

PQSCADA Sapphire



User Manual

Version 1.0.4.29

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1. Introduction

In today's world, power distribution networks deploy an array of protection equipment, power quality analyzers, revenue meters, and other monitoring equipment to ensure high quality and reliable power flow, as well as energy efficiency.

The ability to analyze synchronized data from a variety of data sources by one system is essential for meeting today's highest level of reliability, quality, and energy efficiency.

PQSCADA Sapphire's multi-vendor support sets new standards in power monitoring management software, which enables the acquisition and analysis of all field-generated data on a central software solution, regardless of the IED manufacturer. PQSCADA Sapphire is an expandable platform, in which further capabilities can be easily added as add-ons or can be independently developed by API to meet the customer's custom needs and applications.

PQSCADA can be installed in a single node system, as well as in a distributed client/server structure.

1.1 Key Features

- **Multi-Vendor Support**

PQSCADA Sapphire acquires, processes, and stores recorded data from any recording device through a variety of communication protocols and file formats. PQSCADA Sapphire will automatically calculate and store ~5,000 power parameters, including individual harmonics from acquired waveform signals.

- **Simplifies IT Environment**

PQSCADA Sapphire simplifies your IT environment by eliminating the need to purchase, install and train users, and maintain multiple systems.

- **No Missed Events**

PQSCADA Sapphire has sophisticated event detection capabilities, enabling the devices to record only raw data. PQSCADA Sapphire will find events according to user-defined thresholds during post-processing.

- **Secured Access**

PQSCADA Sapphire data can be reached from any location using standard secured firewall-friendly protocols.

- **Get Notifications**

PQSCADA Sapphire preconfigured scenarios enable sending emails, SMS's, and Push notifications to users.

- **Easily Fix Misconfigurations**

PQSCADA Sapphire allows correcting device installation and configuration errors by recalculating recorded data, as revers polarity, swap phases, connection type, VT/CT ratio, and time inaccuracy which can be easily corrected in past and future measurements.

- **Reporting & Compliance**

PQSCADA Sapphire offers a comprehensive reporting and compliance engine, allowing the design of report templates and compliance policies according to various standards or custom requirements. Reports can be generated manually or on a daily, weekly, monthly, or yearly schedule. Reports can also be triggered by compliance policy violation or by event occurrence.

- **See the Whole Picture**

PQSCADA Sapphire offers a unique set of charts and reports empowering the ability to plan, control, and make data-driven decisions. Get an overview of the electrical network and measuring devices over a geographic map.

- **Control**

PQSCADA Sapphire allows upgrading and/or configuring deployed devices within the network. The tasks automatically update the devices with any Firmware/Configuration files.

- **Synchronized Monitoring**

A unique time synchronization algorithm assures that logged data from multiple units is synchronized and displayed on the same time scale, with a 0.5 μ s typical resolution. Each event on the grid is accurately analyzed for precise root cause analysis, behavior propagation, and it can be traced to its source.

- **BlackBox Devices**

PQSCADA Sapphire collects compressed recorded raw waveform data using ELSPEC PQZ patented protocol. Raw data is processed, stored, and retrieved upon demand as continuous information. This ensures that all the required information to keep the network fully functioning and safe is acquired.

2. License Selection Guide

The following Table 2-1 shows the specifications and benefits of the optional plans. Select the plan that best fits your needs.

Table 2-1. PQSCADA Sapphire License Comparison

File Protocol	Express	Professional	Enterprise
PQZIP	Import/Export	Import/Export	Import/Export
PQZ	Import/Export	Import/Export	Import/Export
COMTRADE	Import/Export	Import/Export	Import/Export
PQDIF	Import/Export	Import/Export	Import/Export
Excel	Export	Export	Export
CSV	Export	Export	Export
Supported protocols			
PQZ	N/A	Yes	Yes
MODBUS	N/A	Per license	Per license
IEC 61850	N/A	Per license	Per license
Investigation			
Measurement points/investigation	2	Unlimited	Unlimited
Trend Chart	Yes	Yes	Yes
Grid Chart	Yes	Yes	Yes
Spectrum Chart	Yes	Yes	Yes
Event Chart	Yes	Yes	Yes
Unipede Chart	Yes	Yes	Yes
Statistics Chart	Yes	Yes	Yes
Scatter Event Chart	Yes	Yes	Yes
Scatter Parameters chart	N/A	Yes	Yes
Phasors	N/A	Yes	Yes
Energy Chart	Yes	Yes	Yes
Cyclic Histogram	N/A	Yes	Yes
Summary Chart	Yes	Yes	Yes
Tasks			
Schedule task	N/A	N/A	Yes
Triggered by event	N/A	N/A	Yes
Manual	Yes	Yes	Yes

File Protocol	Express	Professional	Enterprise
Reports			
Compliance report	Yes	Yes	Yes
Fault location	N/A	Per license	Per license
Components			
Auto fetching	N/A	Yes	Yes
Number of Auto Fetching components Elspec brand	N/A	Per license	Per license
Number of Auto Fetching components other brands	N/A	Per license	Per license
Server			
Concurrent users	1	1	Per license
Security	N/A	N/A	Yes
System Service	N/A	N/A	Yes
Remote access	N/A	N/A	Yes
Servers hierarchy	N/A	N/A	Yes
DataBase			
DataBase size	3 months of continuous recording	1 year of continuous recording	Unlimited
SQL Light	Yes	Yes	Yes
MS SQL server	N/A	N/A	Yes
Client module and features			
Overview	N/A	Per license	Per license
Tags	N/A	Per license	Per license
Notifications			
Emails	N/A	N/A	Yes
SMS	N/A	N/A	Yes
Calculated parameters			
RMS	Yes	Yes	Yes
THD	Yes	Yes	Yes
Unbalance	Yes	Yes	Yes
PST	Yes	Yes	Yes
PLT	Yes	Yes	Yes
Active Power	Yes	Yes	Yes
Reactive power	Yes	Yes	Yes
Apparent Power	Yes	Yes	Yes
Power factor	Yes	Yes	Yes
Energy	Yes	Yes	Yes
Waveform	Yes	Yes	Yes

File Protocol	Express	Professional	Enterprise
Under deviation	Yes	Yes	Yes
Over deviation	Yes	Yes	Yes
IL 15 Min	Yes	Yes	Yes
IL 30 Min	Yes	Yes	Yes
TDD 15 Min	Yes	Yes	Yes
TDD 30 Min	Yes	Yes	Yes
TIF	Yes	Yes	Yes
Harmonics	up to 50	Yes	Yes
Harmonics %	up to 50	Yes	Yes
Inter-harmonics	Yes	Yes	Yes
Spectrum	Amplitude	Amplitude + Angle	Amplitude + Angle
RMS Fundamental	N/A	Yes	Yes
THD Even	N/A	Yes	Yes
THD Odd	N/A	Yes	Yes
Fundamental Waveform	N/A	Yes	Yes
Harmonics Waveform	N/A	Yes	Yes
Active Power Harmonics	N/A	Yes	Yes
Reactive Power Harmonics	N/A	Yes	Yes
Apparent Power Harmonics	N/A	Yes	Yes
CBC Frequency	N/A	Yes	Yes
HRMS	N/A	Yes	Yes
Crest Factor	N/A	Yes	Yes
K Factor	N/A	Yes	Yes
Positive Sequence	N/A	Yes	Yes
Negative Sequence	N/A	Yes	Yes
Zero Sequence	N/A	Yes	Yes
Cyclic Histogram	N/A	Yes	Yes
Energy			
Energy	N/A	N/A	Per license

3. Terms and Definitions

Table 3-1. Terms and Definitions

Term	Definition
Component	A logical representation of a physical device (source of data), or an investigation created from one of the following file types: pqzip, comtrade, pqdif, etc. Components are hosted under an instance.
Feeder	Type of an electrical load.
Instance	A representation of a physical computer on which PQSCADA Sapphire is running.
Nominal value	A value (rate or name) under specified conditions of the available input for a component, circuit, device, piece of equipment, or system.
Tag	Tags in PQSCADA Sapphire are used to organize and group components according to predefined characteristics.
Task	Tasks are add-ons, such as a report, that runs on an individual process. PQSCADA Sapphire supports three types of tasks: Control and Maintenance, Exports, and Reports.
Quantity	Graphical representations in a chart of the measured data. Each quantity consists of a collection of series with slightly different characteristics (e.g., Min/Max, Average).

4. Getting Started

4.1 Installing the Software

1. Download the PQSCADA Sapphire set-up file from the Elspec [website](#).
2. Double click the **Elspec Sapphire Setup v1.x.x.xx** file to run the setup wizard.
The Welcome page appears (indicating the version being installed).



3. Click **Next** to start the installation.
4. Select the installation folder. Do not change the folder from the default folder.
5. Click **Next** to install at the default folder.

The **End-User License Agreement** is displayed.

6. Read the license agreement; then, select **I accept the terms in the License Agreement** option and click **Next**.
7. Click **Install** to start the installation process.

Wait for the program to be installed.



8. Check the **Launch Sapphire** box and click **Finish** to launch the PQS Sapphire application.

4.2 Launch Screen Layout

When launching the PQSCADA Sapphire application it opens in the Investigation module main screen.

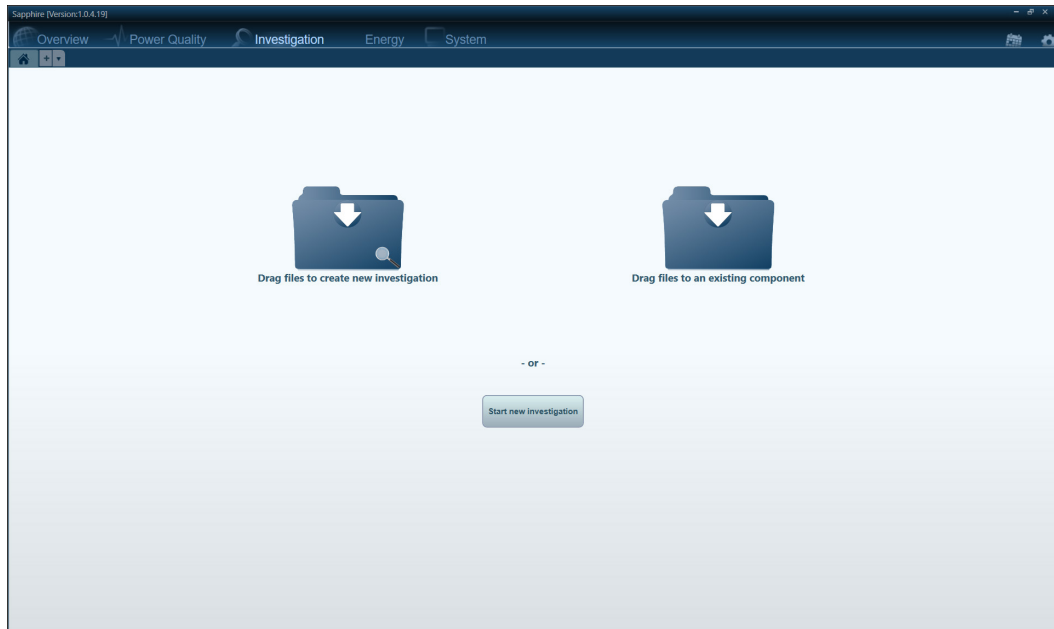




Figure 4-1. Investigation module main screen

The available PQSCADA Sapphire modules are displayed on the Modules bar:

- **Overview** (see section 6)
- **Power Quality** (see section 7)
- **Investigation** (see section 5)
- **Energy** (see section 8)
- **System** (see section 0)

On the upper right corner are the following two icons:

- **Setup**  icon (see section 10)
- **Schedule**  icon (see section 11)


For further details on the Investigation module, see section 5.

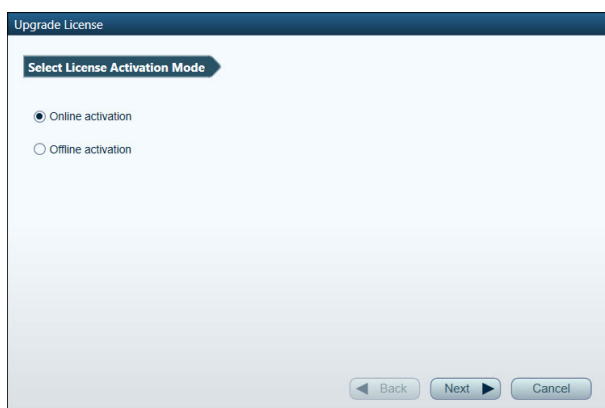
4.3 Activating the License

4.3.1 Online Activation

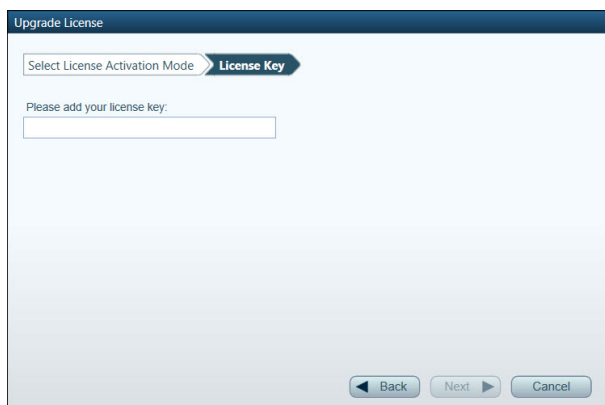
To run Online activation, make sure your computer is connected to the internet.

➔ **Note:** Activation for the enterprise edition must run on the server machine.

1. Click the **Setup**  icon (upper right corner of the application) and select **Install/Upgrade** license from the menu to launch the Upgrade License wizard.



2. Mark the **Online activation** radio button.
3. Click **Next** to go to the License Key page.



4. Enter your license ID. It is recommended copying and pasting the License ID from the License Certificate received from Elspec. This will avoid issues of distinguishing between letters and numbers.
5. Click **Next** to run the activation.
6. On a successful license activation:
 - Click **Close** for a Professional license setup.
 - Click **Next** for an Enterprise license setup and follow the Wizard.

4.3.1.1 Online for Enterprise Edition

With the Enterprise edition license ID, the PQSCADA Sapphire service installation wizard will open automatically.

Then, after installing the software, create the Instance DB.


To create an instance DB:


1. Select the **System** module.
2. Right-click the server instance and select **create server**.
3. Configure the following options on the Database page:
 - **DB Type** – Select the database type in which PQSCADA Sapphire will store the data. PQSCADA Sapphire supports two DB types:
 - ◆ SQLite.
 - ◆ MS SQL Server (MSSQL).

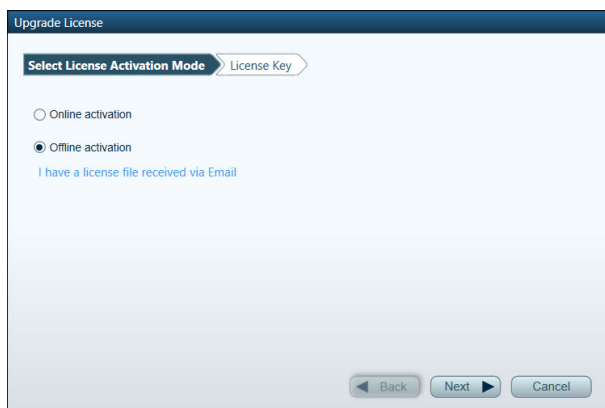
If MSSQL was selected, configure the following options:

 - ◆ **DB URL** – enter the DB URL, or click Browse, to search for the SQL service in your network.
 - ◆ **DB user name** – enter your DB username.
 - ◆ **Password** – enter your DB password.
4. Check the **save as default** to keep these settings as the default. You can use **set default** to fill in the default settings in the future.
5. Click **Test**, to verify the connection with the DB.
6. Click **add** to close the wizard.

