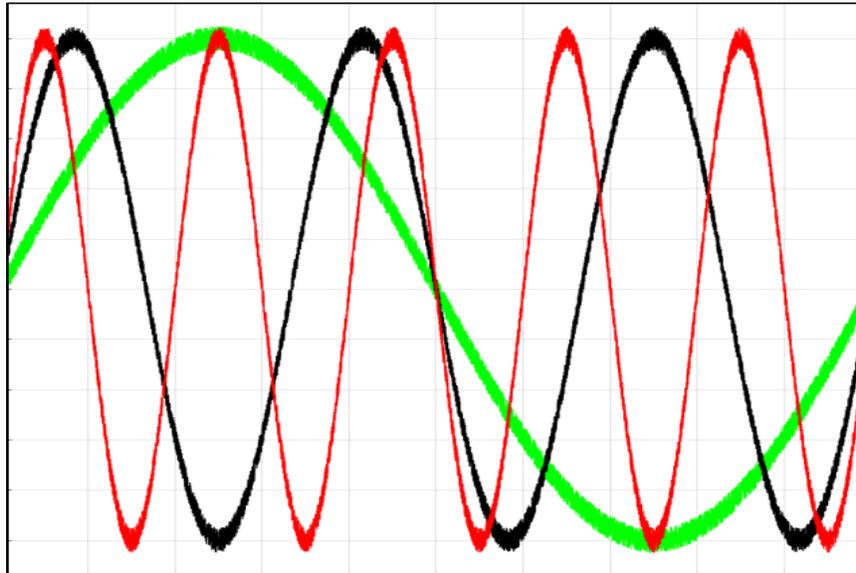


Pervideo™ Software Manual



Pervideo Software Manual

Edition 1 Version 4

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CONTENTS

1. INTRODUCTION 5

 Background 5

 Features 6

 System Requirements..... 7

 Installation Instructions..... 7

 Finding the MAC Address of Your Computer..... 12

2. QUICK START 13

 Starting up the Application 13

 Opening a File 14

 Displaying a Channel 15

 Zooming and Adjusting Views 16

 Saving and Closing a File 16

 Exiting the Application 16

3. OVERVIEW & FEATURES 17

 Overview 17

 Key Features..... 19

4. FILE MENU 20

 Create a New File..... 20

 Opening a File 23

 Save a File 23

 Save a File As 23

 Close a File..... 24

 Import a File..... 25

 Export a File..... 26

 Exit the Application 26

5. EDIT MENU 27

 Compress Data 27

 Smooth Channels 28

 Add Base Channel..... 28

CONTENTS

Mask Existing Channel	28
Simulate Sine Wave	29
Simulate Square Wave	30
Simulate Triangle Wave.....	31
Simulate Sawtooth Wave	32
Simulate Pulse Train	33
Add Event Channel	35
Greater Than Value	35
Less Than Value.....	36
Between Values.....	37
Outside of Values	38
Add Math Channel	39
Add Channels	39
Subtract Channels.....	40
Multiply Channels.....	41
Divide Channels	42
Polynomial Convert Channels.....	43
Convert to Log Base 10 Channel	44
Convert to Log Base 2 Channel	45
Move Channel	46
Delete Channel(s).....	48
Rename Channel(s)	49
Edit Channel Info	49
Edit Channel Comments	50
Edit Start Time	51
Edit File Notes	51
6. VIEW MENU.....	52
Refresh Layout.....	52
Arrange Layout	52
7. TOOLS MENU	54
Preferences	54

CONTENTS

Split File(s).....	55
Concatenate Files	56
Recalc Ch Stats	58
Get App Logs	59
8. HELP MENU	60
Help	60
About.....	60
9. FILE NAVIGATION PANEL	61
Plot Selections Branch	61
File Info Branch	64
10. CHANNEL DISPLAY PANEL	68
Zooming In & Out.....	69
Data Tips	70
Partial File Loading.....	71
11. ACRONYMS & ABBREVIATIONS	73
12. DEFINITIONS	74
13. ICONS	76
14. KEYBOARD SHORTCUTS	77

1. INTRODUCTION

This document describes the installation and operating instructions for the Pervideo™ software application.

Background

As the evolution of big data continues, gaps in data analysis capabilities continue to persist throughout multiple industries. While many data analysis solutions exist, they tend to be either very specialized or very customizable; both requiring significant resources (labor hours and/or money) to take a user's data from some packaged dataset (file or database) to something viewable and understandable.

Existing solutions vary from specialized custom software, open-source data analysis software languages, and spreadsheet applications. Specialized custom software have a significant cost associated with developing and maintaining the required software, defining the software needs to be, and reuse of the software within the same organization. Generally specialized custom software is develop by larger organizations, with large and/or complex data to process, and the significant initial investment in a custom software solution is determine a god return on investment. Open-source data analysis software languages, provide significant power to the user and small business and organizations, by simplifying the solution development process so that a larger consumer community can benefit from. The open-source approach has a similar initial investment obligation to it, though that initial investment is mainly in labor and reduced turn-around time, but is significantly limited in its scalability and reusability. Finally spreadsheets are the most recognizable solution to viewing and analyzing data but have significant size and calculations, to operate efficiently.

The Pervideo™ software closes some of the gaps between spreadsheet style common solutions and the custom software solutions. The software provide a simple solution to basic time series data analysis problems. Built from Mathworks® Matlab® programming platform the software application provides numerical time series data analysis features including channel-to-channel math, signal filtering, and data set concatenation functions.

Features

The software application includes several features for file conversion, waveform modeling, signal conditioning, multiple display options, meta-data correction, data reduction and management tools.

File Conversion:

- Development of new file, for modeling of waveforms
- Saving as Continuous Numerical Time Series (NTSC) and Discrete Numerical Time Series (NTSD) files
- Import from MS Excel® (XLSX), Mathworks Matlab® (MAT) files, and Astronova DCR Files
- Export to XML file (file meta-data only), MS Excel® (XLSX), Mathworks Matlab® (MAT), and Comma Separated Value (CSV) files

Waveform Modeling and Signal Conditioning

- Modeling of sine waves, square waves, triangle waves, saw-tooth waves, and pulse trains
- Math operation of distinct channels (signals): add, subtract, multiply, and divide
- Polynomial conversion, conversion to Log base 10 and Log base 2
- Channel masking (used to emphasize signal feature or events)
- Event detection/identification on condition: greater than, less than, between range, outside of range
- Compression and smoothing of individual or all channels
- Channel ordering and meta-data editing: labels, units, channel names, etc.

Multiple-Display Options

- Up to 4 plot windows overlaid vertically
- All channels displayable from any of the 4 plot windows
- Line-style modification
- Smoothing and waveform magnification options (for improved viewing)

Data Reduction and Management Tools

- Split file into smaller size files

- Concatenate files into single file
- User control of application file size limits

System Requirements

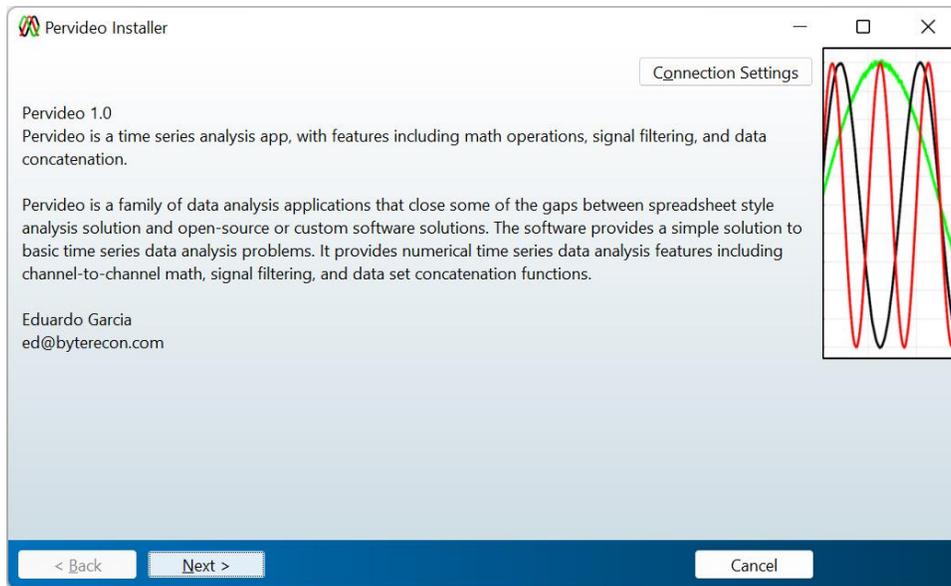
The following are the minimum system requirements needed for the software to properly function:

- Operating System: Microsoft Windows 10 or 11
- Processor: 1.2 GHz or faster
- System Type: 64-bit
- RAM: 16 GB minimum, 32 GB or greater recommended (depending on size of user data)
- Storage: 1 GB
- Runtime Software: MATLAB® Runtime (included with software)

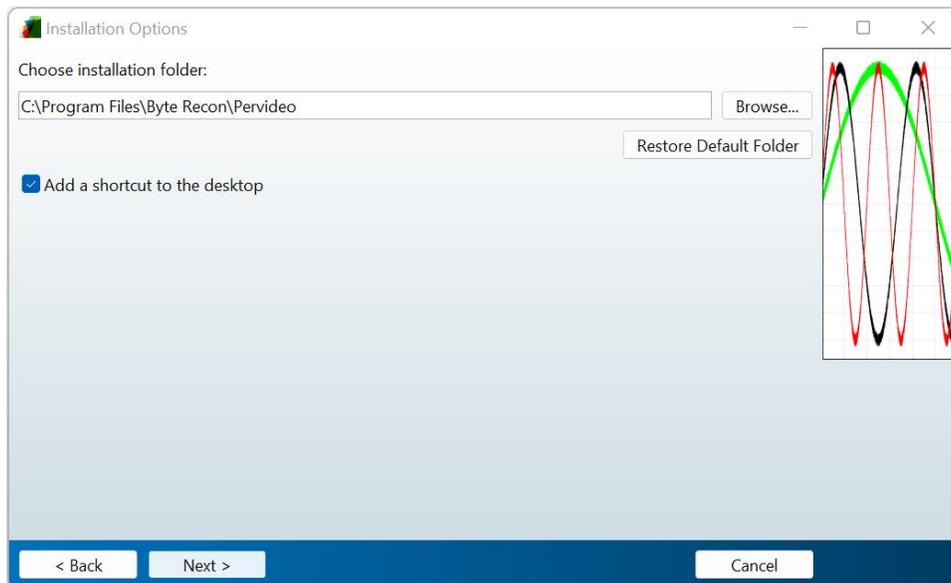
Installation Instructions

The following are the instructions to install Pervideo™ software:

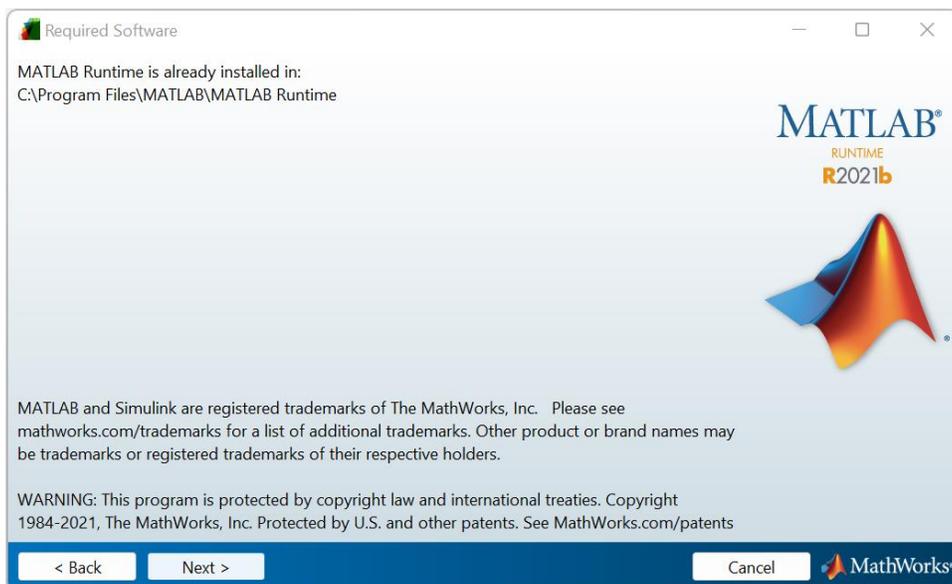
1. Unzip the “Pervideo-Setup.zip” contents
2. Run/Double-click on “PervideoAppInstaller.exe”
3. When the Windows software installation warning appears, click “yes”
4. In the “Pervideo Installer” prompt, click “Next”



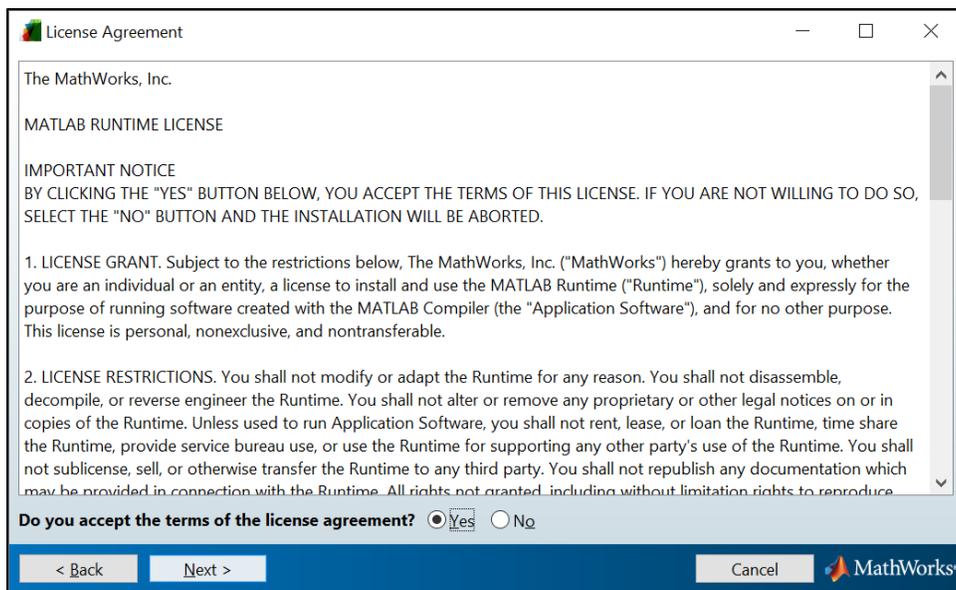
5. In the “Installation Options” prompt check the “Add a shortcut to desktop” checkbox and click “Next”



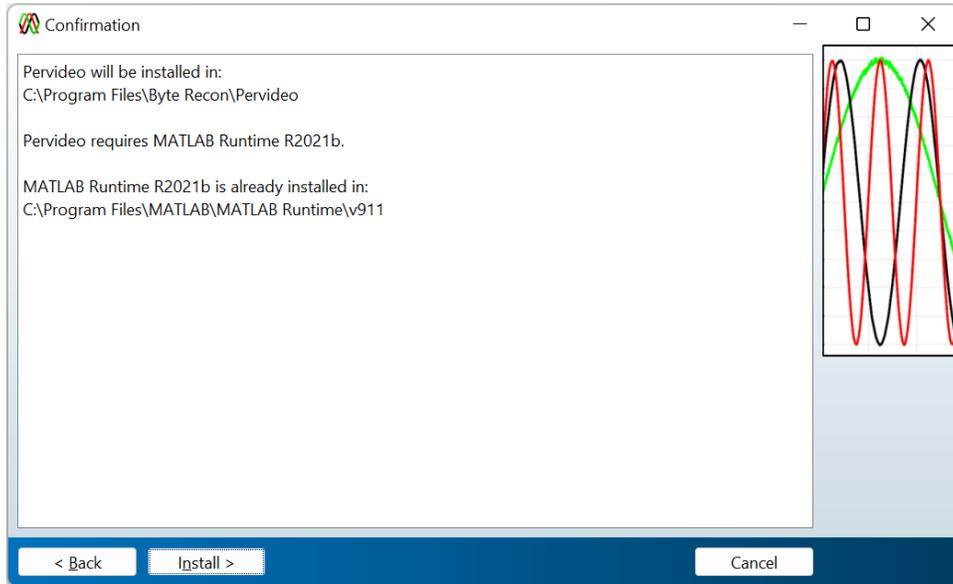
6. In the “Required Software” prompt click “Next”



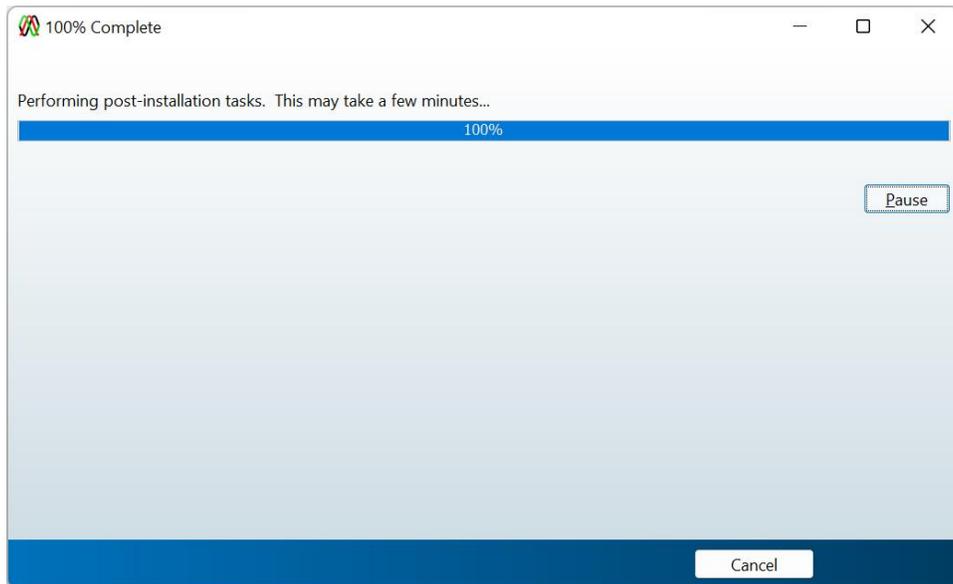
7. In the “License Agreement” prompt click the “Yes” radial button then click “Next”



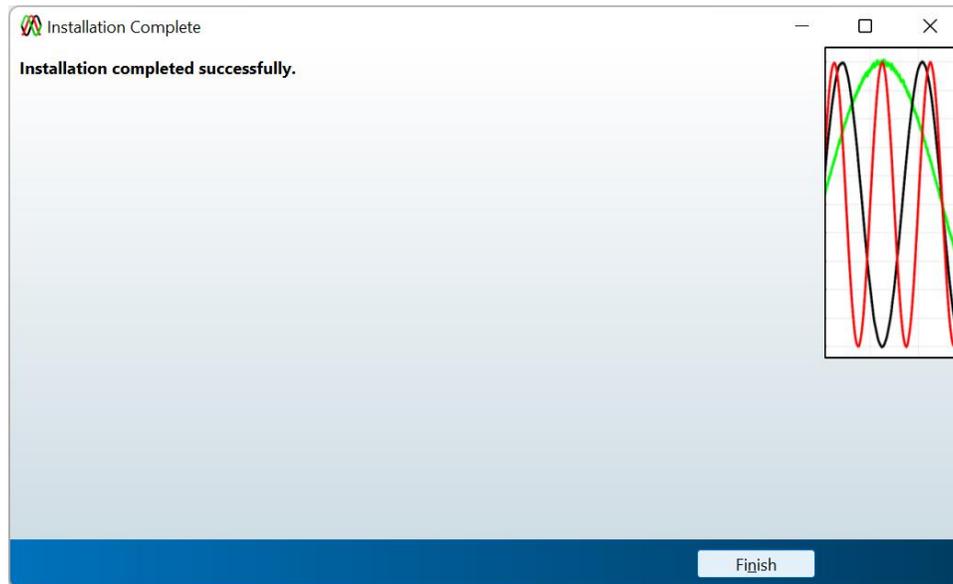
8. In the “Confirmation Prompt” click “Install”



9. Wait for the installation to complete



10. When the “Installation Complete” prompt appears, click “Finish”



11. Installation completed!

12. As an additional step it is recommended the files contained in the “...\application\examples” folder be copied to your users folder “C:\Users\{User Name}\Documents\Pervideo”. This step will allow for quick access of an example file to open in the application.

13. Finally, depending on the product license purchased, save your temporary license as “license.txt” to the app’s license folder:
“C:\Program Files\Byte Recon\Pervideo\application\license”

14. If applicable, repeat the last step once you receive your full license.

Finding the MAC Address of Your Computer

The following are the instructions on how to find the Media Access Control (MAC) address of your computer. The MAC address is used for all yearly and multi-year licenses.

