

Quarch Technology Ltd

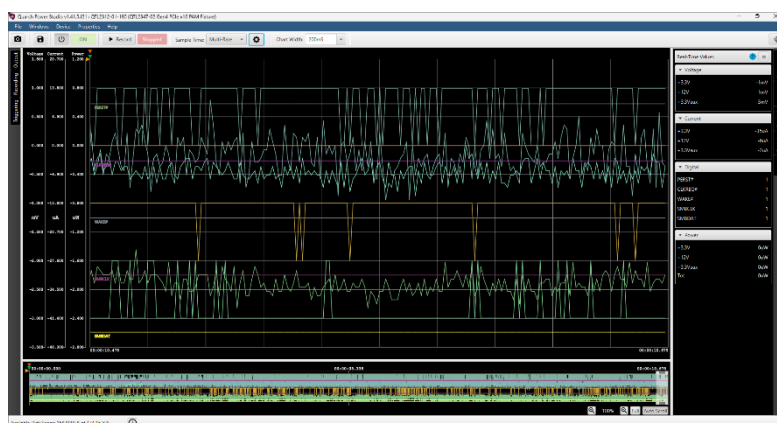
Quarch Power Studio

Technical Manual

For use with:

PAM, HD PPM and XLC devices

Monday, 19 May 2025



Change History

1.0	December 2017	Initial Release
1.1	February 2018	Updated for QPS v1.1 release
1.2	August 2021	Updated for PAMs
1.3	October 2021	Minor PAM updates
1.4	November 2021	Updated for the new controls
1.5	February 2022	Updated for synthetic function channels
1.6	June 2022	Updated for QPS v1.26 release
1.7	August 2022	Updated triggering instructions
1.8	August 2022	Added threshold polarity, digital re-ordering and improved tab control descriptions
1.9	November 2022	Minor update for UI changes
1.10	May 2023	Zoom controls / Additional Features
1.11	August 2023	Setting up log viewer
1.12	December 2023	Multiple GUI updates for QPS 1.37
1.13	July 2024	Multiple GUI updates for QPS 1.41
1.14	April 2025	New features and GUI Updates for QPS 1.46

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Quarch Power Studio

Combined with an PAM, HD PPM or XLC, Quarch Power Studio (QPS) allows you to capture highly accurate power measurements on a storage device.

You can capture power up traces, idle, sleep states and traffic/load scenarios. Data can be captured at high resolution and traces can be recorded from a few seconds up to several days.

PAM devices support multiple additional features, such as digital sideband monitoring and larger number of analog channels.

What you can do with Quarch Power Studio

- View live scope traces of voltage, current and power performance.
- Record high resolution results over a few seconds or multiple days.
- Scroll through multi-gigabyte data sets easily and zoom in to the smallest detail.
- Examine minimum, maximum, mean and RMS values.
- Define your own synthetic channels.
- Accurately measure features on the trace.
- Annotate data.
- Export images and trace sections.
- Perform fully automated capture from a python script.

Before you start

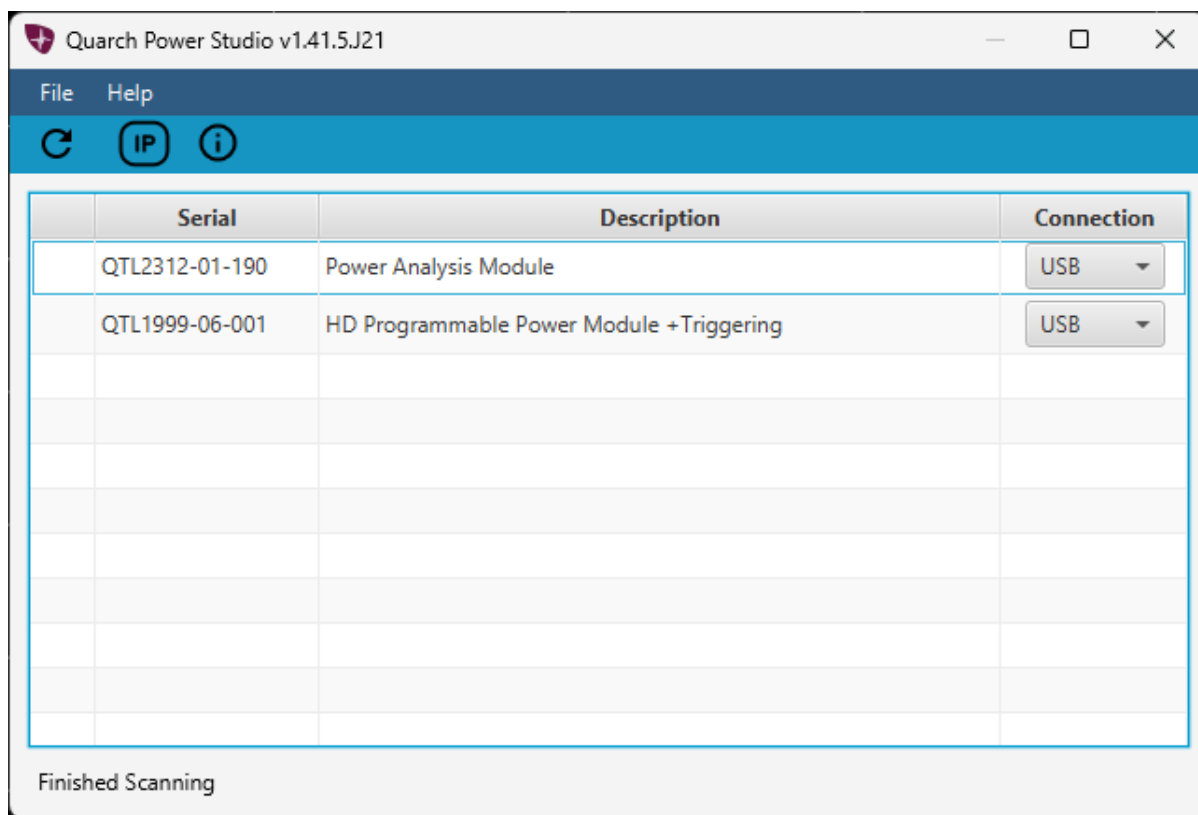
1. QPS has a bundled version of Java 21 included in the distribution. It is no longer necessary to install a separate JRE on your computer.
 2. Make sure your Power Module is connected to your system.
 - XLC, HD and PAM modules are supported.
 3. Connect your storage device to the power module, using one of our simple fixture options.
 - Browse the available fixtures [HERE](#)
 4. If you are streaming data for a long time or your averaging rate is very small, make sure you have enough disk space in your system. The data files can easily be over a gigabyte or even terabytes, during weekend long tests.
 5. Download the latest version of QPS from:
<https://quarch.com/products/quarch-power-studio>
 6. If you want to automate data collection, download QuarchPy for Python from:
<https://quarch.com/products/quarchpy-python-package>
- This will allow you to automate QPS and a range of examples can be found in our application notes:
https://quarch.com/downloads?field_file_type_tid=111

Launching QPS

- For an installed version of QPS you can run from the desktop icon
- From the directory you have QPS saved in, run the executable file.
- If you have QuarchPy installed, you can run QPS with the command:
> python -m quarchpy.run qps

The connection screen opens first and lists the serial number, connection type and name of the devices connected to your system.

The connection screen



Connection screen, showing available modules on USB and TCP connections

The initial connection screen shows the devices available. If you have a device on another subnet, you can enter it manually through the 'IP' scan button

If a software update is available, there will be an update icon on the menu bar.

Launching QPS for live data

The QPS Streaming Mode allows you to view **live data** from your XLC, HD or PAM modules.

- On the connection screen, double click on the module you want to connect.
- Wait for the live screen to load, this can take a few seconds.

Launching QPS to view previous recordings

The QPS Viewing Mode allows you to display **saved data** from previous streaming sessions.

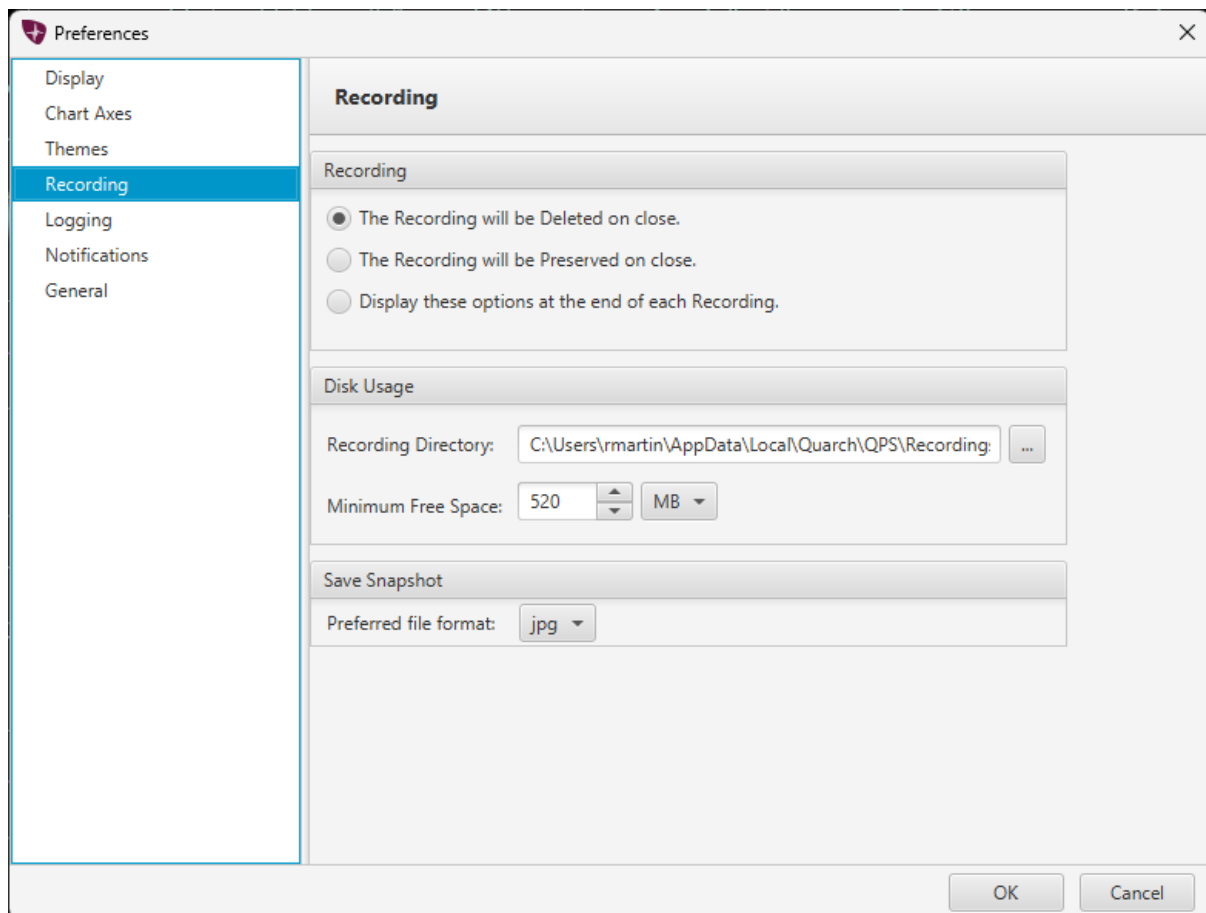
- In the connection screen top menu, click ***File -> Open Recording...***
- Select your .qps file previously created.