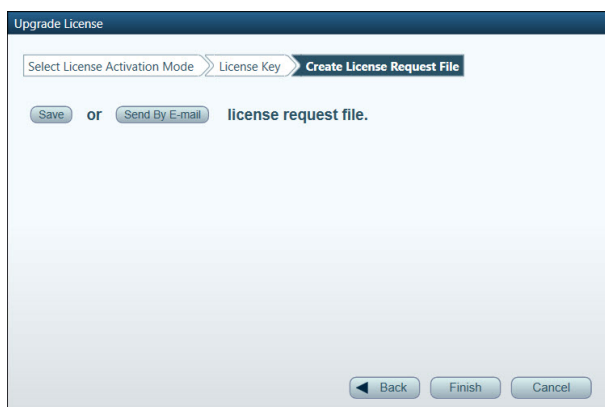
4.3.2 Offline Activation

1. Click the **Setup**  icon and select **Install/Upgrade** license from the menu to launch the Upgrade License wizard.

 **Note:** The Enterprise edition activation must be performed on the server machine.



2. Mark the **Offline activation** radio button.
3. Click **Next** to go to the License Key page.
4. Enter your license ID. It is recommended copying and pasting the License ID from the License Certificate received from Elspec. This will avoid issues of distinguishing between letters and numbers.
5. Click **Next** to open the Create License Request File page.



6. Select how to create the license request file (no internet connection).
 - **Save** – opens Windows Explorer to select a place to store the license request file.
 - **Send by Email** – opens your default email client for sending the license request file.
7. Click **Finish** to close the wizard.
8. Copy the license request file to the computer with an internet connection.
9. Browse to Elspec [licensing website](#).

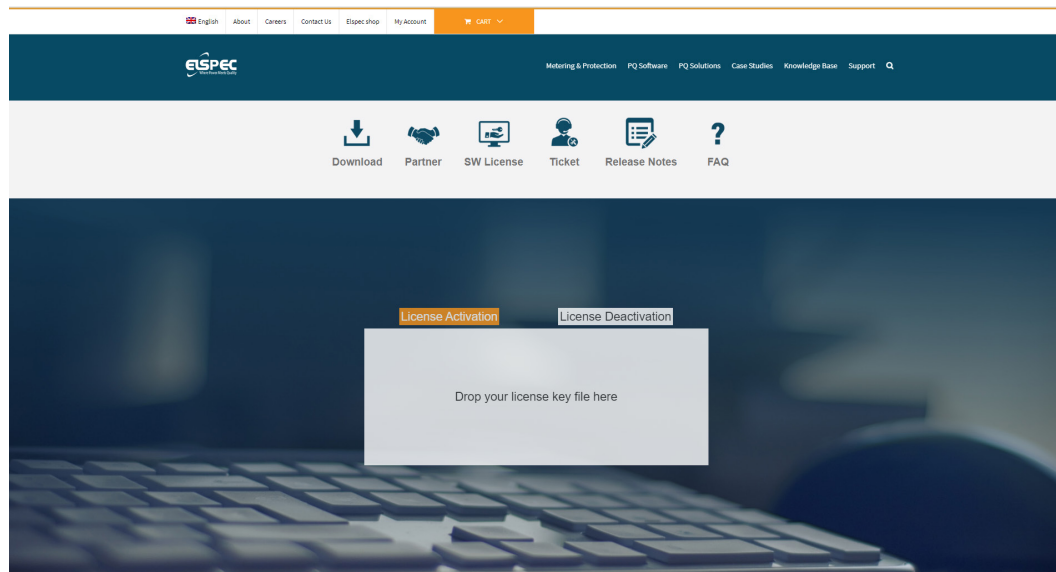
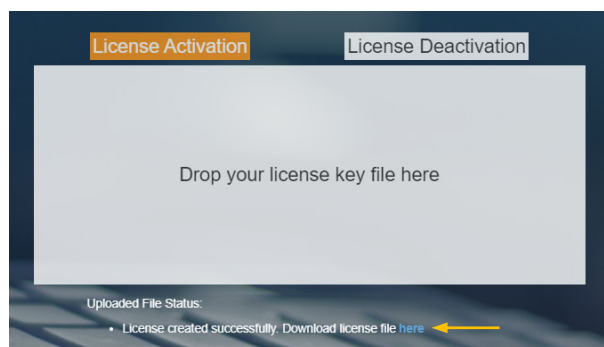


Figure 4-2. Elspec [licensing website](#)

10. On Elspec licensing website, click **License Activation**.
11. Drop the license request file into the designated window.



12. Download the license file to your local computer.

4.3.2.1 Activating the License File

1. Copy the license file into the PQSCADA Sapphire computer.
2. Click the **Setup** icon and select the **Install/Upgrade** license to launch the Upgrade License wizard.
3. On the License Activation Mode, do the following:
 - a. Select the **Offline activation** radio button.
 - b. Click **I have a license file received via Email**.
 - c. Browse to the license file location and select it.
4. Click **Next**.

4.3.2.2 Service Installation for Enterprise Edition

With the Enterprise edition license ID, the PQSCADA Sapphire service installation wizard will open automatically.

Then, after installing the software, create the Instance DB.

To create the Instance DB:

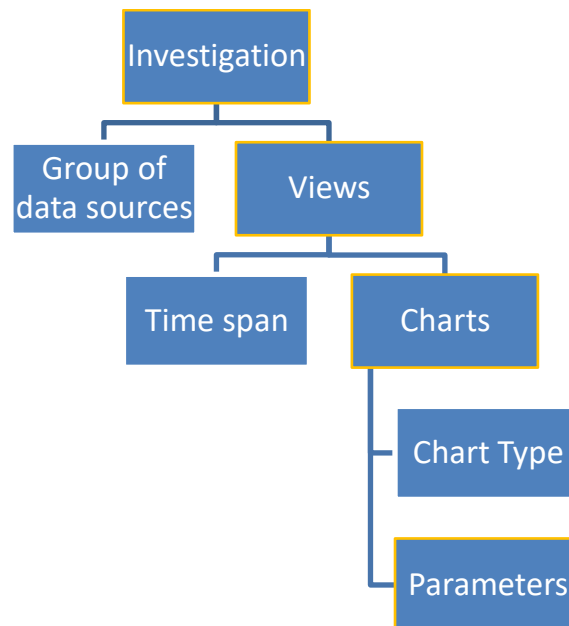
1. Open the PQSCADA Sapphire.
2. On the System module, right-click the server Instance and select **create server**.
3. Configure the following options on the Database page:
 - **DB Type** – Select the database type in which PQSCADA Sapphire will store the data. PQSCADA Sapphire supports two DB types:
 - ◆ SQLite.
 - ◆ MS SQL Server (MSSQL).
 - If MSSQL was selected, configure the following options:
 - ◆ **DB URL** – enter the DB URL, or click Browse, to search for SQL service in your network.
 - ◆ **DB user name**: enter your DB username.
 - ◆ **Password**: enter your DB password.
4. Check the **save as default** to keep these settings as the default. You can use **set default** to fill in the default settings in the future.
5. Click **Test**, to verify the connection with the DB.
6. Click **add** to close the wizard.

5. Investigation Module

The Investigation module is used to perform power quality analysis based on one or more measuring points (components). It provides a variety of powerful tools to assist in the data analysis process.

To fully understand how to operate this module, it is important to know how items are tied together and how to manipulate them.

The investigation module consists of four objects: **Investigation**, **Views**, **Charts**, and **Parameters**, in the following hierarchy:



Investigation:

The Investigation is at the top level of the module's hierarchy. Each Investigation contains a group of data sources (components) and one or multiple views.

Views:

Each View contains a single time interval and one or multiple charts.

Charts:

Each chart contains at least one parameter. PQSCADA Sapphire supports thousands of parameters in 10 different [chart types](#) (see section 5.5.2).

Parameters:

A numerical or another measurable factor that can be plotted in the selected chart.

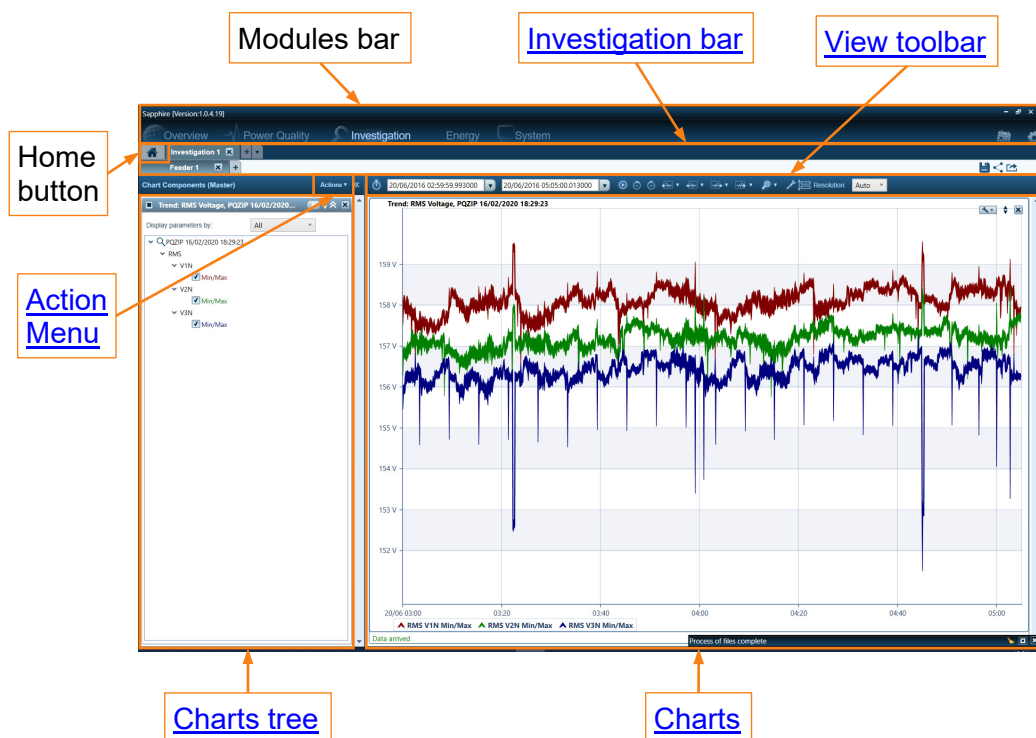



Figure 5-1. Investigation screen


The **Investigation module** screen is divided into two main sections that are divided by a splitter control line (a vertical line between the two sections):

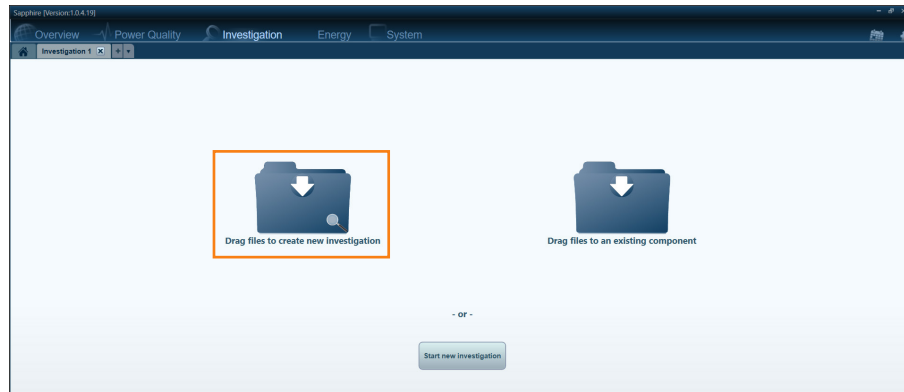
- [Charts tree](#).
The charts tree section can be hidden by clicking the Hide parameters tree  icon on the upper right corner of the Charts tree section.
- Charts section – in the selected view.

Investigations and Views are displayed as tabs in the [Investigation bar](#).

The position of the splitter control can be changed by clicking and dragging the splitter control to the left or right with a pointing device.

5.1 Drag and Drop Files to PQSCADA Sapphire

1. Click the **home**  icon in the Investigation module (upper left corner).
2. Drag and drop supported files (e.g., Elspec PQZ, pqzip, Comtrade, pqdif) into the **Drag file to create new investigation** folder.



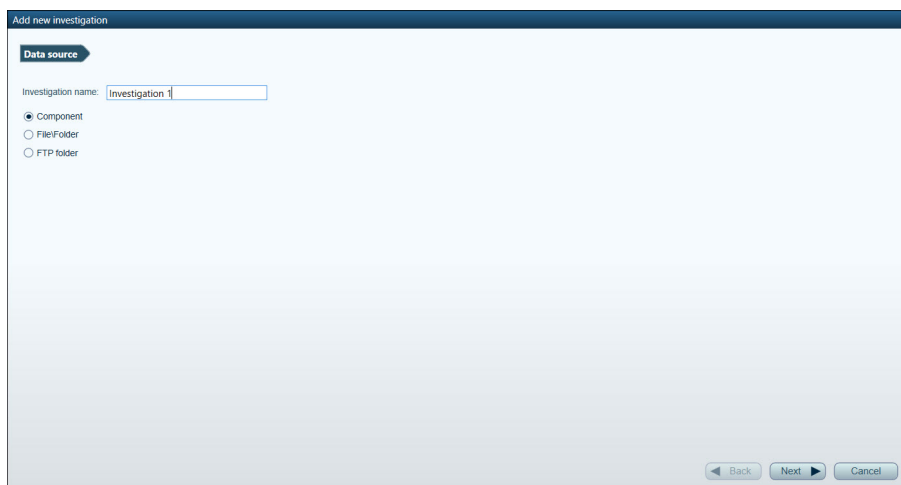
➔ Notes:

- ◆ New investigations are opened based on predefined [templates](#).
- ◆ Multiple files can be opened by holding down the SHIFT or CTRL keys and clicking on additional files.
- ◆ A COMTRADE file is a pair of two files (.CFG and .DAT). The leading file name must be identical for both files and they must be dragged/selected at the same time.

5.2 Start New Investigation Wizard

Launch the start new investigation wizard by one of the following methods from the **Investigation** module home screen:

- Click **Start new investigation** button.
- Click the **Add new investigation**  icon.

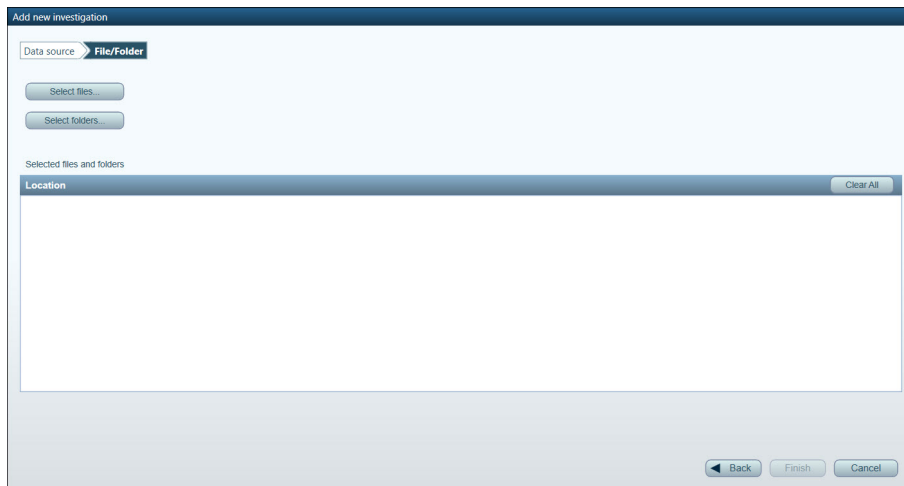


The investigation **Data source** can be from multiple locations.

5.2.1 Importing Files from a Local Computer

1. Type a name for the investigation.
2. Select **File/Folder**.
3. Click **Next** to go to the File/Folder page.
4. Select one of the following options:
 - **Select files** – opens Windows explorer to select specific file/s.
 - **Select folder** – opens Windows explorer to select a specific folder/s.

