specifies which edge of the trigger signal will fire the trigger. The options available are Rising, Falling, and None.

- **Mode**

  This setting determines when the virtual oscilloscope draws a waveform based on a signal condition. The available trigger modes are Normal and Auto.

- **Position (us)**

  The trigger position controls the horizontal location of the trigger event in a displayed waveform. It allows users to capture what a signal did before a trigger event.

- **Threshold (mV)**

  This setting allows users to configure the trigger threshold, which determines the trigger event time based on the voltage and rising or falling edge of the input waveform.

3.1.5 Statistics

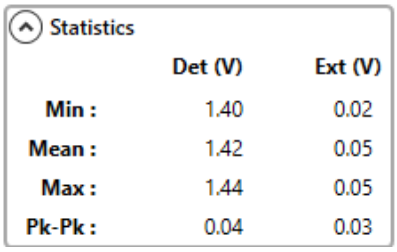


Figure 13 Signal Statistics

The virtual oscilloscope analyzes measured values from a waveform to provide information about the signal. This information includes the lowest value, the highest value, the average value, and the peak-to-peak voltage of the waveform.

3.1.6 Cursors

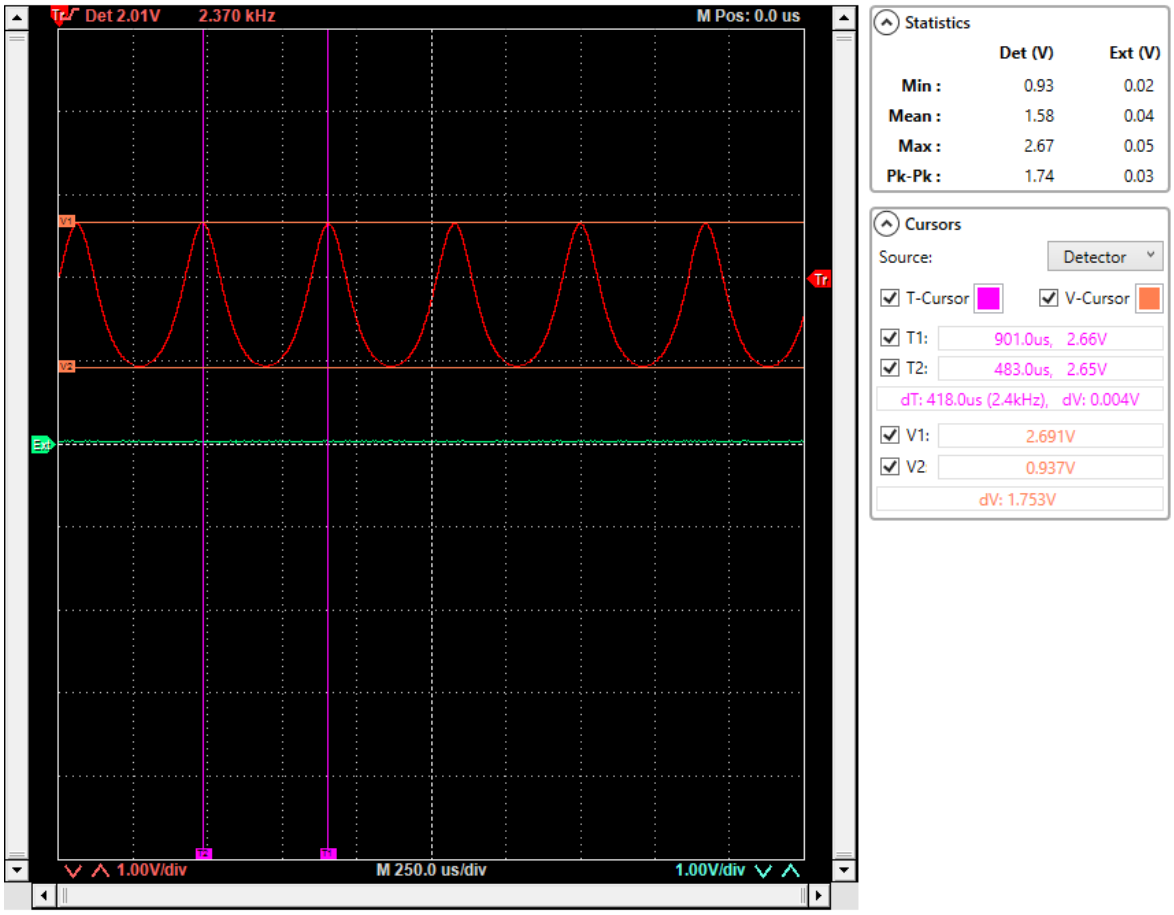


Figure 14 Cursors

The cursors are used to measure time and voltage on the time-domain waveform. Figure 14 shows an oscilloscope displaying signal waveforms with cursors enabled. Both cursors in each axis can be enabled and moved separately. The values of the cursors are displayed on the right, and the difference in time (dT) and voltage (dV) are also displayed.

3.2 Mode Selection

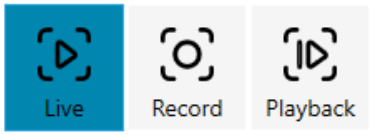


Figure 15 Operation Modes

The software has three operation modes: Live, Record, and Playback.

3.2.1 Live Mode