Preferences

From QPS Click **File -> Preferences...**

The available preferences will depend on the mode you are in.

- **Display:** includes display settings such as precision and refresh rate.
- **Chart Axes:** includes X and Y axes display settings.
- **Themes:** includes color options for display, and axis display options.
- **Recording:** includes save options and free space limits.
- **Logging:** includes debug logging settings.
- **Notifications:** allows notifications to be enabled and disabled.
- **General:** allows control of caching behavior

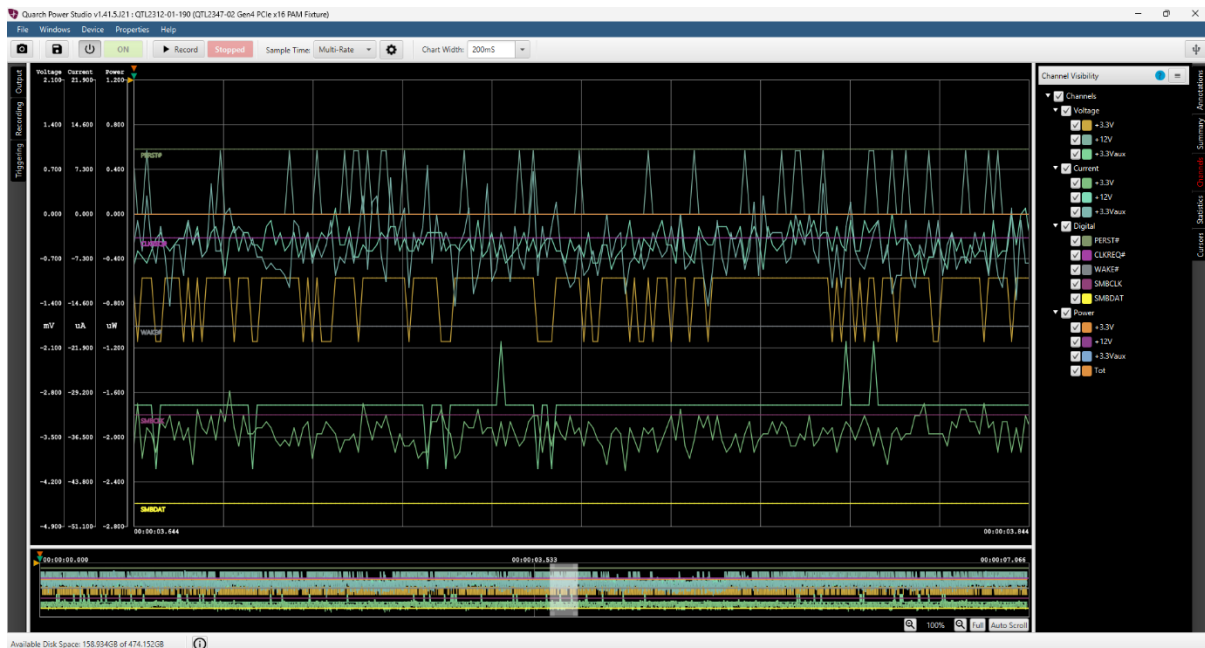


Displaying recording settings of the Preferences dialog

Screen layout

The screen is broken down into a few main sections:

- The lower window is the 'Timeline'. This shows the entire trace captured to give you an overview.
- 'Data View' is the main window and shows the region of data you have selected.
- The tabbed controls on the right hand side relate to viewing. Here you can hide channels, view statistics, controls measurement cursors and more
- On the tool bar are useful controls to set the chart width, take screenshots and similar. More advanced controls are available in the menus.



Zooming

Zoom Box

You can draw a box around an area of interest to zoom in to it.

- Click the left mouse button on either the data or timeline areas and drag the mouse creating a rectangle region. Release to confirm the selection
- Pressing the **Control** key while the left mouse button is depressed changes the color of the start / end square handles from white to red indicating that they are moveable. You can now drag them to adjust if you make a mistake

Fine-tune your selection with keys:

- Using the **+** or **-** keys you can zoom the chart horizontally.
- **Shift** and **+** or **Shift** and **-** will zoom the chart vertically.
- **Arrow** or **WASD** keys will pan the chart.

Or with mouse scroll:

- Position the mouse over the data view.
- Move the **scroll wheel** to pan the chart horizontally.
- **Alt** and **scroll wheel** will pan the chart vertically (if possible).
- **Control** and **scroll wheel** will zoom the chart horizontally.
- **Shift** and **scroll wheel** will zoom the chart vertically.

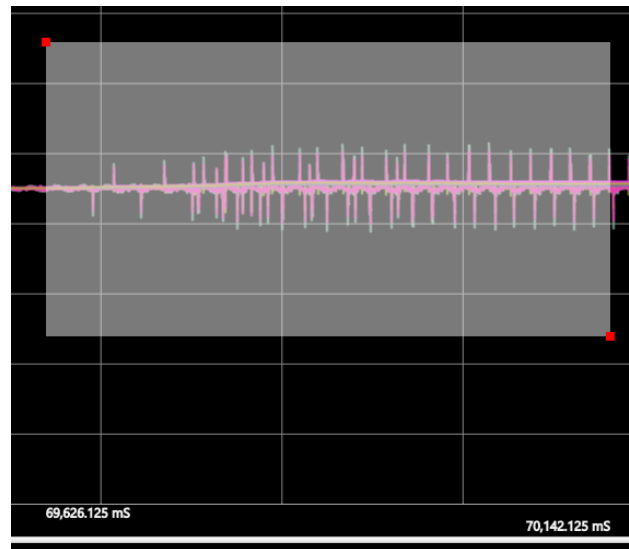
Or you can set the length of time shown on the screen by using the Chart Width control on the toolbar.

You can also right click anywhere in the main chart to access controls to:

- Switch the scale behavior. Choosing “Scale to selection” will cause the y-axes to be rescaled to best fit the maxima and minima of the signal values within the currently visible main chart. Choosing “Scale to all time” will cause the axes to be scaled according to the maxima and minima across the entire duration of the trace.
- Zoom to fit will cause the visible selection to be zoomed in vertically to best fit the signal values currently visible
- Zoom out will zoom the chart out both horizontally and vertically

- Toggle off axes– this prevent the axis on the left of the screen from being drawn, but the associated signals will continue to draw in the chart

Shown below is a highlighted region in the chart window and shows the start and end times of the selected region along the lower time rail; the time units are the same as those specified in the Preferences dialog.



A highlighted region showing the moveable start / end points

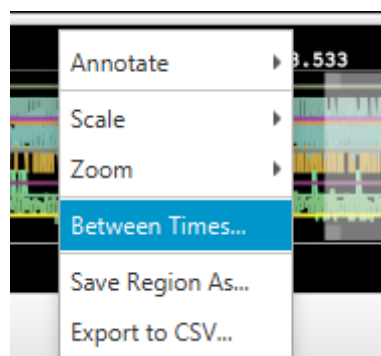
Timeline Zoom

There are several ways to manipulate the timeline highlight region:

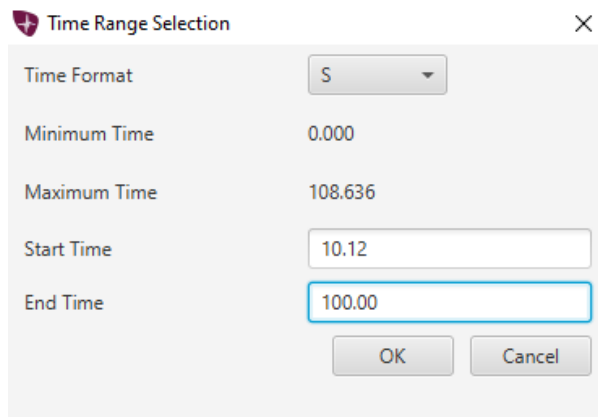
- Double-click to jump to the selected area
- Scroll the mouse wheel
- Click the central area of the highlight region to change the cursor to a cross and then drag either left or right horizontally.
- Click the highlighted region 4 corner handles and drag them to the desired location.
- Click the + or – buttons to zoom the timeline in or out
- Click **Full** to reset the timeline zoom to display the full data set and the data view to a default zoom level.



- While viewing live data, toggle the **Auto Scroll** button on to lock the main chart and timeline highlight to showing the latest data as it is ingested. Toggle off to allow free movement and hold the main chart on a specific location. This control only appears while viewing live data.
- Right-click the mouse button when the mouse pointer is hovering inside the timeline region to bring up the timeline context menu and select option *Between Times...* and show the *Time Range Selection* dialog.



Timeline context menu

A screenshot of the 'Time Range Selection' dialog box. The dialog has a title bar with a red shield icon and the text 'Time Range Selection' and a close button 'X'. Inside, there are five rows of controls: 'Time Format' with a dropdown menu showing 'S'; 'Minimum Time' with a text field showing '0.000'; 'Maximum Time' with a text field showing '108.636'; 'Start Time' with a text field showing '10.12'; and 'End Time' with a text field showing '100.00'. At the bottom are 'OK' and 'Cancel' buttons. The 'End Time' field is highlighted with a blue border.

Field	Value
Time Format	S
Minimum Time	0.000
Maximum Time	108.636
Start Time	10.12
End Time	100.00

Showing the Time Range Selection dialog

Select a time format and a start and end time between the shown minimum and maximum values and click OK.

Display tabs

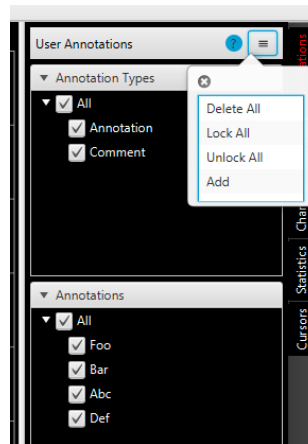
The right hand side tab controls contain various options to change what you see on the chart, and to show additional data.

- Annotations
- Summary
- Channels
- Statistics
- Cursors

Annotations tab

The **Annotations** tab allows you to display or hide recording annotations and comments.

The Annotations tab has a menu as shown in the Figure below for bulk changes:

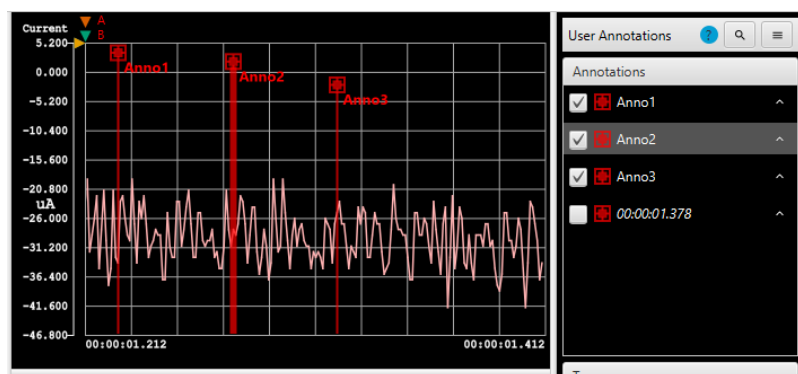


Menu for the Annotations Tab

Delete All deletes all annotations and **Lock All/Unlock All** lock and unlock all annotations in the chart view. Right clicking on a particular annotation brings up the **Edit Annotation** and **Delete** menu items.