A list of the selected files/folders is displayed on the bottom part of the page.



5. Click **Finish** to start processing the files.

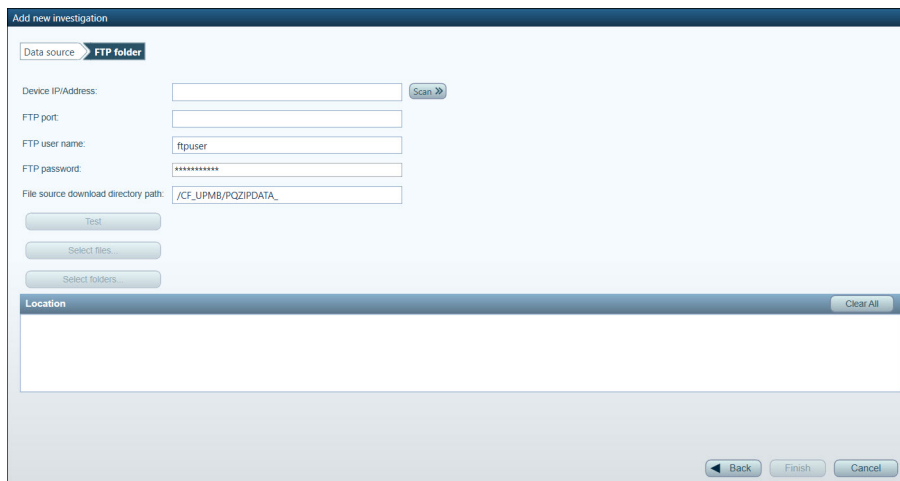
➔ Notes:

- ◆ New investigations are opened based on predefined [templates](#).
- ◆ Multiple files can be opened by holding down the SHIFT or CTRL keys and clicking on additional files.
- ◆ A COMTRADE file is a pair of two files (.CFG and .DAT). The leading file name must be identical for both files and they must be dragged/selected at the same time.

5.2.2 Importing Files from an FTP Server

The FTP option was optimized to import PQZIP/PQZ files from Elspec BlackBox devices.

1. Type a name for the investigation.
2. Select **FTP Folder**.
3. Click **Next** to go to the FTP Folder page.



The screenshot shows the 'Add new investigation' wizard, specifically the 'FTP folder' page. The 'Data source' dropdown is set to 'FTP folder'. The form includes the following fields and buttons:

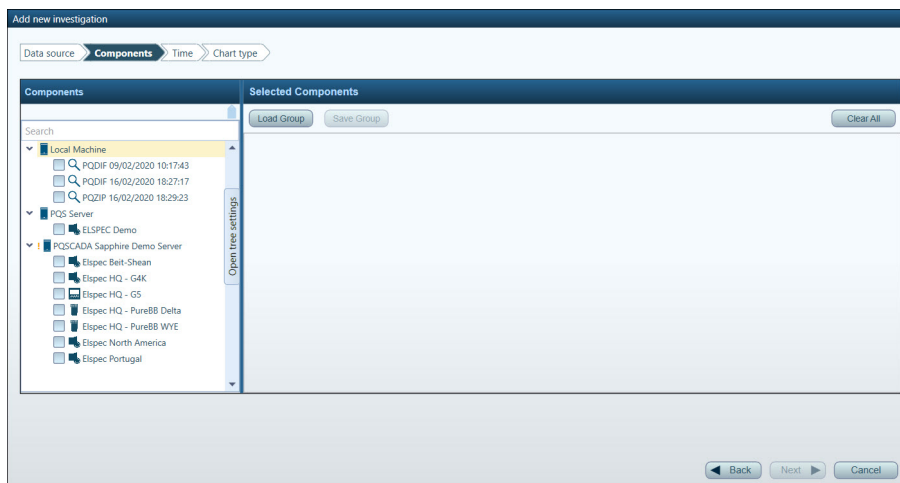
- Device IP/Address:** A text input field with a 'Scan >>' button to its right.
- FTP port:** A text input field.
- FTP user name:** A text input field containing 'ftpuser'.
- FTP password:** A text input field with masked characters (asterisks).
- File source download directory path:** A text input field containing '/CF_UPMB/PQZIPDATA_'.
- Buttons:** 'Test', 'Select files', and 'Select folders' are located below the input fields.
- Location:** A large empty text area at the bottom of the form, with a 'Clear All' button in the top right corner.
- Navigation:** 'Back', 'Finish', and 'Cancel' buttons are located at the bottom right of the window.

4. On the **FTP Folder** page, configure the following options:
 - **Device IP address** – enter the FTP server address or click **Scan >>** to search for available devices on the network.
 - **FTP port** – enter the FTP port number (only if not the default FTP port).
 - **FTP User name** – enter the FTP username. By default, the username is the default username of the selected device (e.g., for the G4K device it is ftpuser).
 - **FTP Password** – enter the FTP password. By default, the password is the default password of the selected device (e.g., for the G4K device it is ftppassword).
 - **Files source download directory path** – enter the path to the folder where the files are located. By default, the path is the default path of the selected device (e.g., for the G4K device it is /CF_UPMB/PQZIPDATA_).
 - **Test connection** – will test the connection to the device.
 - **Select files** – will open Windows Explorer to select specific file/s.
 - **Select folder** – will open Windows Explorer to select a specific folder/s.
- After selecting, a list of the selected files/folders will be presented at the bottom part of the page.
5. Click **Finish** to start processing the files.

5.2.3 Creating Investigation from a Component

If data was already uploaded and processed, a new investigation can be performed based on existing components.

1. Type a name for the investigation.
2. Select the **Component** option.
3. Click **Next** to go to the Component page.



4. Select the components to include in the investigation by one of the following methods:

- Mark the component boxes in the Component section.

Click the [Tag](#) icon to sort component by tags (for more details on tags, see section 9.9.4).

- Click the **Load Group** button in the **Selected Components** section to load components with Windows Explorer.

A list of the selected components appears in the Selected Components section. To save the selected list, click **Save Group**.

5. Click **Next** to go to the Time page.

5.2.3.1 Time

1. Configure the following options:

- **Time intervals** – The time interval is a list of predefined time intervals. Selecting **All** will set the time interval for all the data available in the database. When selecting **Selected interval**, the time interval can be manually configured in the **From date** and **To date** fields.

Selecting **Real time** allows streaming and displaying real-time data from a Component into PQSCADA Sapphire. Three chart types are supported: Trend, Spectrum, and Phasor.

- **Resolution** – defines the displayed resolution of the selected parameter. Selecting Auto will optimize the resolution to the screen size, screen resolution, chart type, and selected parameter.

2. Click **Next** to go to the Chart Type page.

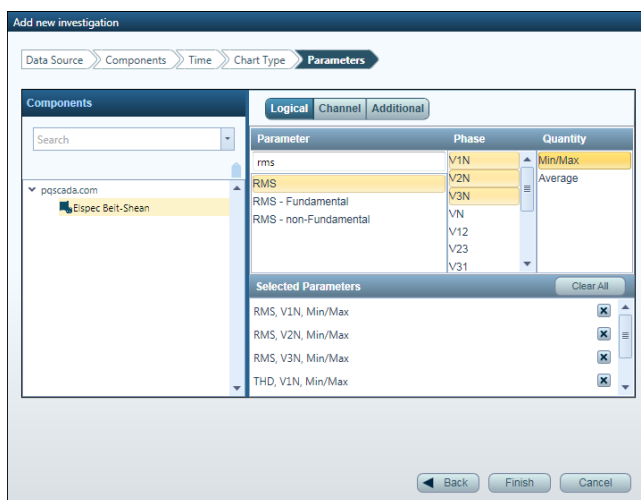
5.2.3.2 Chart Type

1. Select one of the [chart type](#) options or a [Template](#).

➡ **Notes:**

- ◆ The **Event** chart leads to **Event types**. Check the event type to display.
 - ◆ The **Template** chart leads to **Templates**. Select the template to display.
2. Click **Next** to go to the Parameters page.

5.2.3.3 Parameters



1. Select how parameters are tagged:
 - **Logical** – parameters are tagged according to their logic.
 - **Channels** – parameters are stored without any power topology and can be selected by a channel name.
 - **Additional** – non-power parameters are selected (e.g., Temperature).
2. Select **Components** in the Component section. Multiple components can be selected by holding down the SHIFT or CTRL keys and clicking on another component. Click the **Tag** icon to sort components by tag.
3. Select the **Parameter** in the parameter column. The list of parameters is dynamic and depends on the selected component and time interval.
4. Click the **Phase** value to select. A second click cancels the selection. Multiple phases can be selected.

Quantity values are displayed. Quantities are graphical representations in a chart of the measured data. Each quantity consists of a collection of series with slightly different characteristics (e.g., Min/Max, Average, Sample).

- **Min/Max** –the minimum and maximum values during a time period.
- **Average** – the average value during a time period.
- **Sample** – the native resolution of a parameter without any aggregation.

For Harmonic Parameters, Harmonics Ranges can be defined.

A list of the selected parameters is displayed at the bottom of the page.


5. Click **Finish** to open the investigation.

5.3 Investigation Bar


The Investigation bar presents all open investigations and views as tabs and includes tool icons for saving, sharing, and exporting the investigations.

➔ **Note:** The Investigation files contain the Investigation, views, charts, and parameter properties as well as the parameter's data.


5.3.1 Save an Investigation

1. Click the **Save**  icon at the top right corner of the Investigation screen.
2. Select the folder to save the investigation.

5.3.2 Share an Investigation

1. Click the **Share**  icon at the top right corner of the Investigation screen.
Your default email application will open with the investigation files attached.
2. Send the attached investigation files to selected recipients.

5.3.3 Export an Investigation



1. Click the **Export** icon  at the top right corner of the Investigation screen.
A drop-down menu with the export formats will open.

➔ **Note:** PQSCADA Sapphire uses a predefined editable XML export template for the word export.

2. Select the folder to save the investigation.

5.3.4 Open a Saved Investigation

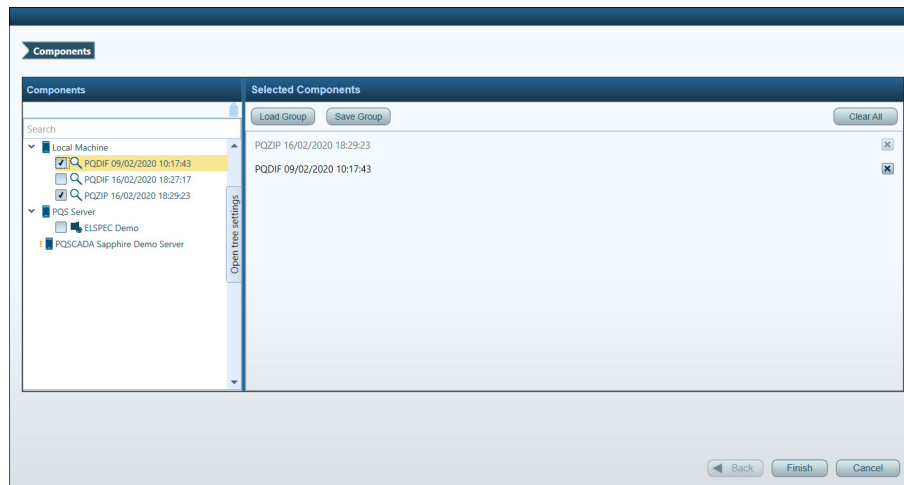
Saved investigation can be opened in one of the following methods:

- Click the **Home**  icon then drag and drop the .inv files into the **Drag file to create a new investigation** folder.
- Double click the .inv file to automatically open the Investigation module in the PQSCADA Sapphire application.
- Click the **Import investigation**  icon next to the Investigation tab in the Investigation bar and select **Import investigation**.

➔ **Notes:** The data stored in an investigation file has the same resolution and time range as the one configured in the charts. Therefore, if a saved investigation is opened on a computer that does not have open communication with the data source (component), new data queries such as zoom in/out will not work and an exclamation mark **!** will appear next to the component name in the components tree.

5.3.5 Add Component to an Investigation

1. Right-click the Investigation tab and select **Add component** from the menu. The Components page is displayed.



2. On the **Components** section, select component/s by marking the component checkbox. Click the **Tag** icon to sort components by tag.

A list of the selected components is displayed on the **Selected Components** section.

- Click **Load Group** to load components from a folder.
- Click **Save Group** to save the selected list.

3. Click **Finish** to close the Components window.

5.3.6 Rename an Investigation

1. Right-click the **Investigation** tab in the investigation bar and select **Rename**.
2. In the Rename window, enter the new investigation name.
3. Click **OK** to apply the changes.


5.3.7 Move an Investigation Tab

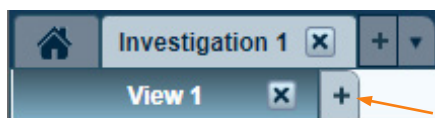
Right-click the Investigation tab in the Investigation bar and select **Move left** or **Move right**.

5.4 Views

Views are the second level of an investigation. Views are multiple charts with one common length of time.

5.4.1 Add a New View

To add a view to an investigation, click the **Add new view**  icon next to the view tab in the investigation bar.



The **Add investigation view** wizard is launched.



1. On the **Time** page, configure the following options:
 - **Time intervals** – The time interval is a list of predefined time intervals. Selecting **All** will set the time interval for all the data available in the database. When selecting **Selected interval**, the time interval can be manually configured in the **From date** and **To date** fields.
 - **Resolution** – Defines the displayed resolution of the selected parameter. Selecting **Auto** will fit the best resolution to the screen size, the screen resolution, the chart type, and the selected parameter.
2. Click **Next** to go to the Chart type page.
3. On the Chart type page, select one of the [chart type](#) options or [Template](#).
4. Click **Next** to go to the Parameters page.
5. On the Parameters page, select the component(s) to view from the **Components** section. Multiple components can be selected by holding down the SHIFT or CTRL keys and clicking other components. Click the **Tag** icon to sort the components by tag.
6. Select the parameter in the **Parameter** column on the right side of the Parameter page. The list of available parameters is dynamic and depends on the selected component, the time interval, and the type of parameters:
 - **Logical** – the parameters are according to logic and can be calculated.

- **Channels** – parameters without any power topology.
 - **Additional** – for non-power parameters such as Temperature, Pressure.
7. Select the **Phase** (or **Channel** for Channel parameters). A second click cancels the selection. Multiple Phases/Channels can be selected.
 8. Depending on the selected Parameter, selects the **Quantity**. Quantities are graphical representations of measured data in a chart. Each quantity consists of a collection of series with slightly different characteristics (e.g., Min/Max, Average, and Sample). A second click cancels the selection. Multiple quantities can be selected
 - **Min/Max** – displays the minimum and maximum values during a time period.
 - **Average** – displays the average value during a time period.
 - **Sample** – displays the native resolution of a parameter without any aggregation.

After selecting, the list of the **Selected parameters** is displayed at the bottom of the page.

9. Click **Finish** to open the view.


5.4.2 Rename a View

1. Right-click the View tab in the investigation bar and select **Rename**.
2. On the Rename window, enter the new investigation name.
3. Click **OK** to apply the changes.

5.4.3 Move a View Tab

Right-click the View tab in the investigation bar and select **Move left** or **Move right**.

5.4.4 Close a View Tab

Either click the tab close  icon or click the mouse middle button.