Live mode operates the PDA36AU device and streams the output continuously to the virtual two-channel oscilloscope. The device operation is integrated with the virtual two-channel oscilloscope controls, as explained in Chapter 3.1. Simply click the **Start PDA**/**Stop PDA** button to start acquiring data from both the detector channel and the external signal channel.



Figure 16 Start/Stop PDA

3.2.2 Record Mode

In Record mode, the user can record the digitalized data from both the detector channel and external signal channel to the PC.

Recording Option

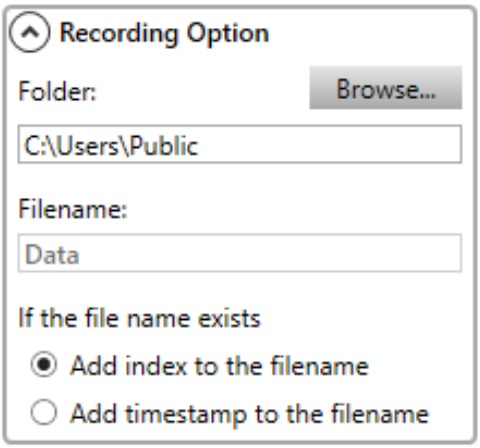


Figure 17 Recording Option

The user needs to choose a directory and specify the filename for the data. The **Start Recording** button is disabled if no filename has been specified. If the filename exists, the user can choose either a four-digit index, starting from 0001, or the timestamp in the format [YYYY]-[MM]-[DD]T[hh]-[mm]-[ss] to be added to the filename.

The software records as much data as the PDA36AU detector can capture. To improve the recording performance, the data is stored to a fixed-size buffer before being written to a file on disk. When the buffer is full, the data in the buffer will be saved to a file, and a new buffer will be created to receive new data. It is very likely that a recording creates multiple files if the data continuously streams to disk. The multiple data files are indexed by 1, 2, …., and so on, as shown in Figure 19.

Click the **Start Recording** button to start recording. The button label will be changed to **Stop Recording**, and a flashing indicator 

is displayed to the right of the button to remind the user that recording is active.