Double-clicking on an annotation will jump to it on the main screen.

Hovering over an annotation in the menu will highlight it on the chart.

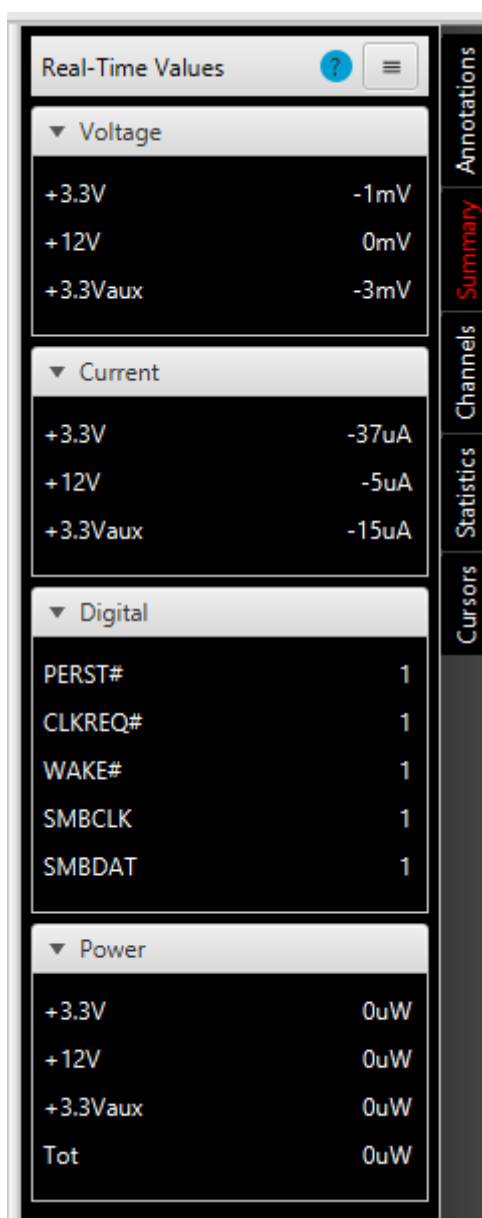


Summary tab

The **Summary** tab presents a grid of live values while recording. The level of precision and refresh rate can both be set via the *Preferences* dialog.

This is useful to see immediately what the device under test is doing.

In archive mode or after the recording has stopped, this shows the values under the cursor, while the cursor is over the data view chart



Real-Time Values	
▼ Voltage	
+3.3V	-1mV
+12V	0mV
+3.3Vaux	-3mV
▼ Current	
+3.3V	-37uA
+12V	-5uA
+3.3Vaux	-15uA
▼ Digital	
PERST#	1
CLKREQ#	1
WAKE#	1
SMBCLK	1
SMBDAT	1
▼ Power	
+3.3V	0uW
+12V	0uW
+3.3Vaux	0uW
Tot	0uW

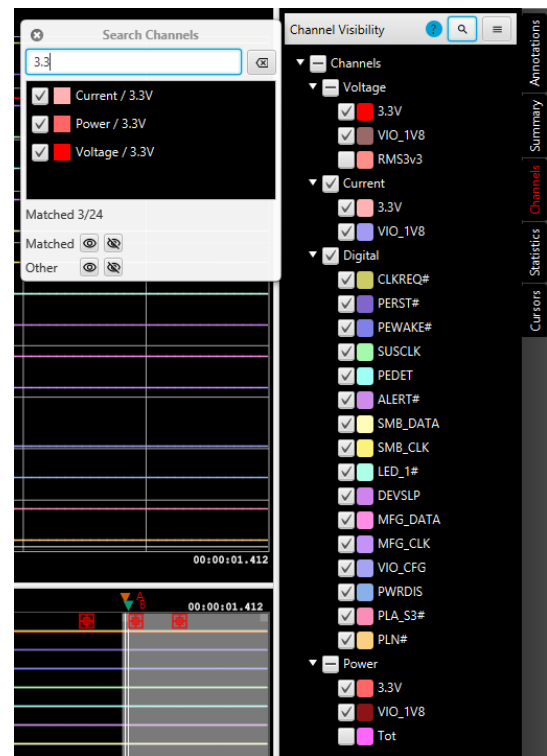
Channels tab

The **Channels** tab lists all available channels, allowing you to turn on and off certain channels so as to help minimize visual clutter in the Data View window.

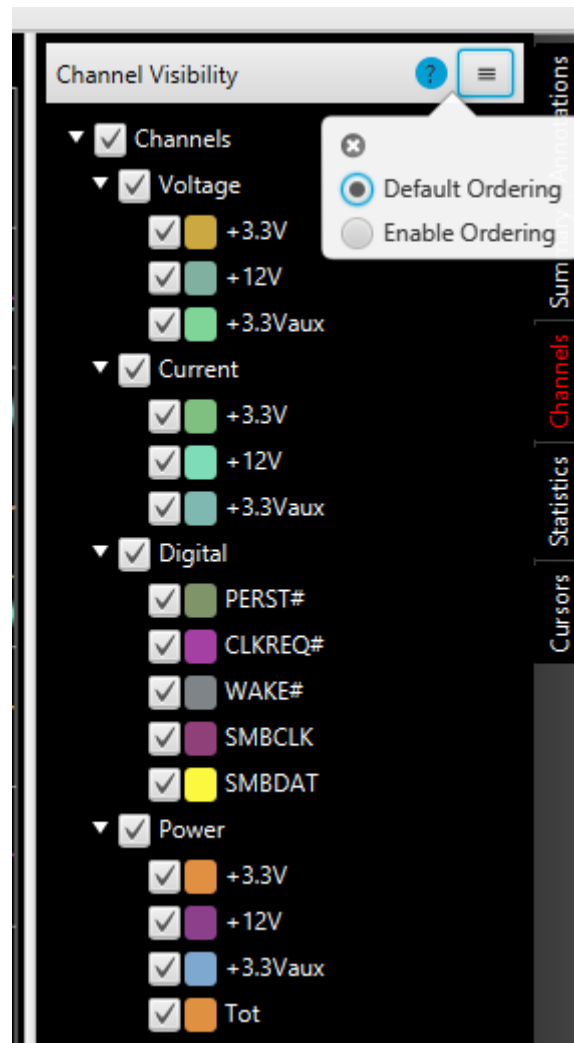
You can change the color of the channels here by clicking on the colored square.

Hover over the channel text will highlight it in the chart view.

If you have many channels you can use the search function to find them more easily.



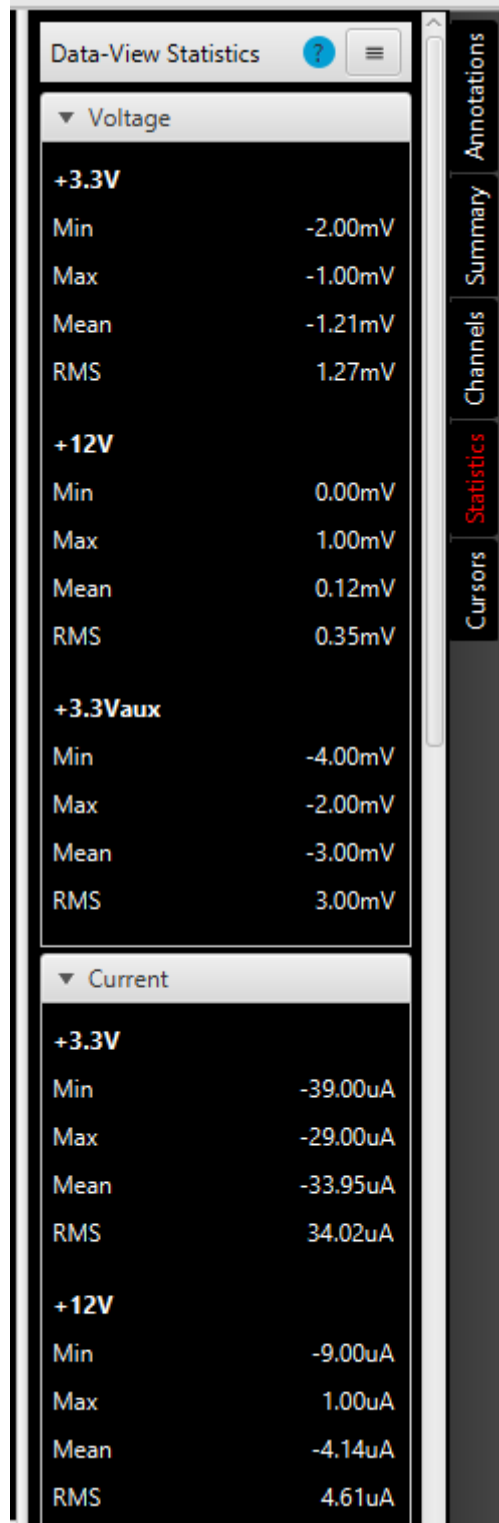
Digital channels can be re-ordered by enabling ordering mode from the menu



With this done, you can drag and drop the signals by grabbing their name text and changing the order.

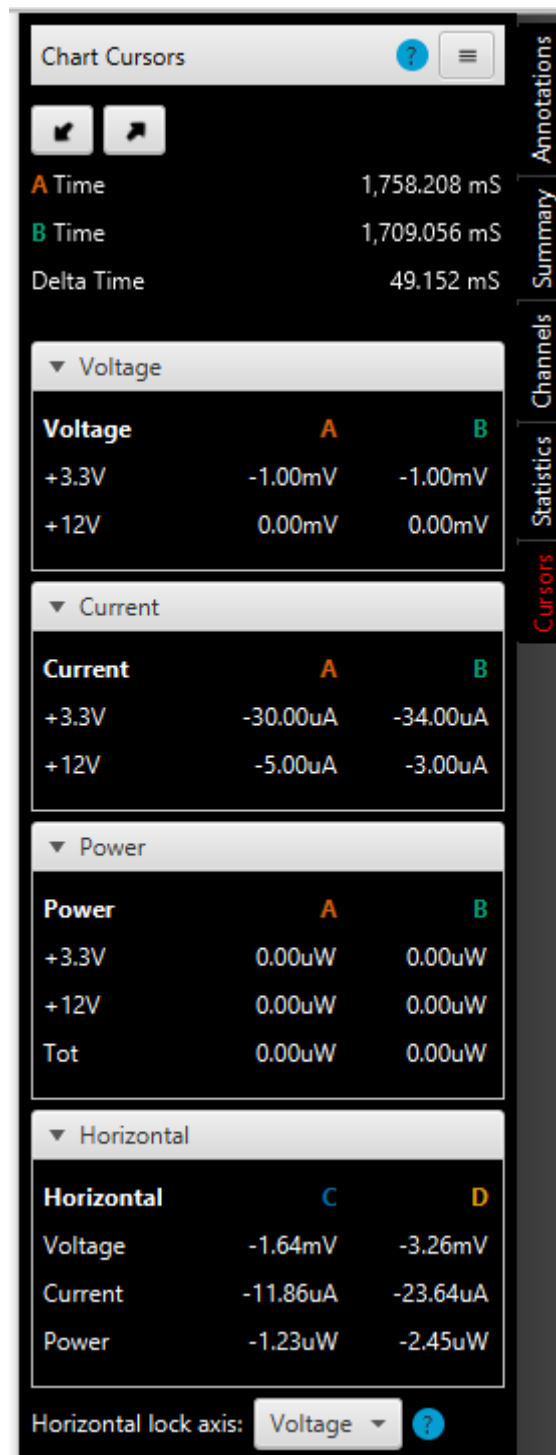
Statistics Tab

The **Statistics** tab provides basic real time statistics of the data currently in the main data view window.