1. Press the windows “Start” key on your computer and type “cmd” and press “Enter” in the search field.
2. In the “Command Window” type “getmac” and press “Enter”
3. The “Physical Address”, highlighted below with a transport name, is your device’s MAC address

```
C:\Users\username>getmac

Physical Address      Transport Name
=====
9B-CD-3A-DE-31-4D   Media disconnected
02-D1-4A-BE-DE-23   \Device\Tcpip_{1D252B68...}
```

4. If the “getmac” command did not return the MAC address, in the “Command Window” type “ipconfig /all” and press “Enter”
5. The “Physical Address”, highlighted below, is your device’s MAC address

```
C:\Users\username>ipconfig /all

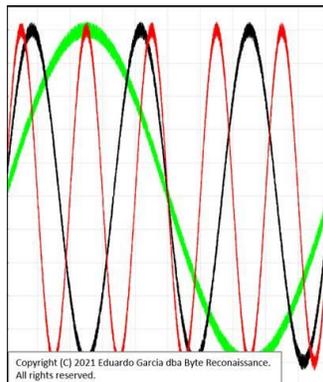
Wireless LAN adapter Wi-Fi 2:

Connection-specific DNS Suffix . . :
Description . . . . . : Intel(R) Dual Band Wireless...
Physical Address. . . . . : 02-D1-4A-BE-DE-23
DHCP Enabled. . . . . : Yes
Autoconfiguration Enabled . . . . : Yes
```

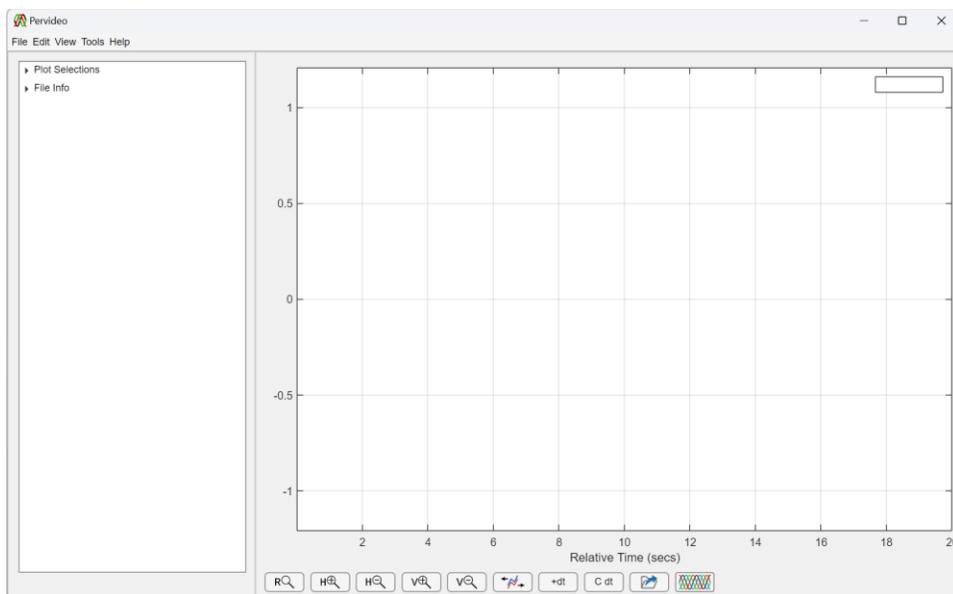
2. QUICK START

Starting up the Application

1. On the desktop double-click the “Pervideo” icon
2. Wait for the initial start-up screen to finish.



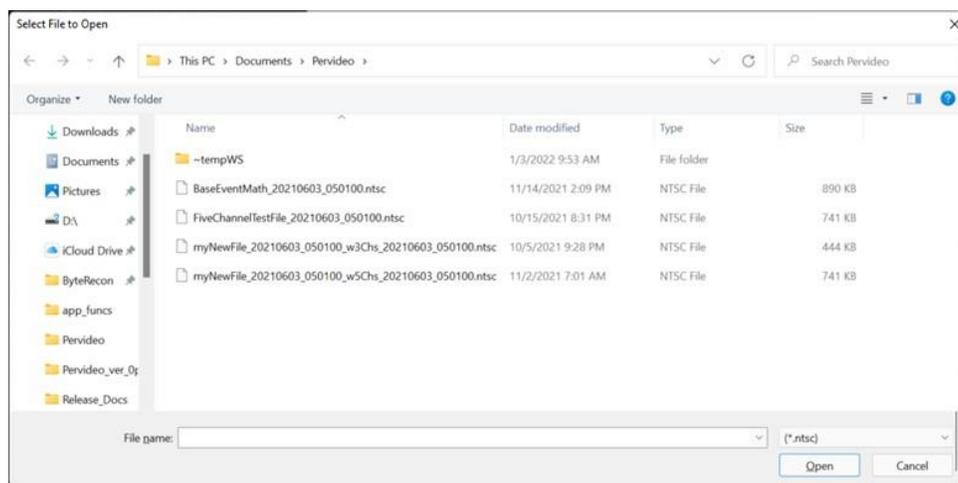
3. Wait for the final start-up screen to finish. Please note there may be up to a minute between the two start-up screens
4. When completed you should the app open as shown below



Opening a File

NOTE: Example file(s) are included with the software. It is recommended that those files contained in the “C:\Program Files\Byte_Recon\Pervideo\application\examples” folder be copied to your users folder “C:\Users\{User Name}\Documents\Pervideo”. This step will allow for quick access of an example file to open in the application

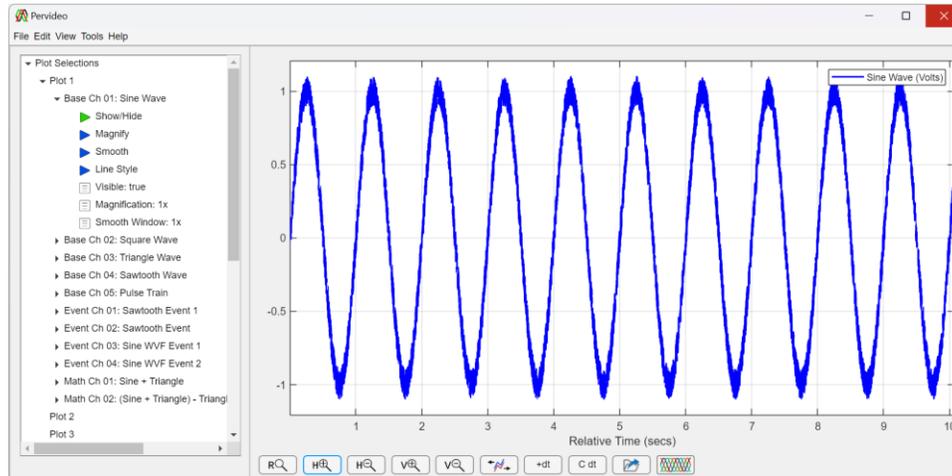
1. In the app click → File → Open
2. Navigate to the desired file location



3. Select the desired file and click → Open

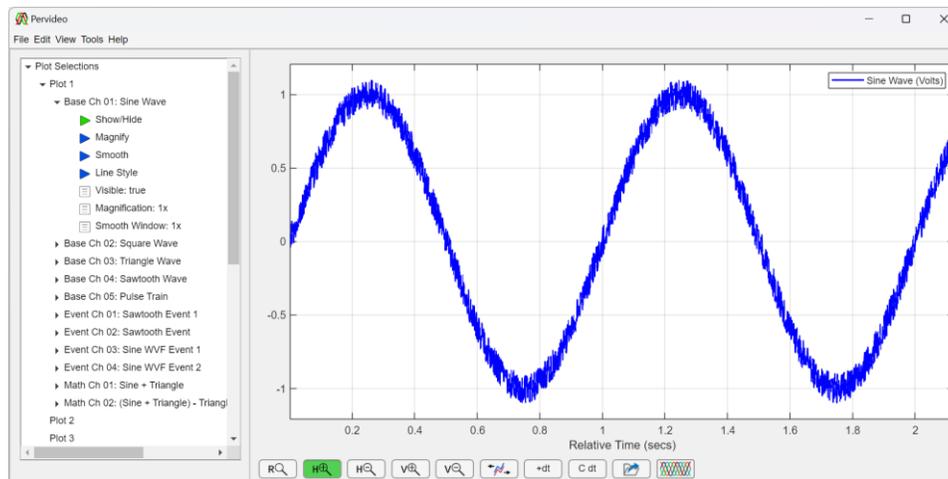
Displaying a Channel

1. In the left panel, if needed, expand the Plot Selections → Plot 1 selection tree
2. Expand the first Base Channel, i.e. “Base Ch 01...”
3. Click on the Show/Hide icon



Zooming and Adjusting Views

1. At the bottom of the plot window, click the Horizontal Zoom In Button
2. Place the mouse somewhere along the trace
3. Depress and hold the mouse's left click button → drag the mouse to the right → release the mouse's left click button
4. A zoomed in view of the trace should appear similar to the one below



Saving and Closing a File

1. In the app click → File → Close
2. If the save changes prompt appears, click “Yes” or “No” as desired



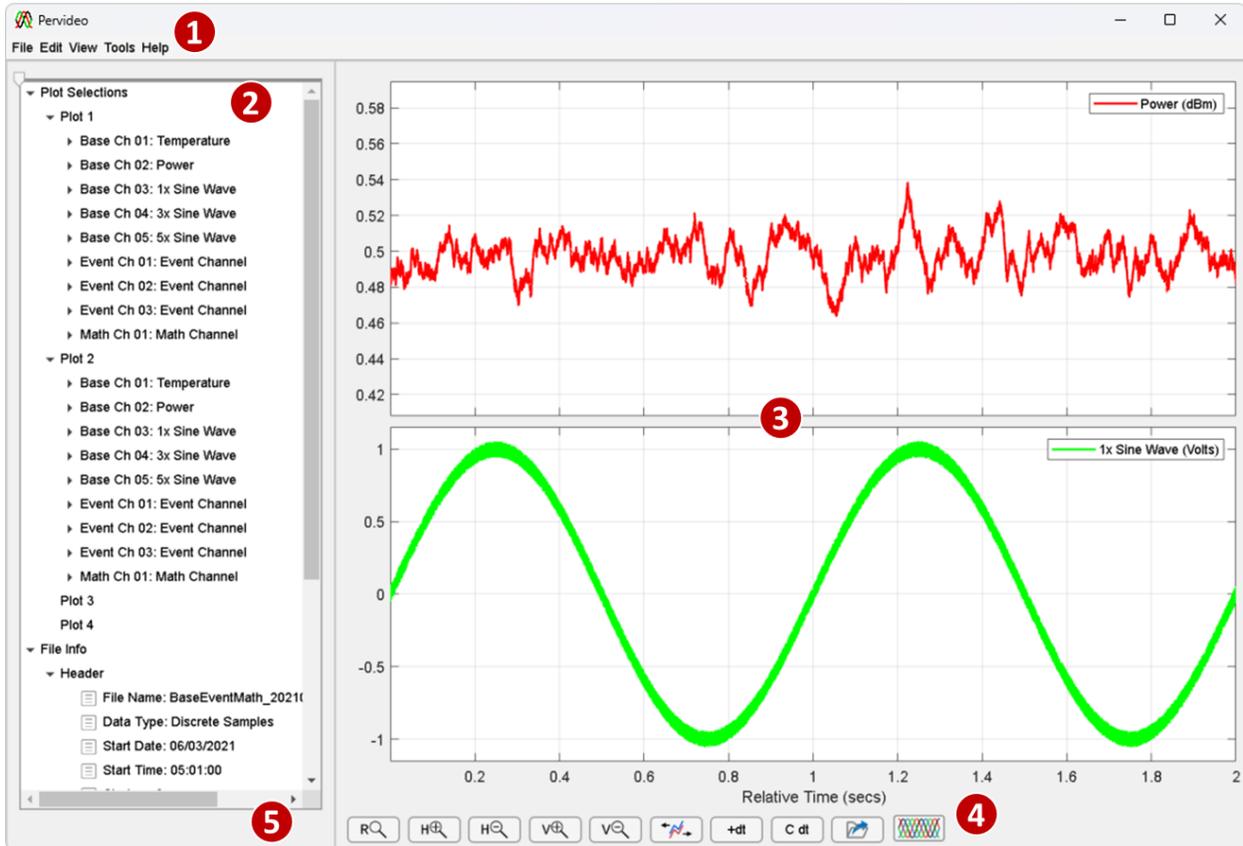
Exiting the Application

In the app click → File → Exit or alternatively click the “X” at the top-right corner of the app

3. OVERVIEW & FEATURES

Overview

The Pervideo™ software application is composed of four major areas providing distinct file/data management operations.



- 1) Menu Bar
- 2) File Navigation Panel
- 3) Channel Display Panel
- 4) Channel Navigation Buttons
- 5) Application Status Window

The “Menu Bar” provides the major areas of operation including file type operations, file editing operations, channel viewing operations, and other special operations. The file type operations contained in the “File” menu include features to create, save, import/export, and close files. The file editing operations contained in the “Edit” menu include features to add, delete, smooth,

compress, and move channels. The “View” menu include feature to arrange the channel/trace display window and refresh the window display. The “Tools” menu include special features to manipulate files (merging/splitting) and arrange the application (preferences). Finally, the “Help” menu includes feature that opens the help file (this document) and general information about the software application.

The “File Navigation Panel” is the location where information of the file contents are displayed (“File Info” branch), where the channels contained in the file are added to the display window’s plots (“Plot Selection” branch) and where the individual channel manipulation features are contained (“Plot Selection → Plot N → Base Ch N” branch).

The “Channel/Trace Display Panel” is the area where channels/traces are displayed in one more plots arranged vertically; up to 4 plots can be displayed.

The “Channel/Trace Navigation Buttons” is where the buttons used to zoom in/out and traverse a file. This area includes buttons to add and clear “data tips”, text box containing X-Y information about the selected data point.

The “Application Status Window” is the area where text messages indicating the status of some operation are displayed. Text is displayed in this area when the application is performing some operation requested by the user including saving, smoothing, adding a channel, etc. When an operation is in progress a text message will be displayed and the background color will change to emphasize the operation is in progress.

Key Features

The Pervideo™ software application is available in distinct product configurations, depending its product license, with the default configuration being the “Pervideo Viewer” configuration. Increasing features are available depending on product configuration licensed.

Application Feature	Pervideo Viewer	Pervideo Lite	Pervideo
Opening, creating and saving NTS Files	X	X	X
Importing files from MAT, XLSX and CSV	X	X	X
Importing files from other file types (AN-DCR)			X
Exporting files to MAT, XLSX, and CSV		X	X
Data Compression		X	X
Channel Smoothing/Filtering		X	X
Base channel creation	X	X	X
Event channel creation		X	X
Math channel creation			X
Channel Conversion to Other Units			X
Up to dual (2x) plot layout	X		
Up to quad (4x) plot layout		X	X
Up to 250K Sample limit	X		
Up to 250M Sample limit		X	X
File conversion from other data types			X
File splitting and concatenation			X
Partial file loading			X

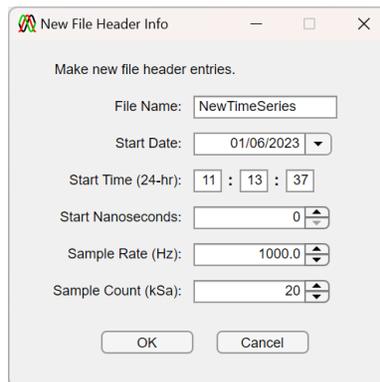
4. FILE MENU

The File Menu is composed of several functions to open, close, or migrate to different file types. The menu items and corresponding functions are defined below:

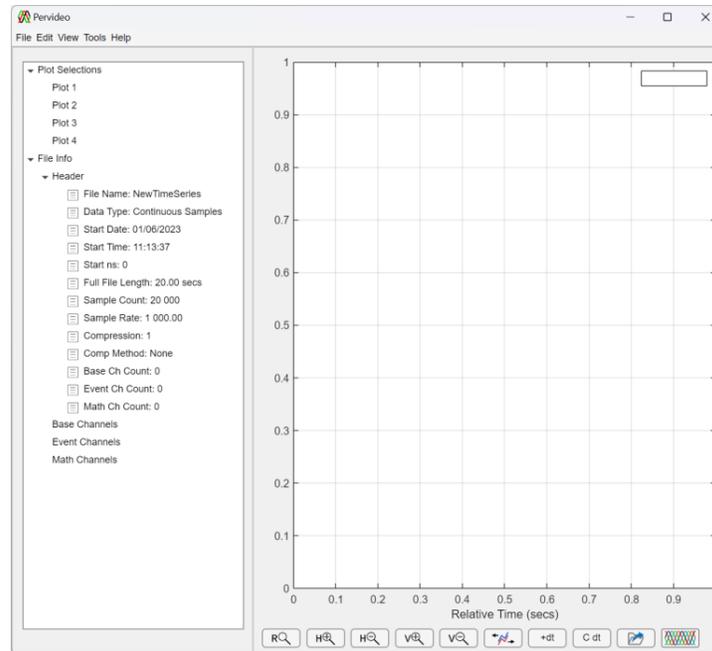
- New: creates a new NTSC file type
- Open: opens an NTSC or NTSD file type
- Save: saves the open file
- Save As: saves the open file as a new file name. Note the software will automatically apply the timestamp of the file's start time to the end of the filename the user entered
- Close: Closes the file
- Import: Allows the user to import different supported file-types into the application. Supported file types include: MAT and XLSX
- Export: Allows the user to export to different supported file-types. Supported file types include: CSV, MAT and XLSX
- Exit: Closes the software application.

Create a New File

1. In the menu bar click File → New



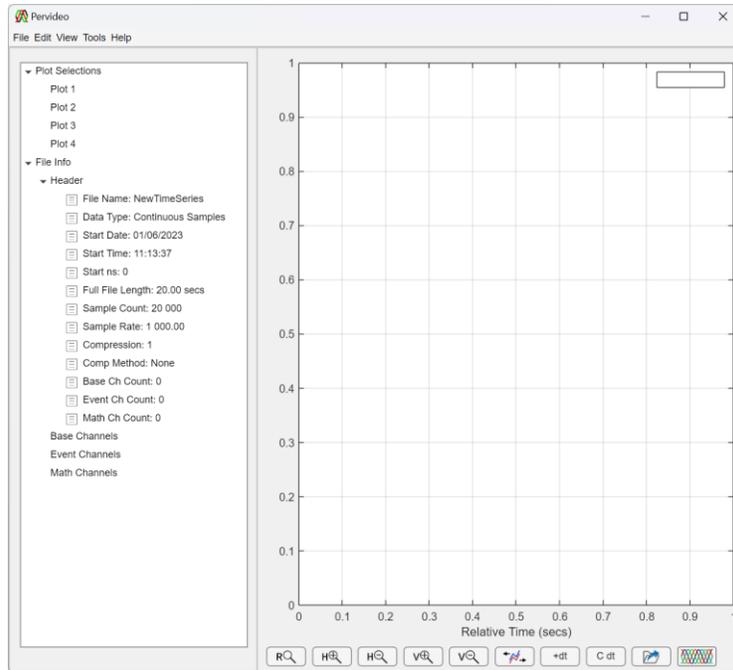
2. When the “New File Header Info” prompt appears, modify the fields to define the file name, file's start date and time, file's sample rate, and number of samples (sample count) contained in the file then click “OK”
3. When the new file is created the application will update similar to the figure below. Please note that while the “Plot Selection” tree branch contains “Plot N” branches, there are no branches contained within the “Plot N” branches because no channels have been added yet.



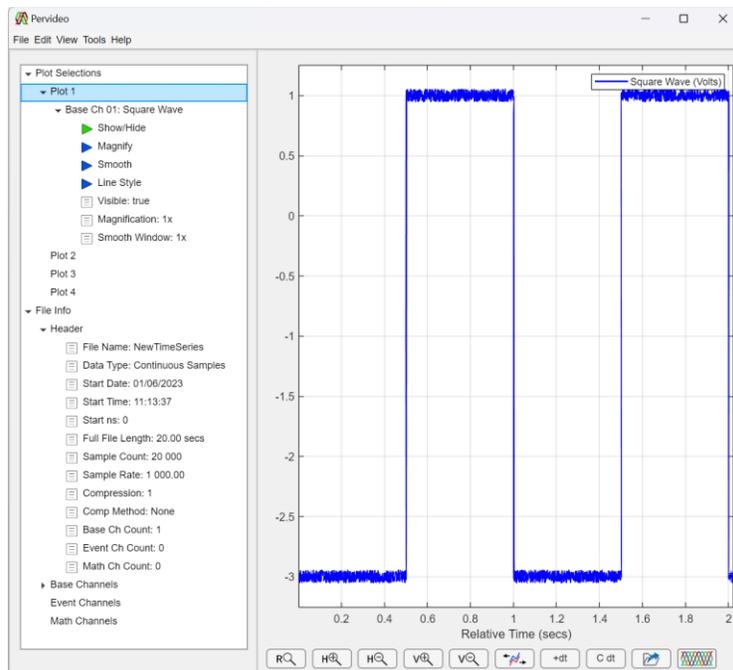
4. In the menu bar, click Edit → Add Base Channel → select desired waveform simulation option (“Simulate Square Wave” shown in this section).