Figure 18 Start/Stop Recording

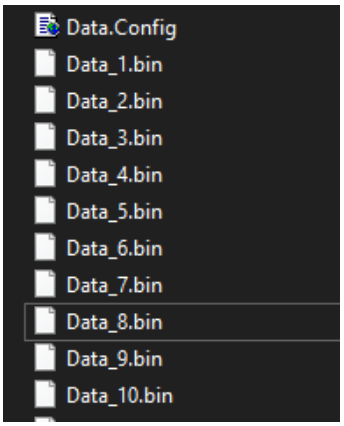


Figure 19 Data Files of a PDA36AU Recording

File Format

To ensure the saved data can be opened and displayed without information loss, the raw data is saved in a binary file with the extension .bin. In addition to the captured data from both channels, each record includes the metadata of the PDA operation. The metadata is saved in a separate file with the same filename but a different extension .Config in XML format. Here is an example of the metadata file:

<?xml version="1.0" encoding="UTF-8"?>

<BaseData Num_files="10" Max_record="9968" Recs_per_sub="1046">

<Src_name length="5000">RawDetData</Src_name>

<Src_name length="5000">RawExtData</Src_name>

<Src_name length="4">TrigPosition</Src_name>

<Src_name length="2">TrigThreshold</Src_name>

<Src_name length=”1”>TrigSource</Src_name>

<Src_name length="1">TrigMode</Src_name>

<Src_name length="1">TrigChannel</Src_name>

<Src_name length="1">TrigSlope</Src_name>

<Src_name length="1">DetTimeDiv</Src_name>

<Src_name length="1">DetGain</Src_name>

<Src_name length="8">Timestamp</Src_name>

</BaseData>

- Num_files: Total number of binary files for this recording.
- Max_record: Total number of frames recorded in this recording.
- Recs_per_sub: Total number of frames recorded in the single binary file.
- RawDetData: Data from the Detector channel in 16-bit unsigned integers. A total of 5000 bytes are needed to record 2500 data points.
- RawExtData: Data from the External signal channel in 16-bit unsigned integers. A total of 5000 bytes are needed to record 2500 data points.
- TrigPosition: Trigger position in Time in a 32-bit integer.

- TrigThreshold: Trigger threshold in Voltage in a 16-bit unsigned integer.
- TrigSource: Trigger source in an 8-bit unsigned integer. Valid values:
  0:- TriggerIn, 1 - Input
- TrigMode: Trigger mode in an 8-bit unsigned integer. Valid values:
  0 - Auto, 1 - Normal.
- TrigChannel: Trigger source in an 8-bit unsigned integer. Valid values:
  0 - Detector channel, 1 - External signal channel.
- TrigSlope: Trigger slope in an 8-bit unsigned integer. Valid values:
  0 - Falling, 1 - Rising, 2 - None.
- DetTimeDiv: Detector Time/Division selection in an 8-bit unsigned integer. Valid values:
  0 - 250 µs, 1 - 500 µs, 2 - 1 ms, 2 - 2.5 ms, 3 - 5 ms, 4 - 10 ms, 5 - 25 ms, 6 - 50 ms, 7 - 100 ms, 8 - 250 ms, 9 - 500 ms, 10 - 1 s, 11 - 2.5 s, 12 - 5 s, 13 - 10 s, 14 - 25 s, 15 - 50 s.
- DetGain: Detector gain selection in an 8-bit unsigned integer. Valid values:
  0 - 0 dB, 1 - 10 dB, 2 - 20 dB, 3 - 30 dB, 4 - 40 dB, 5 - 50 dB, 6 - 60 dB, 7 - 70 dB.
- Timestamp: Time for the recorded frame in a 64-bit signed integer.

Export Displayed PDA Data

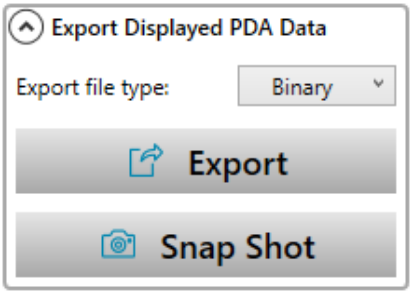


Figure 20 Export Displayed PDA Data

By clicking the **Export** button, the user can export the raw data of the currently displayed signal to a file of the type selected. Three types are available: Binary, CSV, and Text. The data will be saved in the format described in Chapter 3.2.2.2. Clicking the **Snap Shot** button exports the oscilloscope display to a PNG image.

