



## **PXDAC4800 Playback Application Operator's Manual**

Revision 1.31

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# 1 OVERVIEW

The PXDAC4800 Playback Application (“Playback Application”) is an application that is installed as part of the standard PXDAC4800 software installation on Microsoft Windows platforms. This application is used to control one or more Signatec PXDAC4800 data acquisition PCI Express (PCIe) expansion boards. The following PXDAC4800 hardware is supported by the PXDAC4800 Playback Application:

- PXDAC4800A - a four channel, AC-coupled, 14-bit data arbitrary waveform generator card with individual channel generation rates up to 1.2GHz.
- PXDAC4800D - a four channel, DC-coupled, 14-bit data arbitrary waveform generator card with individual channel generation rates up to 1.2GHz.

For the purposes of this document and the Playback Application, the term PXDAC4800 is used to refer to PXDAC4800 devices of any revision (e.g. PXDAC4800A or PXDAC4800D) unless explicitly stated otherwise.

The PXDAC4800 Playback Application is a virtual Playback Application that allows the operator to view or edit all PXDAC4800 hardware settings as well as create and play PXDAC4800 generation data. For many users, the Playback Application is the primary software tool used to play PXDAC4800 generation data.

The goal of this document is to provide information for operational use of the PXDAC4800 Playback Application. This manual is not a PXDAC4800 hardware reference manual. For more specific details on the PXDAC4800 hardware and operation consult the PXDAC4800 Operator’s Manual. The PXDAC4800 Operator’s Manual is located in the “Documentation” folder of the PXDAC4800 installation folder (C:\Program Files\Signatec\PXDAC4800 by default). There may also be a link in the Start Menu under All Programs → Signatec → PXDAC4800.

## 1.1 Requirements

Refer to the PXDAC4800 Operator’s Manual for hardware and system requirements for running PXDAC4800 hardware.

The PXDAC4800 Playback Application is dependent on core libraries and components installed by the PXDAC4800 software setup.

## 1.2 Running the PXDAC4800 Playback Application

There are several ways to start the PXDAC4800 Playback Application:

- Via the shortcut installed on the Desktop.
- Via the Start Menu (Start → All Programs → Signatec → PXDAC4800 → PXDAC4800 Playback Application)
- Directly: C:\Program Files\Signatec\PXDAC4800\PlaybackXD48.exe

The PXDAC4800 Software Installation associates a few different file types with the PXDAC4800 Playback Application. When activated from Windows Explorer, the PXDAC4800 Playback Application will automatically be loaded with the specified file as a startup file. The [Startup Files](#) section describes these file types in more detail.

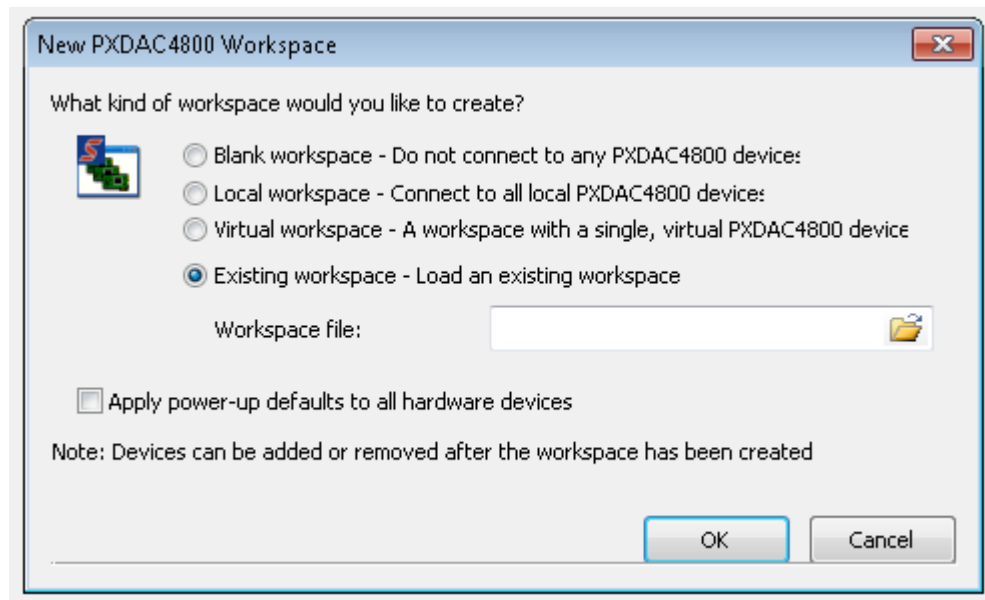
## 1.3 PXDAC4800 Workspaces

A PXDAC4800 Workspace is the top-level container for PXDAC4800 Playback Application data, which represents a collection of one or more PXDAC4800 devices and their hardware settings and relationships.

By default, when the Playback Application starts it will determine if there are any PXDAC4800 devices in the local system. If at least one PXDAC4800 device is present, a new workspace is created containing all detected PXDAC4800 devices. In this case, PXDAC4800 hardware is not modified in any way. This allows the Playback Application to unobtrusively connect to the PXDAC4800 devices without affecting other programs that may be using the PXDAC4800 hardware.

If no physical PXDAC4800 devices are detected in the system<sup>1</sup> then the “New PXDAC4800 Workspace” window will be displayed. This window is the starting point for creating a new PXDAC4800 Workspace and is shown below.

### 1.3.1 New PXDAC4800 Workspace Window



**Figure 1: New PXDAC4800 Workspace Window**

The “New PXDAC4800 Workspace” window contains a few predefined workspace types that the user can select from. All workspace types are functionally equivalent; the main difference between the predefined types is which devices are initially selected into the workspace. Any workspace type can contain any type of device. Virtual devices can be added to a Local workspace, for example.

**Blank workspace** – An empty workspace will be created that does not contain any PXDAC4800 devices. Devices may be subsequently added by selecting “New Local PXDAC4800 Device” from the File menu.

**Local Workspace** – Connects to all local PXDAC4800 devices. A local device is a PXDAC4800 device that is located in the same computer that is running the PXDAC4800 Playback Application. By default, this type of workspace will be created when the application starts and one or more local PXDAC4800 devices are detected. When connecting to the local PXDAC4800 devices, no hardware settings are modified. This allows the Playback Application to connect to the devices in an unobtrusive manner in the event that the hardware is being used by

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<sup>1</sup> If you have PXDAC4800 devices in your system but none are detected by the Playback Application then it's likely that the PXDAC4800 device driver is missing or has not been installed. Consult the PXDAC4800 Operator's Manual for details on how to install the PXDAC4800 driver.

another process. Furthermore, all hardware settings displayed in the application forms will be initialized to the actual PXDAC4800 hardware settings.

**Virtual Workspace** – Connect to a single virtual PXDAC4800 device. A virtual PXDAC4800 device is a simulated PXDAC4800 device that is not connected to any real hardware. The most common use for a virtual workspace is to use the View Windows for the virtual device to view previously saved data.

**Existing Workspace** – Load an existing PXDAC4800 workspace. This is equivalent to selecting “Open Workspace...” from the File Menu. Note that unlike the other workspace types, when opening up an existing workspace, the hardware settings for all devices referenced in the workspace will be updated to use the settings specified in the workspace data. This assumes that no other processes are currently using the PXDAC4800 devices.

If the “Apply power-up defaults to all hardware devices” option is selected then all devices added into the workspace will be put into Standby operating mode and all hardware settings will be initialized to their power-up values.

## **1.4 PXDAC4800 Device Types**

The PXDAC4800 Playback Application can work with different types of PXDAC4800 devices.

### **1.4.1 Local PXDAC4800 Devices**

Local PXDAC4800 devices are PXDAC4800 devices that are installed in the computer that is running the PXDAC4800 Playback Application. By default, when the PXDAC4800 Playback Application starts up, it will attempt to create a default workspace with all local devices.

### **1.4.2 Virtual PXDAC4800 Devices**

A virtual device is an imaginary device that is not connected to any real hardware. Most application operations may be performed, but since there’s no real hardware being controlled it isn’t very exciting.

The virtual device mechanization is mainly used as a software debugging tool for application development. It can be used to help differentiate between software and hardware/firmware problems.

When a virtual device is used the board’s name will be prefaced with “Virtual”.

## 1.5 Startup Files

The PXDAC4800 Playback Application understands various file types that are used when operating PXDAC4800 devices. When passed on the command line, these files will automatically be opened up and applied to any or all PXDAC4800 devices in the workspace. When one of these known files is specified on the command line, this is referred to as a *startup file*.

During the PXDAC4800 Software Installation, these known file types are associated with the PXDAC4800 Playback Application such that when they are activated (e.g. double-clicked) the PXDAC4800 Playback Application will be opened up with that file. This has the same effect as starting the PXDAC4800 Playback Application with the startup file on the command line.

During PXDAC4800 Playback Application initialization, after all PXDAC4800 devices have connection establish, the application will check to see if a startup file was specified. If so, the configuration will be applied to the PXDAC4800 device specified in the Workspace File.

The currently associated file types are listed in the following table:

File Type	Extension	Notes
PXDAC4800 Workspace Files	.xd48ws	When a PXDAC4800 workspace is opened, the PXDAC4800 Playback Application will disconnect from all current PXDAC4800 devices and connect to the devices defined in the previously saved workspace. All hardware settings and device relations are also restored.