5.4.5 Actions Menu

The **Actions** menu includes a list of features/actions that will be applied to the view. Click the **Actions** button and select the following from the menu:

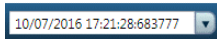
- **Add new Chart** – Launches the [Add new chart](#) wizard (see section 5.5).
- **Hide charts legend boxes** – Hides the chart legend box for all charts in the view.
- **Change charts background color** – for changing the chart background color.
- **Normalized display mode** – Normalizes the data of all the charts in the view. Voltage and current will be normalized to the nominal values. Power will be normalized to the product of Voltage × Current nominals. To undo the Normalized display mode, click on **Regular display** mode.
- **Save as template** – save the current view as a [template](#) for use in future investigations, or for defining a file or an event template.
- **Export** – exports this view to the selected file format (**Word/Excel/to Clipboard**).
- **Clone view** – opens a new view with the same view characteristics. This can also be done by right-clicking the view tab and selecting the Clone view.
- **Add slave pane** – Enables investigating two time-ranges simultaneously in a single window. The left pane is the master of the slave pane on the right.
- **Create new task** – opens the [Add new task](#) wizard based on the selected time frame and components of the view (see details in section 11.3).
- **Vertical + Horizontal crosshair** – adds the horizontal crosshair. To remove the horizontal crosshair, select **Vertical crosshair**.

5.4.6 View Toolbar

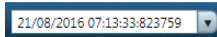
Once a view is established, the view settings can be modified from the View toolbar.



Fixed time interval – select a predefined time interval. Selecting All will set the time interval for all the data available in the database.



Start time – sets the start time of the view.



End time – sets the end start time of the view.



Start new query – click the start new query button after changing the selected time interval.



Previous time/Next time – move back to the Previous time frame. To move in the opposite direction, click the Next time frame icon.



Append back – leaves the end time intact and moves the start time back by a selected amount.



Back – shifts back the current time duration to a specified amount of time.



Forward – moves forward the current time duration for a specified amount of time.



Append forward – leaves the start time intact and moves the end time forward by a selected amount of time.



Expand time – expands the time interval equally in both directions at a specified magnitude. To return click Previous time.



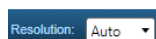
Zoom/Drill modes – PQSCADA Sapphire supports two zoom modes: drill and digital. The drill mode requires changes in the time frame of a new query from the server, and the displayed data is optimized to the time interval and screen resolution.

- To zoom in, select the Zoom navigation mode; then, click the end of the scrollbar and drag it to the required zoom.
- To drill in, select the Drill navigation mode; then, right-click or left-click or center-click the pointing device and drag it to the required time interval. The drill action involves a new query from the database. For details on how to drill see section 5.5.4.



Fit charts in view – Organizes the chart size in two modes:

- Fit charts to screen – resized to the screen height.
- Best fit with scrolling –optimized chart height to the screen height to enable scrolling.



Resolution – defines the number of points to be displayed on the chart. In Auto mode, PQSCADA Sapphire optimizes the number of points to the screen resolution.

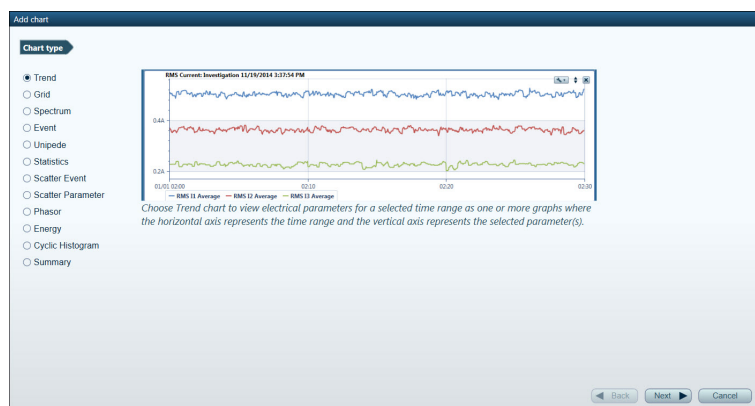
5.5 Charts

Charts are the third level of an investigation. The PQSCADA Sapphire Investigation module offers numerous chart types to choose from; each with its unique characteristics and tools options.

➔ **Note:** For details on the available charts per license, see Table 2-1 in Chapter 2.

5.5.1 Add a New Chart

To add a chart, click the **Actions** menu and select **Add new chart**. The **Add chart** wizard is launched.






1. Select one of the [chart types](#) (see chart types in the following section 5.5.2).
2. Click **Next** to go to the **Parameters** page or the **Event type** or **Scatter Event Chart Type** when selecting the Event or Scatter Event chart types.
3. On the **Parameters** page, select the component(s) to view from the **Components** section. Multiple components can be selected by holding down the SHIFT or CTRL keys and clicking other components. Click the **Tag** icon to sort the components by tag.
4. Select the parameter in the **Parameter** column on the right side of the Parameter page. The list of available parameters is dynamic and depends on the selected component, the time interval, and the type of parameters:
 - **Logical** – parameters that are according to logic and can be calculated.
 - **Channels** – parameters without any power topology.
 - **Additional** – for non-power parameters (e.g., temperature, pressure).
5. Select the **Phase** (or **Channel** for Channel parameters). A second click cancels the selection. Multiple Phases/Channels can be selected.
6. Depending on the selected Parameter, selects the **Quantity**.
 - **Min/Max** –the minimum and maximum values during a time period.
 - **Average** – the average value during a time period.
 - **Sample** – the native resolution of a parameter without any aggregation.

After selecting, the list of the **Selected parameters** is displayed at the bottom of the page.
7. Click **Finish** to open the view.

5.5.2 Charts Types

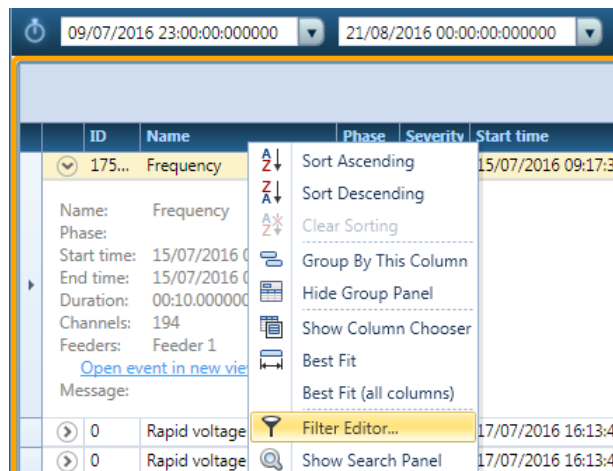
On the upper right corner of the charts are three icons that can be used to perform actions on the displayed chart:

-  **Chart settings:** Clicking opens the chart settings menu.
-  **Move chart up/down:** Clicking the arrows moves the chart up or down.
-  **Close:** Clicking closes the chart.

The **Chart settings** menu includes options that are applicable for all chart types and in most cases are self-explanatory. Other options require an explanation and may be unique to the chart type.

For table type charts, the following two options are available:

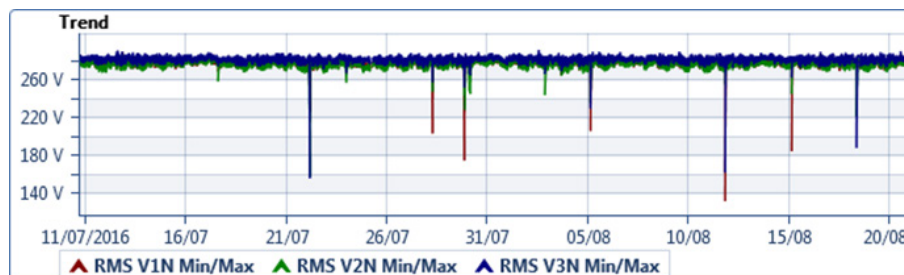
- Dragging each of the header cells to the upper bar will group the table according to the column values. Multiple cells can be dragged to create a hierarchy.
- Right-click on the header row to open the table tools pop-up window.



The table tools pop-up window has various options to select, such as **Show Column Chooser** to select which columns to display.

5.5.2.1 Trend Chart

For viewing the trend of parameters in a selected time range.



Trend chart tools

The Trend chart tool menu includes the following options:

- **Hide/Show legend box**
- **Hide/Show crosshair**
- **Hide/Show grid lines**
- **Export** – the chart information can be exported in one of the following ways: Copy chart to clipboard, Export chart to image, and Export chart to Excel.
- **Normalized display mode** – Normalize the data in the chart. Voltage and current will be normalized to the nominal values. Power will be normalized to the product of Voltage × Current nominals.
- **Axis Y settings**
- **Split to charts** – splits the chart according to the displayed parameters. Returning to the non-split chart can be done by drag & drop of the parameters from the **Chart Components** tree (on the left side).
- **Change color**
- **Bring parameter to front**
- **Show/Hide min/max values**
- **Disable/Enable curve chart** – the data in the charts can be displayed according to the measurement resolution or can be curved to display a continuous chart from the individual measurements.
- **Vertical + Horizontal crosshair**

5.5.2.2 Grid Chart

For viewing selected parameters in a selected time range in a table.

Time Stamp	[V] RMS VIN Voltag...	[V] RMS V1N Voltag...	[V] RMS V2N Voltag...	[V] RMS V3N Voltag...	[V] RMS V4N Voltag...	[V] RMS V5N Voltag...	[V] RMS V6N Voltag...	[V] RMS V7N Voltag...	[V] RMS V8N Voltag...
09/07/2016 23:00:00.000000	280.2168	281.0616	279.559	280.2041	283.5762	284.5639	280.6345	279.8437	284.2393
09/07/2016 23:01:00.000000	279.854	280.989	279.2777	280.2977	283.7833	284.4265	280.4467	279.8527	284.2316
09/07/2016 23:02:00.000000	280.1801	281.1014	279.6048	280.4693	283.7926	284.7401	280.5657	280.1046	284.2958
09/07/2016 23:03:00.000000	280.4127	281.1848	279.3699	280.5259	284.1652	284.8301	280.9572	280.2382	284.537
09/07/2016 23:04:00.000000	280.7555	281.3979	279.9611	280.8011	284.1268	284.8341	281.0999	280.3787	284.5492
09/07/2016 23:05:00.000000	280.8029	281.5145	279.9549	280.7825	284.0363	284.8058	281.1522	280.4699	284.458
09/07/2016 23:06:00.000000	278.6693	281.4817	277.6576	280.6698	281.9461	284.8708	280.9984	280.0343	284.3745
09/07/2016 23:07:00.000000	280.7637	281.5775	279.9828	280.6544	284.1738	284.8103	281.1775	280.3069	284.522
09/07/2016 23:08:00.000000	279.4726	281.547	277.1761	280.4128	281.9893	284.6332	281.2022	279.9681	284.3099
09/07/2016 23:09:00.000000	279.3698	282.0401	277.0552	280.4967	281.9668	285.1553	281.3688	279.7955	284.433
09/07/2016 23:10:00.000000	279.782	282.4809	277.5464	280.9238	282.5945	285.4795	281.1421	280.3336	284.9799
09/07/2016 23:11:00.000000	280.789	282.6166	277.9041	280.7961	283.2887	285.6027	281.1201	280.5100	285.102
09/07/2016 23:12:00.000000	282.0479	282.8207	280.1929	281.126	284.7876	285.4544	282.451	280.7205	285.1872

Grid chart tools

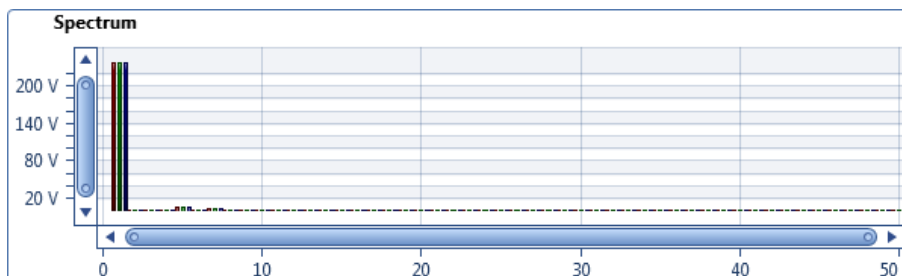
The Grid chart tool menu includes the following options:

- **Split to charts** – splits the chart according to the displayed parameters. (returning to the non-split chart can be done only by drag & drop).
- **Export to Excel**
- **Normalized display mode** – Normalize the data in the chart. Voltage and current will be normalized to the nominal values. Power will be normalized to the product of Voltage × Current nominals.
- **Resolution** – The grid chart resolution can be different from the view resolution. The available resolution options depend on the selected time interval. In auto mode, the grid will include 100,000 points at a resolution equal to the [time interval]/100,000. In view mode, the grid resolution is the same as the View resolution.
- **Show/Hide status column** – Adds a column that indicates the status of the data, as missing data or an event.

5.5.2.3 Spectrum Chart

View selected parameters for a selected time range in a bar chart. This allows viewing and investigating the frequency domain phenomenon.

Unlike the trend chart, the X-axis in the spectrum chart is not the time domain; therefore, the drill-in option is not available (the digital zoom option is enabled by default).



Spectrum chart tools

The Spectrum chart tool menu includes the following options:

- **Hide/Show legend box**
- **Hide/Show crosshair**
- **Change background color**
- **Hide/Show grid lines**
- **Export**
- **Split to charts**
- **Change color**
- **Bring parameter to front**
- **Show min/max values**
- **Disable/Enable fundamental** – disable the fundamental bar to rescale the Y-axis for a better view of the nonfundamental harmonics.

5.5.2.4 Event Chart

When creating an Event chart, the following Event types can be selected: System, Power Quality, I/O (digital, analog, relay), and Custom events. The events are displayed in a table for a selected time range, providing valuable information such as occurrence, duration, and severity of the events.

ID	Name	Phase	Severity	Start time	End time	Duration	Value	Value (% from ref.)	Event Source	Component Name
175	Frequency	S1	5	15/07/2016 09:17:32.811659	15/07/2016 09:17:42.811659	00:10.000000	55.8516	6.88	Measuring device	Elspec NA
0	Rapid voltage changes...	V12	55	17/07/2016 16:13:48.924637	17/07/2016 16:13:49:008085	00:00.083447	0.2463	0	PQ Server	Elspec NA
0	Rapid voltage changes...	V2N	55	17/07/2016 16:13:48.924637	17/07/2016 16:13:49:008085	00:00.083447	15.6247	0.06	PQ Server	Elspec NA
0	Rapid voltage changes...	V2N	55	17/07/2016 16:13:48.924637	17/07/2016 16:13:49:008085	00:00.083447	0.1647	0	PQ Server	Elspec NA
0	Rapid voltage changes...	V12	55	17/07/2016 16:13:48.924637	17/07/2016 16:13:49:008085	00:00.083447	23.0717	0.05	PQ Server	Elspec NA
0	Rapid voltage changes...	V2N	55	22/07/2016 04:44:30.490281	22/07/2016 04:44:30.499883	00:00.008402	0	0	PQ Server	Elspec NA
0	Rapid voltage changes...	V2N	55	22/07/2016 04:44:30.490281	22/07/2016 04:44:30.499883	00:00.008402	1.0119	0	PQ Server	Elspec NA
0	Rapid voltage changes...	V31	55	22/07/2016 04:44:30.523616	22/07/2016 04:44:30.532019	00:00.008402	1.0887	0	PQ Server	Elspec NA
0	Rapid voltage changes...	V31	55	22/07/2016 04:44:30.523616	22/07/2016 04:44:30.532019	00:00.008402	0	0	PQ Server	Elspec NA
0	Rapid voltage changes...	V31	55	22/07/2016 04:44:48.534050	22/07/2016 04:44:48.542472	00:00.008421	16.4376	0.03	PQ Server	Elspec NA
0	Rapid voltage changes...	V2N	55	22/07/2016 04:44:48.534050	22/07/2016 04:44:48.542472	00:00.008421	9.8318	0.04	PQ Server	Elspec NA
0	Rapid voltage changes...	V31	55	22/07/2016 04:44:48.534050	22/07/2016 04:44:48.542472	00:00.008421	0	0	PQ Server	Elspec NA
0	Rapid voltage changes...	V2N	55	22/07/2016 04:44:48.534050	22/07/2016 04:44:48.542472	00:00.008421	0	0	PQ Server	Elspec NA

- Click the event expand icon to open a detailed bar that includes more information on the event with a link to open the event in a different view based on a predefined [template](#).