Recording Info

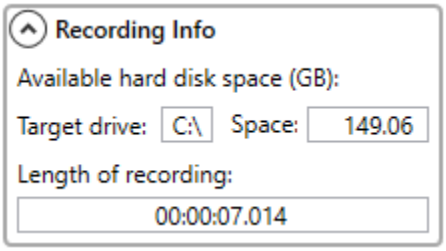


Figure 21 Recording Info

The available hard disk space of the selected target drive (from the recording directory) and the time of the recording are displayed in the **Recording Info** panel.

PDA Running Info

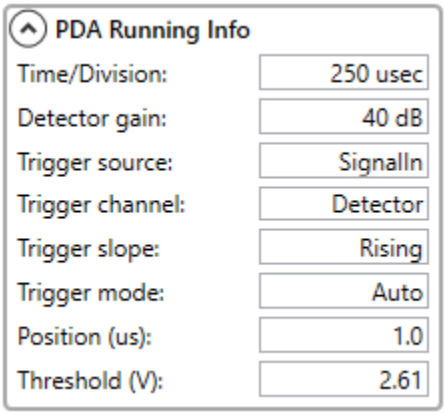


Figure 22 PDA Running Info

The values of the PDA36AU operation parameters are displayed in the **PDA Running Info** panel.

3.2.3 Playback Mode

The user can load a previously recorded data file for playback.

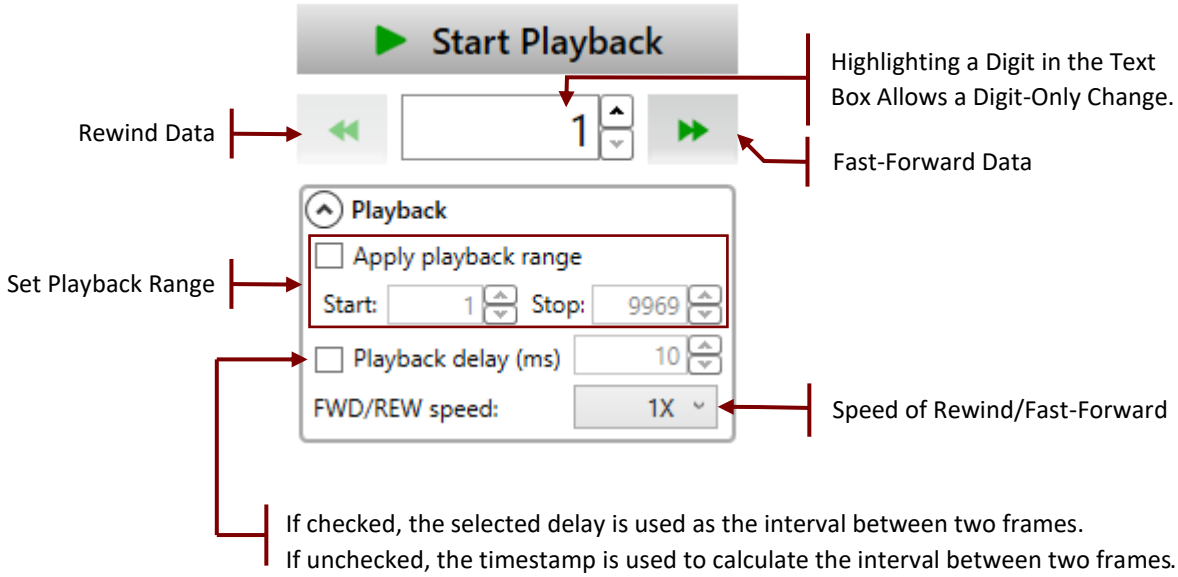


Figure 23 Playback Options

The **Oscilloscope** settings, **Detector/ExtIn** settings, **Export Loaded Dataset** settings and **Cursors** operations are all similar to those in **Live mode,** as explained in Chapter 3.1. The frame information and PDA settings of this recording are also available in Playback mode.