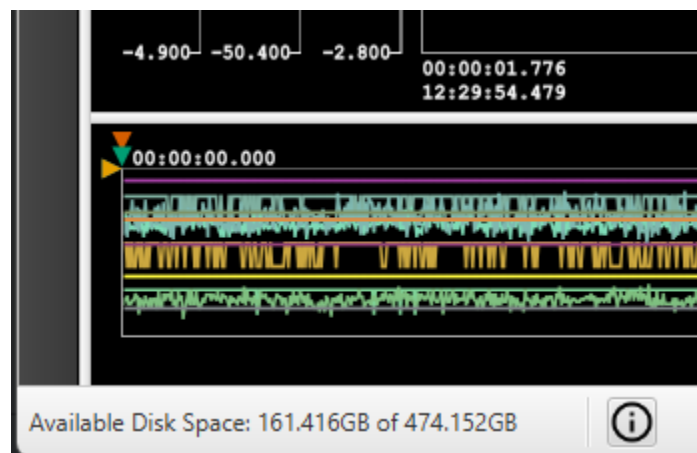
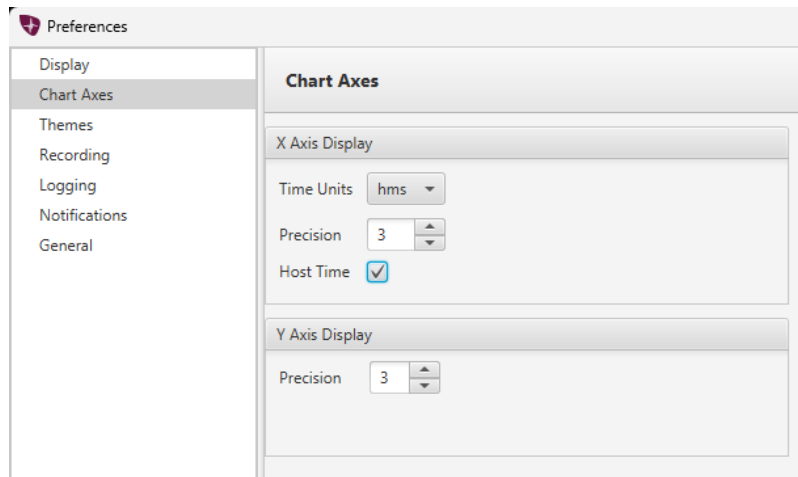
Cursors tab

This tab gives you a quick way to read the values under the draggable measurement cursors. The buttons at the top allow you to quickly bring the cursors onto the current screen, or put them away.



Host timing sync

You can display the host time on the analysis by enabling the option in preferences. This adds the real time clock display to the start and end of the main display window, helping you track the actual time that an event occurred



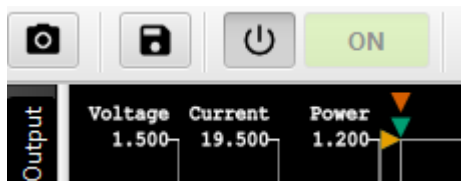
Measurements

There are various ways to measure things that you see on the chart:

- Chart axes:
You can read the approximate value from the axis
- Measurement cursors:
You can measure with cursors and read off the axis or the 'cursors' tab
- Summary tab
You can see the value under the mouse cursor here
- Statistics
The right side statistics tab shows stats for the current screen. The main statistics grid shows stats for regions of the trace

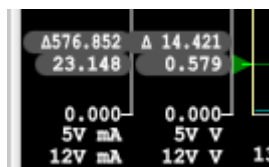
Measurement Cursors

You can use the markers to measure absolute and relative values. These are found at the top left of each area.



Horizontal and vertical markers

- Drag one or both markers to the desired position. The measurement value will be shown on the chart axis in a grey highlight.
- Remember that the power axis is on the right of the chart, and values will be displayed in this axis as well.



Marker values on Y-axis

In this example we can see a voltage of 0.579V and a current of 23.148mA at the marker position. The delta values above these two values show the distance between the two markers.

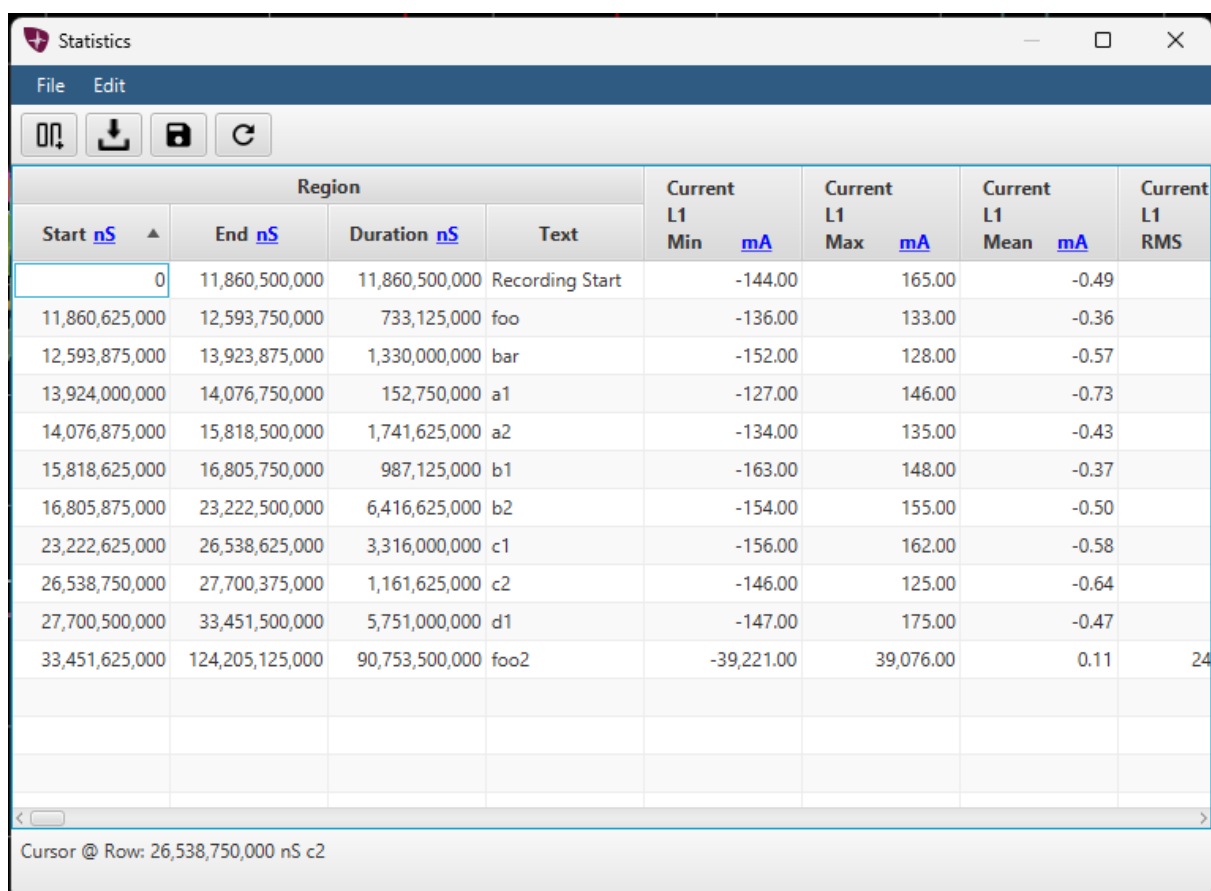
The 'Cursors' tab on the right hand side also shows values under the cursors

Statistics Grid

Statistics are automatically calculated for the trace.

Select **Windows -> Statistics Grid** to open the view.

- Statistics are displayed for the trace. If annotations are present, then statistics are calculated between each pair of annotations.
- Many statistics are available for each channel. Click the '+' icon on the top right to change the displayed values.



Region				Current L1 Min mA	Current L1 Max mA	Current L1 Mean mA	Current L1 RMS
Start nS ▲	End nS	Duration nS	Text				
0	11,860,500,000	11,860,500,000	Recording Start	-144.00	165.00	-0.49	
11,860,625,000	12,593,750,000	733,125,000	foo	-136.00	133.00	-0.36	
12,593,875,000	13,923,875,000	1,330,000,000	bar	-152.00	128.00	-0.57	
13,924,000,000	14,076,750,000	152,750,000	a1	-127.00	146.00	-0.73	
14,076,875,000	15,818,500,000	1,741,625,000	a2	-134.00	135.00	-0.43	
15,818,625,000	16,805,750,000	987,125,000	b1	-163.00	148.00	-0.37	
16,805,875,000	23,222,500,000	6,416,625,000	b2	-154.00	155.00	-0.50	
23,222,625,000	26,538,625,000	3,316,000,000	c1	-156.00	162.00	-0.58	
26,538,750,000	27,700,375,000	1,161,625,000	c2	-146.00	125.00	-0.64	
27,700,500,000	33,451,500,000	5,751,000,000	d1	-147.00	175.00	-0.47	
33,451,625,000	124,205,125,000	90,753,500,000	foo2	-39,221.00	39,076.00	0.11	24

Cursor @ Row: 26,538,750,000 nS c2

Statistics Grid window display

Right-clicking in the *Statistics Grid* window brings up the ***Between Times...*** context menu item, which displays the *Statistics Range Selection* dialog

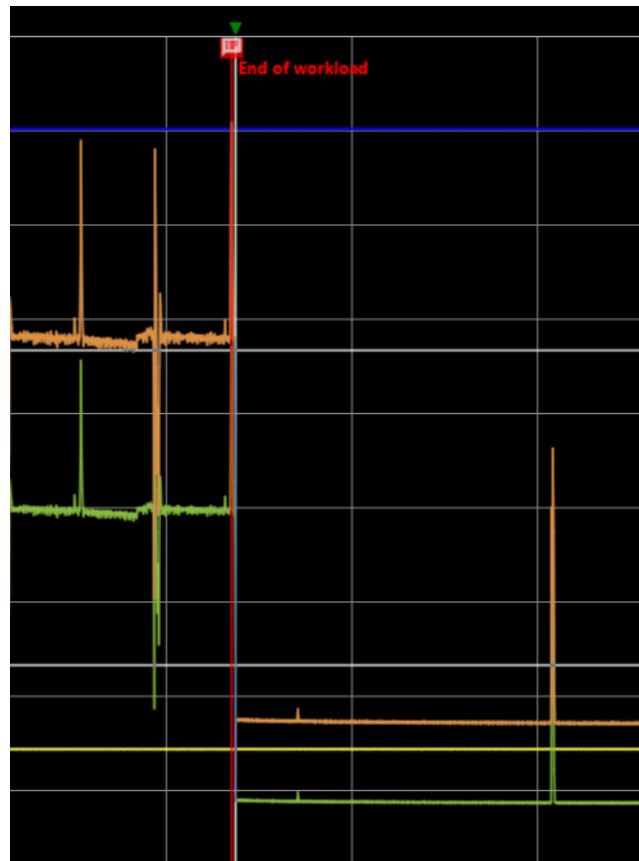


Statistics Grid Between Times... context menu

The *Statistics Range Selection* dialog allows additional rows to be added to the *Statistics Grid* that compute statistics between start and end times.