## 1.6 Associate Files

The PXDAC4800 Playback Application understands others various file types that are used when operating PXDAC4800 devices.

The currently associated file types are listed in the following table:

File Type	Extension	Notes
PXDAC4800 Firmware Update Files	.xsvf	Files of this type contain PXDAC4800 firmware. The firmware update is not immediate; the user will have the ability to cancel out.
PXDAC4800 Playback Data Files	.rd8 .rd16	Files of this type contain previously generated data.
Signatec Recorded Data Context	.rd8.srdc .rd16.srdc	Files of this type contain context of the generated data (i.e. various Hardware settings related to the generated data).

## 2 PXDAC4800 PLAYBACK APPLICATION OPERATION

The Playback Application may be used to modify any of the various hardware settings that affect how the PXDAC4800 behaves. These settings are distributed over the tabbed view at the bottom of the main device page. These settings are described in the subsequent sections.

For most hardware settings, whenever an item in the user-interface is selected, the hardware is immediately updated with the new setting. When editing a user interface item with a field control (e.g. the RAM offset parameter on the Playback tab) the user will need to press Enter in order for the modification to have effect. On success, the status bar will indicate the successful update. On error, a message box with details on the error will be displayed.

Certain options are only displayed if the underlying PXDAC4800 device supports those features, like DC output.

### 2.1 The Playback Tab

The Playback Tab is the first tab of the main application window. This is the interface for controlling PXDAC4800 operations like starting/stopping data generation.

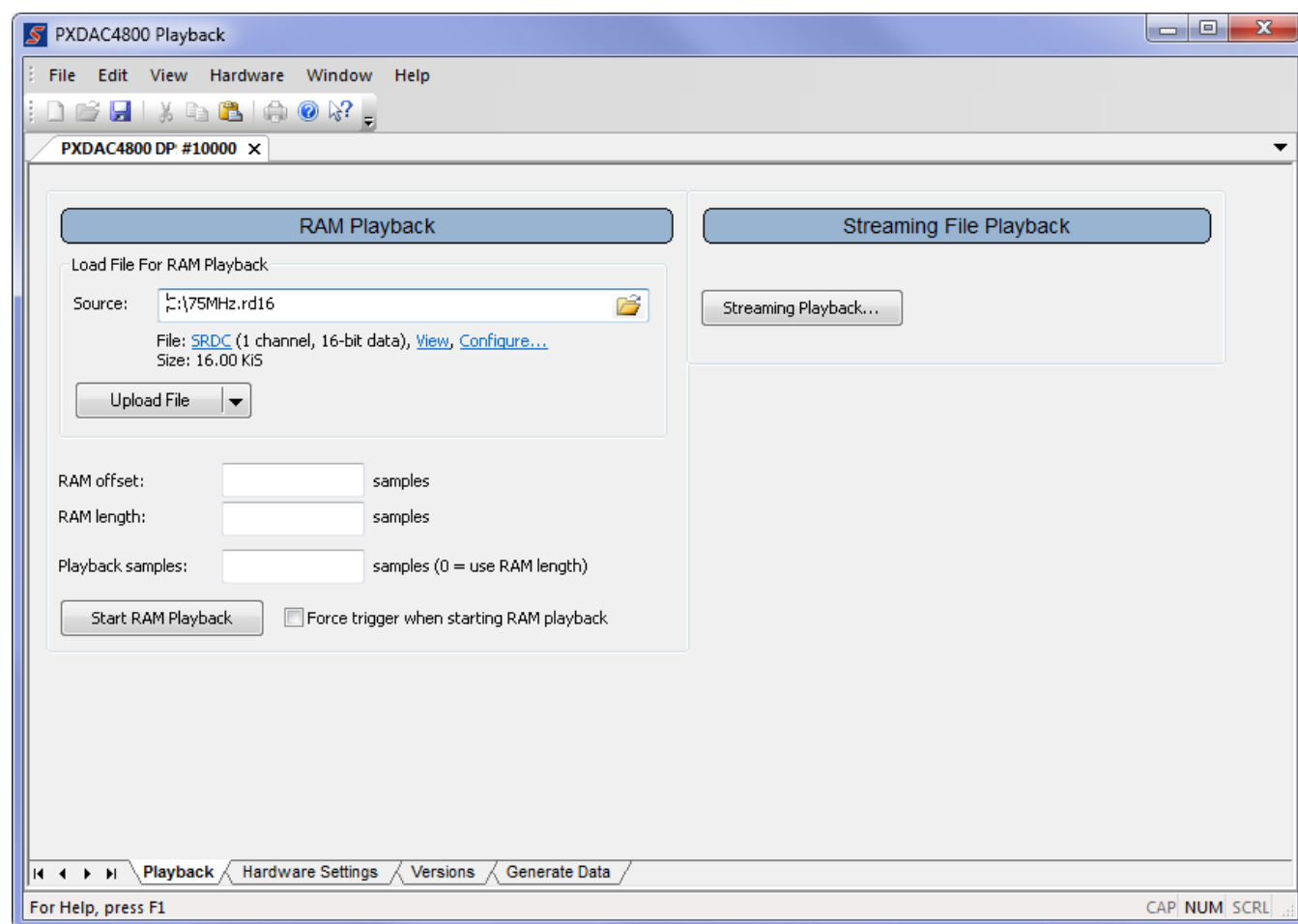


Figure 2-1: PXDAC4800 Playback Tab User Interface

## 2.1.1 The RAM Playback Section

### 2.1.1.1 Source

The “Source” field allows selecting the file containing the generation data. Clicking on the small folder icon will open a standard Windows File dialog to allow the user to browse for the name and location of the desired file. If the path and the file name are known, putting the exact address will also work.

If the data file (.rd8 or .rd16) has a SRDC associate with it, 3 options will appear.

- **SRDC:** Will open a new window showing the setting in the SRDC file.
- **View:** Will open a new window showing the data. See [View Window](#).
- **Configure:** Will open a new window showing the setting in the SRDC file and allow applying them to the PXDAC4800. See [Configure Window](#).

### 2.1.1.2 Configure Window

Clicking on the text “Configure...” below “[Source](#)” will bring up the “Configure PXDAC4800 From SRDC Data” window shown below.

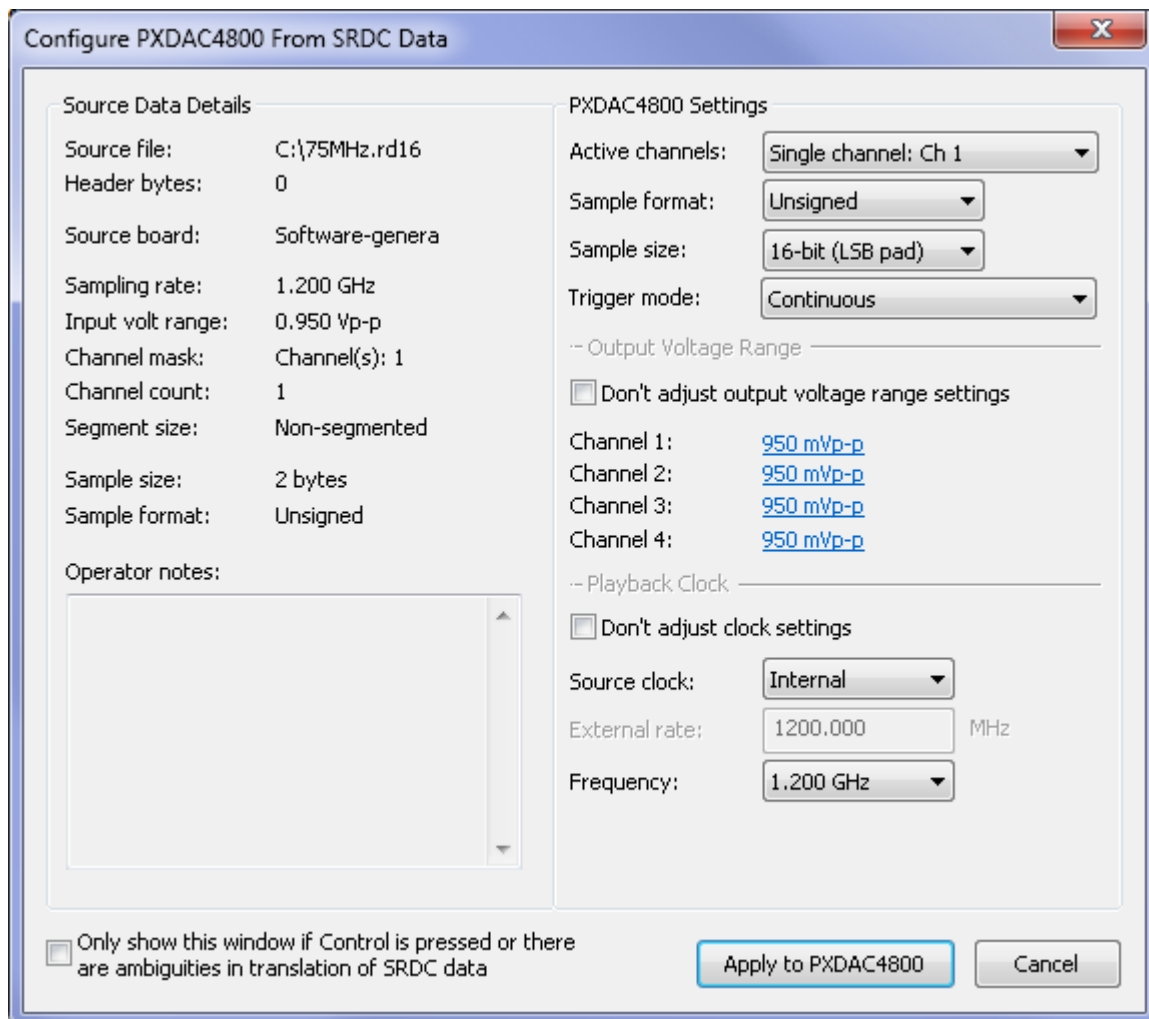


Figure 2-2: Configure PXDAC4800 From SRDC Data User Interface



The left section shows the information included in the SRDC. The information is automatically transferred in the settings (right section). If wanted, it is possible to change some combo box. Then, by clicking “Apply to PXDAC4800” button, the settings will be transferred to the PXDAC4800 card. See [Hardware Setting](#) for information about the combo box.