3.3 Toolbar

3.3.1 User PDA Settings

Clicking icon will open a **User PDA Settings** window and allow the user to save and recall the PDA operation settings, see Figure 24.

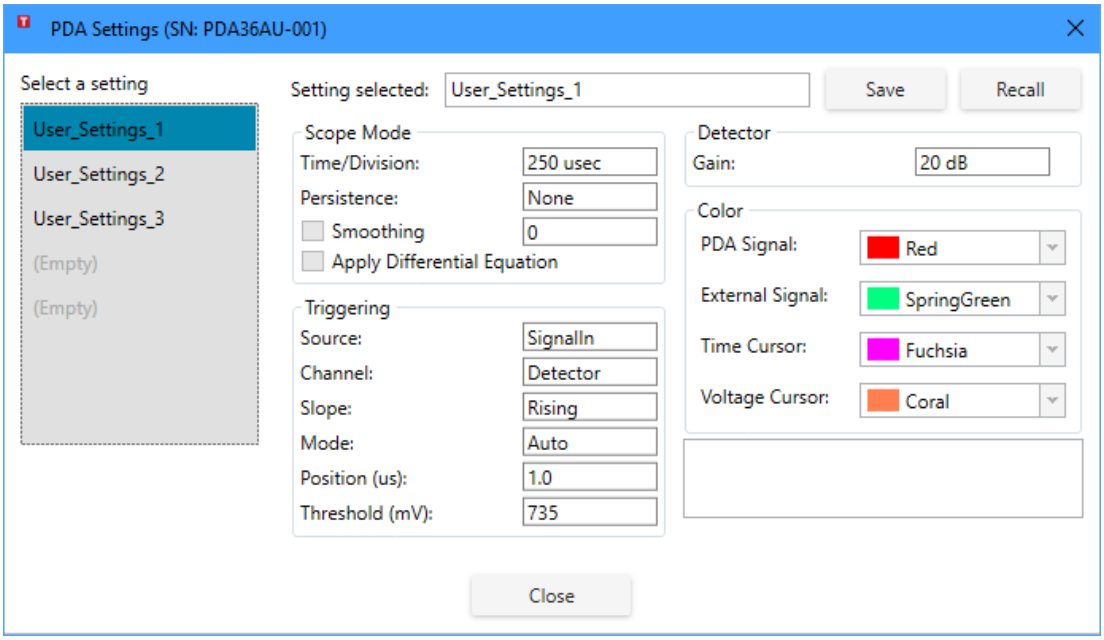


Figure 24 User PDA Settings

3.3.2 Application Options

Clicking icon opens the **Application Options** window as shown in Figure 25, which features two tabs.