ID	Name	Phase	Severity	Start time	End time	Duration	Value	Value (% from ref.)	Event Source	Component Name
175	Frequency	S1	5	15/07/2016 09:17:32.811659	15/07/2016 09:17:42.811659	00:10.000000	55.8516	6.88	Measuring device	Elspec NA
0	Rapid voltage changes...	V12	55	17/07/2016 16:13:48.924637	17/07/2016 16:13:49:008085	00:00.083447	0.2463	0	PQ Server	Elspec NA
0	Rapid voltage changes...	V2N	55	17/07/2016 16:13:48.924637	17/07/2016 16:13:49:008085	00:00.083447	15.6247	0.06	PQ Server	Elspec NA
0	Rapid voltage changes...	V2N	55	17/07/2016 16:13:48.924637	17/07/2016 16:13:49:008085	00:00.083447	0.1647	0	PQ Server	Elspec NA

Event chart tools

The Event chart tool menu includes the following options:

- Export chart to excel**
- Separate/aggregate PQ events** – by default power quality events are aggregated. If events of the same type overlap in time, PQSCADA Sapphire will aggregate them to a single event. The aggregated start time is the time that one of the phases entered to the event condition. The end time is the time that the last phase exited from the event condition. The depth is the highest phase aggregated.
- Display oldest events first**
- Set maximum events to display**
- Show/Hide masked events** – The compliance defines flagged or non-flagged data. For example, "ignore data during dip or interruption; in this example, even a short dip of less than a second will ignore the events during this time interval (e.g., events based on 10 minutes because during those 10 minutes there was an interruption). Show masked events will show all events, including those which should be ignored, and Hide masked events will show only the events where there was no flagged data.

5.5.2.5 Unipede Chart

The Unipede chart allows viewing power quality events in a table according to the EN5016 standard. The table provides valuable information on the occurrence and duration of these events.

Dips and Interruptions					
Value (% from ref.)	Duration (ms)				
	10 < t ≤ 200	200 < t ≤ 500	500 < t ≤ 1000	1000 < t ≤ 5000	5000 < t ≤ 60000
90 > u ≥ 80		28	2	0	0
80 > u ≥ 70		4	12	0	0
70 > u ≥ 40		14	6	0	0
40 > u ≥ 5		0	0	0	0
5 > u		0	0	0	0

Swells			
Value (% from ref.)	Duration (ms)		
	10 < t ≤ 500	500 < t ≤ 5000	5000 < t ≤ 60000
u ≥ 120		0	0
120 > u > 110		2	0

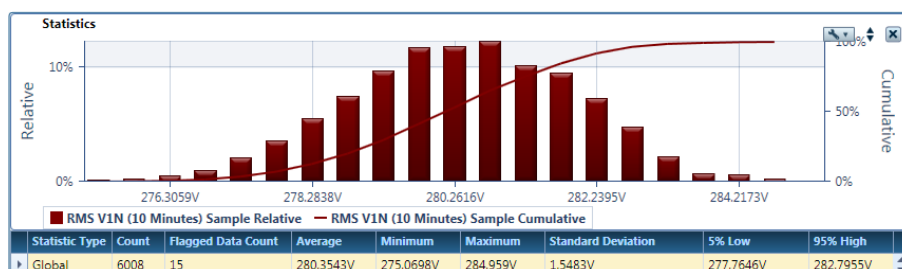
Unipede chart tools

The Unipede chart tool menu includes the following options:

- **Separate PQ events**
- **Show/Hide masked events**

5.5.2.6 Statistics Chart

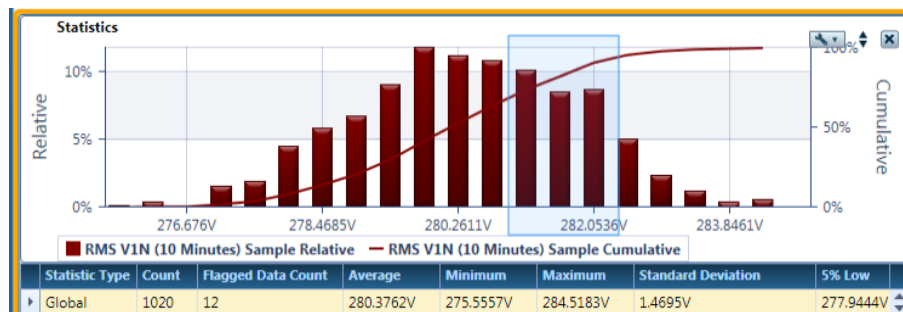
The Statistics chart shows the calculations of Relative and Cumulative statistics and a statistic data table.



- **Parameter Name** – the selected parameter of the statistics chart.
- **Statistic Type** – the statistic chart can work in two modes:
 - **Global** – the statistical calculation refers to the entire parameter range.
 - **Range** – the statistical calculation refers to the selected range as shown in the chart. When zooming into a specific range, the percentage refers to the zoomed-in interval or to the entire range.
- **Count** – the number of points included in the statistical calculation.
- **Flagged data count** – the number of points that were ignored from the statistical calculation, due to flags.
- **Average** – the average value of the selected parameter during the selected time interval and the parameter range.
- **Minimum** – the minimum measured value of the selected parameter during the selected time interval and the parameter range.
- **Maximum** – the maximum measured value of the selected parameter during the selected time interval and the parameter range.

- **Standard Deviation** – the standard deviation value of the selected parameter during the selected time interval and the parameter range.
- **5% Low** – percentile value low (the value is editable)
- **95% High** – percentile value high (the value is editable)

The chart automatically splits the selected range of the selected parameter into equal 5–50 subranges (configurable through the Chart setting menu). Each subrange is displayed as a bar in the chart with its relative statistic value. To drill into a specific range, left-click and drag the mouse to a specific range.



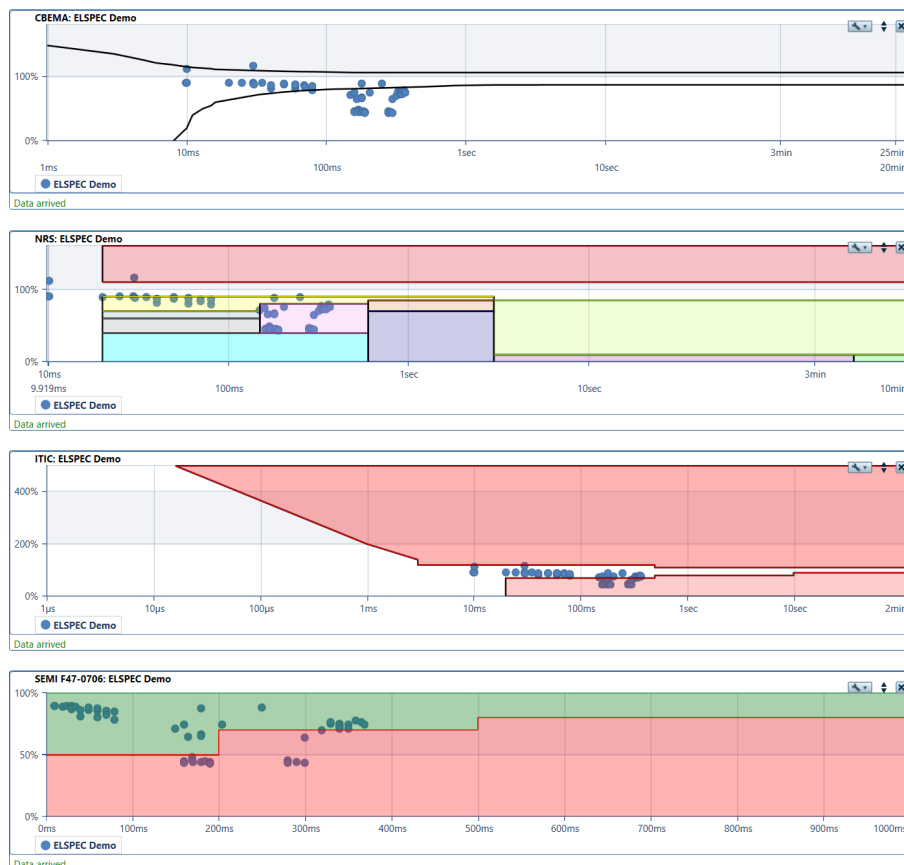
Statistic chart tools

The Statistic chart tool menu includes the following options:

- **Hide/Show legend box**
- **Hide/Show crosshair**
- **Change background color**
- **Hide/Show grid lines**
- **Export**
- **Normalized display mode** – Normalizes the data in the chart. Voltage and current will be normalized to the nominal values. Power will be normalized to the product of Voltage × Current nominals.
- **Split to charts**
- **Hide/Show statistics data**
- **Range mode** – toggle between Range mode and Global mode
- **Back to default range** – if drill in was performed, click the Back to default range to drill out.
- **Set number of ranges** – controls the number of the displayed bars (5–50).
- **Bring parameter to front**
- **Change color**
- **Change percentage values** – to change new low and high percentage values.
- **Set Min/Max range values** – set the parameters' Min and Max range.
- **Include/exclude flagged data** – by default flagged data is excluded from the statistic calculation. Click Include/exclude flagged data to toggle between states.

5.5.2.7 Scatter Event Chart

The Scatter Event chart allows viewing events according to the following standards: CBEMA, NRS, ITIC, IEEE1668 (Type 1, 2, 3), SEMI F47-0706, or custom definitions. The view scatters the events on a defined area in the chart.



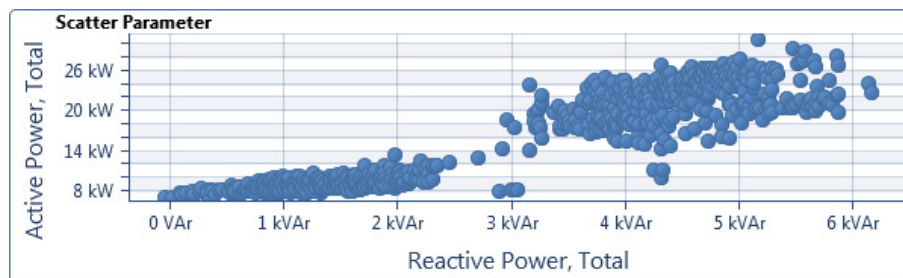
Scatter Event chart tools

The Scatter Event chart tool menu includes the following options:

- **Hide/Show legend box**
- **Hide/Show crosshair**
- **Change background color**
- **Hide/Show grid lines**
- **Export**
- **Separate PQ events**
- **Change color**
- **Show/Hide masked events** – The compliance defines flagged or non-flagged data. For example, "ignore data during dip or interruption; in this example, even a short dip of less than a second will ignore the events during this time interval (e.g., events based on 10 minutes because during those 10 minutes there was an interruption). Show masked events will show all events, including those which should be ignored, and Hide masked events will show only the events where there was no flagged data.

5.5.2.8 Scatter Parameters Chart (Professional and Enterprise only)

The Scatter Parameters chart allows reviewing scattered dots of a specific parameter in relation to another parameter.



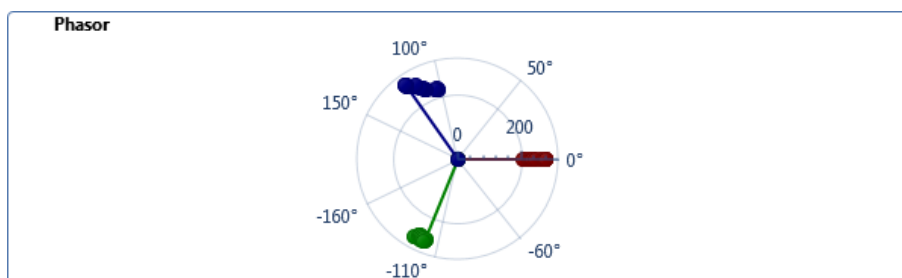
Scatter Parameter chart tools

The Scatter Parameter chart tool menu includes the following options:

- **Hide/Show legend box**
- **Hide/Show crosshair**
- **Change background color**
- **Hide/Show grid lines**
- **Export**
- **Normalized display mode** – Normalize the data in the chart. Voltage and current will be normalized to the nominal values. Power will be normalized to the product of Voltage × Current nominals.
- **Axis settings**
- **Change color**
- **Split to charts**
- **Filter on** – allows hiding points that are outside the normal operating condition of a third parameter. For example, view the relationship between power factor and active power only at current levels of 10–30 Amps.

5.5.2.9 Phasor (Professional and Enterprise only)

View the phasor's amplitude and angle for a selected time range. The diagram also shows changes in both the amplitude and phase.



Phasor chart tools

The Phasor chart tool menu includes the following options:

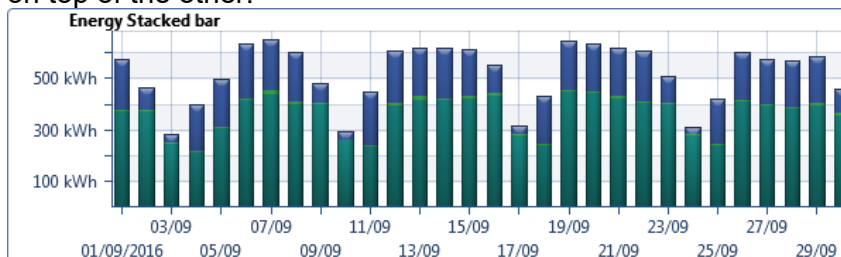
- **Hide/Show legend box**
- **Change background color**
- **Split to charts**
- **Export**
- **Normalized display mode** – Normalize the data in the chart. Voltage and current will be normalized to the nominal values. Power will be normalized to the product of Voltage × Current nominals.
- **Change color**
- **Set zero origin** – by default, the zero origin is set to 3-o'clock. Click Set zero origin to select a new origin.
- **Show limit series** – click Show limit series to enter a limit radius to be displayed in the phasor chart.

5.5.2.10 Energy Chart

View Energy data from multiple components for a selected time range. It allows reviewing energy data in 4 charts layout types: stacked bars, side-by-side bars, Trend, and Pie.

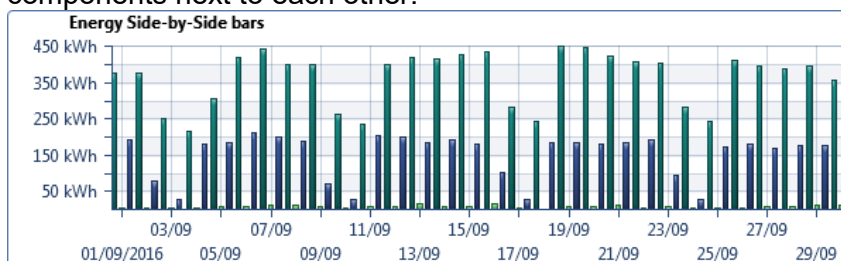
- **Stacked bars**

The stacked bars enable viewing energy data from multiple components one on top of the other.



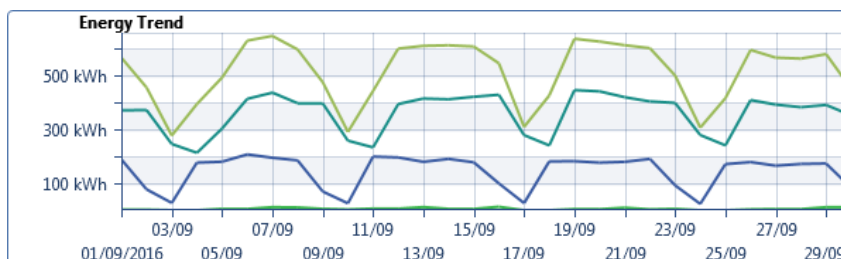
- **Side-By-Side Bars**

The Side-By-Side bars enables viewing energy data from multiple components next to each other.