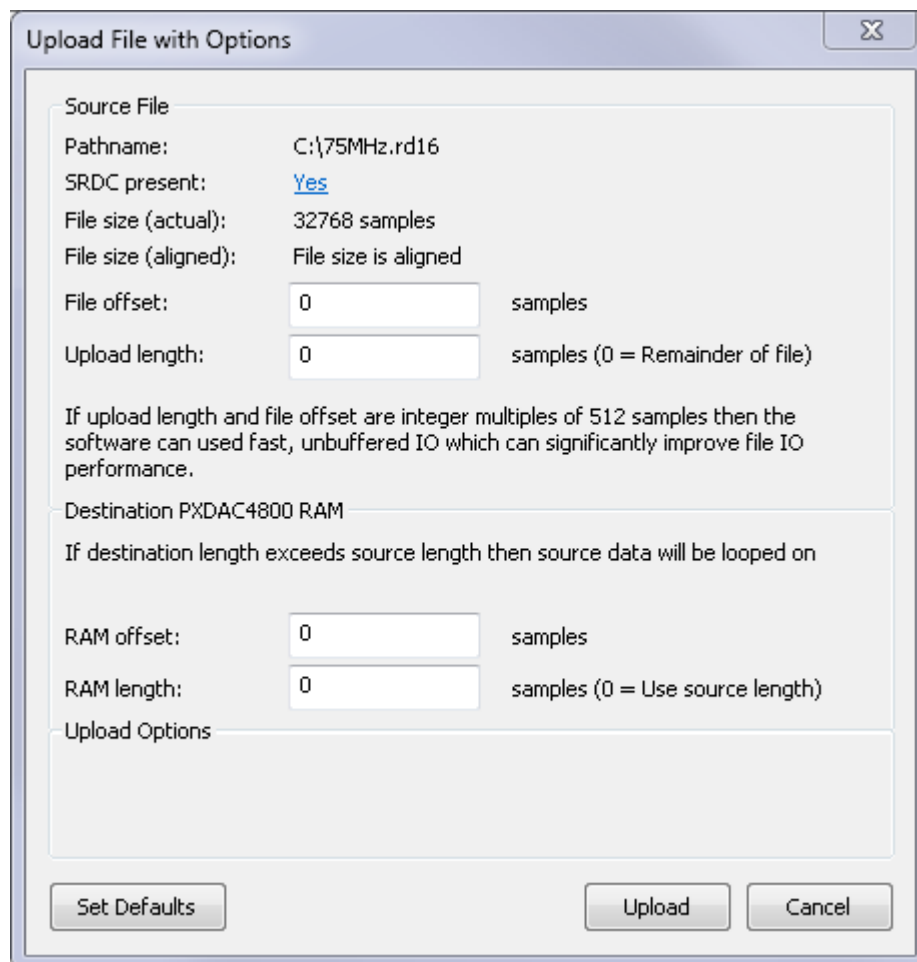
### 2.1.1.3 Upload File

The button “Upload File” will entirely copy the file shown in the source into the RAM, with default options. Therefore, the file size must be an integer multiple of 8192 bytes and less or equal of 1073741824 bytes (1GiB). See [Upload File with Options](#) for more option.

*Related PXDAC4800 library function: LoadFileIntoRamXD48*

### 2.1.1.4 Upload File with Options

Clicking the “Upload File with Options...” button will bring up the window shown below. This function allows copying a subsection of a file or to concatenate files in the RAM.



**Figure 2-3: Upload File with Options User Interface**

- File offset: The offset, in sample, into the source file at which to begin copying.
- Upload length: The number of samples to copy from the file. If this parameter is zero then the file size (minus File Offset) will be used. This parameter must be an integer multiple of 8192 bytes.

- RAM offset: The offset, in samples, into PXDAC4800 RAM at which to begin loading playback data. This parameter must be an integer multiple of 8192 bytes.
- RAM length: The number of samples to load from the file. This parameter must be an integer multiple of 8192 bytes. If this parameter is zero, then the amount of data to be loaded will be derived from the source length. This parameter should not be greater than “Upload length”.
- Defaults: All parameters are set to 0.

*Related PXDAC4800 library function: LoadFileIntoRamXD48*

#### **2.1.1.5 Playback RAM offset**

The “Playback RAM offset” field will offset the starting sample of the playback data into PXDAC4800 RAM. This parameter must be an integer multiple of 8192 bytes. When upload is completed, the field is updated to the default value of 0.

This field, associated with “Playback RAM length” allows playing a subsection of the RAM for the next Playback. So, the user can upload a lot of data (may take some time) and rapidly change configurations for many playback situations.

*Related PXDAC4800 library function: BeginRamPlaybackXD48*

#### **2.1.1.6 Playback RAM length**

The “Playback RAM length” field will configure the total number of samples of data to use for the playback data. This parameter must be an integer multiple of 8192 bytes. When upload is completed, the field is updated to the total number of samples uploaded.

This value is independent of channel count: If the card is configured for dual channel playback then the card will play back (Playback RAM length / 2) samples per channel. If the card is configured for four channel playback then the card will play back (Playback RAM length / 4) samples per channel.

This field, associated with “Playback RAM offset” allows playing a subsection of the RAM for the next Playback. So, the user can upload a lot of data (may take some time) and rapidly change configurations for many playback situations.

*Related PXDAC4800 library function: BeginRamPlaybackXD48*

#### **2.1.1.7 Playback samples**

The “Playback samples” field will configure the number of samples to play per trigger. When upload is completed, the field is updated to the default value of 0. If this parameter is zero then the “Playback RAM length” parameter will define the playback length.

The total number of bytes should be an integer multiple of (8 \* number of active channels) bytes. This parameter is ignored if the Trigger Mode setting is configured for Continuous playback. If this parameter is greater than “Playback RAM length” then the PXDAC4800 will loop back around to the start of the playback data.

“Playback samples” allows playing a subsection area of the RAM upon a trigger event, then to the next subsequent section. So, the user can upload a lot of data (may take some time) and rapidly change from one section to the next for each trigger. At the end of “Playback RAM length”, it will loop at “Playback RAM offset”.

*Related PXDAC4800 library function: BeginRamPlaybackXD48*

### 2.1.1.8 Start RAM Playback

The button “Start RAM Playback” will begin RAM playback according to “[RAM offset](#)”, “[RAM length](#)” and “[Playback samples](#)” parameters.

This function is the primary method for starting a RAM playback operation. A RAM playback operation is a playback operation in which all playback data has been previously loaded into PXDAC4800 RAM. The PXDAC4800 can then play (or loop on) this data at rates up to the maximum playback rate which is 1.2GHz (clock rate) and 4.8GB/s (output transfer rate).

Calling this function will arm the PXDAC4800 for RAM playback and wait until “Stop RAM Playback” is clicked, or implicitly with some special functions. Actual hardware playback will not begin until a trigger event is detected by the PXDAC4800.

If the current “[Trigger Mode](#)” setting (found on “[Hardware Settings](#)” tab) is configured to “Continuous” then the “[Playback samples](#)” is ignored and the PXDAC4800 will loop around the specified RAM segment indefinitely after it receives a single trigger.

If the current “[Trigger Mode](#)” setting is configured to “Play-Per-Trigger” then the PXDAC4800 will playback “[Playback samples](#)” samples and then stop playback and rearm for another trigger. When another trigger is received the PXDAC4800 will playback another “[Playback samples](#)” data, resuming where it stopped in the RAM segment, looping as necessary. This process is repeated until the RAM playback is stopped.

If the current “[Trigger Mode](#)” setting is configured to “Single Shot”, then the PXDAC4800 will playback “[Playback samples](#)” samples and then stop playback altogether, ignoring any further trigger events. In order to resume playback, the RAM playback will need to be stopped and rearmed.

Note: During a playback, most options are blocked.

*Related PXDAC4800 library function: `BeginRamPlaybackXD48`*

### 2.1.1.9 Force trigger when starting RAM playback

If the check box is selected when “Start RAM Playback” button is clicked, a software trigger will be automatically issued and data will start to play immediately.

*Related PXDAC4800 library function: `IssueSoftwareTriggerXD48`*

## 2.1.2 Streaming Playback Section

The button “Streaming Playback...” opens a new window. See [Streaming Playback Window](#) for more details.

## 2.2 The Hardware Settings Tab

This tab allows viewing/modifying the various PXDAC4800 hardware settings. Except where explicitly noted, whenever a setting is changed in the user interface it is applied immediately to the underlying hardware. On success, the application status bar will be updated to indicate that the hardware was updated. On error, the operator will be notified via a message box.