Annotations

You can add annotations and comments to a trace, which serves as an excellent way of making notes and highlighting important areas for another engineer to view later.

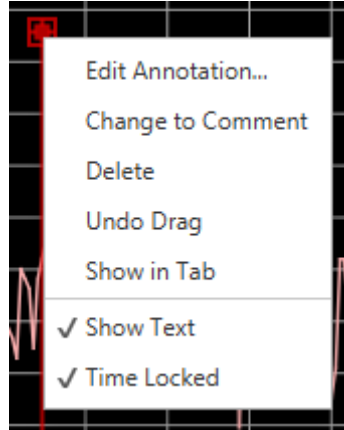


Annotation marking when the test workload completed

- Add an annotation in the data view with **Right-click -> Add Annotation...**
- Annotations can be added via Python script for powerful automated test
- Annotations can be added using the auto-annotation controls in the Triggering tab

Editing annotations

- Edit an annotation by **Right-clicking** on the annotation symbol.



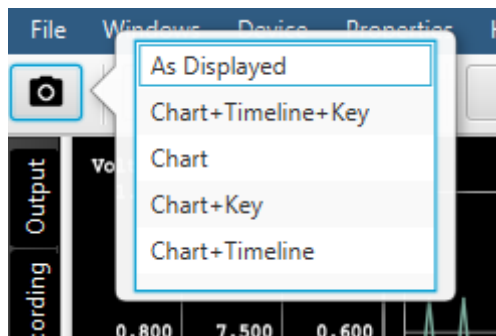
Edit Annotation	Allows you to add/change the text of an annotation.
Change to Comment	Toggles the type between annotation and comment.
Delete	Removes the annotation.
Undo drag	Undoes the last move.
Show in Tab	Shows the annotation in the menu.
Show Text	Toggles display of annotation text.
Time Locked	Unlocking allows you to left click and drag the annotation along the x axis (time).

Exporting

You can export images and sub-regions of a trace and CSV data for later use.

Export screenshots

- Click **Save Snapshot** and select what should be included in the snapshot, and then the directory you want the file to be saved in.



- The default file type can be changed within the application preferences.

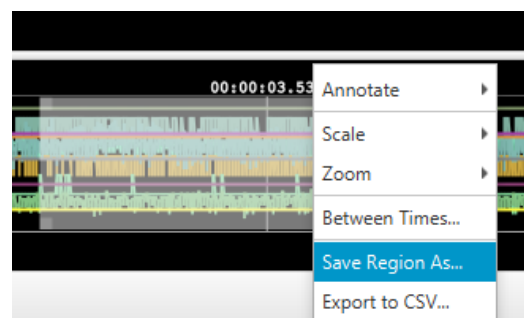
Export region

You can create a new .qps file from a limited section of an existing trace. This significantly reduces the usage of disk space and allows you to easily share interesting sections of your data.

You can also export as a raw CSV file for post processing, noting that this is much larger than a compressed .qps format file.

Trace files can be very large if you are running at high resolution or for a long period. It can take a long time to save a trace section if it is multiple gigabytes in size. Make sure you have sufficient disk space for the trace.

- Select the region you wish to export.
- **Right-click** on the highlighted region on the time-line and select **Save Region As...**

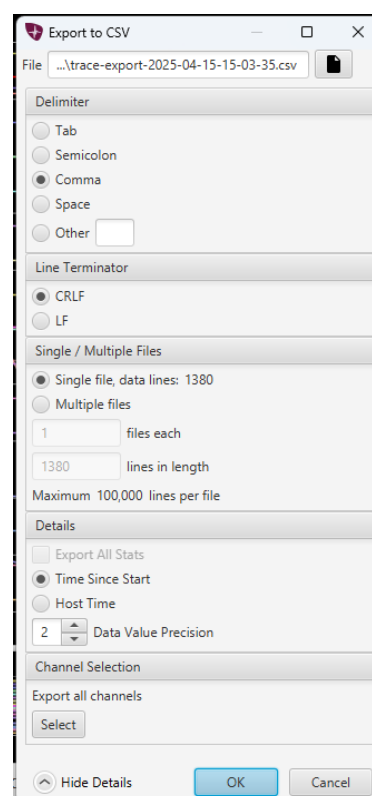


Selecting a region for export

Additional export options are found in the **File -> Export** menu.

The exported CSV can be customized by clicking the “Show Details” drop down on the Export to CSV dialog.

In this dialogue you can select the delimiter type, line terminator, number of files to spread data across, system time or elapsed time, and channels to export.



Streaming live data

When connected to a Power Module, there are several additional controls available to let you control the module.

When first connecting to a module, the screen will be empty.



Initial screen when connected to a power module

The application presents you with two methods of configuring your required recording. These are the *Toolbar Controls* and the *Tabbed Controls on the left-hand side*. We will first describe the toolbar controls.

Toolbar controls

Power on

For devices that allow power on/off control, this button toggles the power state



Power modules have variable outputs. You **MUST** ensure the correct voltage is selected **BEFORE** you turn the power on. HD modules will automatically select the correct voltage range based on the fixture, but XLC modules must be set manually.

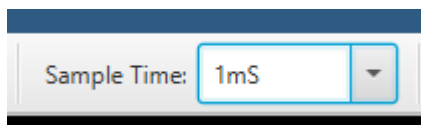
Sampling time

Quarch power modules sample internally various rates. Commonly this is 250k samples/second (4uS resolution), and this generates a lot of data.

Multiple samples can be averaged together to produce a single measurement. This allows perfect average power measurement, while reducing the data rate.

In QPS, the underlying complexity of hardware and software sample averaging is simplified down to a single control where you can enter your desired sample rate.

In the example below, one sample will be recorded every 1mS (which will be made up of 250 raw 4uS samples, averaged together).

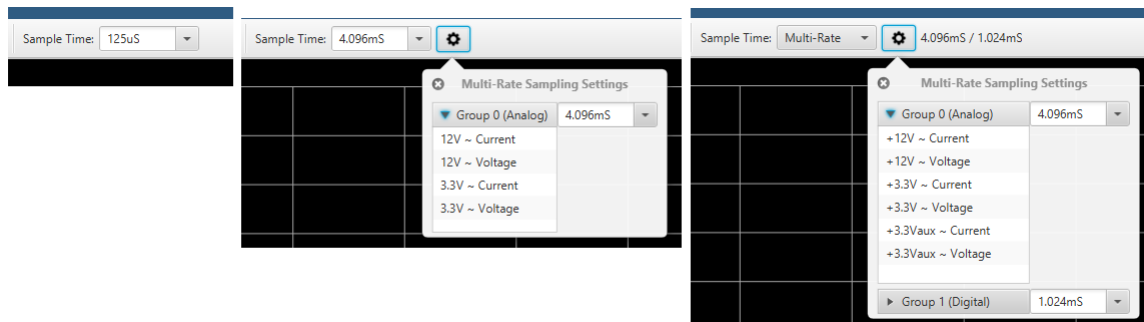


Fast sampling rates produce a LOT of data. XLC modules can stream constantly at 64uS sampling on a fast PC. HD modules can stream normally constantly at 4uS sampling, depending on the PC and connection type.

If your PC cannot pull data off the module fast enough, the internal memory will eventually fill up and the stream will terminate. If this happens, simply choose a larger sampling rate. You must select the sampling rate **BEFORE** you start streaming.

Streaming will also stop automatically if disk space is getting low.

The sampling time controls vary depending on the type of sampling the connected device supports. There are three key versions



Sampling time controls

For a single-rate device, a single combo-box is presented that allows a time to be selected from the listed stock values, or additional non-stock times entered.

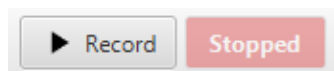
For a multi-rate device that only supports a single-rate, the same sampling time combo-box is provided but a settings button is also provided, which on clicking loads the *Multi Rate Sampling Settings* pop-over. This pop-over also allows the sampling time to be set as well as additional information relating to the different device groups.

For a full multi-rate device with multiple sampling time groups, the addition of a “Multi-Rate” is shown in the combo-box when multiple rates are selected, as well as a label clearly showing what these rates are without the need to load the pop-over.

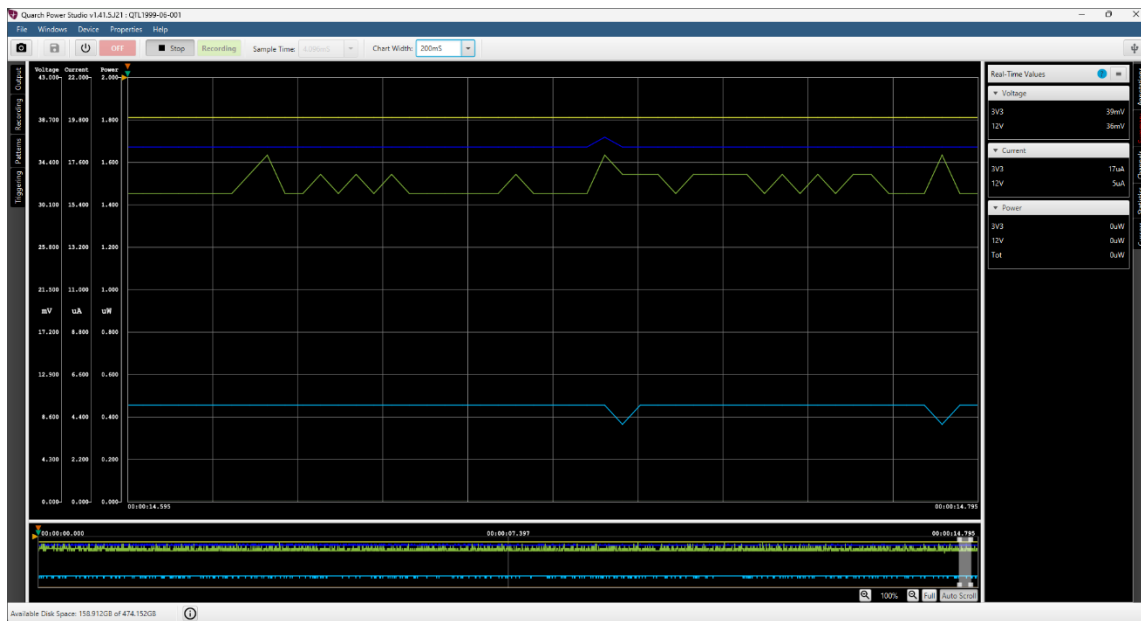
Starting a stream

Here we have a spinning drive connected to an HD power module.