Please note the following attributes updated in the application

- Right Arrows (triangles) and nested branches are contained in the “Plot Selections → Plot N” tree branch
- The “Base Ch Count” field of the “File Info → Header” branch is incremented by one
- A right arrow (triangle) and nested information is contained in the “File Info → Base Channels” branch

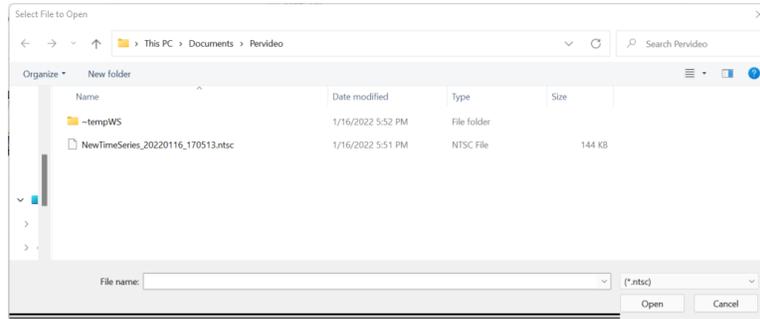


5. In the “Plot Selections → Plot 1 → Base Ch 01” tree branch click the “Show/Hide” icon. Once clicked, the channels trace is shown on the screen.

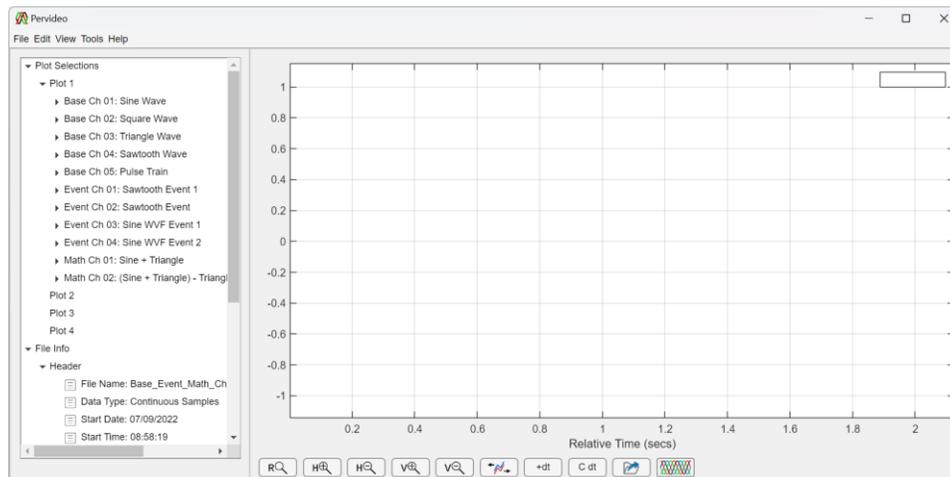


Opening a File

1. In the menu bar click File → Open



2. In the “Select File to Open” window, navigate to the desired file, select the file and click “OK”. Note: to open an NTSD file change the file type drop-down menu to “(.ntsd)”.
3. Wait for the application to load the selected file. When the file opens the application should update similar to the figure below

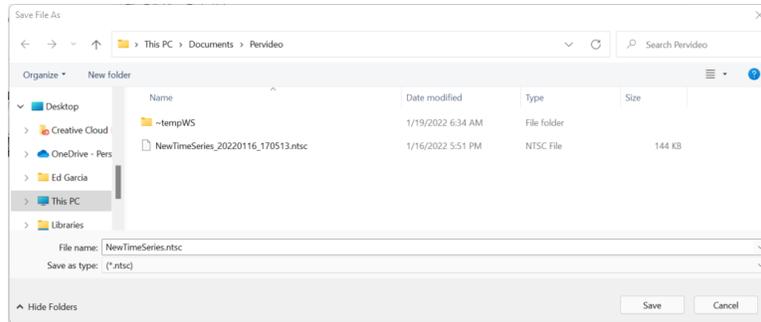


Save a File

1. In the menu bar click File → Save

Save a File As

1. In the menu bar click File → Save As

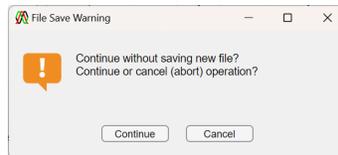


2. In the “Save File As” window, navigate to the desired folder, enter the desired name in the “File name” field, and click “OK”

Note: the application will automatically append the entered file name with the timestamp of the file. The file timestamp is the start date and time shown in the file’s header information in “yyyymmdd_HHMMSS” format.

Close a File

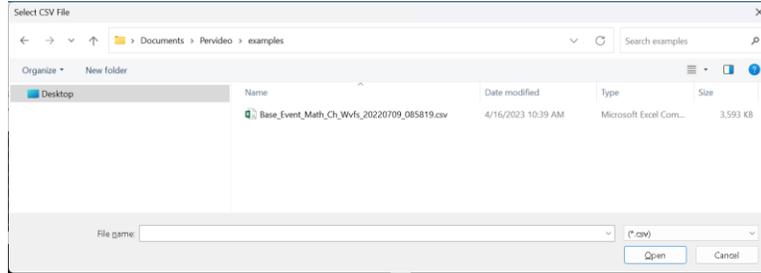
1. In the menu bar click File → Close
2. When the “Do you want to save your changes” prompt appears click “Yes” or “No”



Note: The “Do you want to save your changes” appears even if the file was recently saved.

Import a File

1. In the menu bar click File → Import → From CSV (or ...)



2. In the “Select CSV File” window, navigate to the desired folder, select the desired file name, and click “OK”

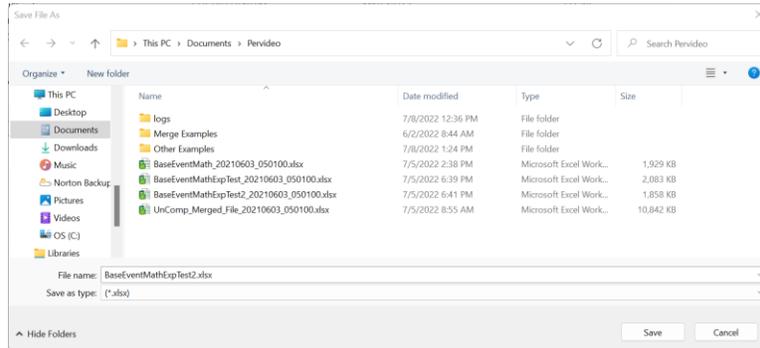
NOTE:

1. Though not required, to best import an XLSX or CSV file, the file should be formatted as shown in the following figure. It is recommended that the user export an existing NTSC/NTSD file to XLSX to use as the basis for modifying an XLSX (or CSV) file that can be easily imported to Pervideo. Similar conditions and recommendations exist for the MAT files.
2. CSV and XLSX files formatted in a manner other than shown below, will be imported if a distinct contiguous numeric table/matrix is detected. If header information is not detected, default header information will be applied which can be changed within the app, and your files header information will be saved to the app’s “File Notes”.
3. To import Custom Instrument files, click File → Import → Other Files → {desired file type}

Channel_Info.Ch_Type	Base	Base	Base	Base	Base	Event	Event	Event	Event	Math
Channel_Info.Number	1	2	3	4	5	1	2	3	4	1
Channel_Info.Name	Temperature	Power	1x Sine Wave	3x Sine Wave	5x Sine Wave	Event Channel	Event Channel	Event Channel	Event Channel	Math Channel
Channel_Info.Unit	degrees F	dBm	Volts	Volts	Volts	[none]	[none]	[none]	[none]	Volts
Channel_Info.Scale	linear	log10	linear	linear	linear	Binary	Binary	Binary	Binary	linear
Channel_Info.Event_Count	0	0	3, 392	6, 6	0	3	392	6	6	0
Channel_Info.Event_Ch_Num	0	0	1, 2	3, 4	0	0	0	0	0	0
Time (s)	0.0001	0.043945873	0.199975076	-0.039316538	-0.002390909	-0.005919398	0	0	1	0
	0.0002	0.75033715	0.805590816	0.007989549	0.033815771	0.002107904	0	0	1	0
	0.0003	0.651787214	0.324104507	0.016940537	-0.01959014	-0.013785137	0	0	1	0
	0.0004	0.042349486	0.064529444	0.037242345	-0.029750289	0.007013048	0	0	1	0

Export a File

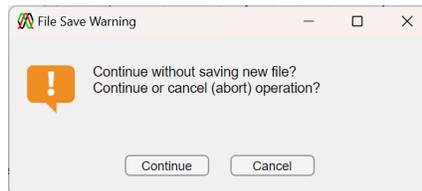
1. In the menu bar click File → Export → To XLSX (or ...)



1. In the “Save File As” window, navigate to the desired folder, enter the desired name in the “File name” field, and click “OK”

Exit the Application

1. In the menu bar click File → Exit
2. If the “File Save Warning” prompt appears click “Continue” or “Cancel”



5. EDIT MENU

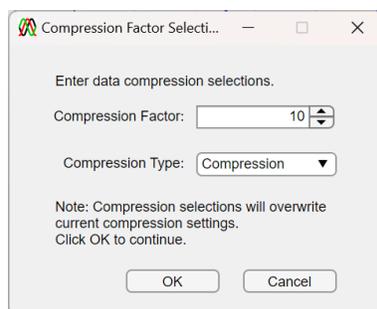
The Edit Menu is composed of several functions to add, modify, and condition channel data. The menu items and corresponding functions are defined below:

- Compress Data: compresses the open file's data channels
- Smooth Channels: smooths the open file's data channels
- Add Base Channel: adds a channel to the file by simulating a continuous waveform: sine wave, square wave, etc.
- Add Event Channel: adds a channel to the file that indicates some stated of another channel: channel greater than a value, less than a value, etc.
- Add Math Channel: adds a channel to the file that performs some mathematical operation on a single file or multiple files
- Move Channel: moves a channel's position within a channel group
- Delete Channel(s): deletes one or more channels from a file
- Rename Channel(s): renames one or more channels in a file
- Edit Channel Info: modifies channel information within a file
- Edit Start Time: modifies that files start date and time

Compress Data

The "Compress Data" function compresses all channels of the open file using the desired compression option

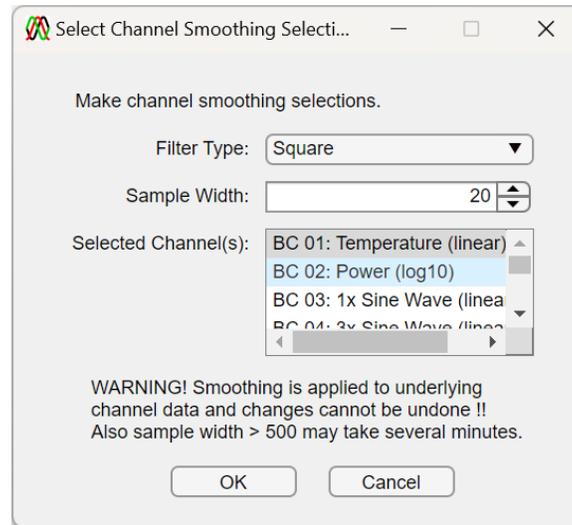
1. In the menu bar click Edit → Compress Data
2. Select the "Compression Factor" and "Compression Type" and click "OK"



Smooth Channels

The “Smooth Channels” function all or select number of channels. This smoothing functions is done on the underlying channel data in memory and cannot be undone (without closing the file without saving).

1. In the menu bar click Edit → Smooth Channels → Select Channels (or All Channels)
2. Select the “Channel Smoothing” prompt, select the “Filter Type”, “Sample Width” and desired “Channels” and click “OK”.



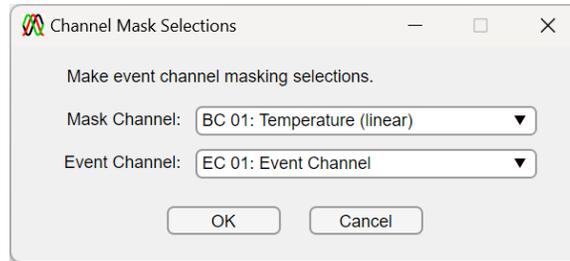
Add Base Channel

The “Add Base Channel” function adds a channel to the file’s base channels using the desired simulation or channel operation function.

Mask Existing Channel

The “Mask Existing Channel” function adds a channel to the “Base Channels” by copying an existing channel and hiding the portions of the channel that are not classified as an “event” based on the event channel selected or occur within the time range selected.

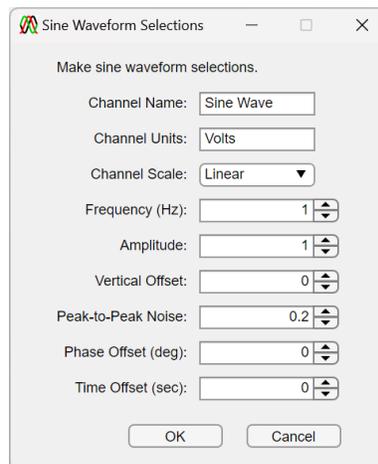
1. In the menu bar click Edit → Add Base Channel → Mask Existing Channel
2. Select the “Mask Channel” and “Event Channel” and click “OK”



Simulate Sine Wave

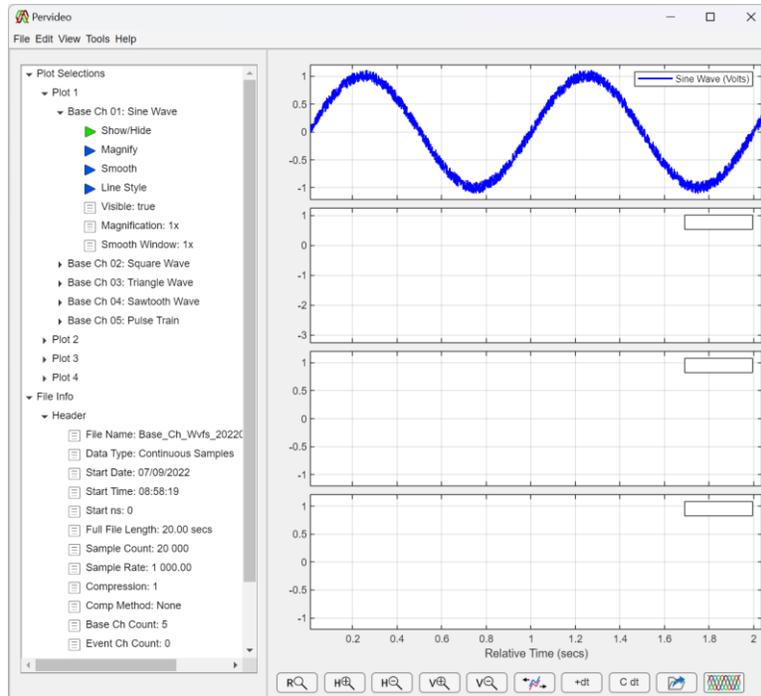
The “Simulate Sine Wave” function adds a channel to the “Base Channels” by simulating a sine wave.

1. In the menu bar click Edit → Add Base Channel → Simulate Sine Wave
2. When the “Sine Waveform Selections” prompt appears, make the desired entries and selections and click “OK”



3. In the “Plot Selections → Plot N → Base Ch 0X” tree branch click the “Show/Hide” icon. Once clicked, the channels trace is shown on the screen.

Note: Sine wave, shown below, was added to Base Channel 2 and displayed on Plot 2.



Simulate Square Wave

The “Simulate Square Wave” function adds a channel to the “Base Channels” by simulating a square wave.

1. In the menu bar click Edit → Add Base Channel → Simulate Square Wave
2. When the “Square Waveform Selections” prompt appears, make the desired entries and selections and click “OK”

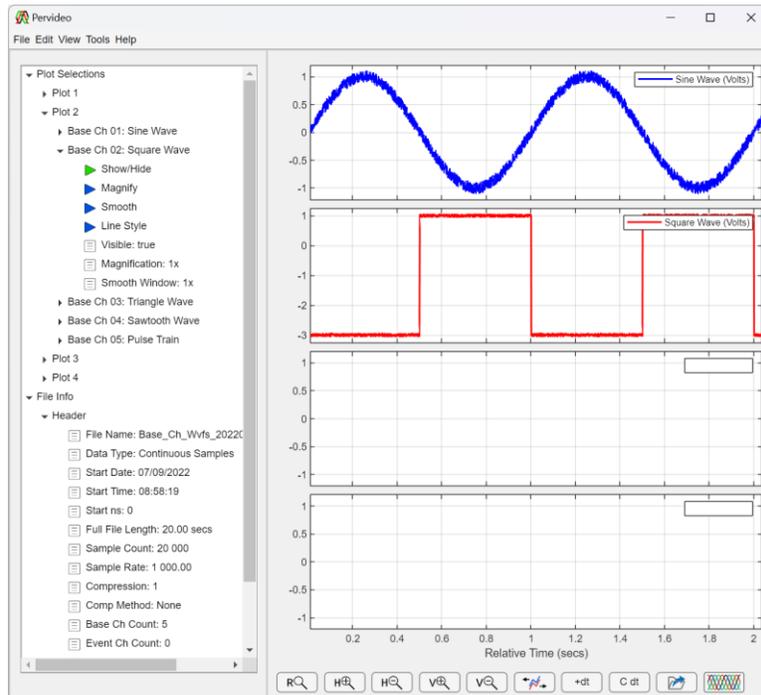
The screenshot shows a dialog box titled 'Square Waveform Selections'. It contains the following fields and controls:

- Channel Name: Square Wave
- Channel Units: Volts
- Channel Scale: Linear (dropdown menu)
- Frequency (Hz): 1 (spin box)
- Amplitude: 2 (spin box)
- Vertical Offset: -1 (spin box)
- Peak-to-Peak Noise: 0.1 (spin box)
- Time Offset (sec): 0.5 (spin box)

At the bottom of the dialog are 'OK' and 'Cancel' buttons.

3. In the “Plot Selections → Plot N → Base Ch 0X” tree branch click the “Show/Hide” icon. Once clicked, the channels trace is shown on the screen.

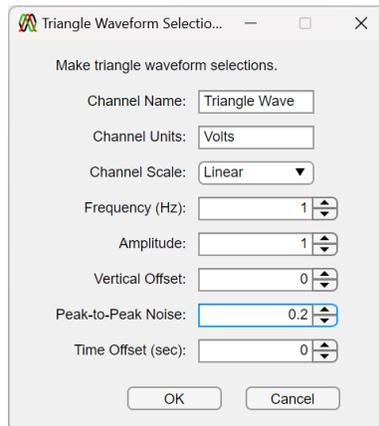
Note: Square wave, shown below, was added to Base Channel 1 and displayed on Plot 1.



Simulate Triangle Wave

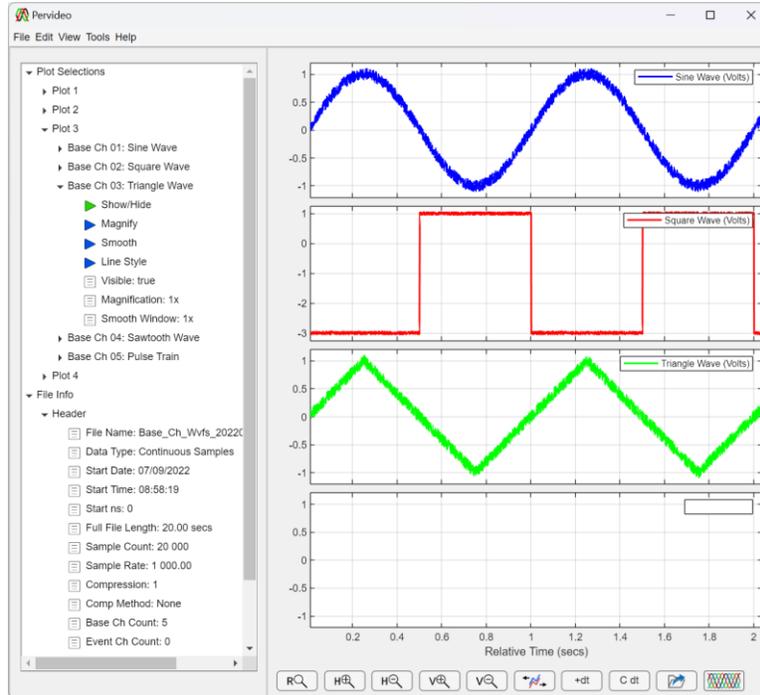
The “Simulate Triangle Wave” function adds a channel to the “Base Channels” by simulating a square wave.

1. In the menu bar click Edit → Add Base Channel → Simulate Triangle Wave
2. When the “Triangle Waveform Selections” prompt appears, make the desired entries and selections and click “OK”



3. In the “Plot Selections → Plot N → Base Ch 0X” tree branch click the “Show/Hide” icon. Once clicked, the channels trace is shown on the screen.