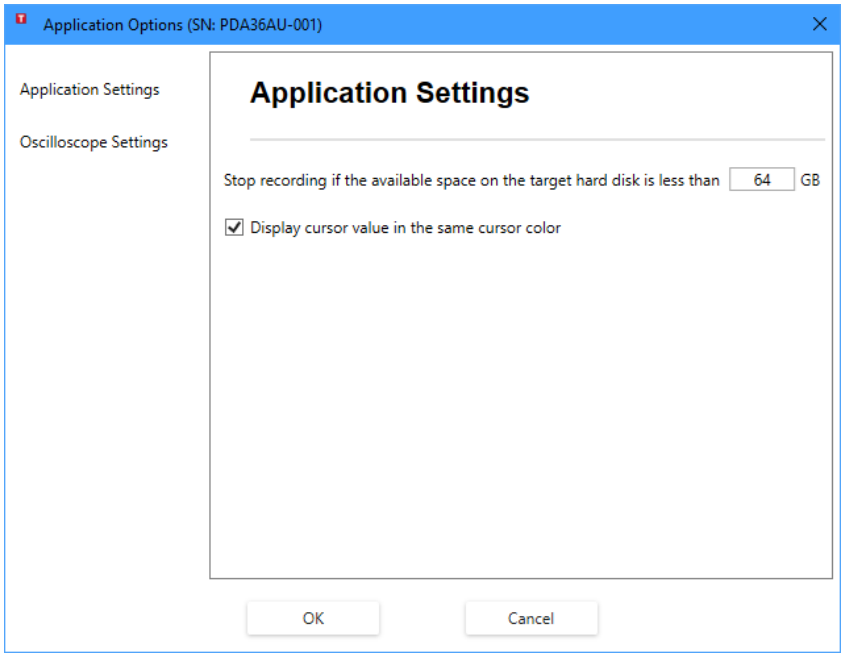


Figure 25 Application Settings

Application Settings

- **Stop recording if the available space on the target hard disk is less than** 64 **GB**: To prevent a decrease in computer performance or recording issues due to low disk space, the recording would automatically stop when the free space drops below this value. If the recording has a high input or long duration, the user might want to set a higher free space threshold.
- **Display cursor value in the same cursor color:** If this is unchecked, the cursor value will be displayed in black.

Oscilloscope Settings

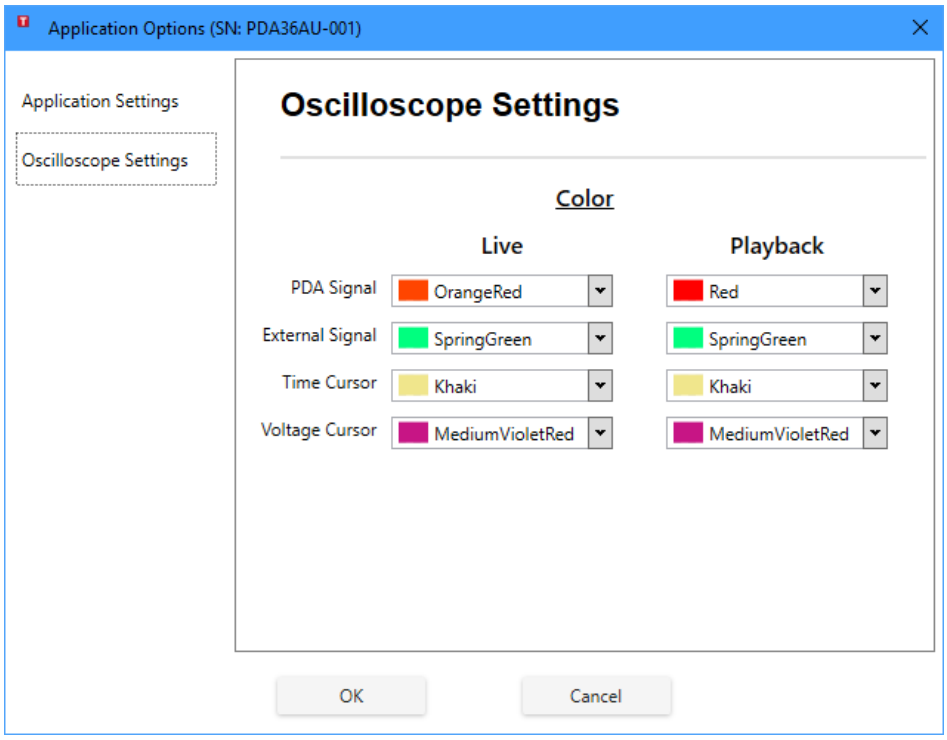


Figure 26 Oscilloscope Settings

In **Oscilloscope Settings**, the user can select the color for the oscilloscope display.

Chapter 4 Thorlabs Worldwide Contacts

For technical support or sales inquiries, please visit us at www.thorlabs.com/contact for our most up-to-date contact information.



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