- Click the **Record** button to begin collecting data.



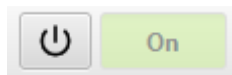
You will now see the data collecting on the display.



Data streaming, outputs turned off

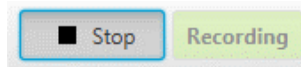
Now we will power up the drive, using the current 3V/12V voltage selection. We have selected 4mS averaging to get a good level of detail.

- Click the power button to enable the outputs





- When you are finished collecting data, click the stop button.



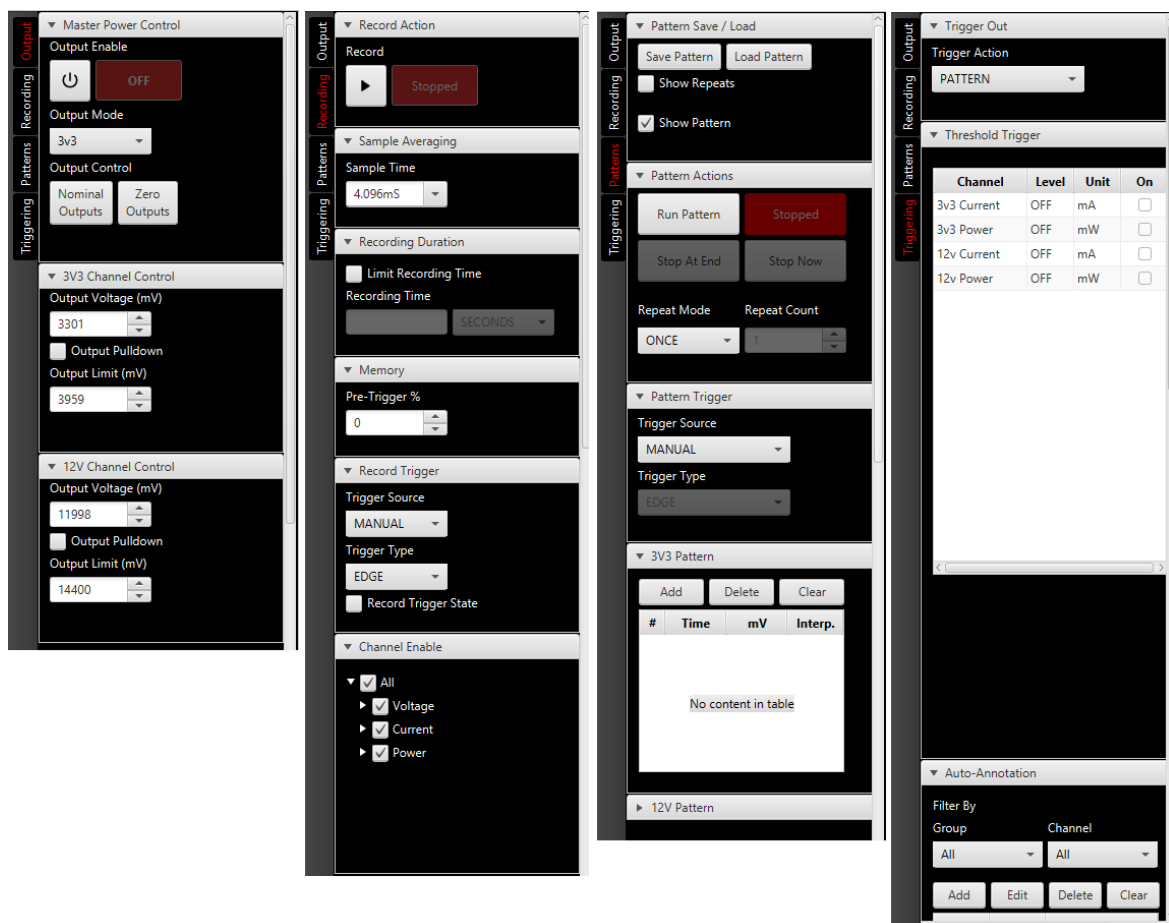
By default, data will be deleted when you close the application or make another recording. Save the recording if you want to keep it. You can change this default behavior in the application properties.

Recording controls

The controls on the left-hand side consist of four collapsible tab panes:

- Output,
- Recording
- Patterns (PPM only)
- Triggering

The currently selected tab is indicated in red and can be opened and closed by repeatedly clicking the named tab. This is useful that once the recording options have been configured the controls can be hidden to allow a greater display area once streaming has commenced.



Output, Recording, Patterns and Triggering controls

Note that the available tab panes, titled panes and controls will vary depending on the connected device. For example, the *Patterns* tab is not displayed for PAM devices and the *Output* controls simply consist of the **Output Enable** ON/OFF button.

Output tab

The Output controls consist of the *Master Power Control* and the *Voltage Channel Controls (PPM only)*. Each of these grouped controls are collapsible and expandable by repeatedly clicking on their title.

Collapsing the grouped controls can be useful in the case of several controls, as is the case for the *Patterns* tab.

Master Power Control

The **Output Enable** ON/OFF toggle button is equivalent to the *Power Enable* ON/OFF button on the toolbar in that it sets the outputs on or off.

The **Output Mode** combo box specifies which output mode is required for PPM devices, such as 3V3 or 5V.

The **Output Control** group consists of the two buttons **Nominal Outputs** and **Zero Outputs**, which respectively set the output voltages to their nominal and zero values.

Voltage Channel Controls

For PPM devices, the *Channel Control* displays the supported output voltages, each in their own group.

In each control you can set the current output voltage via the **Output Voltage (mV)** editable spinner.

The **Output Pulldown** option allow you to enable or disable current sinking. When enabled, the PPM can pull current out of the attached device if the requested voltage is lower than the measured value. This happens in the case of patterns, where (for example) a square wave can be requested. With 'pulldown' turned off, the voltage will be driven high and only float low. With the setting enabled the voltage will be actively pulled down as well, producing a cleaner voltage waveform and making a more aggressive test for the drive.

The **Output Limit (mV)** control allows a persistent value to be set for the maximum voltage on the rail. This does not reset on power cycle, so you can use it to protect devices by ensuring the user cannot accidentally request a higher voltage.

You can perform voltage margining tests by changing these Output Voltage values at any time, even while data is being recorded. (PPM only)

Recording tab

The Recording controls consist of the groups relating to the recording of data. This includes how long to record for and additional options for record triggering and channel selection.

Record Action

The **Record** button is equivalent to the *Record* button on the toolbar in that it starts and stops live streaming.

Sample Averaging

The **Sample Time** editable combo box is equivalent to the *Sample Time* combo box on the toolbar. It supports various stock values for quick selection. You can also

enter your own sample time, such as 55mS or 125uS. Values you enter manually will be held in the dropdown for the duration of the session.

Memory

The **Memory** collapsible pane consists of the single control **Pre-Trigger %**. This sets the percentage of memory to be used to capture data before a record trigger event occurs.

Record Trigger

Record Trigger chooses what will begin a recording

MANUAL	Started by manual click of the record button
EXTERNAL	Started by an external trigger input (EDGE trigger begins on a rising edge. LEVEL trigger records for the time the trigger is high).
THRESHOLD	Started on the measured value exceeding a set threshold. This option ALSO requires one or more threshold triggers to be set

The **Record Trigger State** checkbox enables/disables the stream mode trigger state.

Channel Enable

Available on some instruments only, the **Channel Enable** control contains an expandable tree view allowing you to enable or disable specific channels when recording.

Turning off channels will reduce size of the analysis files

Synthetic Channels

Here you can add additional synthetic function channels to the predefined channels.

These are new channels which are created from one or more other channels (for example combining current and voltage, to get power).

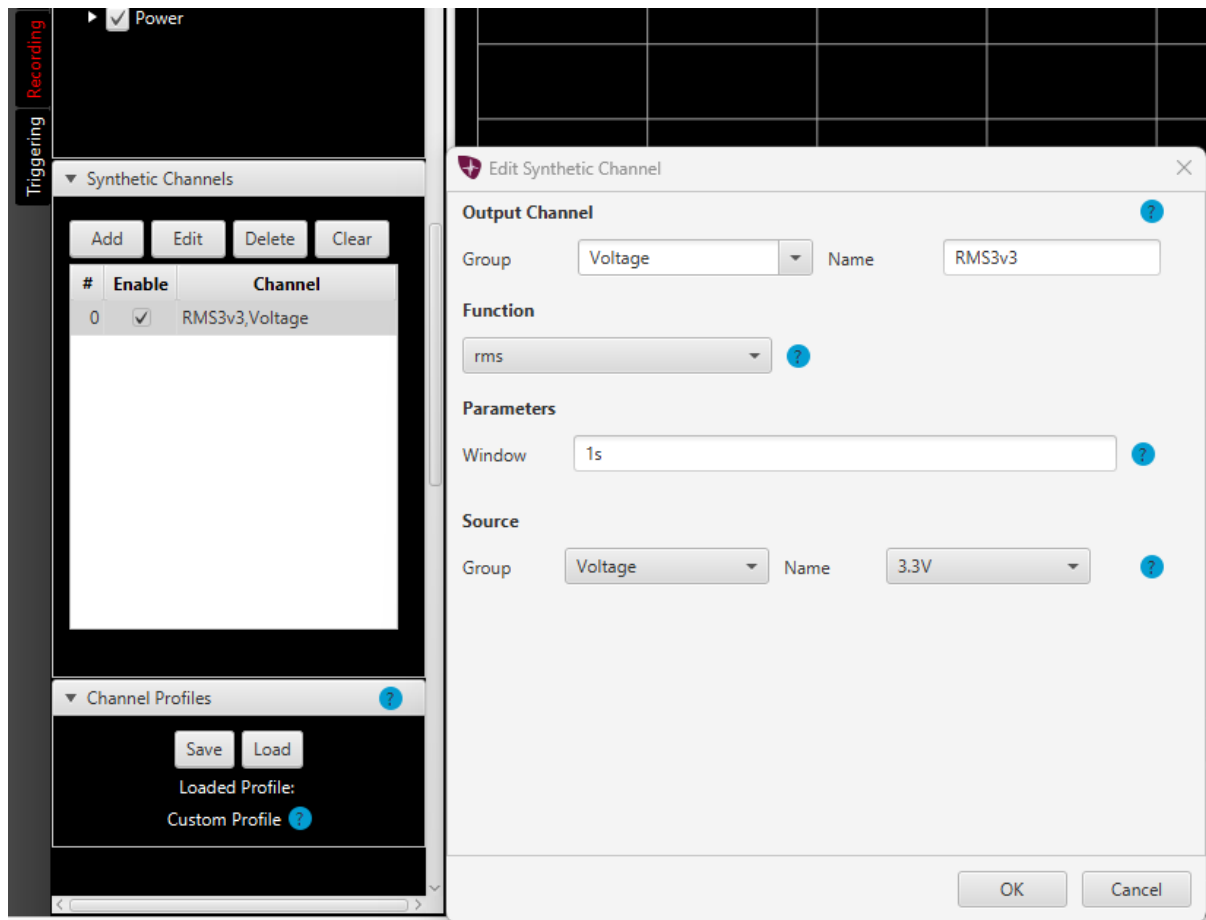
Synthetic channels are currently mainly used for our AC devices, where RMS, phase and frequency need to be calculated.