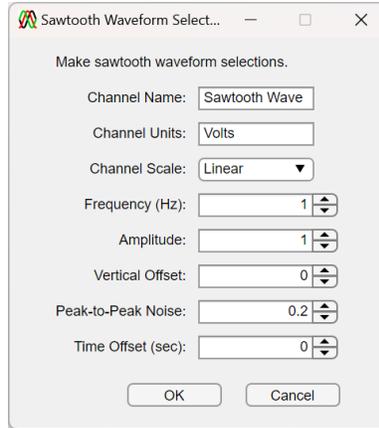
Note: Triangle wave, shown below, was added to Base Channel 3 and displayed on Plot 3.



Simulate Sawtooth Wave

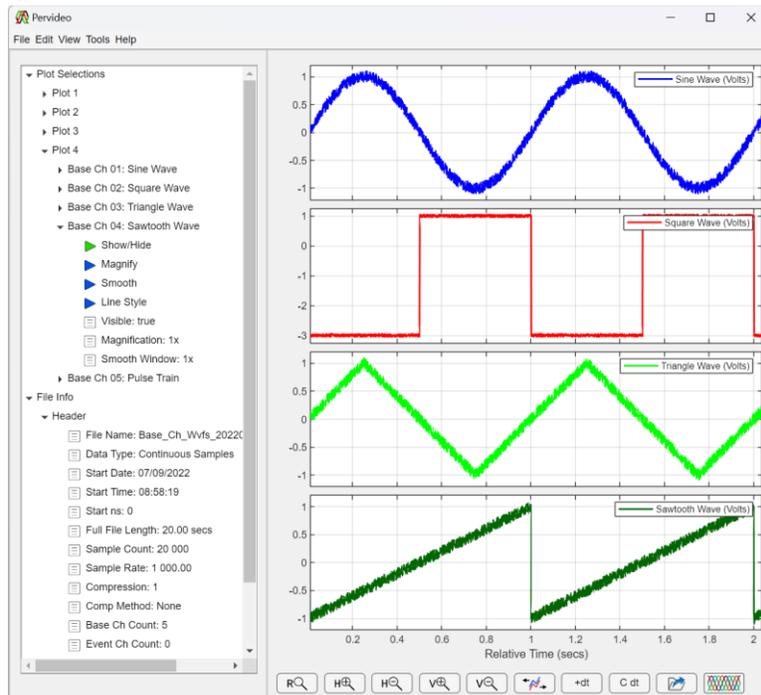
The “Simulate Sawtooth Wave” function adds a channel to the “Base Channels” by simulating a square wave.

1. In the menu bar click Edit → Add Base Channel → Simulate Sawtooth Wave
2. When the “Sawtooth Waveform Selections” prompt appears, make the desired entries and selections and click “OK”



3. In the “Plot Selections → Plot N → Base Ch 0X” tree branch click the “Show/Hide” icon. Once clicked, the channels trace is shown on the screen.

Note: Square wave, shown below, was added to Base Channel 4 and displayed on Plot 4.

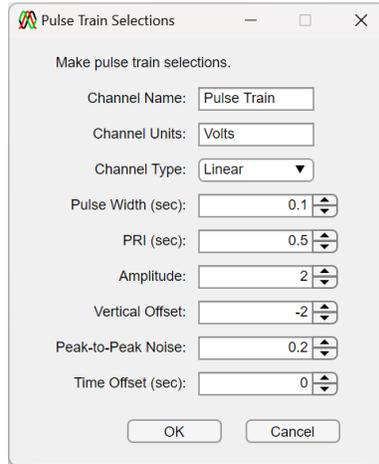


Simulate Pulse Train

The “Simulate Pulse Train” function adds a channel to the “Base Channels” by simulating a square wave.

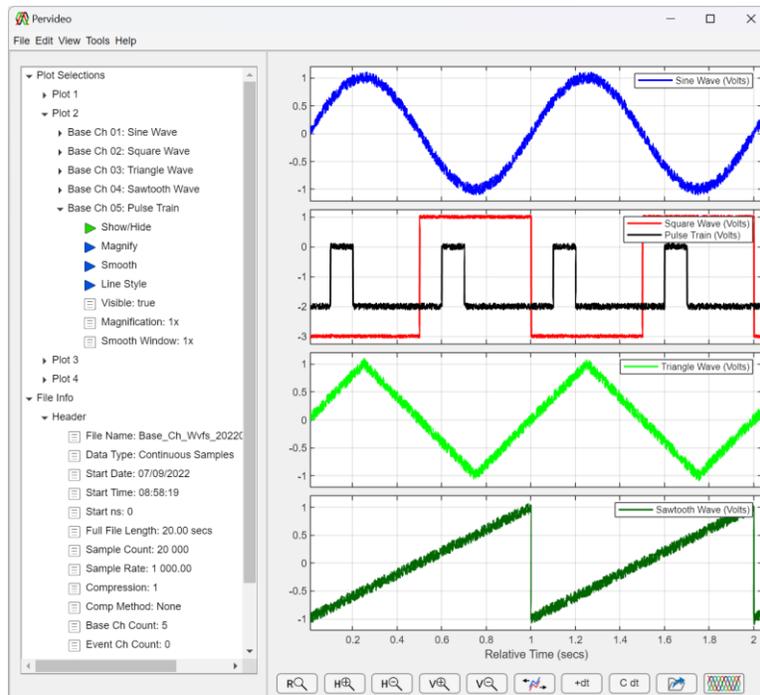
1. In the menu bar click Edit → Add Base Channel → Simulate Pulse Train

- When the “Pulse Train Selections” prompt appears, make the desired entries and selections and click “OK”



- In the “Plot Selections → Plot N → Base Ch 0X” tree branch click the “Show/Hide” icon. Once clicked, the channels trace is shown on the screen.

Note: Pulse train, shown below, was added to Base Channel 5 and displayed on Plot 2.



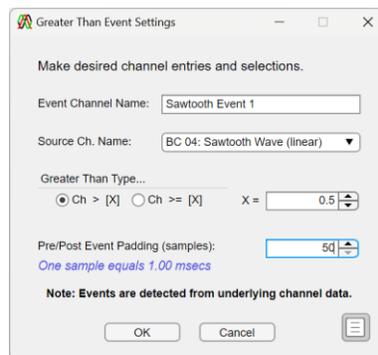
Add Event Channel

The “Add Event Channel” function adds a channel to the file’s event channels using the desired event flag triggering selections.

Greater Than Value

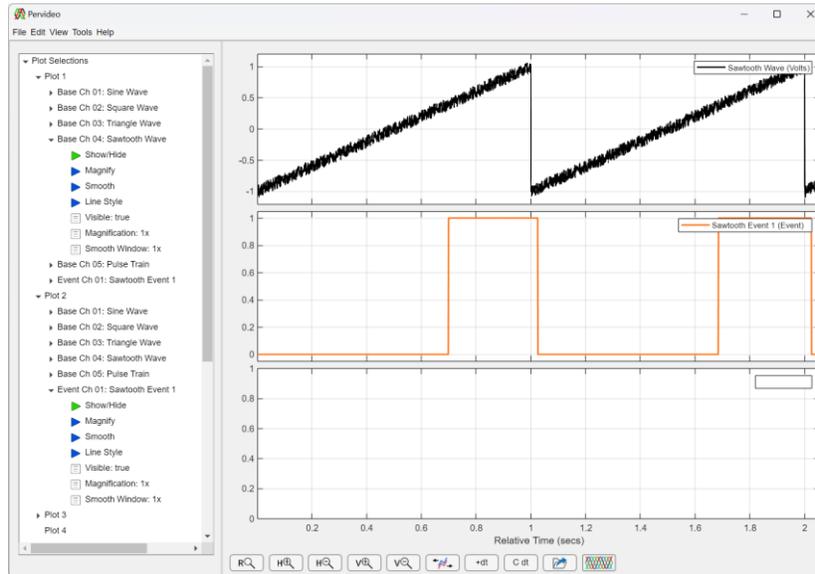
The “Greater Than Value” function adds a channel to the “Event Channels” by simulating an event waveform whose value equals “1” when the event is occurring and value equals “0” when it does not.

1. In the menu bar click Edit → Add Event Channel → Greater Than Value
2. When the “Greater Than Event Settings” prompt appears, make the desired entries and selections and click “OK”



3. In the “Plot Selections → Plot N → Event Ch 0X” tree branch click the “Show/Hide” icon. Once clicked, the channels trace is shown on the screen.

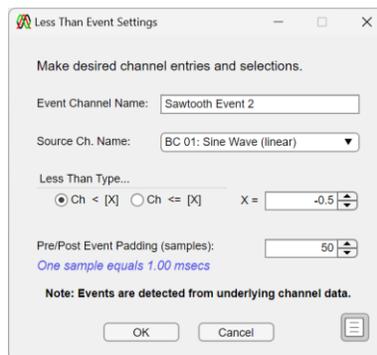
Note: notice the event flag overlap created by the “Pre/Post Event Padding” this is helpful to prevent erroneous event identification due to noisy signals



Less Than Value

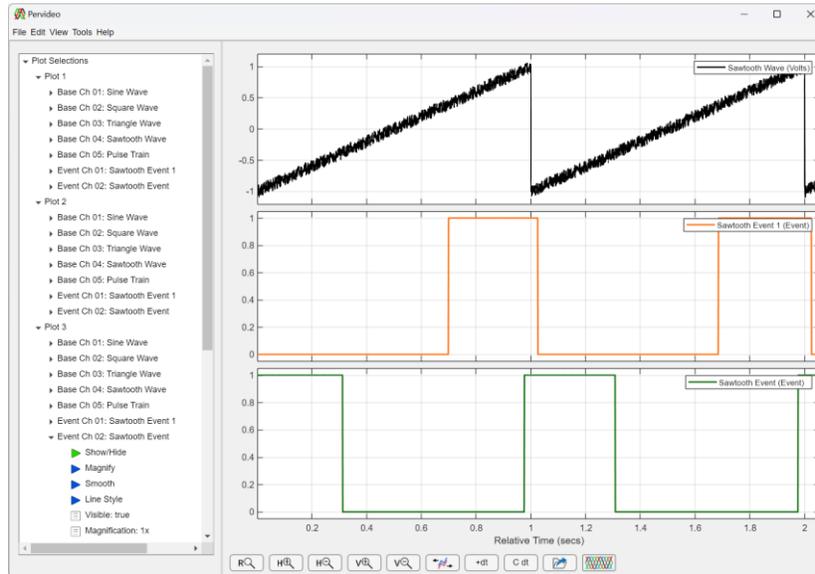
The “Less Than Value” function adds a channel to the “Event Channels” by simulating an event waveform whose value equals “1” when the event is occurring and value equals “0” when it does not.

1. In the menu bar click Edit → Add Event Channel → Less Than Value
2. When the “Less Than Event Settings” prompt appears, make the desired entries and selections and click “OK”



3. In the “Plot Selections → Plot N → Event Ch 0X” tree branch click the “Show/Hide” icon. Once clicked, the channels trace is shown on the screen.

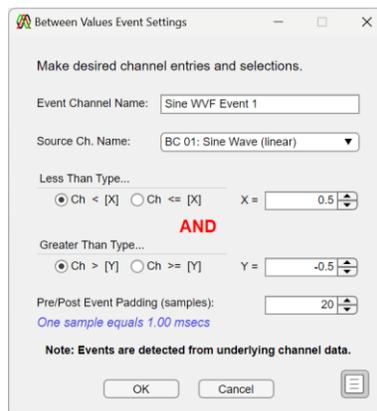
Note: notice the event flag overlap created by the “Pre/Post Event Padding” this is helpful to prevent erroneous event identification due to noisy signals



Between Values

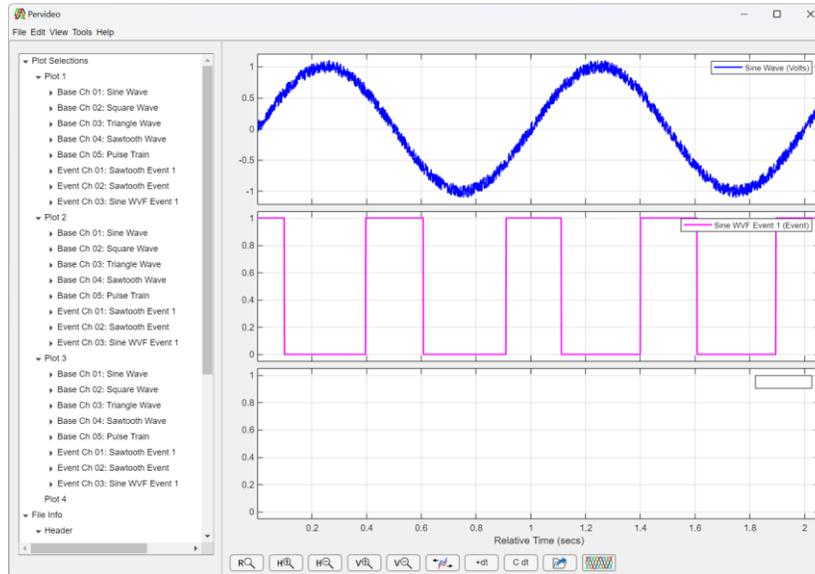
The “Between Values” function adds a channel to the “Event Channels” by simulating an event waveform whose value equals “1” when the event is occurring and value equals “0” when it does not.

1. In the menu bar click Edit → Add Event Channel → Between Values
2. When the “Between Values Event Settings” prompt appears, make the desired entries and selections and click “OK”



3. In the “Plot Selections → Plot N → Event Ch 0X” tree branch click the “Show/Hide” icon. Once clicked, the channels trace is shown on the screen.

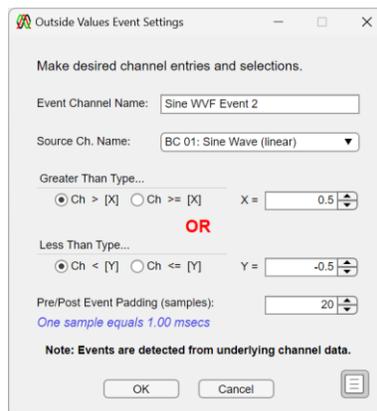
Note: notice the event flag overlap created by the “Pre/Post Event Padding” this is helpful to prevent erroneous event identification due to noisy signals



Outside of Values

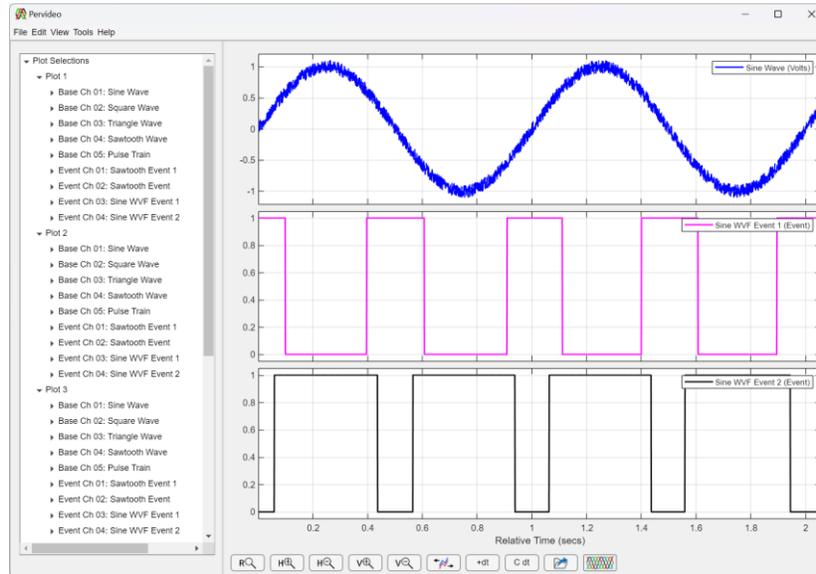
The “Outside of Values” function adds a channel to the “Event Channels” by simulating an event waveform whose value equals “1” when the event is occurring and value equals “0” when it does not.

1. In the menu bar click Edit → Add Event Channel → Outside of Values
2. When the “Outside Values Event Settings” prompt appears, make the desired entries and selections and click “OK”



3. In the “Plot Selections → Plot N → Event Ch 0X” tree branch click the “Show/Hide” icon. Once clicked, the channels trace is shown on the screen.

Note: notice the event flag overlap created by the “Pre/Post Event Padding” this is helpful to prevent erroneous event identification due to noisy signals



Add Math Channel

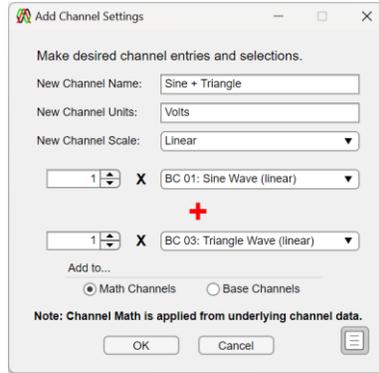
The “Add Math Channel” function adds a channel to the file’s math (or base) channels using the desired math calculation selections.

Add Channels

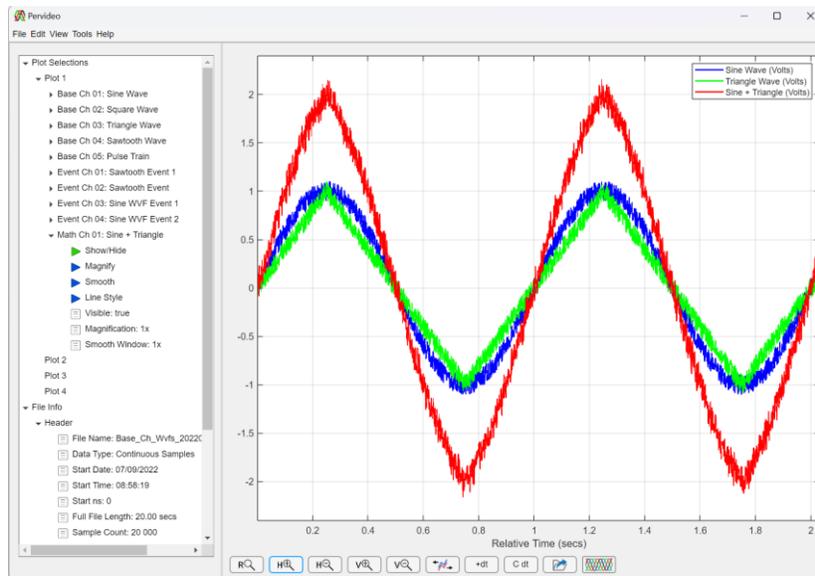
The “Add Channels” function adds a channel to the “Math Channels” group by adding two channels to each other.

1. In the menu bar click Edit → Add Math Channel → Add Channels
2. When the “Add Channel Settings” prompt appears, make the desired entries and selections and click “OK”

Note: (1) a scaling factor can be applied to either channel; (2) the resulting channel can be applied to the “base” channels group or “math” channels group. Channel math information is kept with the corresponding channel information in the “math” channel group. If “base” channels is selected, this channel math information is lost, see FILE NAVIGATION for more information.



3. In the “Plot Selections → Plot N → Math Ch 0X” tree branch click the “Show/Hide” icon. Once clicked, the channels trace is shown on the screen.

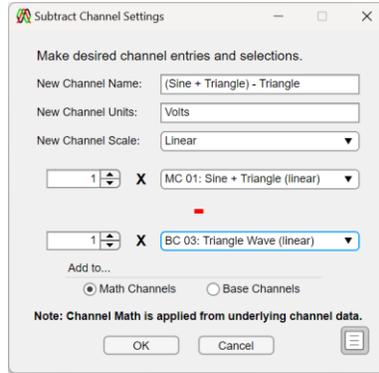


Subtract Channels

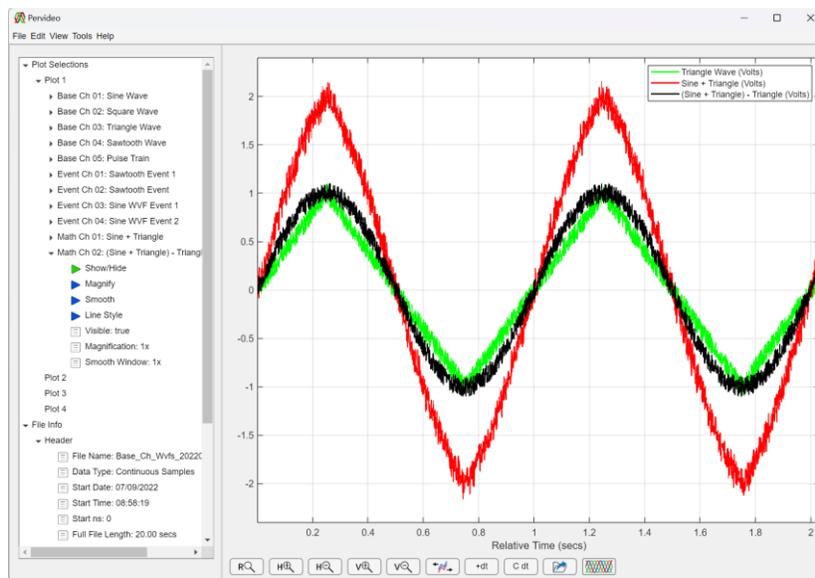
The “Subtract Channels” function adds a channel to the “Math Channels” group by subtracting two channels from each other.