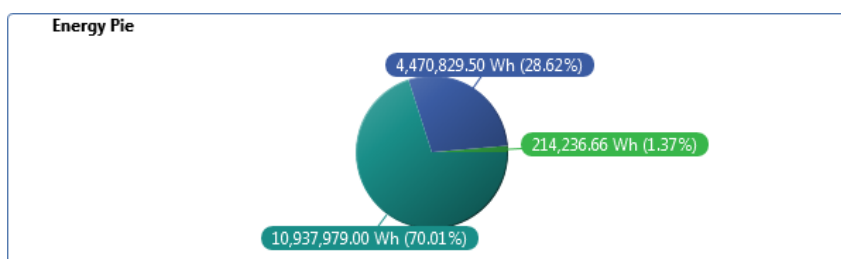
- **Trend**

The trend chart enables viewing energy data over time as a trend. When multiple components are selected, the summary trend of all components on the chart can be displayed.



- **Pie Chart**

The Pie chart enables viewing how the energy is distributed between different components of the same chart.



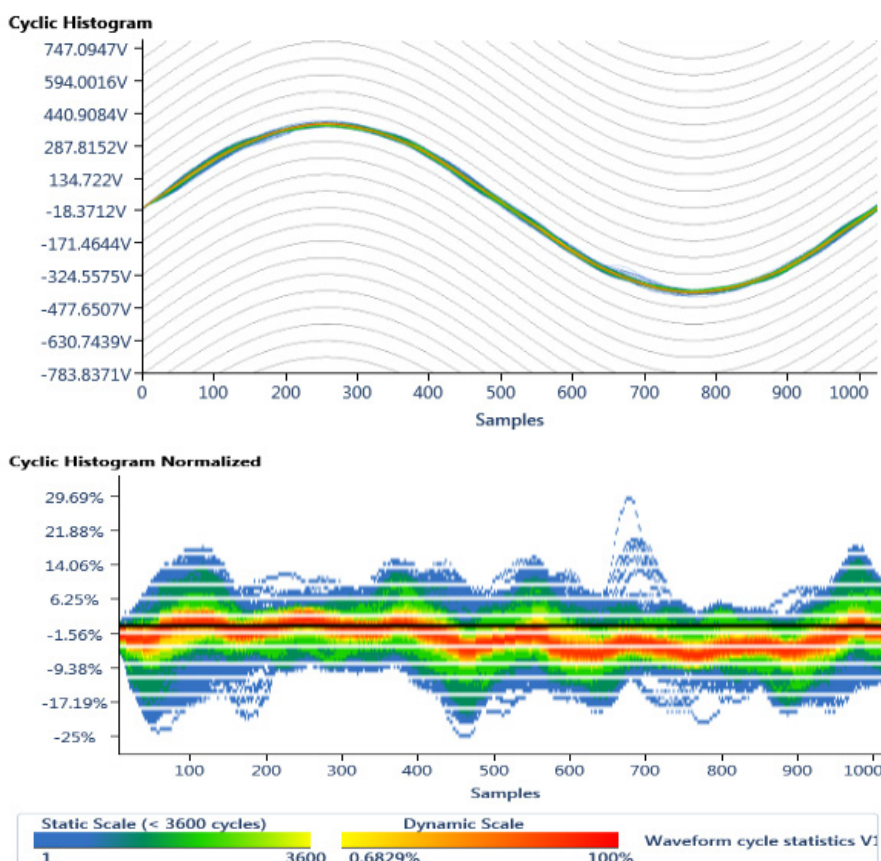
Energy chart tools

The Energy chart tool menu includes the following options:

- **Hide/Show legend box**
- **Change background color**
- **Split to charts**
- **Export**
- **Chart layout** – click select new chart layout (Side-by-side/Trend/Pie).
- **Change color**
- **Show total series (Trend only)** – click to add total series to display the total energy of all selected components.

5.5.2.11 Cyclic Histogram (Professional and Enterprise only)

View overlaid waveform cycles for a selected time range. It is made possible thanks to the unique continuous recording mechanism of Elspec BlackBox analyzers. The histogram shows the deviation from the expected ideal waveform by overlaying the waveforms.



Cyclic histogram chart tools

The Cyclic Histogram chart tool menu includes the following options:

- **Hide/Show legend box**
- **Reset zoom to 100%**

- **Export**
- **Change background color**
- **Edit chart title**
- **Edit axis Y scale**
- **Grid**
- **Normalized display mode** – Normalizes the data in the chart. Voltage and current will be normalized to the nominal values. Power will be normalized to the product of Voltage × Current nominals.

➔ **Note:** The data used for this chart is waveform samples. Requests of more than a few seconds/minutes will result in a large amount of data and the response may take 10–15 seconds, or even more, depending on the requested period.

5.5.2.12 Summary Chart

View parameters for a selected time range. This chart displays the minimum, maximum, and average value of each parameter.

Component	Parameter	Min	Max	Average
ELSPEC Demo	RMS V1N (Auto)	108.611 V	289.149 V	233.999 V
ELSPEC Demo	RMS V2N (Auto)	103.128 V	257.023 V	233.851 V
ELSPEC Demo	RMS V3N (Auto)	101.611 V	253.308 V	233.497 V

Summary chart tools

The Summary chart tool menu includes the following options:

- **Export to Excel**
- **Normalized display mode** – Normalizes the data in the chart. Voltage and current will be normalized to the nominal values. Power will be normalized to the product of Voltage × Current nominals.

5.5.3 Min/Max View

The following is a theoretical explanation about the method used to optimize the data representation, considering the request and response time.

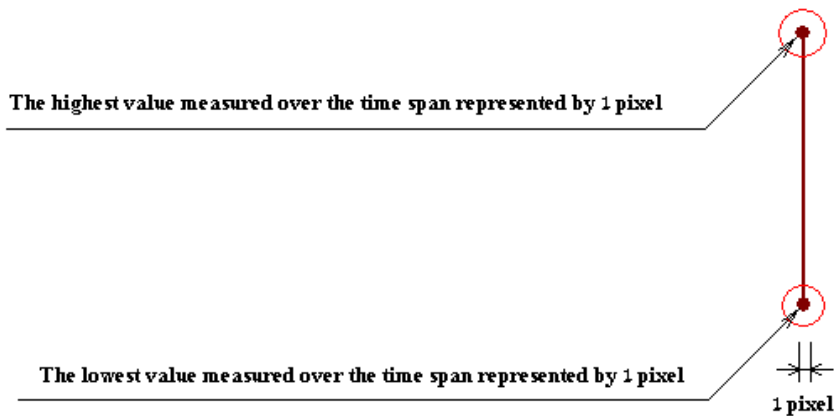
PQSCADA sapphire is capable of continuously storing waveform signals for an extended time interval. This creates a tremendous amount of data that is available to the user at every single moment, from the time the component was initially configured.

When initiating an investigation for a time interval of over a year, the large quantity of data exceeds the resolution capabilities of the display and that of the human eye.

For example, when displaying the RMS values for a time interval of 1-year, there are more than 1,892 million cycles (60Hz x 60sec x 60min x 24hours x 365days). The screen resolution is typically around 1,000 pixels; therefore, on this time interval, each pixel on the screen represents roughly 1.89 million cycles. By only averaging these values, spikes and aberrations will be missed.

The “Min/Max view” was introduced for this situation, for spotting these occurring spikes and aberrations over a 1-year time interval. The “Min/Max view” enables the representation of every horizontal pixel as a vertical bar (1 pixel wide), while its top-end represents the maximum measured value and its bottom end represents the minimum measured value. As a result, significant aberrations can be clearly visible.

By drilling in, the event can be isolated to the original length of time over which it occurred.



5.5.4 Drilling In

When investigating the collected data to find the cause of failure, drilling into specific locations along the chart can be extremely helpful.

PQSCADA Sapphire supports three drill-in options:

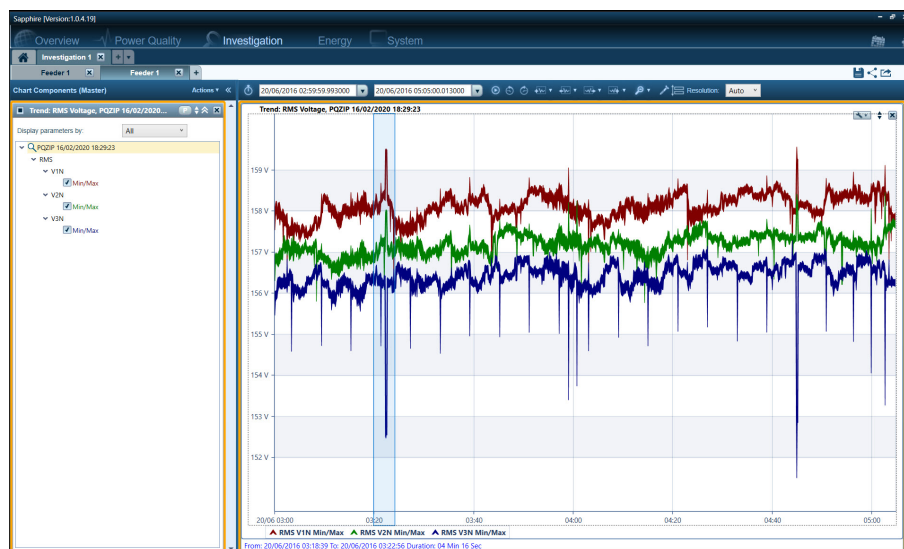
- Active Region
- Single Region
- Multiple Regions

5.5.4.1 Active Region

The Active Region allows drilling into a selected region along the chart.

1. Click the **Drill navigation mode** icon on the view toolbar.
2. Left-Click and drag the mouse along the region to drill into.

The region is highlighted by a blue shadow and the time interval is displayed below the chart.



3. Release the mouse button. The drilled-in region is displayed.

Click the **Previous time frame**  icon to return to the previous time frame.

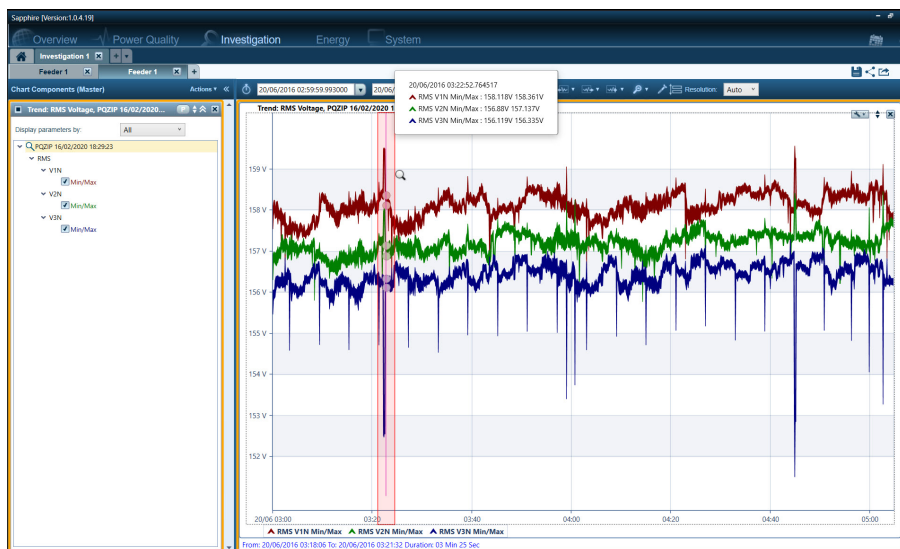
4. To further enlarge the region of interest, repeat these steps to continue drilling-in.

5.5.4.2 Single Region

The single region drill option is similar to the active region feature but creates a separate chart tab of the drilled-in region. This operation opens a new view. There can be many graphs in a view

1. Click the **Drill navigation mode** icon on the view toolbar.
2. Right-click and drag the mouse along the region to drill into.

The region is highlighted by a red shadow and the time interval is displayed below the chart.



3. Release the mouse button. The drilled-in region is displayed, and a new chart tab is created.
4. To further enlarge the region of interest, repeat these steps, or continue with the active region feature.

5.5.4.3 Multiple Regions

The multiple regions drill option is similar to the single drill feature but makes it easier to create separate chart tabs of selected drilled-in regions.

1. Click the **Drill navigation mode** icon on the view toolbar.
2. Center-Click and drag the mouse along the region to drill into.

The region is highlighted by a green shadow and the time interval is displayed below the chart.

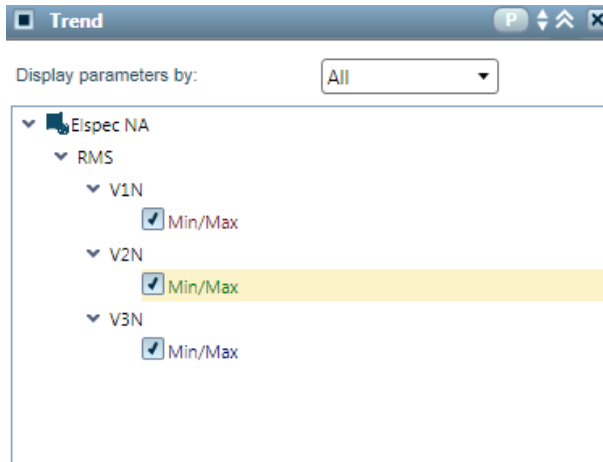


Figure 5-2. Selected regions









3. Release the mouse center button.
4. Select an additional region by repeating steps 1 and 3 above.
5. Repeat for all required regions.
6. Double-click any of the selected regions with the mouse left button.
The drilled-in region is displayed, and a new chart tab is created.
7. Repeat for all selected regions. Drill-in chart tabs are created for each of the selected regions.
8. To further enlarge the region of interest, continue with the active region or single region drill options.

5.6 Charts Tree

The chart tree includes a list of the parameters displayed on the chart.



Use the following icons located on the chart tree bar:

-  **Hide chart** – to hide/unhide chart from the view.
-  **Add Parameter** – to add parameters to a chart.
-  **Move chart** – to move the location of the chart in the view.
-  **Minimize chart tree** – to minimize the chart tree.
-  **Delete chart** – to delete chart from the view
-  **Minimize parameter** – to minimize it in the chart tree.
-  **Hide parameter** – to hide/unhide a parameter from the chart.
-  **Display parameters by** – parameters in PQSCADA Sapphire can be displayed as channels (e.g., channels 1, 2, 3, etc.), logical (e.g., V1, V2, V3, etc.) or additional (e.g., temperature, pressure). Use the **Display parameter by** to sort parameters according to type.

5.6.1 Move Parameters Between Charts

Moving a parameter between charts is done by dragging and dropping the parameter between the chart trees.

To move a parameter into a separate chart, select the parameter, and drag it into the scrollbar area (out of the chart tree section).

5.7 Templates

Templates are investigations that contain topologies, charts, and parameters that can be used as a starting point for a new investigation. You can create your own custom templates and store, reuse, and share them with others.

For example, you might use a PQSCADA Sapphire template that is formatted for an event investigation. Such a template would likely include high-resolution parameters relevant to the specific event (e.g., Voltage RMS for DIP).

5.7.1 Investigation Template

Instead of creating the structure of a new investigation from scratch, you can use an investigation template with predefined topology, charts, and parameters.

To open a new Investigation/View from a Template, select **Template** from the **Chart type** page of the **Add new Investigation/View** wizard.

5.7.1.1 Create a New Investigation Template

1. Create a View with all the charts and parameters you wish to include in the template. The view cannot include more than 1 component.
2. Click **Actions** and select **Save as template**.
3. In the **Save template** window, do the following:
 - Under Template type, select **Investigation**.
 - Give the new template a name.
 - Under Topology, select the topology in which this template will be active.
 - If the template should include events, mark the [Create a separate view for each of the following events](#) checkbox and the events to include.
4. Click **Save**.

5.7.1.2 Modify an Investigation Template

A single template can include different parameters for different power topologies. For example, the same template will include differential voltages when you open a component configured as Delta and phase to neutral voltages when you open a component configured as WYE.