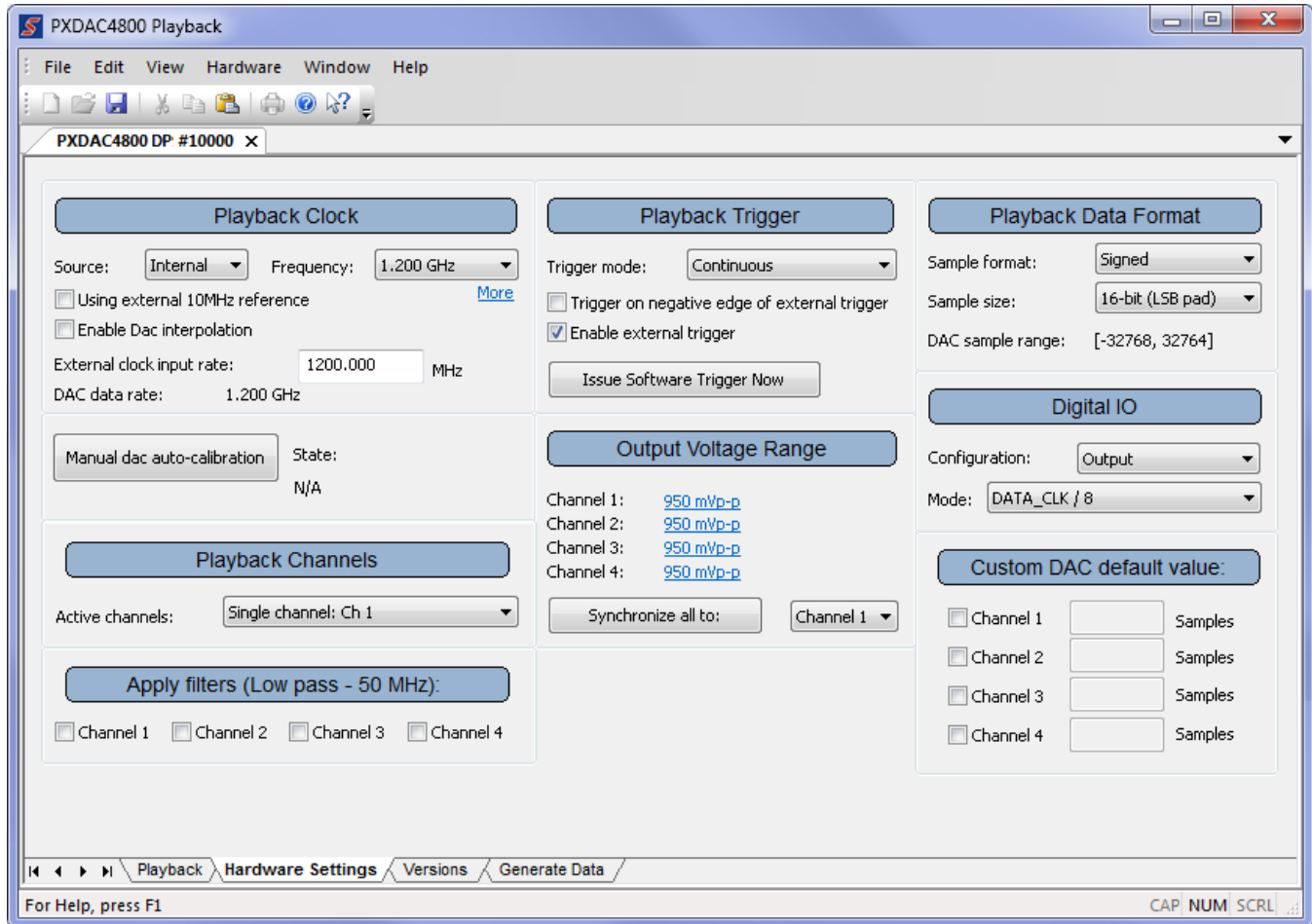


Figure 2-4: PXDAC4800 Hardware Setting Tab User Interface

### 2.2.1 Playback Clock Section

#### 2.2.1.1 Source

The combo box “Source” allows selecting Internal or External clock source.

- Internal: There are 2 oscillators on board that can be selected.
- External: Select the clock connected to the Clock Input of the board. When selected, a DAC auto-calibration is done. If you change the clock signal frequency, a “[Manual dac auto-calibration](#)” must be done. Also, you need to enter the field “[External clock input rate](#)” to setup the clock properly.

*Related PXDAC4800 library function: SetPlaybackClockSourceXD48*

### 2.2.1.2 Frequency

The combo box “Frequency” allows selecting the desired clock frequency.

- If internal clock is selected: It will automatically select the right oscillator and divide the clock properly to obtain the desired value.
- If external clock is selected: If the external clock input rate is entered properly, the menu will automatically select the proper clock divider to obtain the desired frequency value.

Note: When a value is selected, a DAC auto-calibration is done.

*Related PXDAC4800 library functions: SetPlaybackClockSourceXD48 and SetClockDividerNXD48*

### 2.2.1.3 More, under Playback Clock Frequency

The “More” link, below Playback Clock Frequency, will open a window that allows forcing an oscillator and the clock divider.

Note: When pressing “OK” button, the parameters are updated and a DAC auto-calibration is done.

Note: Only available with internal clock.

*Related PXDAC4800 library functions: SetPlaybackClockSourceXD48 and SetClockDividerNXD48*

### 2.2.1.4 Using external 10MHz reference

The check box “Using external 10MHz reference” allows synchronizing the internal oscillator to a reference clock connected to the Clock Input of the board.

*Related PXDAC4800 library function: SetExternalReferenceClockEnableXD48*

### 2.2.1.5 Enable DAC interpolation

The check box “Enable DAC interpolation” enables the internal DAC interpolation (x2).

When interpolation is enabled the DACs will interpolate playback data by a factor of 2. So, the playback clock rate will remain the same but the playback data rate (the rate at which data is consumed) will be halved since the DAC is providing one additional sample for every sample of input. Using the interpolation will reduce the roll-off effect of the DAC.

Note: This hardware setting affects all DACs; mixed interpolation is not allowed.

*Related PXDAC4800 library function: SetDacInterpolationEnableXD48*

### 2.2.1.6 External clock input rate

The field “External clock input rate” should be updated any time the external clock rate changes when the external clock is selected as the acquisition clock source. This will ensure that the PXDAC4800 firmware is synchronized properly with the playback clock. Failure to call this function when the external clock frequency is changed can result in bad playback data. This value is only relevant when the external clock is selected as the playback clock source.

*Related PXDAC4800 library function: SetExternalPlaybackClockRateXD48*

### 2.2.1.7 Manual dac auto-calibration

The “Manual dac auto-calibration” button is useful when the external clock signal frequency is changed. It recalibrates the DAC with the new clock frequency. With internal clock, the calibration is done automatically.

*Related PXDAC4800 library function: StartDacAutoCalibrationXD48*

## 2.2.2 Playback Channels Section

### 2.2.2.1 Active channels

The combo box “Active channels” defines which channels are played back.

When multiple channels of data are generated, the format of the data is sample interleaved:

- Four channel: Ch 1, Ch 2, Ch 3, Ch 4, Ch 1, Ch 2, Ch 3, Ch 4...
- Dual channel: Ch 1, Ch 2, Ch 1, Ch 2...

*Related PXDAC4800 library function: SetActiveChannelMaskXD48*

## 2.2.3 Apply filters Section

### 2.2.3.1 Channel 1-4

The 4 check boxes “Channel 1-4” enable/disable the analog low-pass (50MHz) filter at the output of the DAC. Each channel filter is independent.

Note: Only available on PXDAC4800D.

*Related PXDAC4800 library function: SetFilterXD48*

## 2.2.4 Playback Trigger Section

### 2.2.4.1 Trigger mode

The combo box “Trigger mode” allows selecting how trigger events are used to start data playback. The PXDAC4800 implements three trigger modes:

- Play per-trigger: Each trigger event will result in the board playing back a static number of samples “[playback samples](#)”. Not available in streaming.
- Continuous: A single trigger event is used to begin a continuous looping of the playback data. When the board gets to the end of the playback data it will loop around back to the start of the playback data and resume playback with that data. Not available in streaming.
- Single Shot: This is a special case of the “Per-Trigger” mode in which a single trigger event is used to begin playback of a static number of samples “[playback samples](#)”. The difference is that only the first trigger is registered and all subsequent triggers are ignored.

*Related PXDAC4800 library function: SetTriggerModeXD48*

#### **2.2.4.2 Trigger on negative edge of external trigger**

The checkbox “Trigger on negative edge of external trigger” selects the rising edge or falling edge of the external trigger pulse. If the external trigger is disabled, this function has no impact.

*Related PXDAC4800 library function: SetExternalTriggerDirXD48*

#### **2.2.4.3 Enable external trigger**

The checkbox “Enable external trigger” enables/disables the pulse on the external trigger connector to start the playback. An external trigger pulse is only considered a trigger event when the card is armed for a playback and waiting for a trigger event. Any trigger pulses that may occur while the card is not waiting for a trigger event will be ignored.

Note: The software trigger is always available.

*Related PXDAC4800 library function: SetExternalTriggerEnableXD48*

#### **2.2.4.4 Issue Software Trigger Now**

The button “Issue Software Trigger Now” sends a software trigger to the card and starts the playback.