1. In the menu bar click Edit → Add Math Channel → Subtract Channels
2. When the “Subtract Channel Settings” prompt appears, make the desired entries and selections and click “OK”

Note: (1) a scaling factor can be applied to either channel; (2) the resulting channel can be applied to the “base” channels group or “math” channels group. Channel math information is kept with the corresponding channel information in the “math” channel group. If “base” channels is selected, this channel math information is lost, see FILE NAVIGATION for more information.



3. In the “Plot Selections → Plot N → Math Ch 0X” tree branch click the “Show/Hide” icon. Once clicked, the channels trace is shown on the screen.

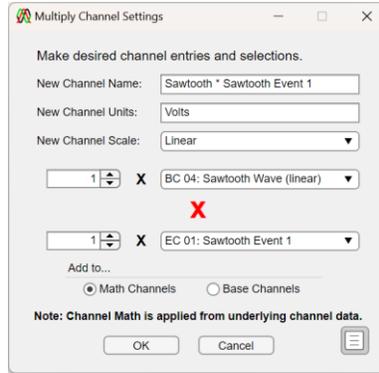


Multiply Channels

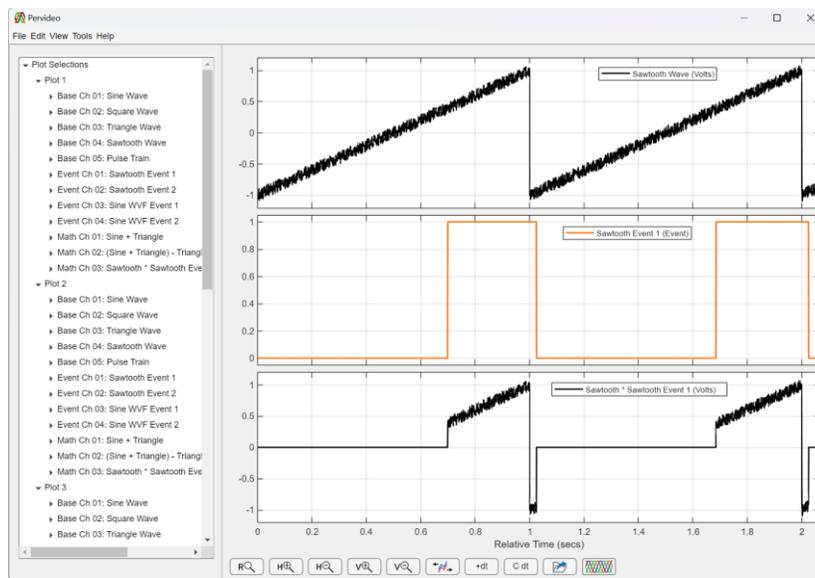
The “Multiply Channels” function adds a channel to the “Math Channels” group by multiplying two channels to each other.

1. In the menu bar click Edit → Add Math Channel → Multiply Channels
2. When the “Multiply Channel Settings” prompt appears, make the desired entries and selections and click “OK”

Note: (1) a scaling factor can be applied to either channel; (2) the resulting channel can be applied to the “base” channels group or “math” channels group. Channel math information is kept with the corresponding channel information in the “math” channel group. If “base” channels is selected, this channel math information is lost, see FILE NAVIGATION for more information.



3. In the “Plot Selections → Plot N → Math Ch 0X” tree branch click the “Show/Hide” icon. Once clicked, the channels trace is shown on the screen.



Divide Channels

The “Divide Channels” function adds a channel to the “Math Channels” group by dividing two channels to each other. *Note: be mindful of divide zero responses; when dividing waveforms zero is defined as 1e-6.*

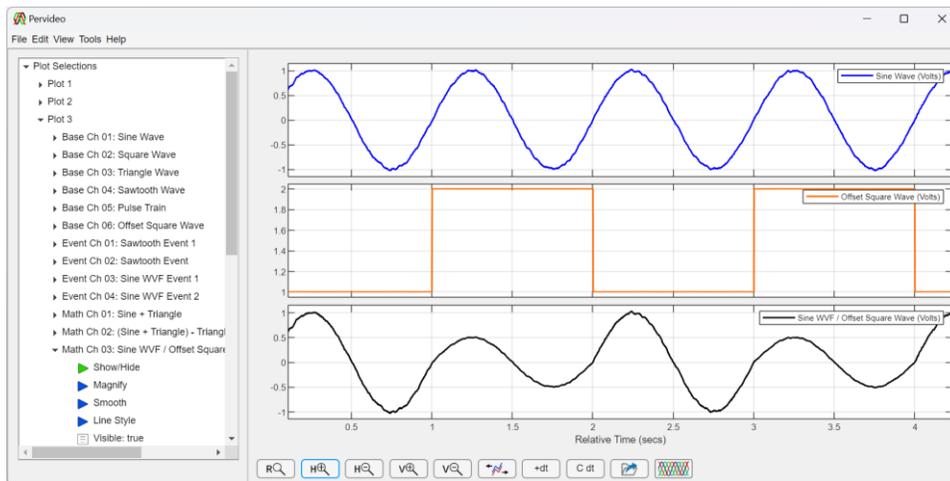
1. In the menu bar click Edit → Add Math Channel → Divide Channels
2. When the “Divide Channel Settings” prompt appears, make the desired entries and selections and click “OK”

Note: (1) a scaling factor can be applied to either channel; (2) the resulting channel can be applied to the “base” channels group or “math” channels group. Channel math information is kept with the corresponding channel information in the “math” channel group. If “base”

channels is selected, this channel math information is lost, see FILE NAVIGATION for more information.



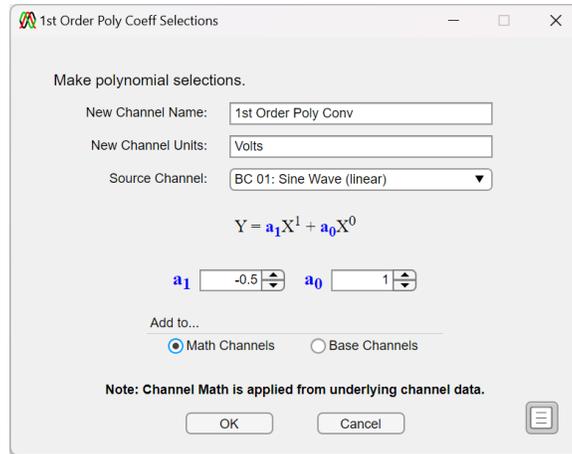
3. In the “Plot Selections → Plot N → Math Ch 0X” tree branch click the “Show/Hide” icon. Once clicked, the channels trace is shown on the screen.



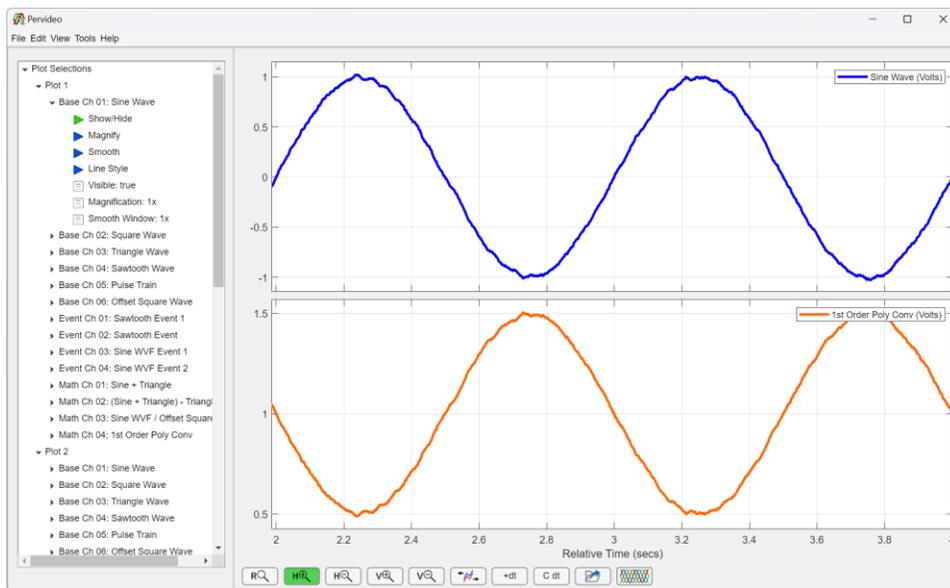
Polynomial Convert Channels

The “Poly Convert Ch” function adds a channel to the “Math Channels” group by performing polynomial conversion on the selected channel.

1. In the menu bar click Edit → Add Math Channel → Poly Convert Ch → X Order Poly Conv
2. When the “X Order Poly Coeff Selections” prompt appears, make the desired entries and selections and click “OK”



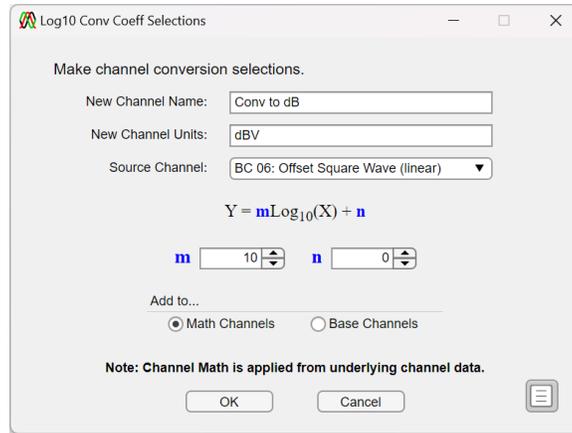
3. In the “Plot Selections → Plot N → Math Ch 0X” tree branch click the “Show/Hide” icon. Once clicked, the channels trace is shown on the screen.



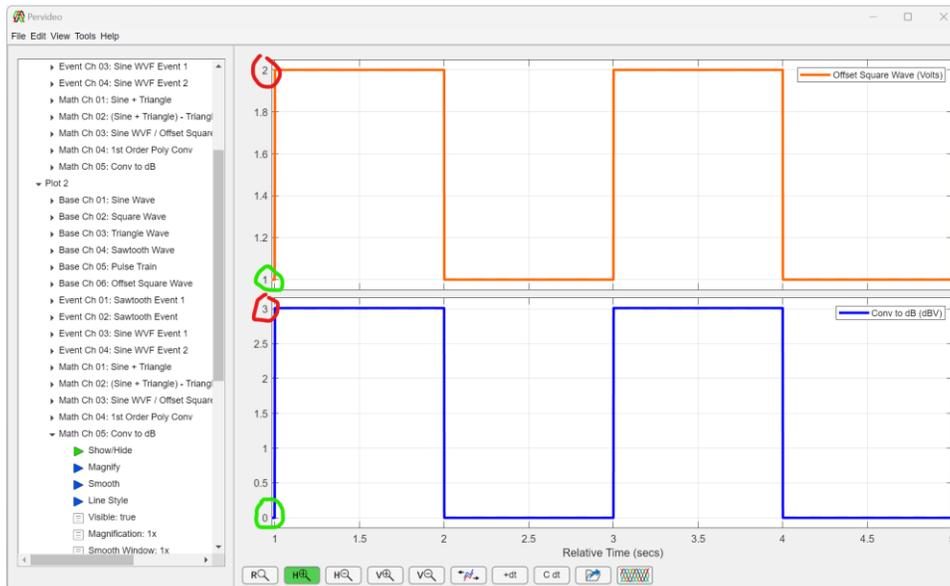
Convert to Log Base 10 Channel

The “Convert to Log 10 Ch” function adds a channel to the “Math Channels” group by performing polynomial conversion on the selected channel.

1. In the menu bar click Edit → Add Math Channel → Convert to Log 10 Ch
2. When the “Log 10 Conv Coeff Selections” prompt appears, make the desired entries and selections and click “OK”



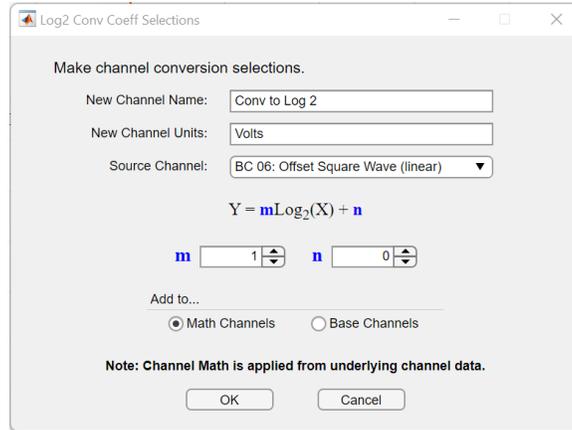
3. In the “Plot Selections → Plot N → Math Ch 0X” tree branch click the “Show/Hide” icon. Once clicked, the channels trace is shown on the screen.



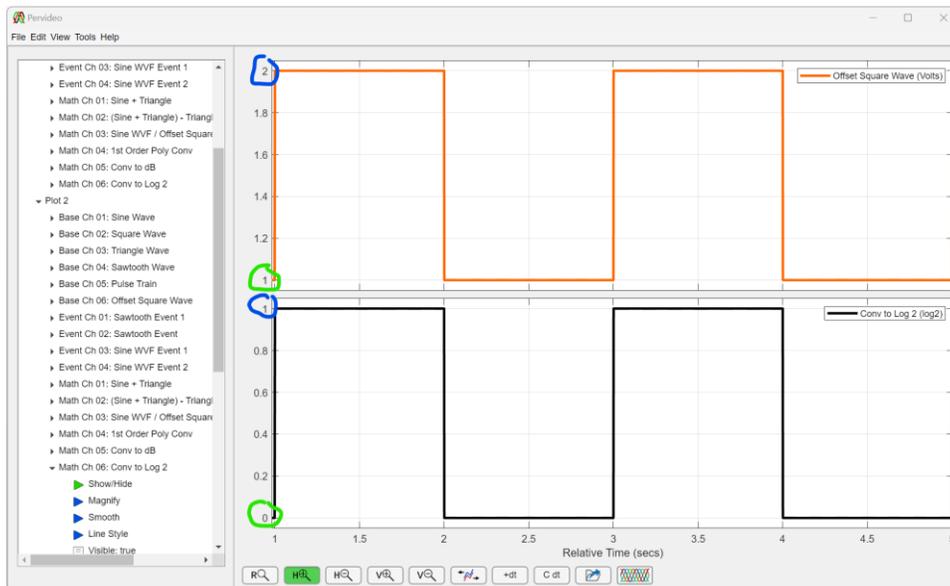
Convert to Log Base 2 Channel

The “Convert to Log 2 Ch” function adds a channel to the “Math Channels” group by performing polynomial conversion on the selected channel.

1. In the menu bar click Edit → Add Math Channel → Convert to Log 2 Ch
2. When the “Log 2 Conv Coeff Selections” prompt appears, make the desired entries and selections and click “OK”



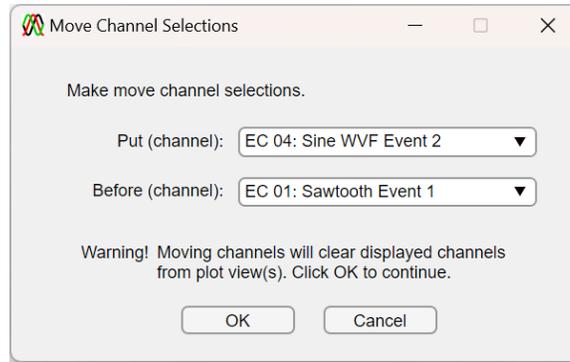
3. In the “Plot Selections → Plot N → Math Ch 0X” tree branch click the “Show/Hide” icon. Once clicked, the channels trace is shown on the screen.



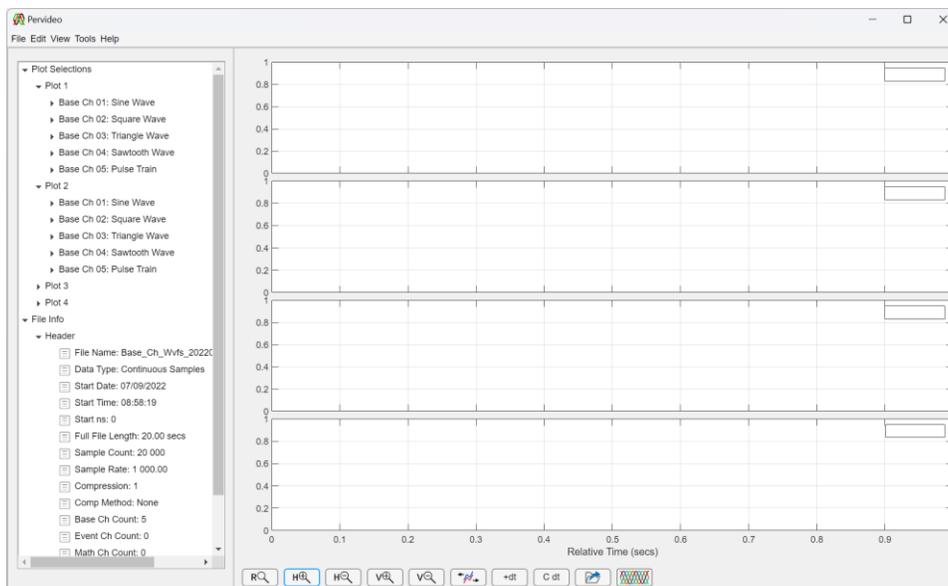
Move Channel

The “Move Channel” function moves a channel to the within its channel group. This allows for reordering of channels as desired by the user.

1. In the menu bar click Edit → Move Channel → {Base, Event, or Math} Channel
2. When the “Move Channel Selections” prompt appears, make the desired entries and selections and click “OK”. Note: this step will clear the Channel Display Panel, but no data will be lost, other than what was selected to delete.



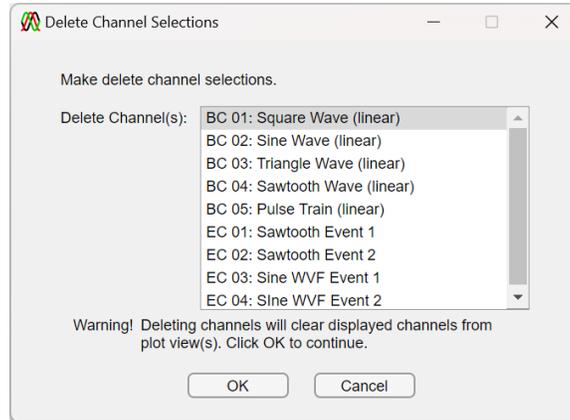
- When the Channel Display Panel clears (shown below), change the desired plots and channels “Show/Hide” feature accordingly to show the desired channels in the Channel Display Window.



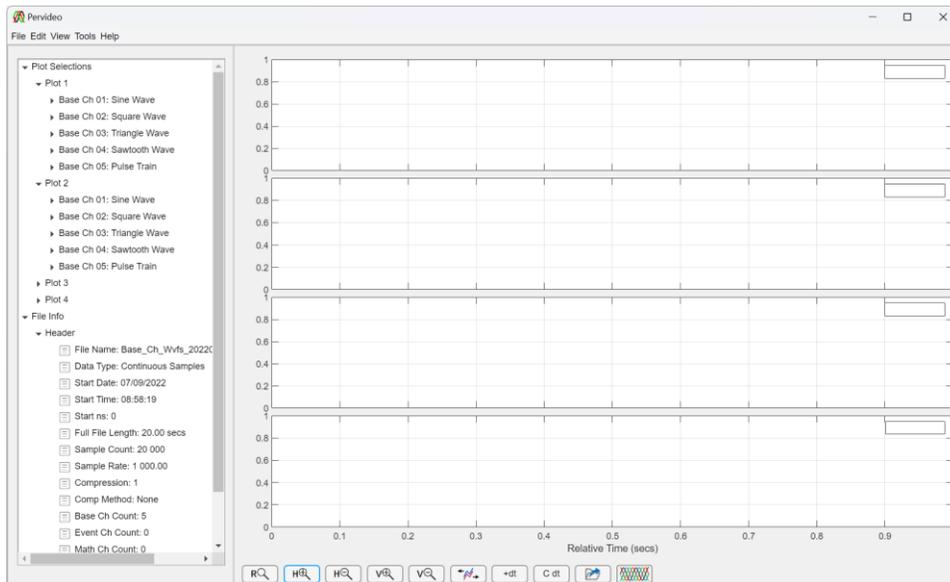
Delete Channel(s)

The “Delete Channel(s)” function deletes a desired channel or channels

1. In the menu bar click Edit → Delete Channel(s)
2. When the “Delete Channel Selections” prompt appears, make the desired selections and click “OK”. Note: this step will clear the Channel Display Panel, but no data will be lost, other than what was selected to delete.