1. Create View with all the charts and parameters you wish to include in the modified template. The view cannot include more than 1 component.
2. Click **Actions** and select **Save as template**.
3. In the **Save template** window, do the following:
 - Under Template type, select **Investigation**.
 - Select the template you want to modify.
 - Under Topology, select the topology in which this template will be active.
 - If the template should include events, mark the [Create a separate view for each of the following events](#) checkbox and the events to include.
4. Click **Save**.

5.7.2 Include Event in a Template

Templates have the option to open separate views for selected events. For example, the template will open the first view according to the template you configured but if during the selected time interval of the view 3 dips occurred, PQSCADA Sapphire will open additional 3 views: 1 for each dip.

5.7.3 Event Template

Event templates are used to open a view with predefined charts and parameters for a specific event type. For example, a template for a dip will include voltage waveform and RMS charts, while a Harmonic event will include a spectrum chart.

5.7.3.1 Create a New Event Template

1. Create View with all the charts and parameters you wish to include in the template. The view cannot include more than 1 component.
2. Click **Actions** and select **Save as template**.
3. In the **Save template** window, do the following:
 - Under Template type, select **Events**.
 - Under Topology, select the topology in which this template will be active.
 - Select the event type.
 - Check the enable user tags, to select the user tags range.
4. Click **Save**.

5.7.3.2 Modify Events Template

A single template can include different parameters for different power topologies. For example, the same template may include differential voltages when you open a component configured as Delta and phase to neutral voltages when you open a component configured as WYE.

1. Create View with all the charts and parameters you wish to include in the modified template. The view cannot include more than 1 component.
2. Click **Actions** and select **Save as template**.
3. In the **Save template** window, do the following:
 - Under Template type, select **Events**.
 - Select the template you want to modify.
 - Under Topology, select the topology in which this template will be active.
 - Select the event type.
 - Check the enable user tags, to select the user tags range.
4. Click **Save**.

5.7.4 Files Template

Files template is used for opening a new investigation based on PQZIP and PQZ files. The file template defines the initial investigation when uploaded to the PQSCADA Sapphire application.

5.7.4.1 Create New File Template

1. Create View with all the charts and parameters you wish to include in the template. The view cannot include more than 1 component.
2. Click the **Actions** menu and select **Save as template**.
3. In the **Save template** window, do the following:
 - Under Template type, select **File**.
 - Under Topology, select the topology in which this template will be active.
 - select the file type.
4. Click **Save**.

5.7.4.2 Modify File Template

A single template can include different parameters for different power topologies. For example, the same template will include differential voltages when you open a component configured as Delta and phase to neutral voltages when you open a component configured as WYE.

1. Create View with all the charts and parameters you wish to include in the template. The view cannot include more than 1 component.
2. Click the **Actions** menu and select **Save as template**.
3. In the **Save template** window, do the following:
 - Under Template type, select **File**.
 - Select the template you want to modify.
 - Select the template you want to modify.
 - Under Topology, select the topology in which this template will be active.
 - select the file type.
4. Click **Save**.

6. Overview Module

The overview module is designed to display all measuring points on a live geographical map with real-time data and general statuses or display a Line diagram, or a table with all instances and components.

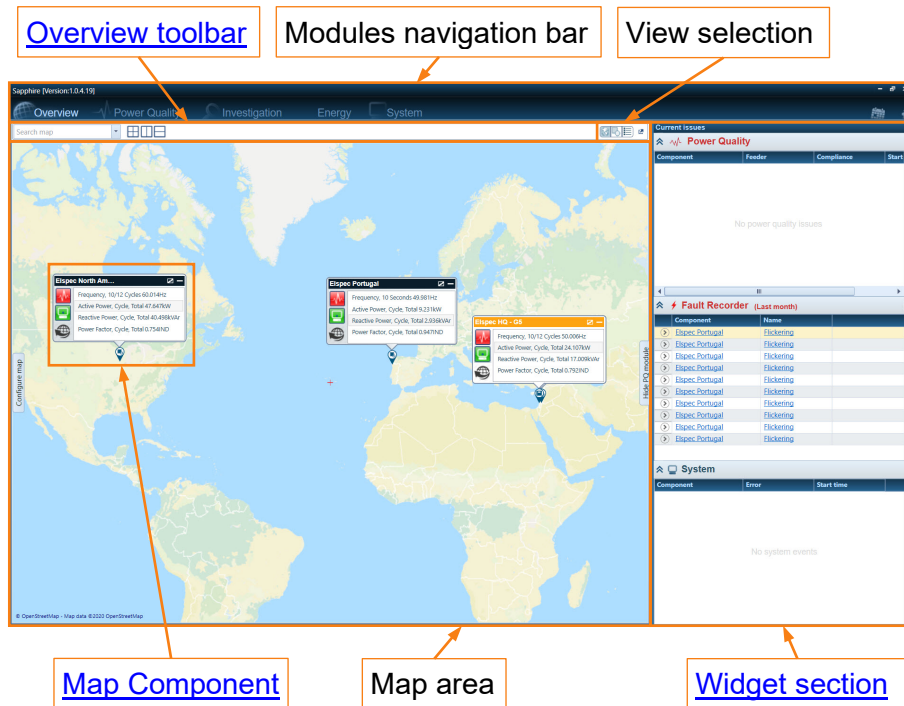


Figure 6-1. Overview screen

The **Overview module** screen is divided into two main sections that are divided by a splitter control line (a vertical line between the two sections).

The left section displays the connected **Instances** and their hosted **components**, as a live geographical map, or as a table, or display a line diagram, and the right section displays the **Widgets** (see section 6.4).

6.1 Overview Toolbar

The overview toolbar includes the following symbols for performing various actions.



Search – to search for a component on the map.



Split view – enables splitting the view vertically, horizontally, or to 4 equal areas.



Toggle Map/List view/Line diagram – allows selecting between map view, a list in a table view, and viewing electrical line diagrams of an instance.










Pop-up – opens a separate floating window with the selected view.



Close map – closes a view when in a split view mode.

6.2 Map Components

The map components display real-time measurements and include the following elements (see following Figure 6-2):

- The physical location of the component.
- Window icons:
 -  or  See a chart of a selected measurement (e.g., Frequency, Power, etc.).
 -  Add/remove displayed parameters.
 -  Hide the measurements window
- Two live statuses:
 -  Power quality status: Green when the electrical conditions are according to the preconfigured grid code.
 -  System status: Green when the measuring device is in operating conditions.
- A link  to open the device website, if applicable.

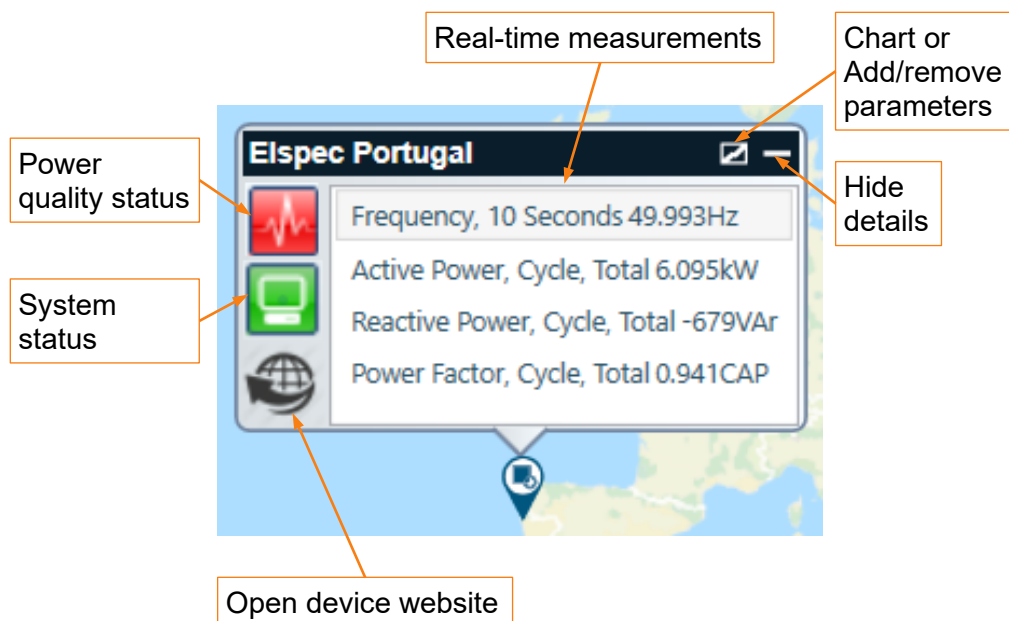


Figure 6-2. Map Component

6.2.1 Adding/Removing a Component to the Map

➔ **Note:** Adding or removing components from the map requires write permissions (see details in section 10.1).

To add a component to the map:

1. Click **Configure map** on the left edge of the map section. The **Components** pane opens.
2. Right-click and drag the component to its location.
3. Click **Save changes** on the map view.


To disregard the change, go to a different view and click **Don't save** on the Save configuration pop-up.

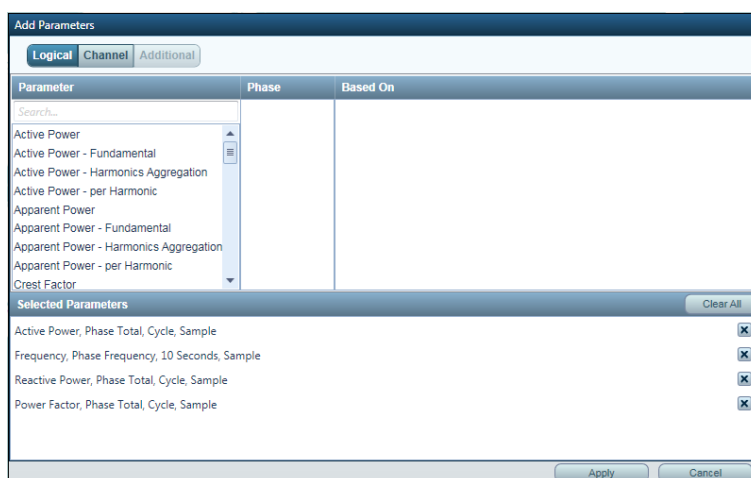
To remove a component to the map:

1. Right-click the component to be removed.
2. Select **Remove component from the map**.

6.2.2 Adding/Removing Parameter to a Component



To add a real-time parameter to a component:

1. Click the **Parameters**  icon on the top right corner of the map component or right-click on a component in the components tree and select **Add/remove parameters**. The Add parameters configuration window opens.



2. Select the desired parameter from the Parameter list and click **Apply**.

To remove a real-time parameter from the component:

1. Click the **Parameters**  icon on the top right corner of the map component or right-click on a component in the components tree to open the **Add/remove parameter** configuration window.
2. Click the **Delete**  icon of the parameter(s) to remove or click **Clear All** to remove all parameters.
3. Click **Apply**.

6.3 Line Diagram

Line diagrams of an instance can be added in various formats (e.g., DWG drawings). For adding Line diagrams, see section 9.9.5.

6.3.1 Adding a Parameter to a Line Diagram

To display a parameter on the line diagram, go to the Line diagram view.

1. Right-click on an object in the line diagram.
2. Select **Add/Remove Parameters**.
3. Click **Save changes**.

Right-clicking an added parameter enables doing the following:

- Changing the parameter location on the line diagram by click and drag.
- Hide/show the connecting line.
- Change the parameter font size.

6.4 Widgets

The **Current issues** widgets display the status of the electrical network:

- **Power Quality:** The power quality widget displays a list of measurement points that are in violation of the preconfigured grid code. A link to the map or the Power Quality module is available for quick access.
- **Fault Recorder:** The fault recorder widget displays a list of short predefined events that occurred during the last hour/day/week/month. A link to the map or investigation is available for quick access. Investigation for a specific event in the list will be opened according to the [event template](#).

To set the preferences of this widget click the **Preferences tool**  icon.

- **System:** The system widget displays a list of system messages/warnings related to operating conditions. A link to the system module is available for further investigation.

7. Power Quality Module

The Power Quality module shows a brief status of the entire network or individual measurement points for a selected period.

The power quality conditions are configurable and can meet any power quality compliance standard (e.g., EN 50160, FOL, IEEE519, and others). This enables identifying the root cause and type of violation quickly and easily. Multiple compliance conditions can apply to a single measurement point for comparison.

A comprehensive report, based on the power quality compliance conditions, can easily be generated from the power quality module.

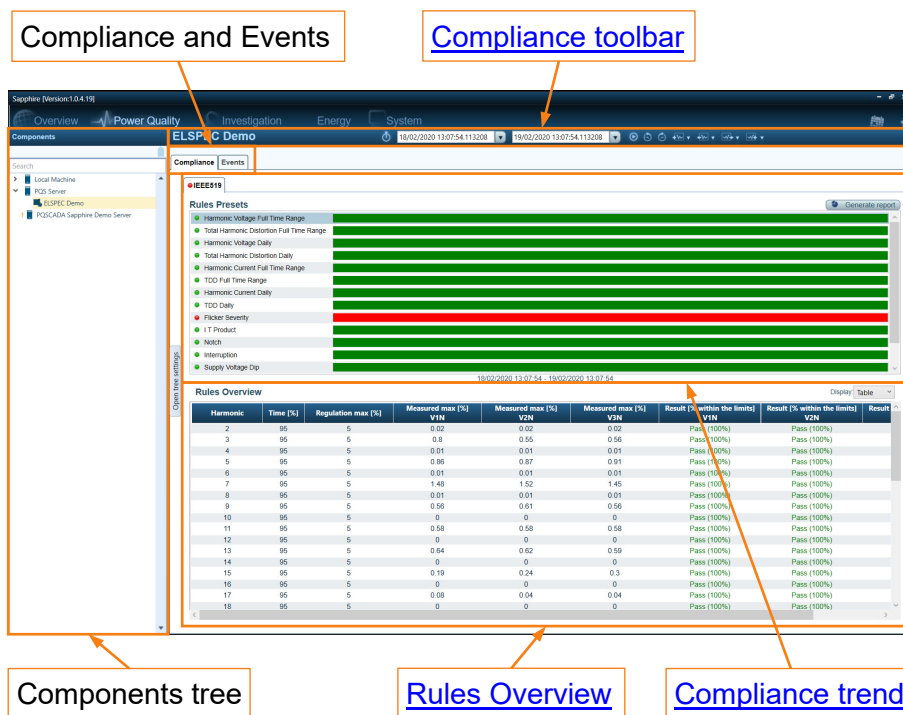


Figure 7-1. Power Quality screen

The **Power Quality module** screen is divided into two main sections that are divided by a splitter control line (a vertical line between the two sections).

The left section displays the connected **Instances** and their hosted **Components**. The right section displays the **Compliance** results of the selected object.

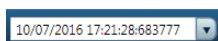
The position of the splitter control can be changed by clicking and dragging the splitter control to the left or right with a pointing device.

7.1 Compliance Toolbar

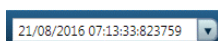
Once compliance is established, it is possible to change the compliance view with the compliance toolbar.



Fixed times interval – The fixed time interval is a list of predefined time intervals used as shortcuts. Selecting All will set the time interval for all the data available in the database.



Start time – sets the start time of the view.



End time – sets the start time of the view



Start new query – To enable the changes of the set time interval, click the start new query button.



Previous time/Next time – To move back to the previous time selection, use Previous time. To move in the opposite direction, use the Next time button.



Append back – Append back: Leave the end time intact and move the start time back by a selected amount.



Back – Select Back to shift the current time duration back to a specified amount of time.



Forward – Select Forward to shift the current time duration forward to a specified amount of time.





Append forward – Append forward: Leave the start time intact and move the end time forward by a selected amount of time.