*Related PXDAC4800 library function: IssueSoftwareTriggerXD48*

### **2.2.5 Output Voltage Range Section**

#### **2.2.5.1 Channel 1-4**

The links “xxx mVp-p” for each channel opens a new window. With the slide bar, the output voltage full range can be setup from 470mV peak-to-peak to 1450mV peak-to-peak for AC-coupled board or from 400mV peak-to-peak to 1470mV peak-to-peak for DC-coupled board. The real analog voltage output might slightly be different, and limited by the data range in the RAM. Each channel range is independent.

*Related PXDAC4800 library function: SetOutputVoltageChNXD48*

#### **2.2.5.2 Synchronize All to**

The button “Synchronize All to” sets up all output voltage range the same as that of the channel specified in the adjacent combo box.

### **2.2.6 Playback Data Format Section**

#### **2.2.6.1 Sample format**

The combo box “Sample format” allows setting the DAC sample format; e.g. signed  $[-N, N+1]$  or unsigned data  $[0, N]$ . See [DAC sample range](#) for allowed values.

*Related PXDAC4800 library function: SetDacSampleFormatXD48*

### 2.2.6.2 Sample size

The combo box “Sample size” allows selecting the data size, 8-bit or 14-bit:

- 8-bit: data size is 8 bit per sample. It can optimize the data transfers, but with less resolution.
- 16-bit (MSB pad): 14-bit data are aligned on 16-bits sample, where the 2 MSB are not used.
- 16-bit (LSB pad): 14-bit data are aligned on 16-bits sample, where the 2 LSB are not used.

See [DAC sample range](#) for allowed values.

*Related PXDAC4800 library function: SetDacSampleSizeXD48*

### 2.2.6.3 DAC sample range

The software shows the DAC range according of the sample format and size. The following table shows the minimum, midscale, and maximum DAC sample values for the various sample sizes and formats:

	Unsigned			Signed		
	Minimum	Midscale	Maximum	Minimum	Midscale	Maximum
8-bit	0	128 (0x80)	255 (0xFF)	-128 (0x80)	0	127 (0x7F)
16-bit MSB pad	0	8192 (0x2000)	16383 (0x3FFF)	-8192 (0x2000)	0	8191 (0x1FFF)
16-bit LSB pad	0	32768 (0x8000)	65532 (0xFFFC)	-32768 (0x8000)	0	32764 (0x7FFC)

## 2.2.7 Digital IO Section

### 2.2.7.1 Configuration

The combo box “Configuration” allows setting the direction of the Digital IO: Input (not supported) and Output.

*Related PXDAC4800 library function: SetDigitalIoCfgXD48*

### 2.2.7.2 Mode

The combo box “Mode” allows setting the mode of the Digital IO when the “[Configuration](#)” is set to output:

- DATA\_CLK/8: DAC clock divided by 8 or 16 in interpolation mode. Max 150MHz.
- Pulse at the beginning of a playback: Start pulse, not perfectly aligned with the data.
- Pulse at the end of a playback: Stop pulse, not perfectly aligned with the data.
- DAC are playing data: Rise with the start pulse and fall with the stop pulse.
- Pulse at Underflow error: Pulse to indicate a streaming underflow error.
- Frame Start: Start pulse at the beginning of a frame. This output works only in RAM playback operating mode

*Related PXDAC4800 library function: SetDigitalIoModeXD48*



## **2.2.8 Custom DAC default value Section**

### **2.2.8.1 Channel 1-4**

The check boxes “Channel 1-4” enable/disable custom output values. By default, the output is midscale of the output (0V). Each channel output is independent.

Note: Only available on PXDAC4800D.

Note: Custom DAC values are disabled during some function call, like clock settings changes or sample format. At that moment, the DAC output is 0V.

*Related PXDAC4800 library function: SetCustomDacValueEnableXD48*

### **2.2.8.2 Values**

The fields “Values” allows entering the custom sample value. The actual analog voltage value is also affected by the sample size, the sample format and the output voltage range. Each channel output is independent.

Note: Only available on PXDAC4800D.

Note: Custom DAC values are disabled during some function call, like clock settings changes or sample format. At that moment, the DAC output is 0V.

*Related PXDAC4800 library function: SetCustomDacValueXD48*

## 2.3 Version Information Tab

This tab shows hardware, firmware and software version that are used. Please send this information during a customer support request.

Version Information	Hardware Configuration
Firmware: 1.53.0.0	Device class: PXDAC4800-DP
Hardware: 3.0.0.0	
Driver: 2.3.7.56	
Library: 2.3.7.56	
Software release: 2.3.7.0	
Process arch.: 64-bit	
System arch.: 64-bit (x64)	

**Figure 2-5: PXDAC4800 Versions Tab User Interface**

The general format used for version numbers by Signatec Inc. is:

*Major.Minor.Sub-Minor.Build*

Where:

- *Major* is the major version number of the entity. This is usually only incremented when the underlying entity goes through a major change.
- *Minor* is the minor version number of the entity. The minor version number is usually incremented whenever the underlying entity is changed.
- *Sub-Minor* is the sub-minor version of the entity is usually used to indicate pre-release or development state.
- *Build* is the package version and is only incremented when the underlying entity has not changed, but has been re-compiled or repackaged.

*PXDAC4800 firmware* – This is the overall PXDAC4800 firmware package number. This is the version number that is referred to in documentation. This item can be updated by [uploading PXDAC4800 firmware](#).

*PXDAC4800 hardware* – This is the hardware revision of the current PXDAC4800. This version is assigned during PXDAC4800 hardware initialization and can only be updated by Signatec Inc.

*PXDAC4800 driver* – This is the version of the underlying PXDAC4800 kernel-mode driver. This is the sole software entity that communicates directly with the PXDAC4800 hardware. This item can be changed by installing newer PXDAC4800 product software.

*PXDAC4800 library* – This is the version of the main PXDAC4800 user-mode shared library. This is the primary interface to the underlying PXDAC4800 device driver. This item can be changed by installing newer PXDAC4800 product software.

*Software release* – This is the version of the current PXDAC4800 product software installation. This item can be changed by installing newer PXDAC4800 product software.

*Related PXDAC4800 library functions:* *GetItemVersionXD48* and *GetVersionTextXD48*

## 2.4 Generate Data Tab

This tab is a tool to generate waveforms that can be used by the PXDAC4800. It automatically interleaves the channels' data and used settings from “[Hardware Settings](#)” tab.