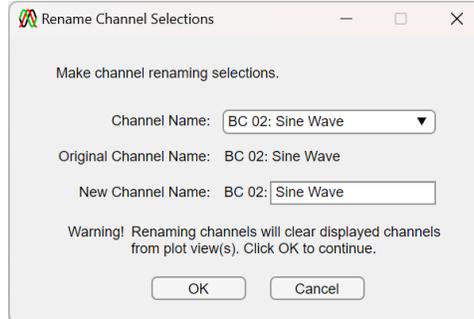
3. When the Channel Display Panel clears (shown below), change the desired plots and channels “Show/Hide” feature accordingly to show the desired channels in the Channel Display Window.



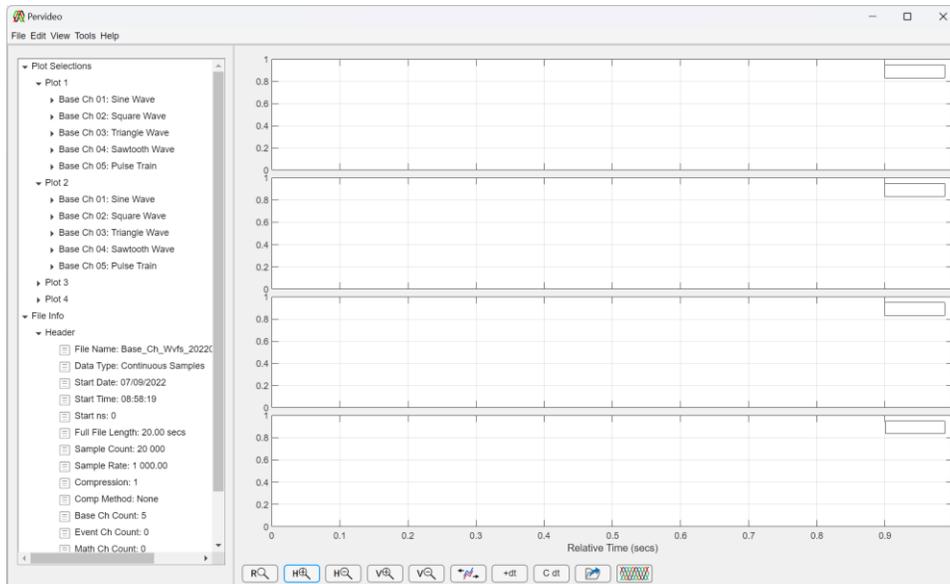
Rename Channel(s)

The “Rename Channel(s)” function renames a desired channel or channels

1. In the menu bar click Edit → Rename Channel(s)
2. When the “Rename Channel Selections” prompt appears, make the desired selections and click “OK”. Note: (1) multiple channels can be renamed at a time; (2) this step will clear the Channel Display Panel, but no data will be lost.



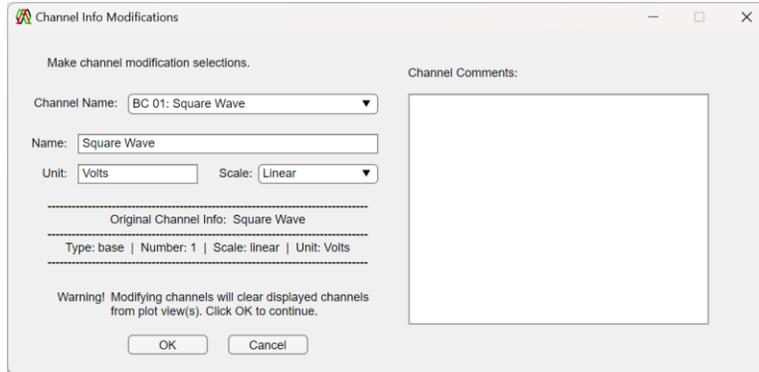
3. When the Channel Display Panel clears (shown below), change the desired plots and channels “Show/Hide” feature accordingly to show the desired channels in the Channel Display Window.



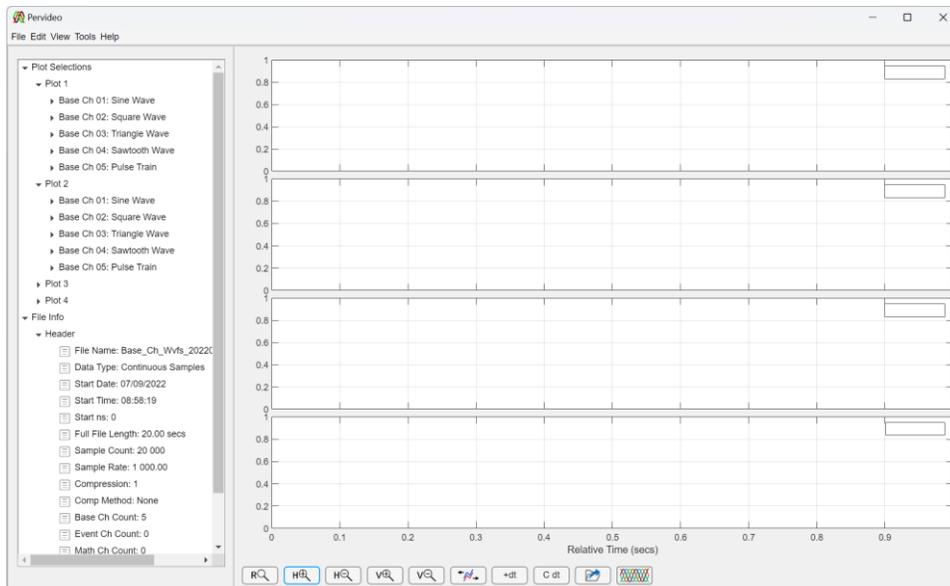
Edit Channel Info

The “Edit Channel Info” function modifies the name, unit, and/or scale of the desired channel or channels

1. In the menu bar click Edit → Edit Channel Info
2. When the “Channel Info Modifications” prompt appears, make the desired selections and click “OK”. Note: (1) multiple channels can be edited at a time; (2) this step will clear the Channel Display Panel, but no data will be lost.



3. When the Channel Display Panel clears (shown below), change the desired plots and channels “Show/Hide” feature accordingly to show the desired channels in the Channel Display Window.



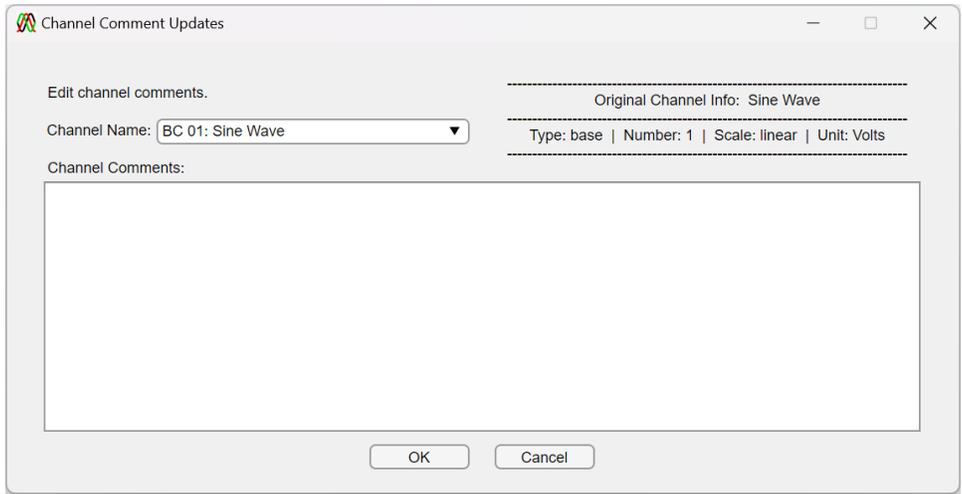
Edit Channel Comments

The “Edit Channel Comments” function allows user to add/edit notes to individual channels. This is a useful feature that allows users to enter information about the respective channels in plain text.

1. In the menu bar click Edit → Edit Channel Comments

2. When the “Channel Comment Updates” prompt appears, make the desired entries/edits and click OK.

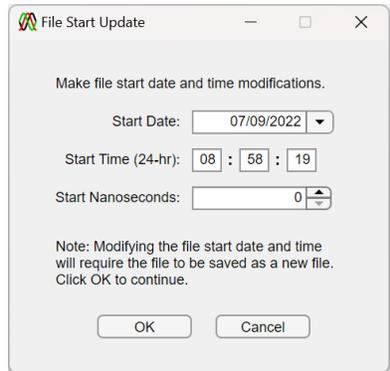
Note: multiple channels can be edited at a time, with no impact to displayed channels.



Edit Start Time

The “Edit Start Time” function modifies the start time of the file. This is used to correct any absolute timing issues of the data source.

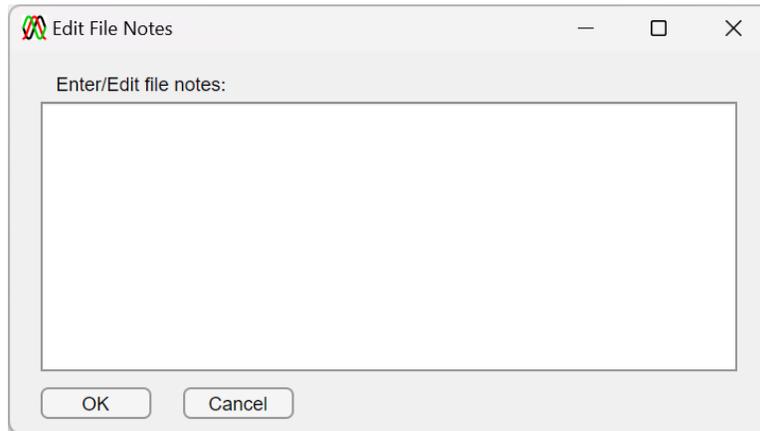
1. In the menu bar click Edit → Edit Start Time
2. When the “File Start Update” prompt appears, make the desired selections and click “OK”.
Note: modifying the file start date/time requires the file to be saved as a new file.



Edit File Notes

The “Edit File Notes” function allows user to add/edit notes to the open file. This is a useful feature that allows users to enter information about the file in plain text.

1. In the menu bar click Edit → Edit File Notes
2. When the “Edit File Notes” prompt appears, make the desired entry/edit and click OK.



6. VIEW MENU

The View Menu is composed of functions to modify and refresh the channel display panel. The menu items and corresponding functions are defined below:

- Refresh Layout: refreshes the channel display panel
- Arrange Layout: changes the number of plots shown in the channel display panel

Refresh Layout

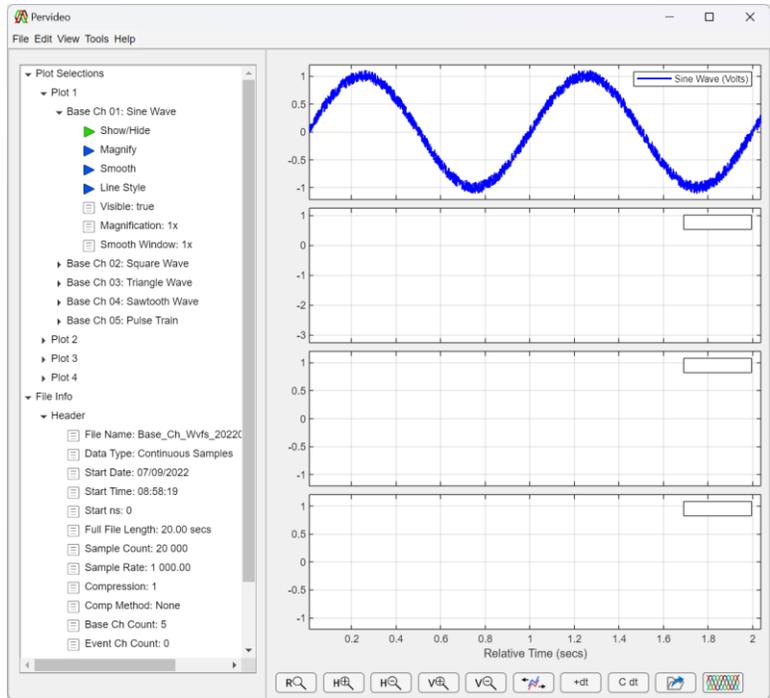
The “Refresh Layout” function, refreshes the “Channel Display Panel”. This function should be used if the window did not resize or refresh correctly after moving or resizing the application.

1. In the menu bar click View → Refresh Layout

Arrange Layout

The “Arrange Layout” changes the number of plots shown in the “Channel/Trace Display Window”. Up to 4 plots can be displayed at the same time.

1. In the menu bar click View → Arrange Layout → desired layout (1x View, 2x View, 3x View, 4x View)
2. The application window will update to show selected layout; “4x View” shown here.



7. TOOLS MENU

The Tools Menu is composed of special application functions available to the user. The menu items and corresponding functions are defined below:

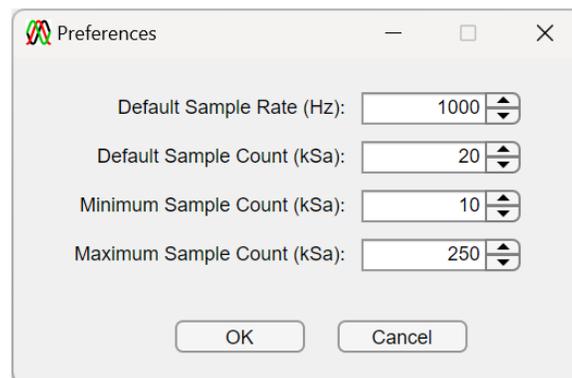
- Preferences: allows the user to modify special application settings
- Split File(s): splits an individual file(s) into smaller files
- Concatenate Files: concatenates multiple files into a single file; files must be of the same channels structure but sampled over non-overlapping time periods
- Recalc Ch Stats: recalculates the channel statistics and updates the channel metadata information
- Get App Logs: opens the log files folder in the windows file explorer

Preferences

The “Preferences” function allows the user to change the modifiable application defaults and constants. The available items are default sample rate, default sample count, and min/max sample count.

Note the “Maximum Sample Count” is the parameter the application uses to limit the file size that the application will open without requiring some level of compression. When set correctly this feature prevents application instability due to large file sizes and available computing resources (RAM, virtual memory, etc.).

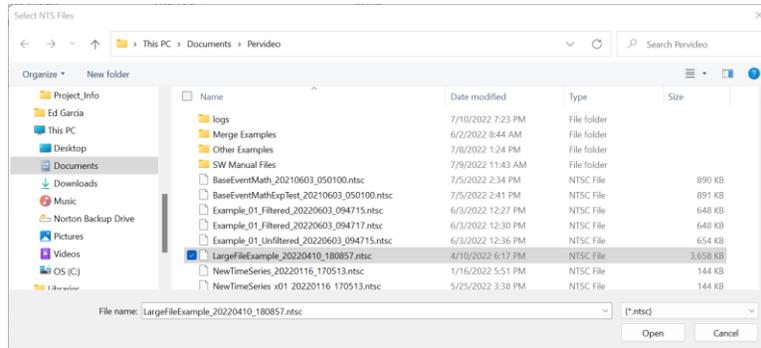
1. In the menu bar click Tools → Preferences
2. When the “Preferences” prompt appears, make the desired selections and click “OK”.



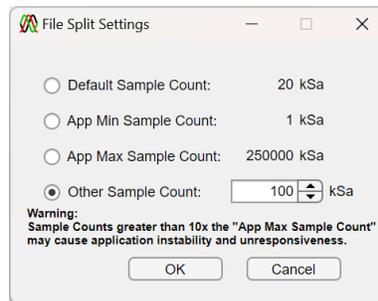
Split File(s)

The “Split File(s)” function will split large files into smaller files to allow for reading into the application without the need of compression. This feature can also be used to reduce the file down to a specific area of interest, to be used with other user applications by exporting to MS Excel®, Matlab®, and/or CSV.

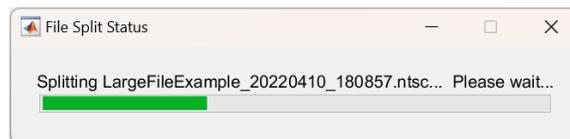
1. In the menu bar click Tools → Split File(s)
2. When the “Select NTS Files” prompt appears, select the desired file(s) and click “Open”.



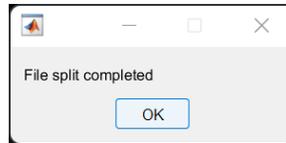
3. When the “File Split Settings” prompt appears make the desired selections and click “OK”
Warning: sample counts greater than the “App Max Sample Count” may cause application instability and unresponsiveness.



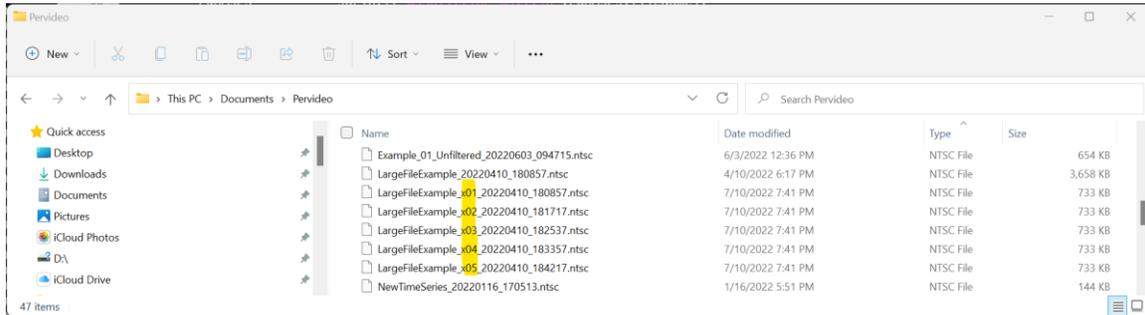
4. Wait for the application to complete the file operations. A progress bar will appear indicating the progress of the individual file split.
 Note: if more than one file is being split from a single operation, the progress bar will reappear; one per file to split.



5. When completed the prompt will appear indicating the file operation is complete.



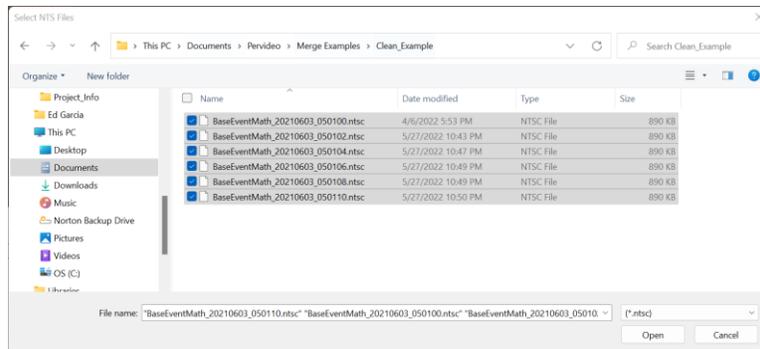
- The new files will be located in the same directory as the original files, and will carry the same base file name, but will have a sequential number included in the file name along with update time stamps indicating the start of the individual files



Concatenate Files

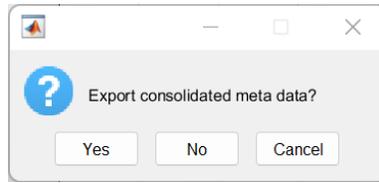
The “Concatenate Files” function will concatenate files into a larger file to allow for reading multiple files as a single file. This feature is typically used to see a data trend collected over multiple data files. Additionally, compression may be needed to view the resulting file.

- In the menu bar click Tools → Concatenate Files
- When the “Select NTS Files” prompt appears, select the desired files and click “Open”.



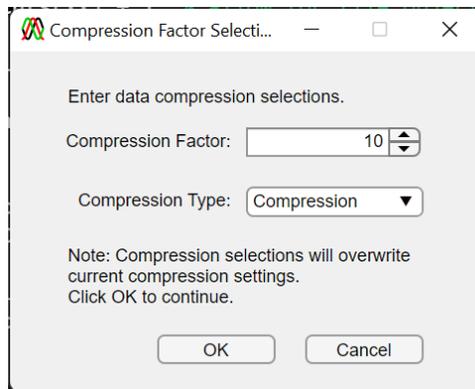
- You will be prompted to export the files’ metadata. When the “Export consolidated meta data?” prompt appears make the desired selection.

Note: if the files to be concatenated are not of the same channel count, type, etc. a “File concatenation validation failed” error message will appear, indicating the file mismatch. If this error is encountered you will be prompted to export the files’ metadata before this process is aborted.

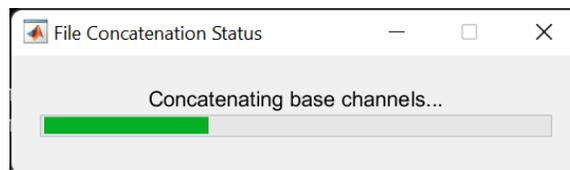


4. If you select to export the metadata, you will be prompted to determine where to save the file. When the “Save File As” prompt appears, select the desired directory and file name and click “Save”
5. If the “Compression Factor Selections” prompt appears select the desired compression options and click “OK”.

Note: If you determine you do not want to have the resulting file compressed, click cancel and update the application preferences accordingly (application maximum limitations apply, see preferences section for more information.)