The table is accompanied with **Save Functions** and **Load Functions** buttons for saving to file and loading from file previously generated function channels.

The table also comes with **Add**, **Edit**, **Delete** and **Clear** buttons for adding and editing a table entry, deleting a specific table row and clearing the entire table.

The **Add** and **Edit** buttons bring up the *Synthetic Channels Editor* dialog, which allows the defining of a synthetic channel.

Channels can be **Enabled/Disabled** without deleting them by ticking/unticking the box in the **Enable** column.



Showing the Synthetic Channels Tab pane and its associated editor

Patterns tab

The Patterns tab allows you to specify a power pattern to apply to a device (PPM modules only).

A pattern is made up of points, each of which specifies a voltage level to change by (relative to the voltage at the start of the pattern), a time to change at, and the 'interpolate' option.

Interpolation causes the unit to move the voltage between two time points in a linear way (instead of jumping directly to the requested voltage).

Pattern Save / Load

The **Save Pattern** and **Load Pattern** buttons allow you save an entered pattern and load a previously saved pattern.

Show Repeats allows repeating patterns to be either shown or not shown on the display

Show Pattern turns on and off the grey pattern edit area on the Display View. This is useful once the required has been entered as the grey pattern edit region can be hidden when streaming has commenced.

Pattern Actions

Run Pattern Runs the current pattern points

Stop At End Stops running when the current pattern cycle is complete and

Stop Now Stops the running pattern immediately

Repeat Mode and **Repeat Count** control how a pattern is repeated and can be ONCE (run just the once), COUNT (repeated a specified number of times) and CYCLE (run repeatedly).

Pattern Trigger

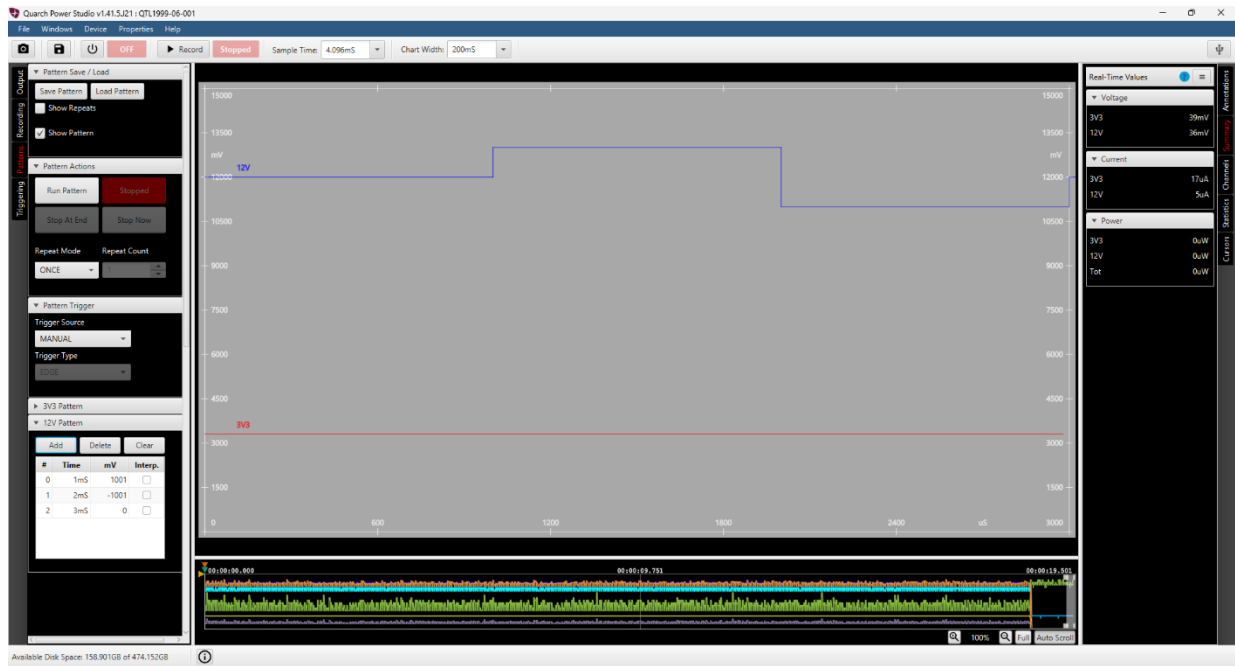
Pattern Trigger contains the combo boxes of **Trigger Source** and **Trigger Type**.

Voltage Pattern Channels

The *Voltage Pattern* groups each contain a single table for generating a pattern. Each table is accompanied by **Add**, **Delete** and **Clear** buttons with **Add** adding a new row, **Delete** deleting a selected row and **Clear** clearing the entire table.

Columns **Time**, **mV** and **Interpolated** are editable.

The image below shows the editing of a 12V pattern.



Triggering tab

The Triggering tab contains options for advanced threshold and external triggers. The controls here will depend on the module you are using.

Trigger Out

Trigger Out consists of the single control of **Trigger Action** which allow you to select what action will cause an external trigger to be generated.

PATTERN	Running a PPM voltage pattern will assert the external trigger
RECORD	Starting a recording will assert the external trigger
THRESHOLD	Exceeding a set threshold will assert the external trigger

Threshold Trigger

Threshold triggers allow a trigger to be generated when a measured channel passes a set threshold.

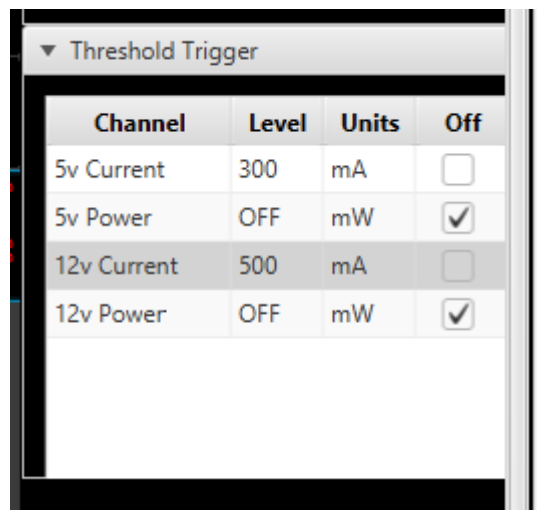
PPM Devices Triggers can be set on current or power channels and the trigger is asserted then the measured value exceeds the trigger

PAM Devices Triggers can be set on any hardware measured channel (voltage, current and digitals). The threshold can be set to trigger on either rising or falling through the set trigger level.

digitals do not have a set level and are set to assert on either a rising or falling edge

Thresholds are a simple tool for capturing an event. They are not designed for highly accurate measurements as the threshold value is of limited resolution (There are 127 steps for specifying a threshold over the range of each channel on PAM).

Here we have created two threshold triggers: 300mA on 5v current and 500mS on 12v current. If either of these values are exceeded, the trigger will occur.



Channel	Level	Units	Off
5v Current	300	mA	☐
5v Power	OFF	mW	☒
12v Current	500	mA	☐
12v Power	OFF	mW	☒

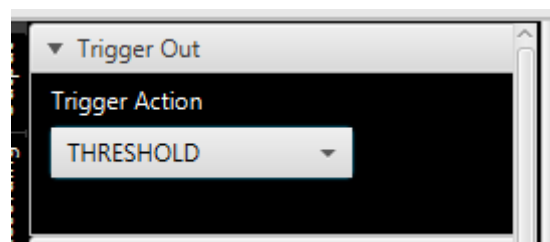
Note that PAM devices also have ‘polarity’ value so you can specify if the trigger should occur on rising or falling transition.

Channel	Level	Unit	Polarity	Off
+3.3V Vol...	OFF	mV	RISING	☒
+3.3V Cur...	OFF	uA	RISING	☒
+12V Vol...	OFF	mV	RISING	☒
+12V Cur...	OFF	uA	RISING	☒
+3.3Vaux ...	OFF	mV	RISING	☒
+3.3Vaux ...	OFF	uA	RISING	☒

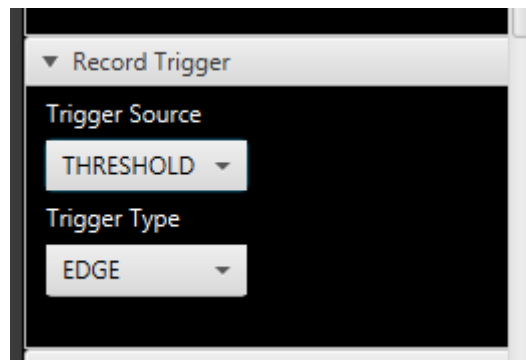
PAM devices also allow threshold trigger on digital change.

Channel	Polarity	Off
PERST# Digital	RISING	☒
CLKREQ# Digital	RISING	☒
WAKE# Digital	RISING	☒
SMBCLK Digital	RISING	☒
SMBDAT Digital	RISING	☒

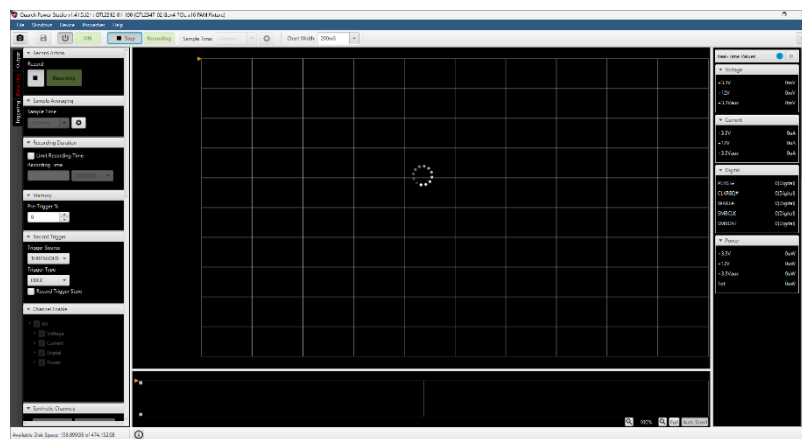
In addition to setting the thresholds, you also must choose the use of the trigger. This can either be to generate a trigger out to the THRESHOLD option.



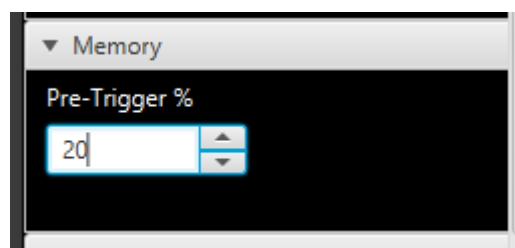
You can also use the threshold to begin a recording, but setting the record trigger mode on the ‘Recording’ tab.