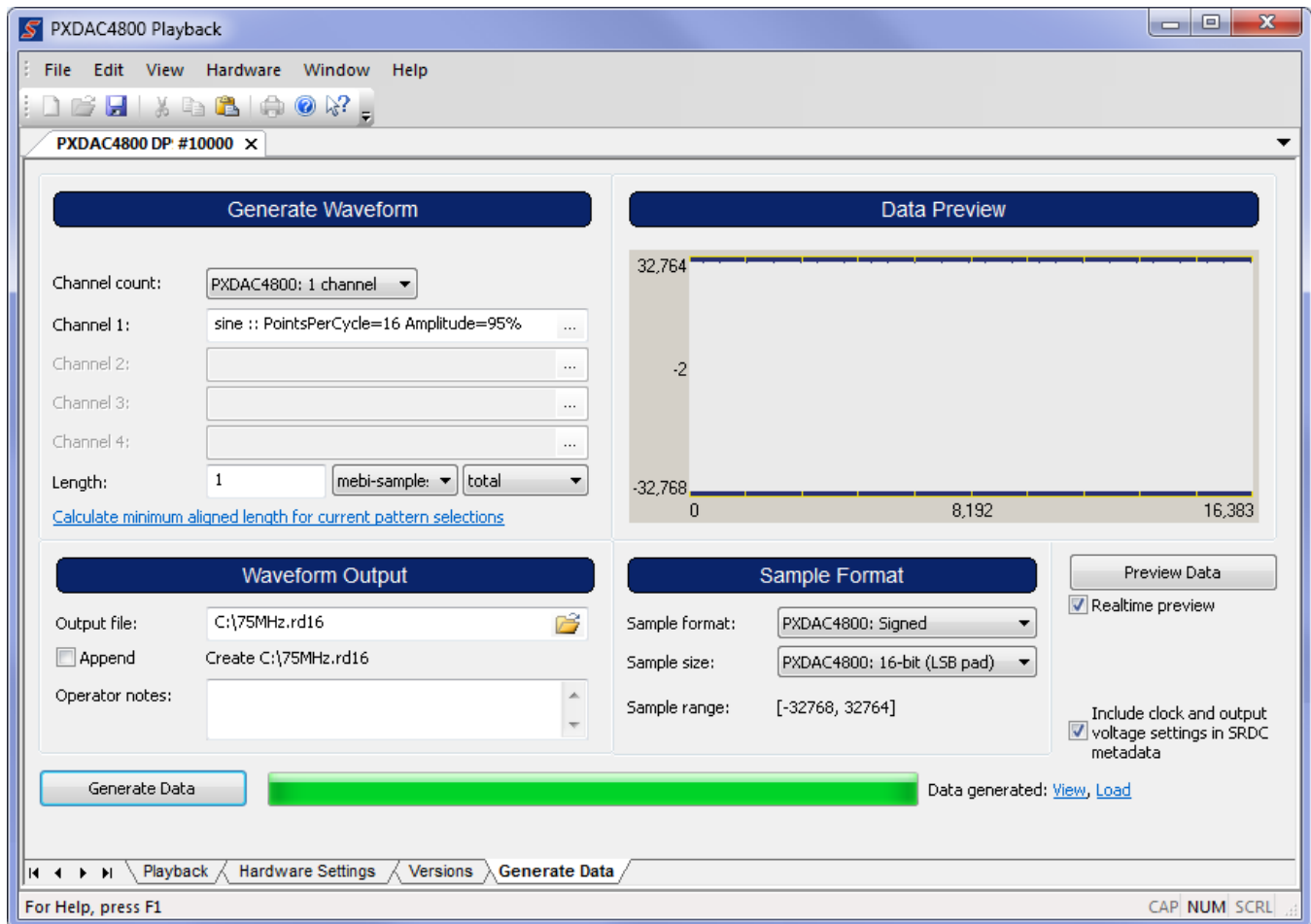


Figure 2-6: Generation Data Tab User Interface

### 2.4.1 Generate Waveform Section

#### 2.4.1.1 Channel count

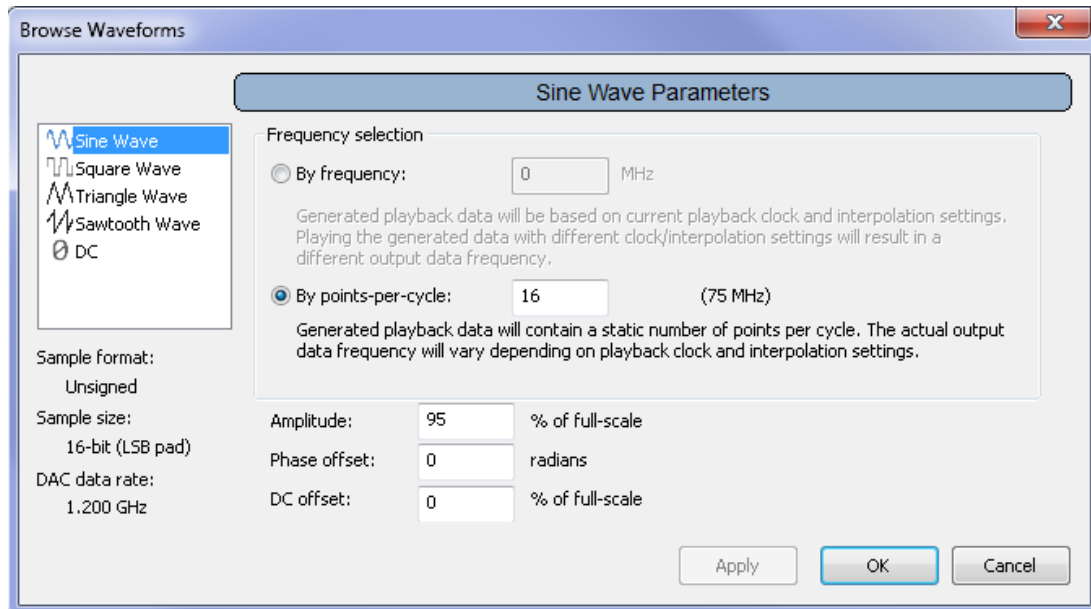
The combo box “Channel count” allows the number of channel (1, 2 or 4). The field starting by “PXDAC4800:” is getting the information from the “[Hardware Settings](#)” tab and changes according to the hardware settings. This is not reciprocal, modifying this combo box will not change the hardware settings.

#### 2.4.1.2 Channel x

The field “Channel x” contains the information for the generation of data. It can be written or created by the new window “[Browse Waveforms](#)”, open by clicking the “...”.

### 2.4.1.3 Browse Waveforms

The window “Browse Waveforms” allows selecting a standard and modifying the parameters.



**Figure 2-7: Browse Waveforms Window User Interface**

- Waveform list: Allows selecting a standard waveform and enabling the required parameters.
- By frequency: Allows editing the frequency of the signal. It is based on the selected clock frequency ([Hardware Settings](#)). Playing the generated data with different clock/interpolation settings will result in a different output data frequency.
- By points-per-cycle: Allows editing the period length in sample. The actual output data frequency will vary depending on playback clock and interpolation settings.
- Amplitude: Allows editing the peak amplitude of the signal. The range should be between 0% and 100% of the full-scale. The actual output data amplitude will vary depending on “[output voltage range](#)”.
- Phase offset: Allows editing the initial phase of the signal, in radians.
- DC offset: Allows editing a DC offset apply to the data. The data can be saturated if required. The range should be between -200% and 200% of the full-scale. The actual output data DC offset will vary depending on “[output voltage range](#)”.

### 2.4.1.4 Length

The field and the combo boxes “Length” allows editing the length of the file to be generated. The length can be “per-channel” or total (all channel). Note: gibi-, mebi-, and kibi- prefixes denote  $1073741824$  ( $2^{30}$ ),  $1048576$  ( $2^{20}$ ), and  $1024$  ( $2^{10}$ ) respectively.

Clicking “Calculate minimum aligned length for current pattern selections” will compute the minimum length for the frequency choice to have a good loop around (first data is also the next data of the last data) and the length limitation of the PXDAC4800.

Note: If the data is to be played by the PXDAC4800, the length needs to be an integer multiple 8192.

## **2.4.2 Data Preview Section**

### **2.4.2.1 Data plot**

This plot previews the first 8192 data to be generated. To zoom, please refer to section “[Scope Panel](#)”.

The preview can be generated when pressing the “Preview Data” button or automatically if the checkbox “Realtime preview” is selected.

## **2.4.3 Waveform Output Section**

### **2.4.3.1 Output file**

The field “Output file” selects the file name and location. By clicking the small folder icon, a standard Windows File dialog will be displayed to allow the user to browse for the name and location of the file.

### **2.4.3.2 Append**

The checkbox “Append” selects if the file is going to be overwritten or the new data will be added.

### **2.4.3.3 Operator notes**

The field “Operator notes” allows adding a note in the SRDC file. It can be read in the “[Source Info of the View Window](#)” or in the “[SRDC link in the RAM Playback Section](#)”.

### **2.4.3.4 Include settings in SRDC metadata**

The checkbox “Include clock and output voltage settings in SRDC metadata” adds various information in the SRDC file.

## **2.4.4 Sample Format Section**

### **2.4.4.1 Sample format**

The combo box “Sample format” allows editing the signed/unsigned [sample format](#). The field starting by “PXDAC4800:” is getting the information from the “[Hardware Settings](#)” tab and changes according to the hardware settings. This is not reciprocal, modifying this combo box will not change the hardware settings.

### **2.4.4.2 Sample size**

The combo box “Sample size” allows editing the 8/16 bit [sample size](#). The field starting by “PXDAC4800:” is getting the information from the “[Hardware Settings](#)” tab and changes according to the hardware settings. This is not reciprocal, modifying this combo box will not change the hardware settings.

## **2.4.5 Generate Data**

By clicking the “Generate Data” button, the “[Output file](#)” and the SRDC file will be generated.

When the generation is complete, 2 shortcuts are displayed: [View](#) and [Load](#) to open a new window.

## 2.5 The View Window

The “View” window has two panels: the Scope panel showing data and the Setting panel contains settings that affect how data is displayed.