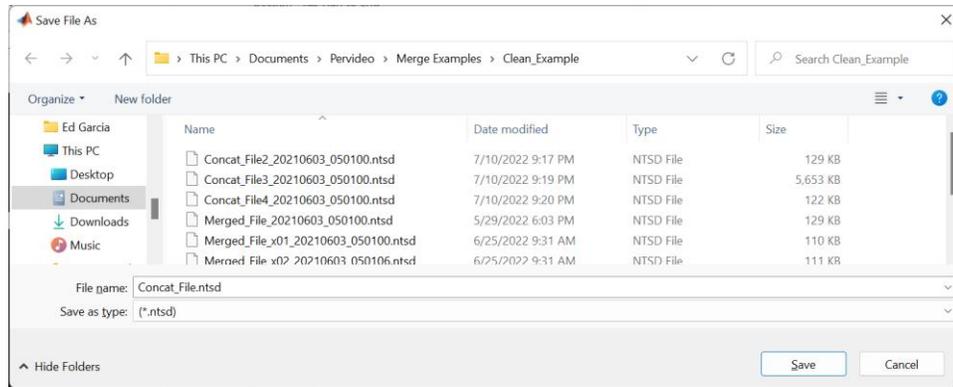


6. Wait for the file concatenation process to complete. Multiple progress bars may appear depending on the data in the files.

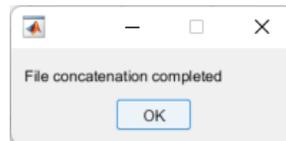


7. In the “Save File As” window, navigate to the desired folder, enter the desired name in the “File name” field, and click “OK”

Note: the application will automatically append the entered file name with the timestamp of the file. The file timestamp is the start date and time shown in the file’s header information in “yyyymmdd_HHMMSS” format. Additionally concatenated files are saved as NTSD files, because the files selected may not represent a continuous time samples.



8. When completed a prompt will appear indicating the file operation is complete.



Recalc Ch Stats

The “Recalc Ch Stats” function recalculates the channel statistics and updates the channel metadata information contained in the file navigation tree’s file information branches. Execute this function if you believe the channels statistics contained with the metadata are incorrect.

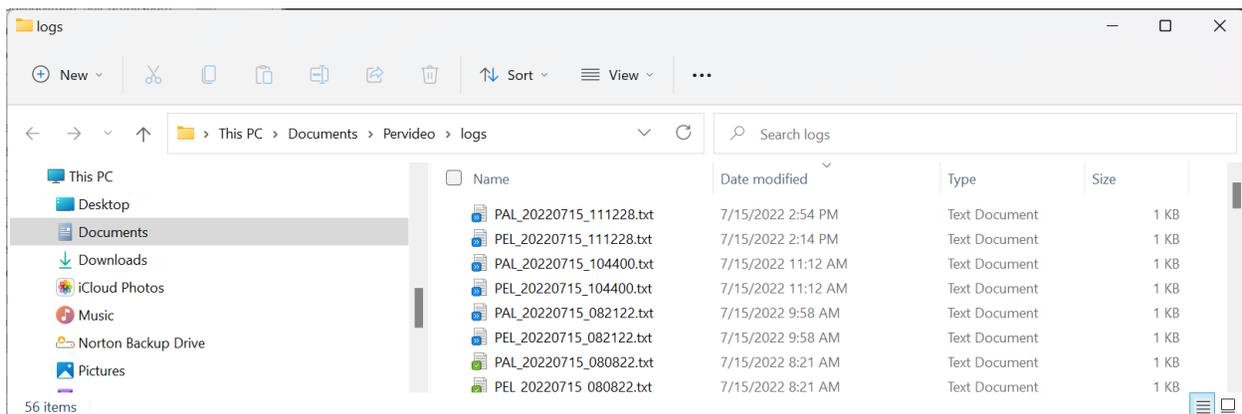
1. In the menu bar click Tools → Recalc Ch Stats
2. Depending on the file size and number of channels this process will complete very quickly. The application status window will show a change in status accordingly.

Get App Logs

The “Get App Logs” function opens the log files folder in the windows file explorer application.

Note there are 2 logs generated every time the application opens: a Pervideo Application Log (PAL) and Pervideo Error Log (PEL). The activity log is to help the user track what the application was tasked to do. The error log is to provide feedback to the developer on errors encountered. Please note, the app only generates an error log and logs error messages; communicating the errors back to the developer is at the discretion of the application’s user.

1. In the menu bar click Tools → Get App Logs
2. A File Explorer window will appear, similar to the one below.



8. HELP MENU

The Help Menu is composed of functions to provide application instructions and development information to the user. The menu items and corresponding functions are defined below:

- Help: opens this help file using the computer’s Portable Document Format (PDF) reader
- About: opens a prompt showing the application’s version and legal information

Help

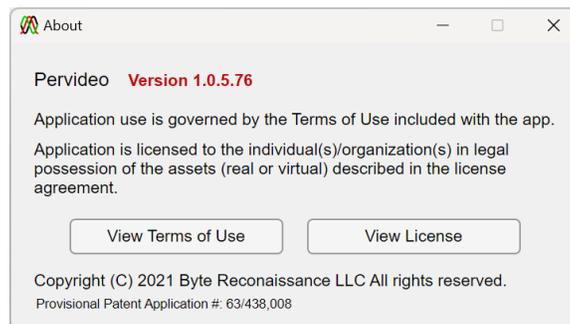
The “Help” function opens this help file using the computer’s Portable Document Format (PDF) reader.

1. In the menu bar click Help → Help
2. Wait for the PDF to open.

About

The “About” function opens a prompt showing the application’s version and legal information.

1. In the menu bar click Help → About
2. A prompt similar to the one below should appear.



3. Click either of the available buttons to view their respective documents or click the “X” at the top right-hand corner to close the prompt.

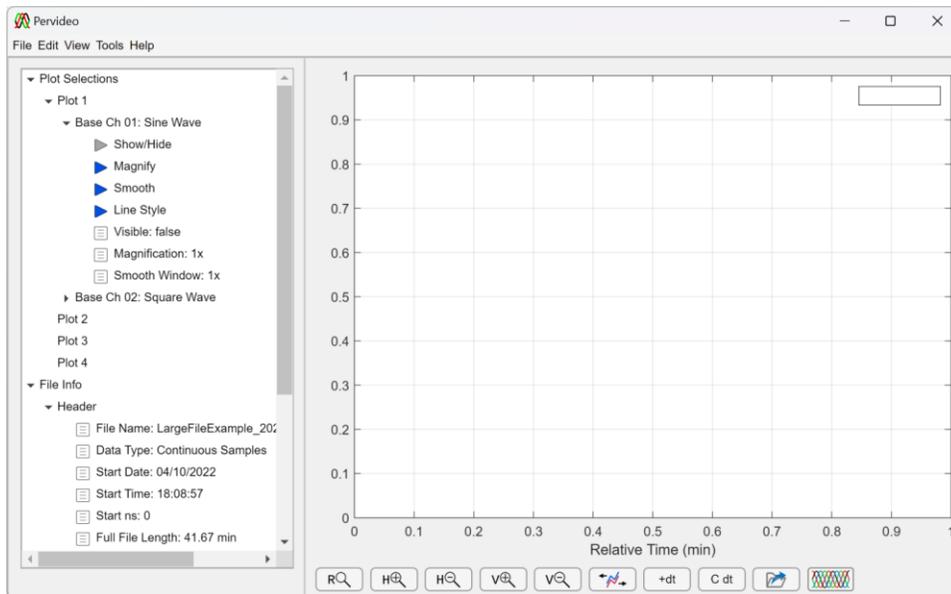
9. FILE NAVIGATION PANEL

The File Navigation Panel is an application navigation tree used to configure the channels to view and view the file and channel information. The branches and corresponding functions are defined below:

- Plot Selections Branch: configures the various plots with the channels to be viewed and modifies the viewed trace(s) and conditions the viewed channels
- File Info Branch: provides basic file metadata and unique channel metadata

Plot Selections Branch

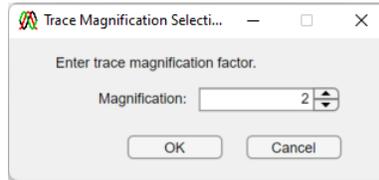
The “Plot Selections” branch provides the functionality to view and condition displayed channels. The “Plot Selections” branch consists of four “Plot N” branches that consist of the branches of channels contained in the data.



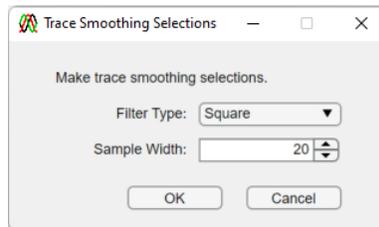
The individual “plot/channel” branches contain the following functions to show, modify, and condition individual channels.

- Show/Hide: adds/removes the respective channel from the plot. The function also updates the “Visible” state field accordingly.
- Magnify: presents the user with the magnification prompt below to scale the respective channel accordingly. This function does not affect the underlying data and allows the user to compare waveforms of dissimilar scales to each other to better compare waveform

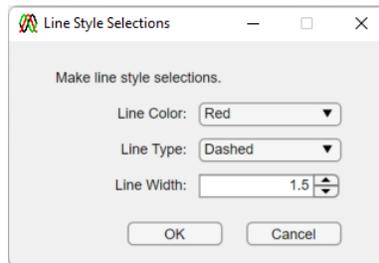
similarities and differences. The function also updates the “Magnification” state field accordingly.



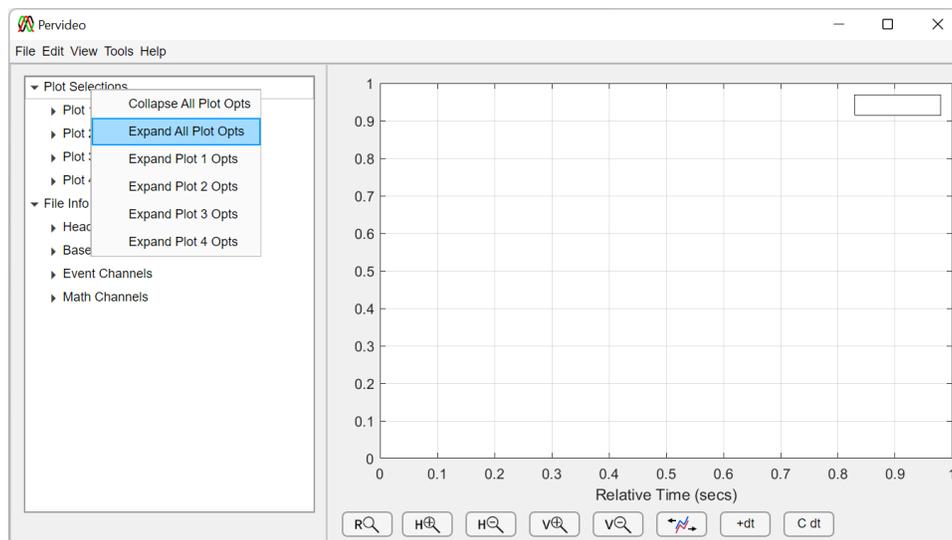
- Smooth: presents the user with the smoothing prompt below to smooth the respective channel accordingly. This function does not affect the underlying data and allows the user to remove the noise from the channel without affecting the actual channel data. The function also updates the “Smooth Window” state field accordingly.



- Line Style: presents the user with the line selections prompt below to modify the respective channel accordingly.

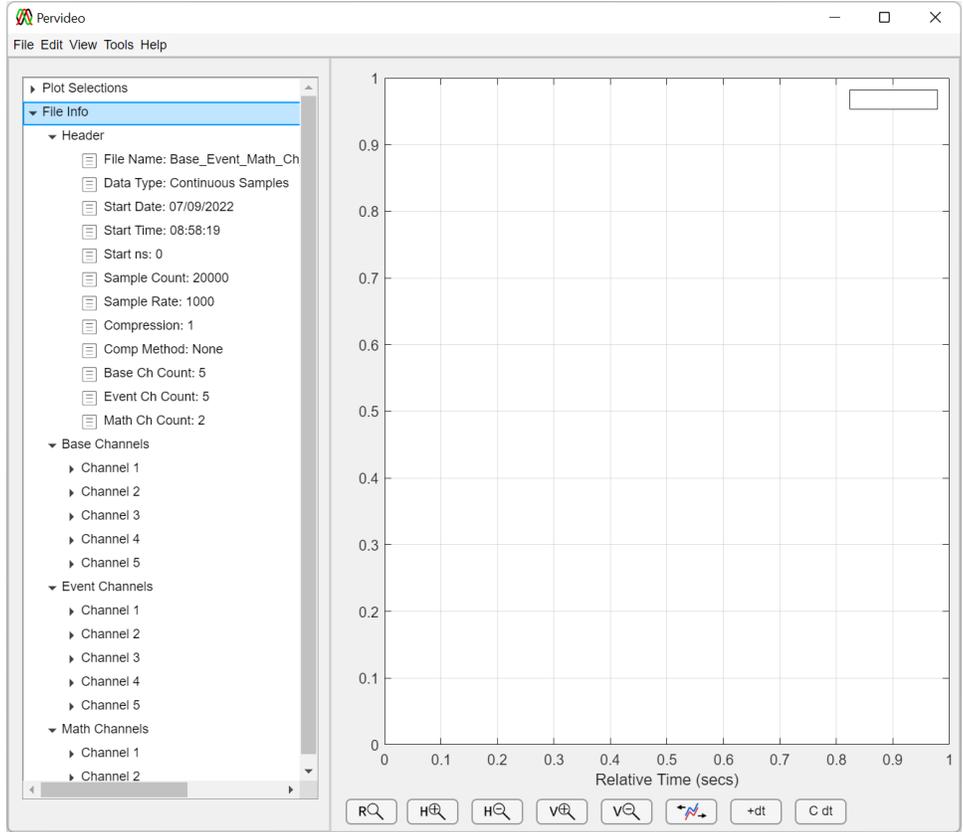


- Plot Expand/Collapse Options: allows the user to expand/collapse individual plot branches. To exercise them, right-click on “Plot Selections” or any of the “Plot N” branches and click on the desired option



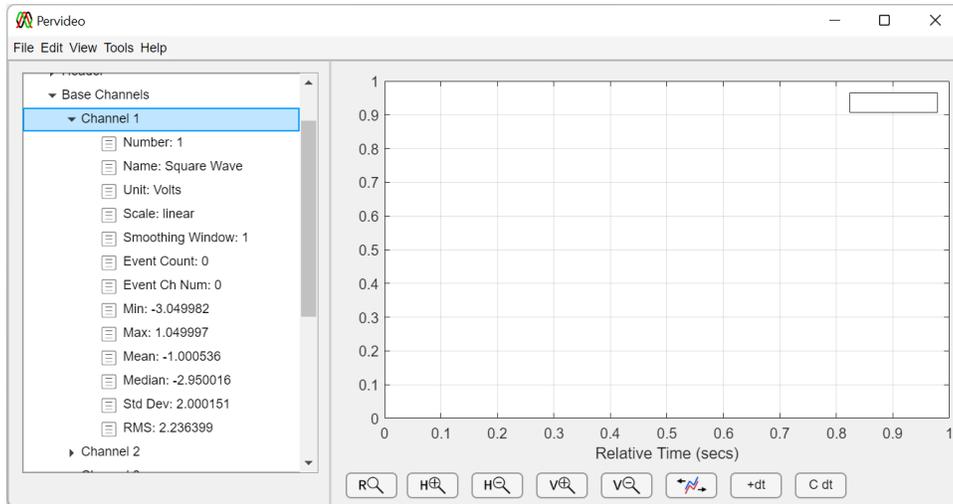
File Info Branch

The “File Info” branch provides the functionality to the file and channels’ metadata. The “File Info” branch consists of four sub-branches that contain the metadata of the respective file data.

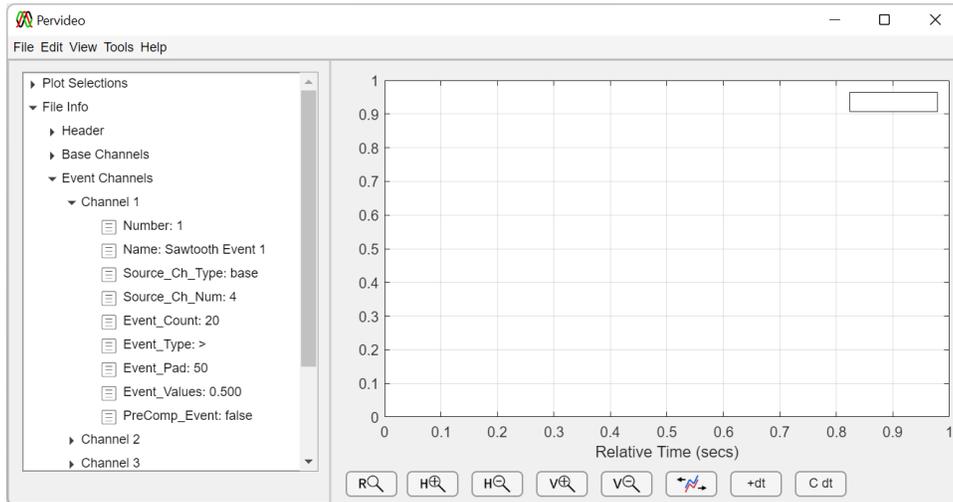


The individual sub-branches contain the following information about the file

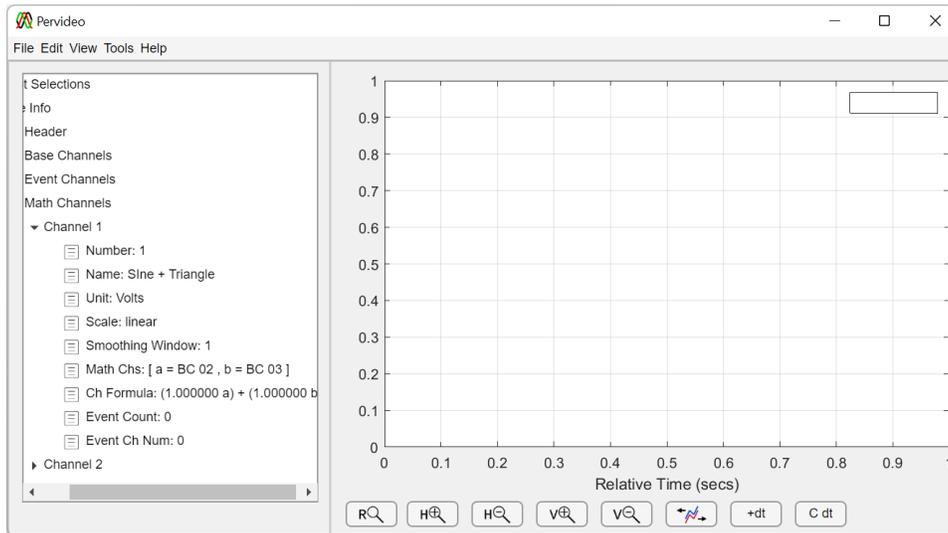
- Header: contains generic file metadata not specific to any channel: file name, file type, start data/time, sampling info, compression info, and channel counts
- Base Channels: contains the metadata of individual base channels: channel name and number, units, scale, smoothing, event info, and waveform statistics



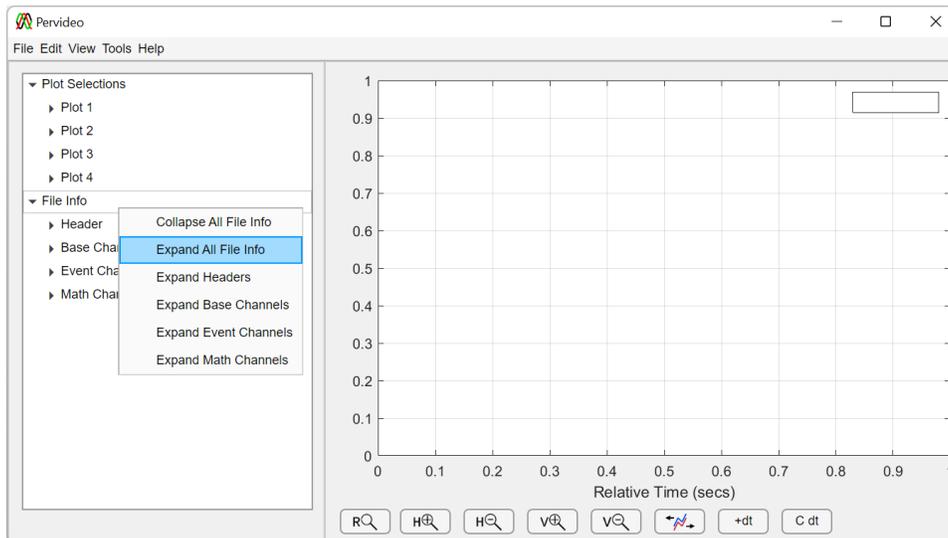
- **Event Channels:** contains the metadata of individual event channels: channel name and number, source channel info, and event characteristics and statistics



- **Math Channels:** contains the metadata of individual math channels: channel name and number, units, scale, smoothing, math info, and event info