With this setting in place you now click 'record' to begin the stream. The stream mode will change to 'Running' but no data will be captured until the threshold is passed, then the data will begin to record.

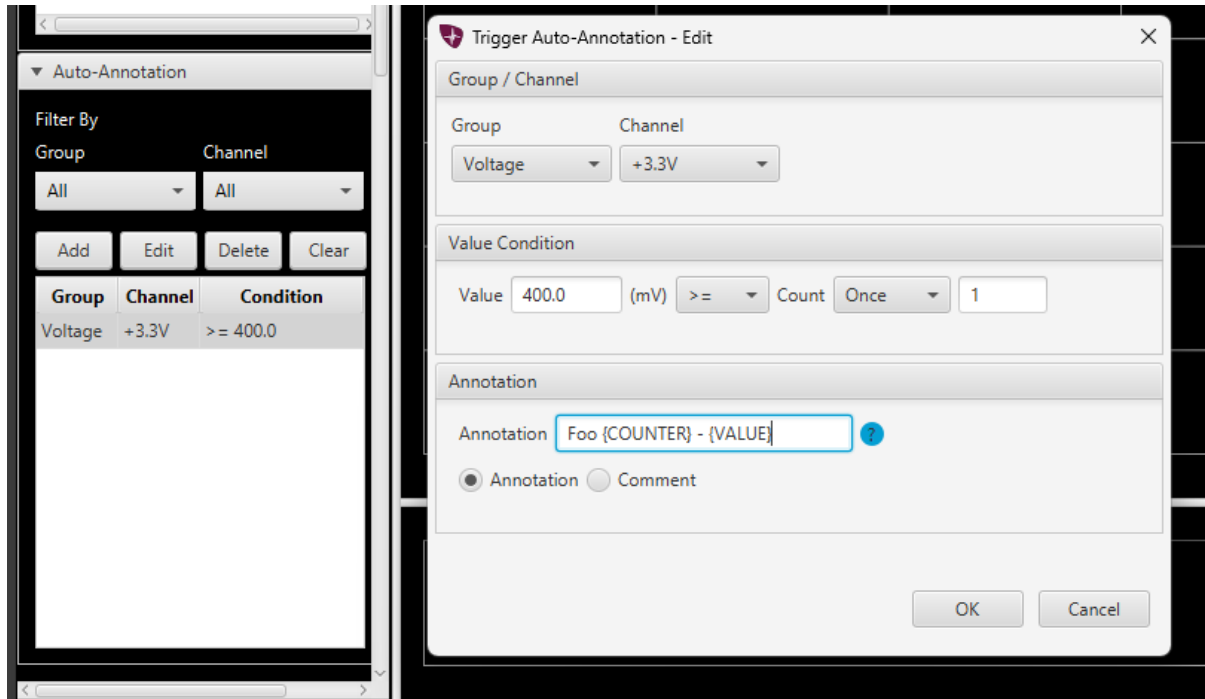


If you want to also capture what happened prior to the trigger event, you can allocate a percentage of the onboard RAM to capture power prior to the threshold. Here we will capture 20% of ram (about half a second at 4uS sampling)



Auto-Annotation

Auto-annotations allows the setting of conditions which should cause an annotation to automatically be added to the trace. The keywords {COUNTER} and {VALUE} included in the annotation name will be substituted with a counter of the number of times the annotation has been triggered and the value of the channel at that instant.



Saving the trace

By default, traces will be discarded if you close the application or start a new stream. When you have stopped the stream, you can choose to save the data for later.

- Click the **Save As** button to keep your data.



- Note that large traces can take a long time to save, especially to a network location.
- The Recording options in the *Preferences* dialog allow you to specify the persistence state of a recording, and provides the following 3 options:
 - The recording will be deleted on close.
 - The recording will be preserved on close.
 - Display the delete/preserve options at the end of a recording.

Properties

The Properties menu item supports the three options of **Device**, **Recording** and **Stream**. **Device** provides information about the connected device. **Recording** provides information about a loaded recording, and **Stream** provides real-time information relating to the data stream once recording has been activated.

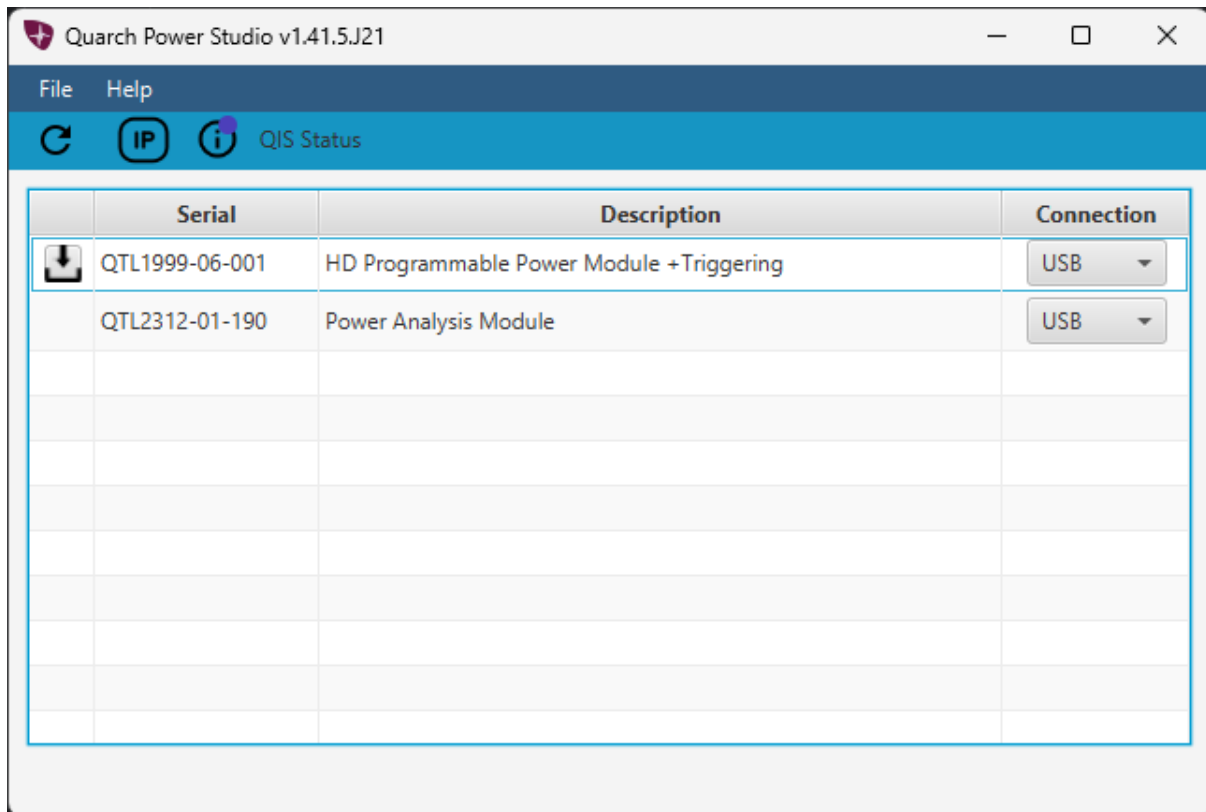
Resetting the device

The **Device** menu item provides a quick way of resetting your connected device to either its default state or back to factory settings. The default state is the same as when a device is turned on. The factory state resets the device to the settings when it left Quarch's production site. Note that when resetting a device back to factory settings you will lose any LAN/Ethernet settings.

Automatic updates

Quarch Power Studio performs two checks to ensure you have the latest version. It first performs a check automatically when you first launch the application. If a newer version is available, you will notice a download arrow in the Connection screen. The second way of checking to see whether you have the latest version is a manual check via the **Help -> Check for Updates...** menu item.

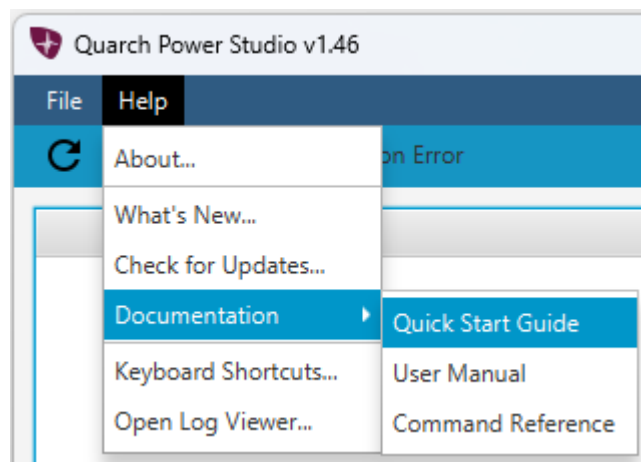
If there is a firmware update available for a device a download button will be shown next to the device entry on the connection screen:



Help Menu

The Help menu has been expanded to include direct access to Quarch’s online documentation, release notes, and support pages.

“What’s New” dialog now appears at application startup, summarizing recent changes and new features introduced in the latest version.



About dialog

The *About* dialog is not only useful for obtaining Quarch’s company and support details but also for determining the version details of both QPS and QIS, which can be helpful when contacting the support team. Click the **Details** button to display the application information.



The About dialog showing application details

Debug log viewing

QPS produces standard formal log files, this feature can be used for advanced debugging. With Ostros Log Viewer installed locally, you can watch the logs in real time

From QPS Click **File -> Preferences -> Logging**

Now follow the following steps:

- Install OtrLogViewer: <https://github.com/otros-systems/otroslogviewer/releases/tag/v1.4.18> Download the zip file under “Assets”.
- Extract the installed zip file to a directory of your choosing.
- Open QPS again and set the “log viewer” preferences field to the directory you extracted to. (Click the button and find the directory)
- Now go to File -> Open Log Viewer, if the directory in the preferences was set correctly this will launch the log viewer with the log opened automatically.
- The log viewer can also be launched on startup with the -logviewer argument, this argument can also accept a path of your choosing e.g. -logviewer="C:\..." The path you pass in must be the directory of the log viewer you previously installed, otherwise the log viewer will not be launched. The argument without the path will use the directory set previously in your preferences.

Customer support from Quarch

There are multiple ways to access the support you need.

You can contact us directly or access an extensive range of valuable support materials from <http://quarch.com/support>.

- The Help **About** menu item provides links to the Quick Start Guide, User Manual and telephone and email support.
- Contact us direct.
- Get going quickly and easily, with help direct from the engineers:
- Call +44 1343 508 140 or email support@quarch.com during UK office [hours](#).
- [Our international partners](#) are well trained in the use of our products and can deal with many basic technical queries from within your time zone, if you prefer. Check <http://quarch.com/resellers> for the contact details of your regional supplier.

Access support from the Quarch website

You can download up-to-date software and drivers, technical manuals, datasheets and more from our website. To help you get started quickly we provide additional documents, such as examples in Perl, Python and C# and Telnet and Serial instructions.

- Key **places to visit on** the Quarch website
- Register your Quarch product to confirm your [international warranty](#):
<http://quarch.com/product-registration>
- Download a wide range of documentation, free applications and drivers to help you make the best possible use of your Quarch tools:
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