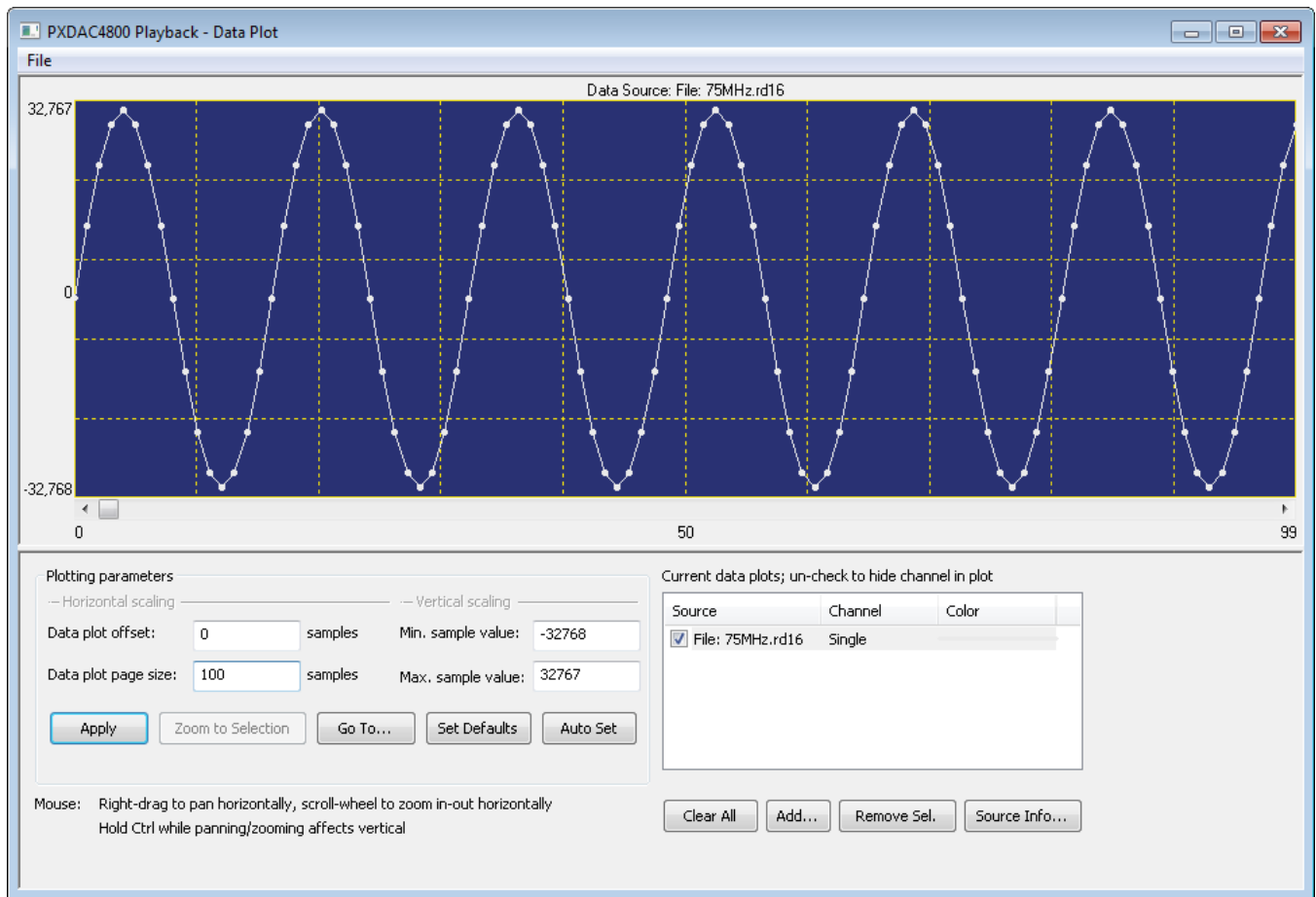


Figure 2-8: Data Plot User Interface

### 2.5.1 The Scope Panel

The Scope panel is where PXDAC4800 generation data is displayed. This can be a data snapshot from the current data generating for streaming, or data previously saved to a file. The plot area can display multiple channels of independent or interleaved data of various sample sizes (8-, 16- bit) and types (signed, unsigned) simultaneously.

The [Settings Panel](#) controls many of the data plotting parameters. This includes scaling parameters, channel visibility, and channel source information. In addition, the mouse may be used to alter the horizontal and vertical scaling of the data as well as panning through the data.

If the plot area is zoomed in sufficiently, data points will be discretely visible. When in this mode, holding the mouse pointer over the data point will result in a tooltip with the channel identifier and sample value being displayed in a tooltip window.

Note: Plotted data is read-only; there are no facilities to modify data with this interface.

### 2.5.1.1 Mouse Controls

The mouse may be used to zoom and pan plotted data. In this section “plot area” represent the blue area where data is actually plotted and “outside plot area” represents the margins outside of the blue data plot area.

**Left-click in plot area:** Set the main selection point to the sample position closest to where the mouse was clicked. This will also result in a vertical trace being displayed in the plot area. The sample position will also be marked under the trace in the lower horizontal axis label area.

**Left-click outside plot area:** This will remove the current selection.

**Shift left-click:** Extends the selection from the main selection point to the sample position closest to where the mouse was clicked. This will result in a second vertical trace being displayed as well as the highlighting of all samples (inclusively) between the two selection points.

**Mouse wheel in plot area:** Rolling the mouse wheel will zoom in/out horizontally on the data under the sample position closest to the mouse position. Note: Plot area must have mouse focus for this to work so if mouse wheel has no effect, click once somewhere on the Plot area pane to give it focus.

**Ctrl + mouse wheel in plot area:** Rolling the mouse wheel while the Control button is held down will zoom in/out vertically on the data.

**Right-drag in plot area:** Holding down the right mouse button and dragging will horizontally pan data left or right depending on the direction of the drag. Note: Right-drag panning doesn’t work as well when the plot area is zoomed in real tight on the data. In this case, the scroll bar can be used.

**Ctrl + right-drag in plot area:** Holding down the Control key while right dragging will allow data to be vertically panned up or down.

### 2.5.1.2 Keyboard Controls

When the scope control has keyboard focus, certain keys have an effect on the scope control:

**Left/Right Arrow:** Moves the current selection point left/right by one sample.

**Ctrl + Left/Right Arrow:** Scrolls left/right by one “line” which is about 1/8 the plot page size.

**Shift + Left/Right Arrow:** Extends selection left/right by one sample.

**Page Up/Down:** Scroll one page up/down. This is equivalent to clicking in the ‘open’ area of a scroll bar.

**Home:** Scroll all the way back to the beginning of the data.

**End:** Scroll all the way to the end of the data.

## 2.5.2 Settings Panel

### 2.5.2.1 Scaling and Apply

Clicking the button Apply will update the view according to the scaling:

- Data plot offset: First sample to show.
- Data plot page size: Number of samples to show.
- Min./Max. sample value: Vertical scaling, minimum and maximum.

### **2.5.2.2 Zoom To Selection**

This button will be enabled when an extended selection is made in the plot area. When this button is clicked it will zoom in horizontally such that the selected region fills the plot area.

### **2.5.2.3 Set Defaults**

Clicking this button will reset the plot area to a default page size and default vertical scaling.

### **2.5.2.4 Auto Set**

Clicking this button will attempt to automatically adjust vertical scaling such that all data fits into the plot area.

### **2.5.2.5 Plot Source List**

This list control lists all current plot sources. The checkboxes are used to toggle individual channel visibility.

### **2.5.2.6 Clear All**

Clicking this button will remove all plot sources from the plot area. This includes displayed PXDAC4800 RAM data, recording snapshots, and external files.

### **2.5.2.7 Add**

Clicking this button will allow the operator to select a data file to plot in the Scope panel. When a file is selected, the Playback 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. If a corresponding SRDC file is unavailable, the user needs to specify the file property in “[Source Info](#)”.

### **2.5.2.8 Remove Sel.**

Clicking this button will remove the source file(s) currently highlighted in the Plot Source List from the plot area. This button will only be enabled when a source is highlighted in the Plot Source List.

### **2.5.2.9 Source Info**

This button is enabled when a plot source is selected in the plot source list control. Clicking this button will open up a number of property pages that displays information on the currently selected data source and allow for reinterpretation of the underlying data.



## 2.6 Streaming Playback Window

The PXDAC4800 Playback Application has the ability to generate data to one or more PXDAC4800 devices from files. Data generation is controlled by clicking the “Streaming Playback...” button in the [Playback tab](#), which will open the “Streaming Playback” window.

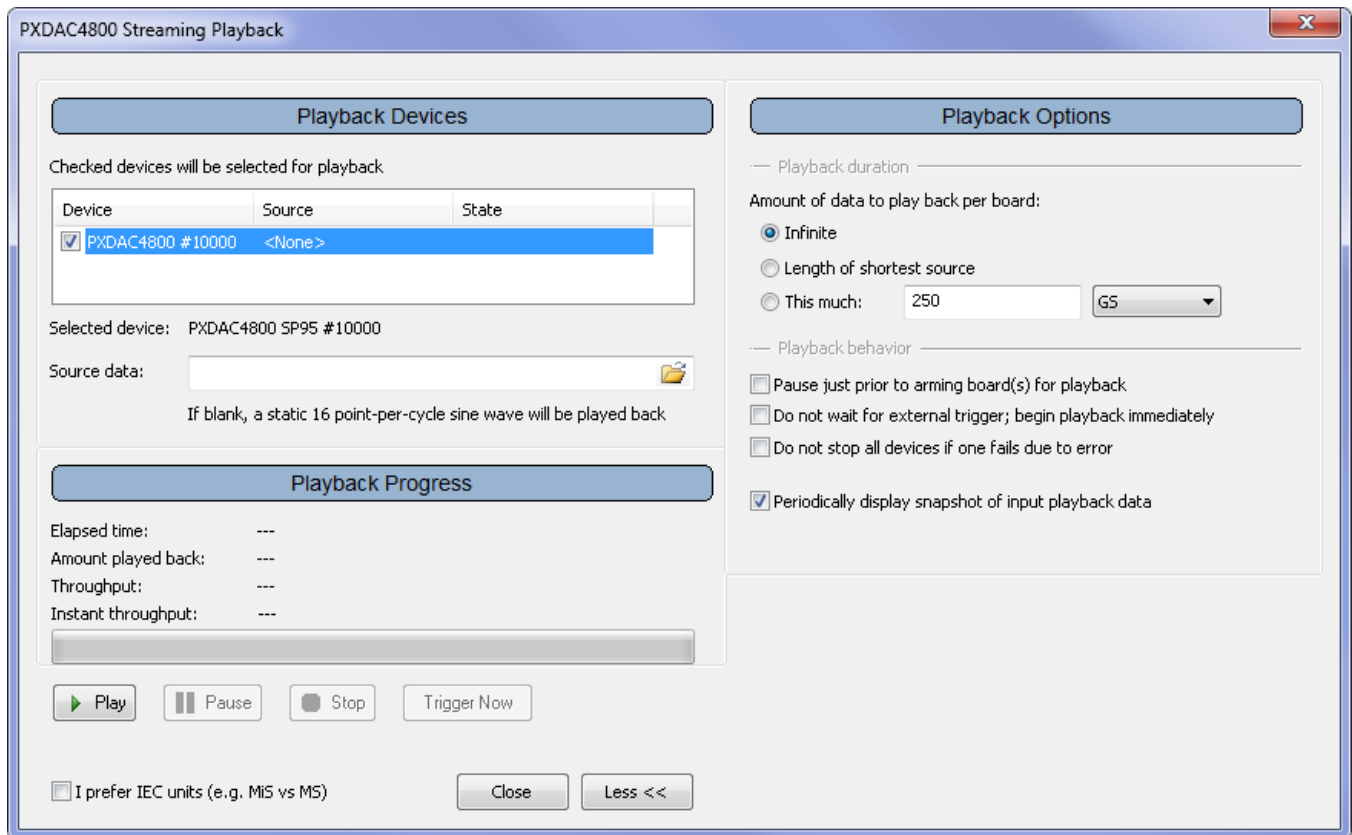


Figure 2-9: Streaming Playback User Interface

### 2.6.1 Playback Devices Section

The “Playback Devices” section shows the list of cards in the workspace, the source file for all of them and their state.