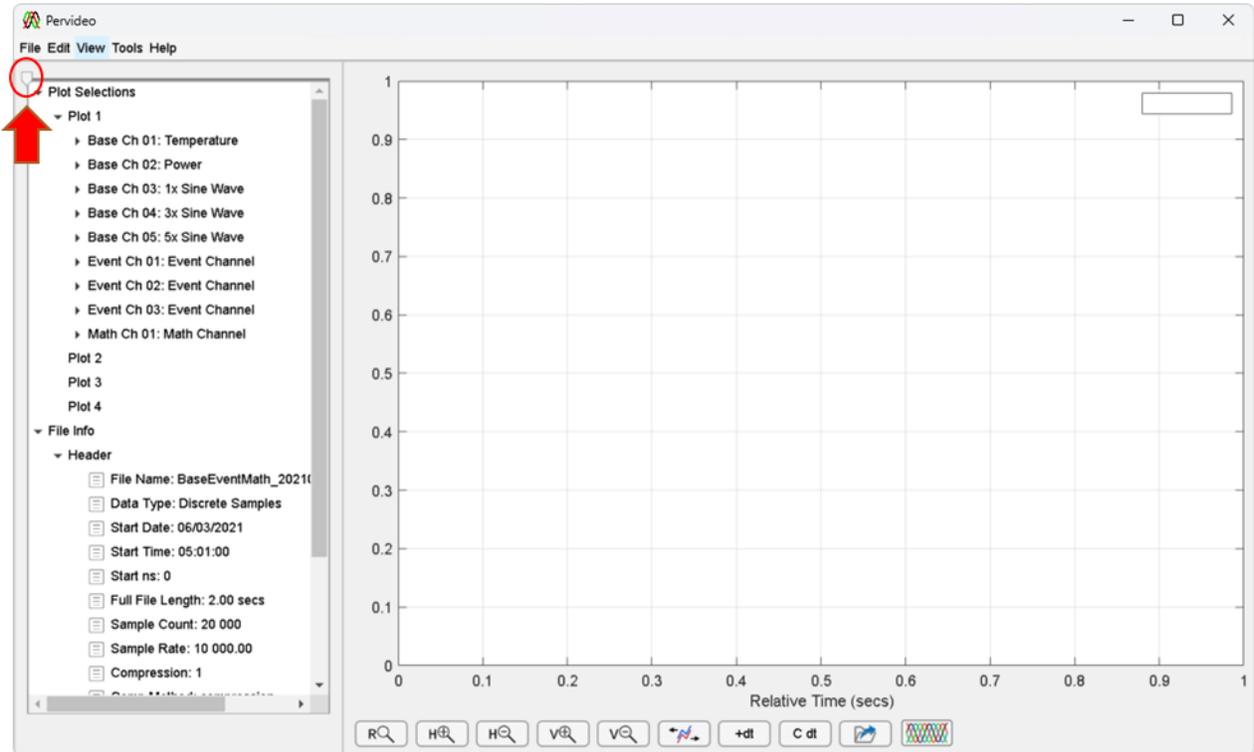


- **File Info Expand/Collapse Options:** allows the user to expand/collapse file information branches. To exercise them, right-click on any of the file information branches: “File Info”, “Header”, “Base Channels”, “Event Channels”, or “Math Channels”



Plot Navigation Panel Resizing

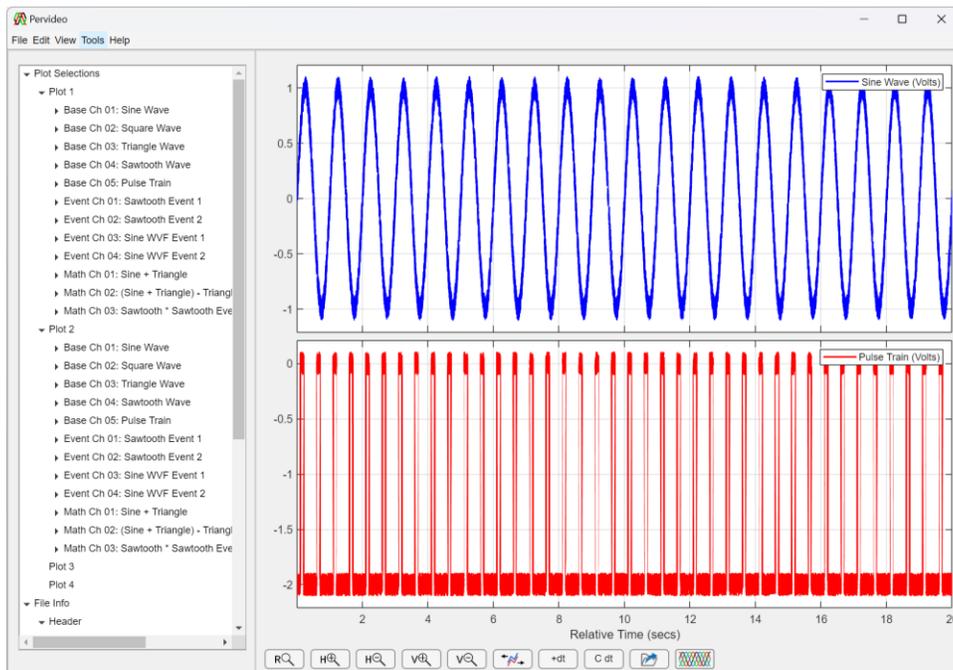
The “File Navigation Panel” can be resized to allow for increased visibility to the plot and file information. To expand/reduce the panel simply click and drag the panel resizing handle (circled in the image below) and drag right or left to increase or decrease the panel width respectively.



10. CHANNEL DISPLAY PANEL

The Channel Display Panel is the right side of the application where channel data is viewed and navigated through. The major features of the Channel Display Panel are defined below:

- Channel Display Area: the area where channels/traces are displayed in one more plots arranged vertically
- Channel Navigation: the area where the buttons used to zoom in/out and traverse a file
- Data Tips: the buttons that enable the displaying of text boxes containing X-Y information about a selected data point

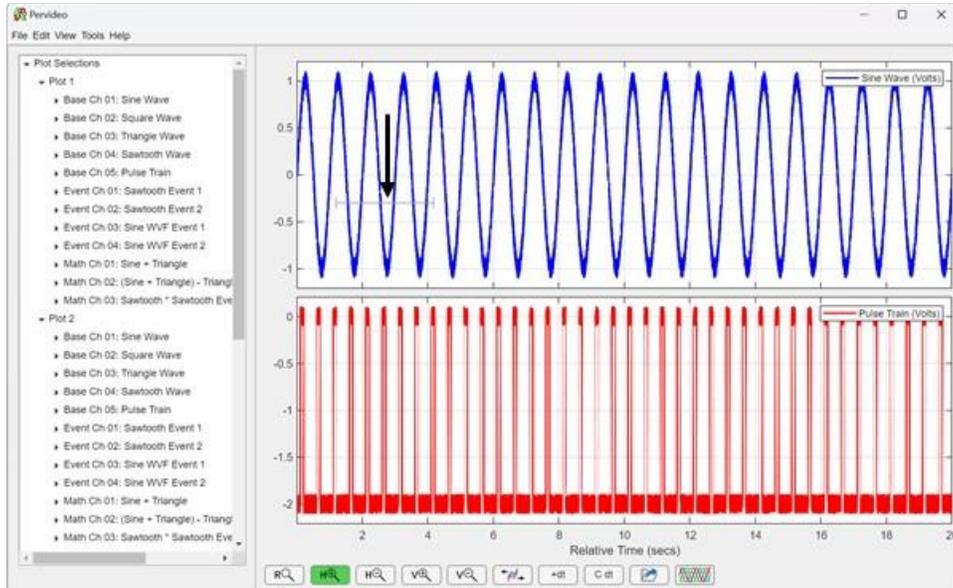


Zooming In & Out

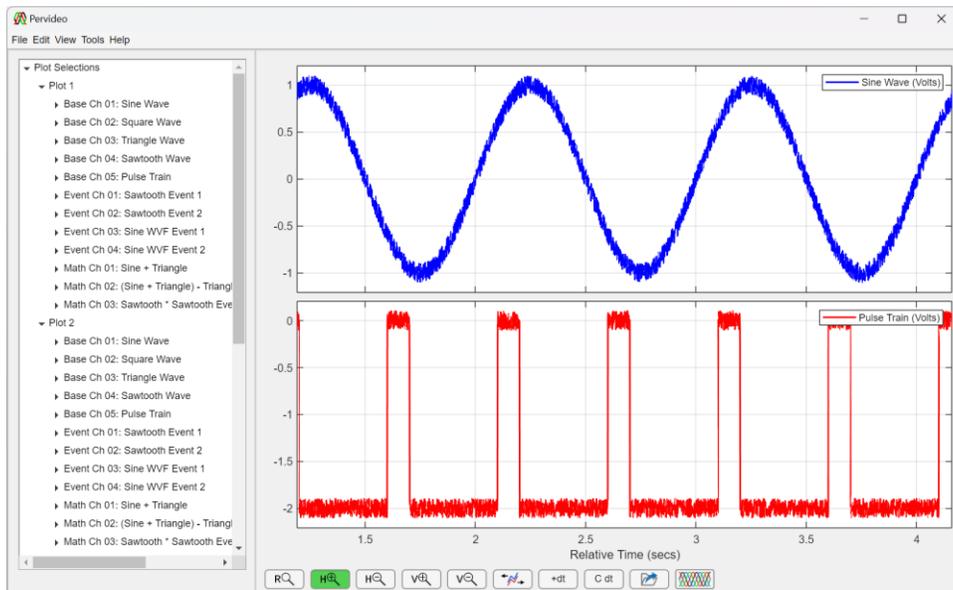
The “Channel Navigation Buttons” allow the user to zoom in/out and traverse a file.

1. To “zoom in” horizontally, click the “Horizontal Zoom In” button (in green below)
2. Using your mouse, click and hold the left-click mouse button, drag the mouse to the right or left, and release the left-click button.

Additionally you may place the mouse pointer over one of the plots and press the mouse’s left-click button one or more times to zoom in horizontally



3. The “Channel Display” panel should now appear similar to the one shown below

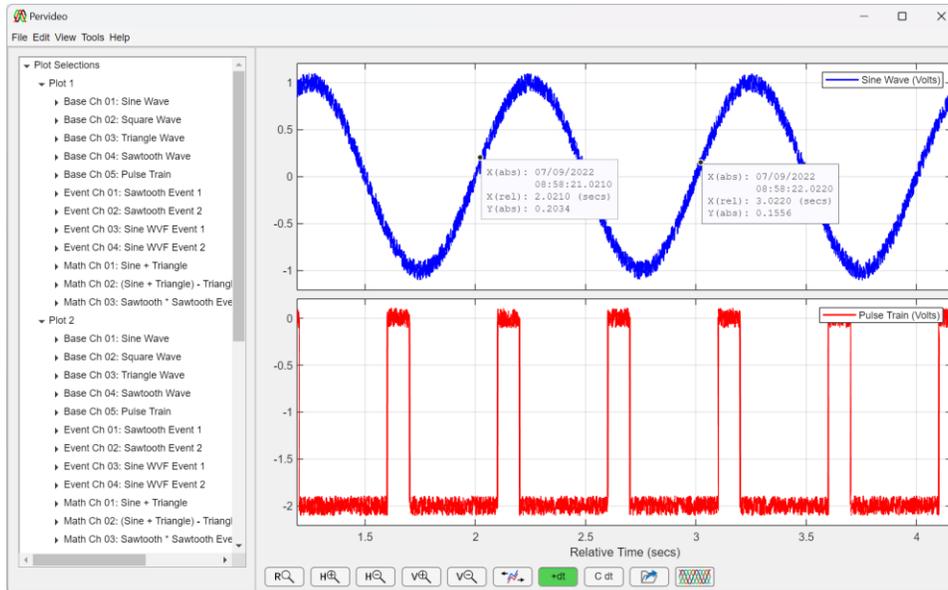


4. To “zoom out” horizontally, place the mouse pointer over one of the plots and press the mouse’s left-click button one or more times to zoom out horizontally.
5. To zoom in/out vertically, repeat these steps using the vertical zoom buttons
6. To reset the displayed channels in all directions horizontally and vertically, click the “Zoom Reset” button: 
7. To move across the channels horizontally, click the “move left/right” button (), place the mouse pointer over one of the plots, and press and the mouse’s left-click button while moving the mouse to the left or right.

Data Tips

Data Tips enable the displaying of text boxes containing X-Y information about a selected data point.

1. To enable a data tip, click the “Enable Data Tips” button (in green below)
2. Using your mouse, left-click at a point along an individual channel. A data tips containing the absolute and relative position of the data point selected should appear.



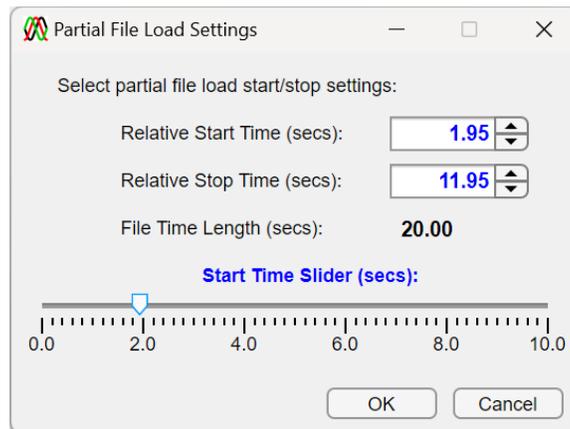
3. To display more than one data tip, hold the {Shift} key and left-click at another point along an individual channel.
4. To delete an individual data tip, left-click on the desired data tip and press the {DELETE} key
5. To delete all data tips click the “Clear Data Tips” button: 

Partial File Loading

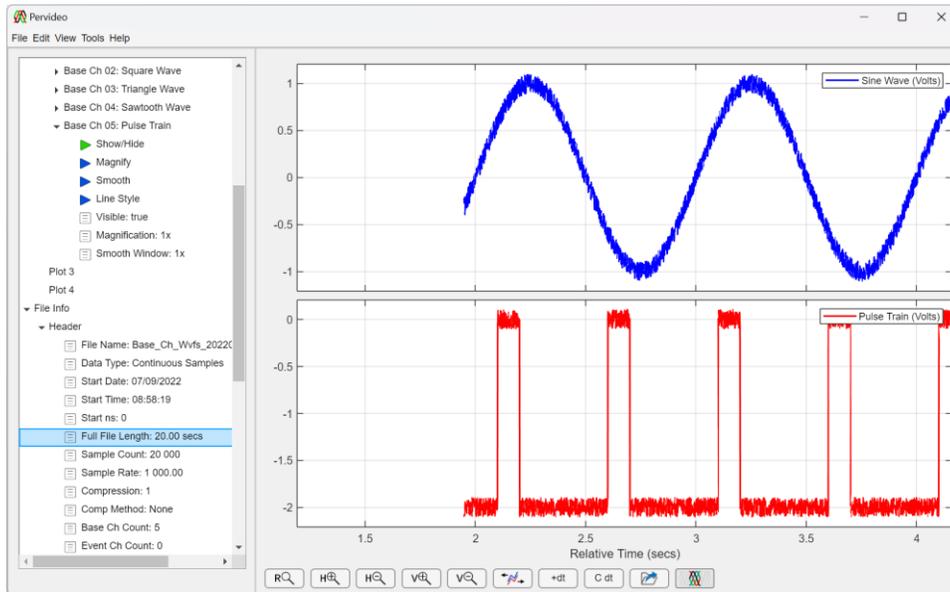
Partial File loading allows the user to load parts of very large files that will not load in the application without compressing them to reduce their sample size. On-load compression and partial file loading work with user preferences and are essential for stable application performance for extremely large files. The default user sample limit preferences are chosen for most efficient application performance.

Note: users are strongly encouraged to modify the sample preferences and use the “on-load compression” and “partial file loading” to best enable them to best work within the constraints of their data sets. Finally, it make take some experimentation to determine the sample limit preferences that works best with you and your machine.

1. To enable partial file loading, click the “File Load Mode” button, such that the shortened trace view is shown: 
2. Click on the “File Reload” button: 
3. When the “Partial File Load Settings” prompt appears, make the desired file load start/stop settings and click “OK”.



4. Show/Hide the desired channels. Notice samples loaded will be less than the total file length time, displayed in the Header information.



5. To return to normal file loading (on-load compression), click the “File Load Mode” button, such that the long trace view is shown: 

11. ACRONYMS & ABBREVIATIONS

The following defines key acronyms used in this document:

Acronym	Definition
CSV	Comma Separated Variables
HHMMSS	Time of Day Time Stamp in hour, minute, seconds format
hrs	Hours
MAT	Mathworks MATLAB® File Type
min	Minutes
NTSC	Numeric Time Series, Continuous
NTSD	Numeric Time Series, Discrete
msec	Milli-seconds
nsec	Nano-seconds
Sec	Seconds
usec	Micro-seconds
XLSX	Microsoft® Excel File Type
yyyymmdd	Date Time Stamp in year, month, day format

12. DEFINITIONS

The following defines key term used in this document:

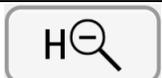
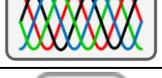
Term	Definition
Base Channel	Channel/Trace the represents some recorded, simulated or acquired data.
Compression	Compression method where the file size is reduced by removing “N” number of samples and replacing the “Nth” sample with the average of the “N” samples removed; e.g. for a compression factor of 10, samples 1-10 are deleted and sample 10 is replaced with the average value of samples 1-10.
Compression Factor	The number of samples to reduce a file size by; e.g. for a compression factor of “10”, “9” samples are removed and “1” sample remains reducing the data set (and file size) by a factor of “10”
Compression Method	Method that reduces the file size by removing and replacing the sample data in some specified manner: compression or decimation
Data Tip	Text box containing X-Y information about a selected data point.
Decimation	Compression method where the file size is reduced by removing “N-1” number of samples and leaving the Nth sample behind; e.g. for a compression factor of 10 samples 1-9 are deleted and sample 10 is left behind.
Event Channel	Channel/Trace the represents some user defined condition occurring. The channel level is equal to “1” (true) during the time period when the event occurs, and is equal to “0” (false) all other times.
Math Channel	Channel/Trace created by an algebraic operation between one or more channels. Channel may be made of nesting multiple math channel operations.
NTSC File	<p>Continuous Numeric Time Series file type, whose samples are a continuous sequence of samples separated in time by a fixed sample rate/period.</p> <p>For these file types, the sample rate included in the “Header → Sample Rate” field is the sample rate of the data within the file. This file type does not contain a time axis vector included in the file.</p>

DEFINITIONS

Term	Definition
NTSD File	<p>Discrete Numeric Time Series file type, whose samples are a discrete sequence of samples separated in time by a one or more sample rates/periods, corresponding to distinct sampled data files.</p> <p>This file type is generally created when files are merged, and may include significant gaps in time samples corresponding to gaps in time between start and end of neighboring files.</p> <p>For these file types, the sample rate included in the “Header → Sample Rate” field is irrelevant.</p>
Smoothing	Statistical/Mathematical method to reduce the noise contained in the channel/trace data
Smoothing Factor	The “N” number of samples to perform the smoothing operation on, e.g. for a smoothing factor of “10” every sample along the channel is replaced with the average (smoothing operation) value of the 10 points neighboring the sample
Smoothing Filter	Statistical/Mathematical method, sample weighting method, to apply the smoothing operation. Smoothing Filter options include: rectangle, triangle, and Gaussian
yyyymmdd_HHMMSS	Time Stamp used in this application which follows the year, month, day, underscore (“_”), hour, minute, second format

13. ICONS

The icons used in the software application are listed below

Icon	Icon Name	Button Function
	Startup Shortcut	Pervideo™ Startup icon
	Taskbar Icon	App taskbar icon
	Refresh Zoom	Zooms out to view the entire trace/channels in both X and Y axes
	Horizontal Zoom In	Enables/Disables the user to zoom in along the X-axis
	Horizontal Zoom Out	Enables/Disables the user to zoom out along the X-axis
	Vertical Zoom In	Enables/Disables the user to zoom in along the Y-axis
	Vertical Zoom Out	Enables/Disables the user to zoom out along the Y-axis
	Move left/right	Enables/Disables the user to move/drag the traces along the X-axis
	Enable data tips	Enables/Disables the add data tip feature, which places an information block of the point along the trace that was clicked
	Clear data tips	Clears all data tips
	Reload Open File	Reloads open file to application
	File Load Mode	Enables/Disables file load mode: full file or partial file
	Edit Channel Comments	Allows user to apply plain text comments to channels. Usually present when adding event and math channels

14. KEYBOARD SHORTCUTS

The keyboard shortcuts available in the software application are listed below

Keyboard Shortcut	Action
<CTRL> + <s>	Save current file
<CTRL> + <o>	Open file
<CTRL> + <r>	Reload current file
<CTRL> + <n>	Create new file
<CTRL> + <SHIFT> + <a>	Save current file as new file
<CTRL> + <w>	Close current file