#### 2.6.1.1 Device Checkbox

The “Device” checkbox enables/disables the cards used for the streaming.

#### 2.6.1.2 Source data

To specify a source file to a card, select the device in the list and specify the pathname in the “Source data” field. Clicking on the small folder icon will open a standard Windows File dialog to allow the user to browse for the name and location of the desired file. If the path and the file name are known, putting the exact address will work. The files need to be at least 2MiB and be an integer multiple of 8192 bytes. If no “Source data” is specified, then a static 16 point-per-cycle sine wave will be played back.

Note: to match the maximum speed of the PCI-express, a raid system or RAM disk is required.

*Related PXDAC4800 library functions: `SessionStreamCreateXD48` and `SessionStreamCreateParmsXD48`*

## 2.6.2 Playback Progress Section

### 2.6.2.1 Elapsed time

“Elapsed time” shows the elapsed time since the beginning of the streaming.

### 2.6.2.2 Amount played back

“Amount played back” shows the amount of data transferred from the PC to the card.

### 2.6.2.3 Throughput

“Throughput” shows the average transfer rate on the PCI express bus.

### 2.6.2.4 Progress bar

The “progress bar” shows the progression of the transfer compared to the amount to play. If the amount is infinite, the progress bar will loop. It does not show if the data is outputting from the DAC.

### 2.6.2.5 Play

The “Play” button starts the streaming according to the “[Playback Devices](#)” and the “[Hardware Settings](#)”. If a non-infinite amount of data is defined, the streaming will automatically stop when the last data is played. If an error occurs during the streaming, the generation will stop.

Note: The “[trigger mode](#)” is required to be “single shot”.

*Related PXDAC4800 library function: BeginStreamingPlaybackXD48*

### 2.6.2.6 Stop

The “Stop” button forces the streaming to stop.

*Related PXDAC4800 library function: EndStreamingPlaybackXD48*

### 2.6.2.7 Trigger Now

The “Trigger Now” button sends a software trigger to the card and starts the playback. Same as “[Issue Software Trigger Now](#)”.

*Related PXDAC4800 library function: IssueSoftwareTriggerXD48*

## 2.6.3 Playback Options Section

### 2.6.3.1 Amount of data play back per board

The “amount of data play back per board” sets up the length of the streaming. The 3 choices are:

- **Infinite**: Generate until a “[stop](#)” occurs. The software will loop in the file.
- **Length of the shortest source**: Generate the equivalent of smallest file if more than one card is selected. Otherwise, stream the size of the file.
- **This much**: Generate the amount of data specified in the field and the units. (Note: gibi-, mebi-, and kibi- prefixes denote  $1073741824 (2^{30})$ ,  $1048576 (2^{20})$ , and  $1024 (2^{10})$  respectively.)

Note: The amount of data needs to be bigger than 2MiB and an integer multiple of 8192 bytes.

Note: Regardless of the recording duration type selected, a recording may be manually stopped by clicking the [“Stop Recording”](#) button the Recording window.

*Related PXDAC4800 library functions: `SessionStreamCreateXD48` and `SessionStreamCreateParmsXD48`*

### **2.6.3.2 Pause just prior to arming board(s) for recording**

The check box “Pause just prior to arming board(s) for recording” will result in the Playback Application displaying a message box after setting everything up for the recording and just prior to actually arming the boards for recording.

### **2.6.3.3 Do not wait for external trigger, begin playback immediately**

The check box “Do not wait for external trigger, begin playback immediately” will automatically start to output data when the [“Play”](#) button is clicked.

*Related PXDAC4800 library function: `IssueSoftwareTriggerXD48`*

### **2.6.3.4 Do not stop all devices if one fails due to error**

The check box “Do not stop all devices if one fails due to error” allows streaming to other cards if one fails.

### **2.6.3.5 Snapshot Options**

Clicking this button will open up the Playback Snapshot Options dialog. See [View Windows](#) for more details.

## **2.7 PXDAC4800 Playback Application Main Menu Options**

### **2.7.1 The File Menu**

#### **2.7.1.1 New Workspace**

Creates a new [PXDAC4800 Workspace](#). The PXDAC4800 Workspace is the top-level file abstraction and contains all PXDAC4800 devices as well as their hardware settings and various relations.

#### **2.7.1.2 Open Existing Workspace**

Opens a previously saved workspace.

#### **2.7.1.3 Save Workspace**

Saves the current workspace to a file associated with the workspace. If no file has been specified for the workspace then this is equivalent to a “Save Workspace As” operation.

#### **2.7.1.4 Save Workspace As**

Saves the current workspace to a new file. A standard Windows File dialog will be displayed to allow the user to browse for the name and location of the workspace file.

#### **2.7.1.5 New Local PXDAC4800 Device**

Opens up a new local PXDAC4800 instance. If there are more than one unallocated local device a Device Selection dialog will allow the user to select a device to use.

Note: This item will only be enabled if there are local PXDAC4800 devices that are not already open in the workspace.

#### **2.7.1.6 Close Device**

Closes the current PXDAC4800 device and remove it from the workspace. Users that run the PXDAC4800 Playback Application on a machine that contains local PXDAC4800 boards will most likely never have a need to use this feature.

#### **2.7.1.7 Plot Data in Scope**

Allows the operator to select a file to be displayed in the [View Window](#).

### **2.7.2 The Hardware Menu**

#### **2.7.2.1 Set Power-Up Defaults**

Resets all PXDAC4800 hardware settings to their default value. This will implicitly put the board into Standby mode which will cancel any current generation.

*Related PXDAC4800 library function: SetPowerupDefaultsXD48*

### 2.7.2.2 Issue Software Trigger

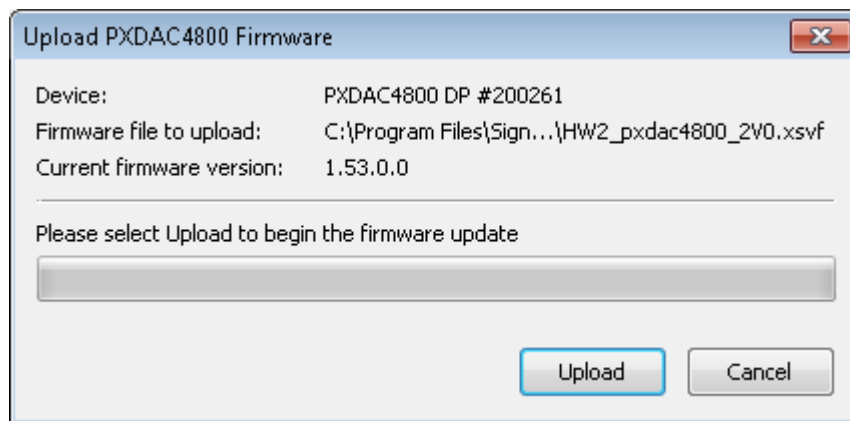
Sends a software trigger to the card and starts the playback. Same as [Issue Software](#) button in “Hardware Settings Tab”.

*Related PXDAC4800 library function: IssueSoftwareTriggerXD48*

### 2.7.2.3 Uploading PXDAC4800 Firmware

Allows uploading PXDAC4800 firmware. Signatec Inc. periodically updates the PXDAC4800 firmware to add new features or correct minor bugs. This updated firmware can usually be downloaded from the Signatec website and comes in the form of a .xsvf file.

Opens up a standard file dialog that the operator can used to select the firmware file to upload. Once selected, the Upload PXDAC4800 Firmware dialog is displayed.



**Figure 2-10: Upload PXDAC4800 Firmware**

*Upload* – Clicking this button will begin the firmware uploading process. The entire operation can take a few minutes.

**IMPORTANT:** Do not interrupt a firmware upload once it has begun. If the firmware upload process is not allowed to finish, the firmware may be lost and the card will not be recognized by the system. In this case, the board will need to be returned to Signatec Inc. so that it can have its firmware uploaded via an alternate method that requires additional hardware. (This only applies to system firmware; custom firmware update failures should not prevent card from being recognized by the system.)

Note: During the firmware upload process there may be times where the progress does not update for a while. This is normal. During these long waits, a countdown timer will be displayed on the progress window.

**IMPORTANT:** When the firmware upload is finished, a complete power shutdown is required, a reboot is not sufficient.

### **3 APPENDIX A – REVISION HISTORY**

#### **Revision 1.0**

- Initial release

#### **Revision 1.1**

- Add a remark about DC boards

#### **Revision 1.2**

- Update some information regarding DC boards

#### **Revision 1.3**

- Add “Frame Start” in Digital I/O.

#### **Revision 1.31**

- Copyright Vitrek LLC.