7.2 Starting a New Compliance Investigation

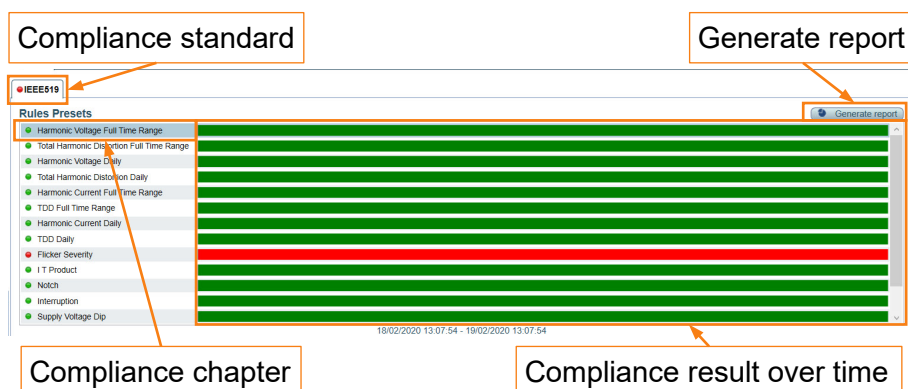
1. Select the component from the **Components** tree. To sort the components by tags, click the **Tag**  icon.

For details on [Open tree settings](#) see section 9.9.4.

2. Select the time interval from the compliance toolbar with one of the following options:
 - Click the **Fixed time intervals**  icon to select a fixed time interval.
 - Type the Start and End times in the time picker box.
3. Click the **Start query**  icon.

7.3 Compliance Trend

Following is a closer look at the **Compliance Trend** part of the screen.



Compliance standard

Select the standard you want to investigate. Multiple compliance conditions can apply to a single measurement point for comparison. See section 9.10.5.1.

Compliance chapter

The compliance is built from a group of rules based on a chapter. Each chapter has its own rules, evaluation window, observation window, sliding window, and result over time.

Compliance result over time

Compliance is a statistical assessment over time. EN50160, for example, has an evaluation period of 1 week. Therefore, every 7 days it gets 1 result. The sliding window will determine how often you will see a result. For example, if the sliding window is 1 day, you will see 1 result every day, representing the last 7 days.

The compliance result overtime section is therefore split into sub-time-intervals representing the result of the compliance for each sliding window. For example, when selecting a time interval of 10 days (May 1st to May 10th) for a compliance standard with an evaluation window of 7 days and a sliding window of 1 day, PQSCADA Sapphire will display 3 sub-time-intervals: the first represents the result from the 1st to the 8th day, the second for the 2nd to the 9th day, and the third for the 3rd to the 10th day. The maximum number of sub-time-intervals is 96. If the time interval needs a higher number division of sub-time-intervals, each sub-time-interval will include more than 1 sliding window period.

PQSCADA Sapphire uses 4 colors to display the results:

- **Green** – pass
- **Orange** – pass but did not meet the target
- **Red** – fail
- **Gray** – not enough data

Generate a report

Click **Generate report** to generate a report based on the configured compliance standards.

7.3.1 Drill In

1. Hover over a sub-time-interval to open the List of sliding windows pop-up window.

Start time	End time	Result	Remarks
18/02/2020 13:07:54	19/02/2020 13:07:54	Pass	Sliding window

2. Click the row you wish to drill-in.
 - One-click will only change the observation window of the Rules overview section.
 - Double click will change the compliance window time interval to the selected sliding window.

7.4 Rules Overview

The Rules Overview section is a detailed overview of a specific chapter and observation window and is governed by the compliance trend section. It provides details on the list of rules for a specific chapter and the result of each rule in a specific time interval.

Rules Overview Display: Table

Harmonic	Time [%]	Regulation max [%]	Measured max [%] V1N	Measured max [%] V2N	Measured max [%] V3N	Result [% within the limits] V1N	Result [% within the limits] V2N	Result
2	95	5	0.02	0.02	0.02	Pass (100%)	Pass (100%)	Pass (100%)
3	95	5	0.8	0.55	0.56	Pass (100%)	Pass (100%)	Pass (100%)
4	95	5	0.01	0.01	0.01	Pass (100%)	Pass (100%)	Pass (100%)
5	95	5	0.86	0.87	0.91	Pass (100%)	Pass (100%)	Pass (100%)
6	95	5	0.01	0.01	0.01	Pass (100%)	Pass (100%)	Pass (100%)
7	95	5	1.48	1.52	1.45	Pass (100%)	Pass (100%)	Pass (100%)
8	95	5	0.01	0.01	0.01	Pass (100%)	Pass (100%)	Pass (100%)
9	95	5	0.56	0.61	0.56	Pass (100%)	Pass (100%)	Pass (100%)
10	95	5	0	0	0	Pass (100%)	Pass (100%)	Pass (100%)
11	95	5	0.58	0.58	0.58	Pass (100%)	Pass (100%)	Pass (100%)
12	95	5	0	0	0	Pass (100%)	Pass (100%)	Pass (100%)
13	95	5	0.64	0.62	0.59	Pass (100%)	Pass (100%)	Pass (100%)
14	95	5	0	0	0	Pass (100%)	Pass (100%)	Pass (100%)
15	95	5	0.19	0.24	0.3	Pass (100%)	Pass (100%)	Pass (100%)
16	95	5	0	0	0	Pass (100%)	Pass (100%)	Pass (100%)
17	95	5	0.08	0.04	0.04	Pass (100%)	Pass (100%)	Pass (100%)
18	95	5	0	0	0	Pass (100%)	Pass (100%)	Pass (100%)

The detailed data can be displayed as a table or as a chart. To switch between the two modes, click the **Display** drop-down menu at the upper right corner of the Rules overview section.

7.5 Events

The Events displays what may be seen in a typical power quality monitor, but in a continuous mode. The events are edited and added through the System module Events tab (see section 9.9.8).


The Events column header can be dragged up to group events by the selected dragged column.

Clicking an Event automatically creates an investigation. The event can then be further investigated. For more details in investigations, see Chapter 5.

8. Energy Module

The Energy Module is a powerful tool that can be used to analyze energy by the customer's PQSCADA Sapphire.

Energy module specifications:

- The Energy module is an Enterprise licensed feature.
- The Energy module is coupled with the **Billing** tab in the client's System module (see section 9.9.14). Therefore, most of the displayed data will be based on the billing configuration.
- Custom dashboards can be exported to Word by clicking the **Export Energy**  icon on the top right corner of the screen. The Word file is created from an XML template that can be modified per customer requirements at (C:\Users\\AppData\Roaming\PQS\Templates\Export).

8.1 Home Page

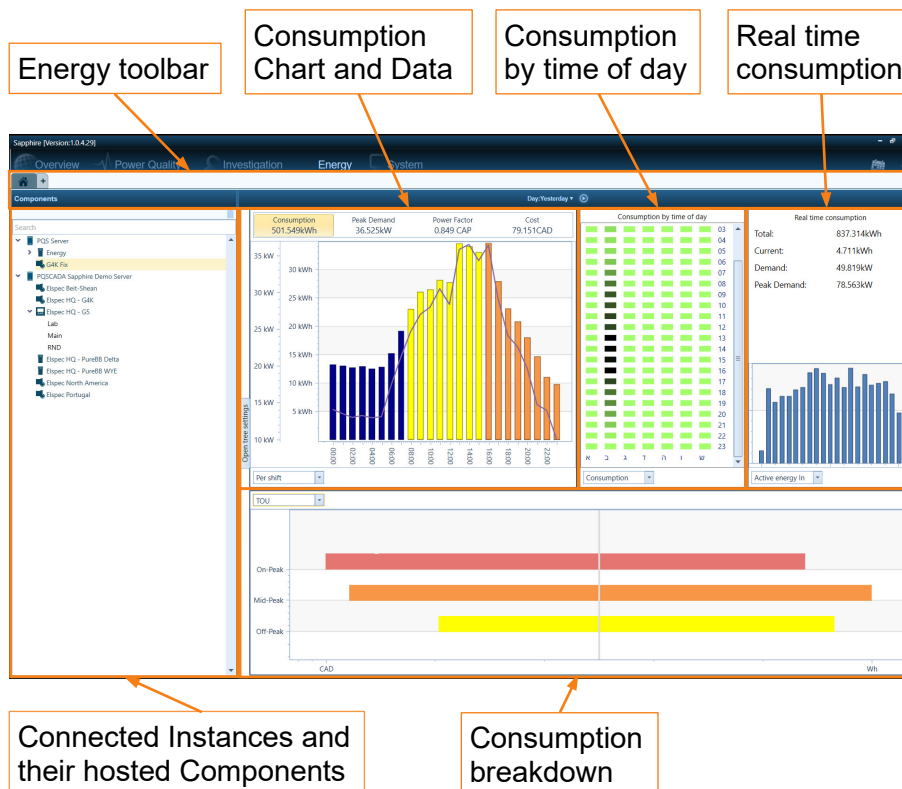


Figure 8-1. Energy Module

The **Energy module** screen is divided into two main sections that are divided by a splitter control line (a vertical line between the two sections).

The left section displays the connected **Instances** and their hosted **Components**. The right section displays the **Energy Consumption** of the selected objects.

The position of the splitter control can be changed by clicking and dragging the splitter control to the left or right with a pointing device.

8.1.1 Energy Toolbar


The Energy toolbar is where new energy dashboards are created, the resolution of the displayed data is selected, and the start query is performed.

8.1.1.1 Resolution

The energy toolbar enables setting the display Resolution according to set time intervals and includes the option to compare in reference to the selected resolution:

- **Day:** Today, Yesterday, Compare to (Previous day, Same day last week, Same day last year, Same day of week last year).
- **Week:** Last 7 days, This week, Last week, Compare to (Previous period, Four weeks ago).
- **Month:** Last 30 days, This month, Last month, Compare to (Previous period, Four weeks ago, Previous year, 52 weeks ago).
- **Year:** Last 12 months, This year, Last year, Compare to (Previous period).
- **Custom:** Time range, Compare to (Previous period, Last year).

8.1.1.2 Start Query

To start a query, click the **Start query**  icon.

Note that changing the Resolution automatically starts a new query.

8.1.2 Widgets

The right side of the Home page screen displays energy consumption Widgets and includes four widgets.

8.1.2.1 Chart and Data

The left widget displays a numeric and graphical presentation of the consumed energy parameters: **Consumption**, **Peak Demand**, **Power Factor**, and **Cost**.

The chart can be displayed according to any one of the above parameters and by one of the following selected value from its dropdown list (depending on the selected energy parameter to display):

- **Per measurement point**
- **Per tariff**
- **Per shift**
- **Per charge**

The numeric values of the parameters are of the overall consumption.

The chart bars represent the selected parameter, and the trending curve represents the Demand (when selecting Consumption or Cost) or the Consumption (when selecting Peak Demand or Cost).

Hovering with the pointing device (mouse) over the chart bars or line displays the values per point.

8.1.2.2 Consumption by Time of Day

The center widget displays the consumption according to time and day. The seven columns are the days (Sunday to Saturday) and the 24 rows are the hour. Hovering with the pointing device (mouse) over any value will show the numeric value of the specific day and hour (if the selected period includes more than one-time window, it will summarize all windows). Higher values have a darker color. The Consumption by the time of day can be presented according to one of the following from its dropdown list:

- **Consumption**
- **Cost**

8.1.2.3 Real Time Consumption

The right-side widget displays the Real-time consumption numeric values, which include: Total, Current, Demand, and Peak Demand.

The chart can be displayed according to the selected value in the dropdown list:

- **Active energy In**
- **Active energy Out**
- **Reactive energy In**
- **Reactive energy Out**
- **Apparent energy**

The real-time chart bars are displayed for 15-minute intervals.

8.1.2.4 Consumption and Cost

The bottom widget displays the energy consumption and cost according to the selected value in the dropdown list:

- **TOU** (Time of Use. See details in section 9.9.14.6.1)

When selecting TOU, the chart vertical axis values are the rates per time of use and the chart horizontal axis is the consumption vs cost.

Hovering with the pointing device (mouse) on the chart displays its values.

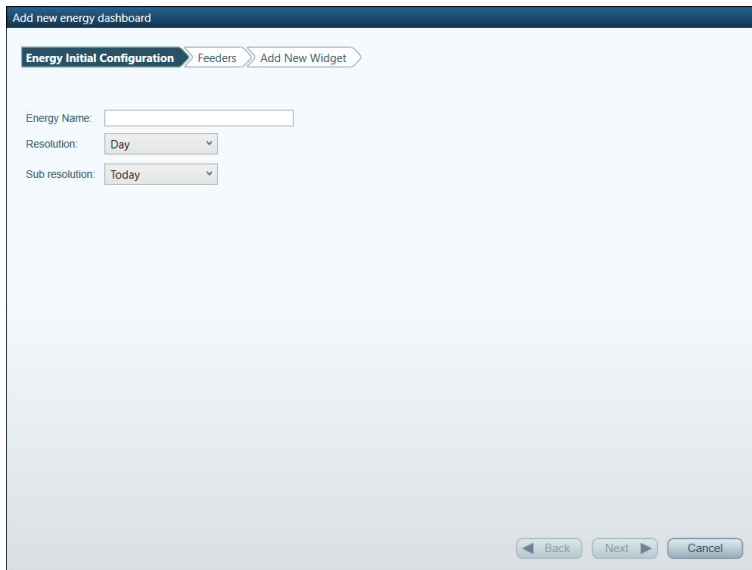
- **Shifts**

When selecting Shifts, the chart vertical axis values are the shifts and the chart horizontal axis is the consumption vs cost.

Hovering with the pointing device (mouse) on the chart displays its values.

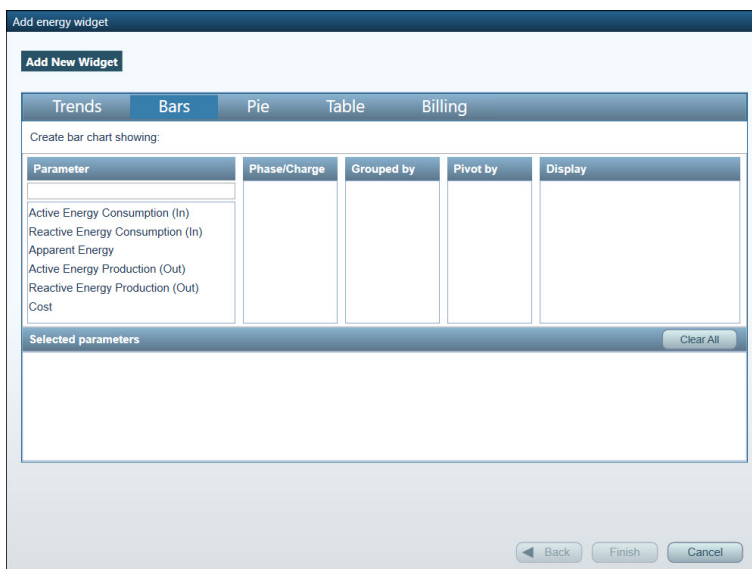
8.2 Add New Dashboard

1. Click the **Add new dashboard**  icon.



The screenshot shows the 'Add new energy dashboard' configuration page. At the top, there is a breadcrumb trail: 'Energy Initial Configuration' > 'Feeder' > 'Add New Widget'. Below this, there are three input fields: 'Energy Name' (a text box), 'Resolution' (a dropdown menu with 'Day' selected), and 'Sub resolution' (a dropdown menu with 'Today' selected). At the bottom right, there are three buttons: 'Back', 'Next', and 'Cancel'.



2. Fill and select the data:
 - **Energy Name** – enter a name for the energy dashboard.
 - **Resolution** – set the resolution for the energy displayed data (Day, Week, Month, Year, Custom). This can later be changed.
 - **Sub resolution** – set a sub-resolution for the energy displayed data (depends on the selected Resolution).
3. Click **Next** to open the Feeder page.
4. Select the Feeder. When there is more than one feeder, the selected Feeder are displayed in the Selected Feeder pane.
5. Click **Next** to open the Add New Widget page.



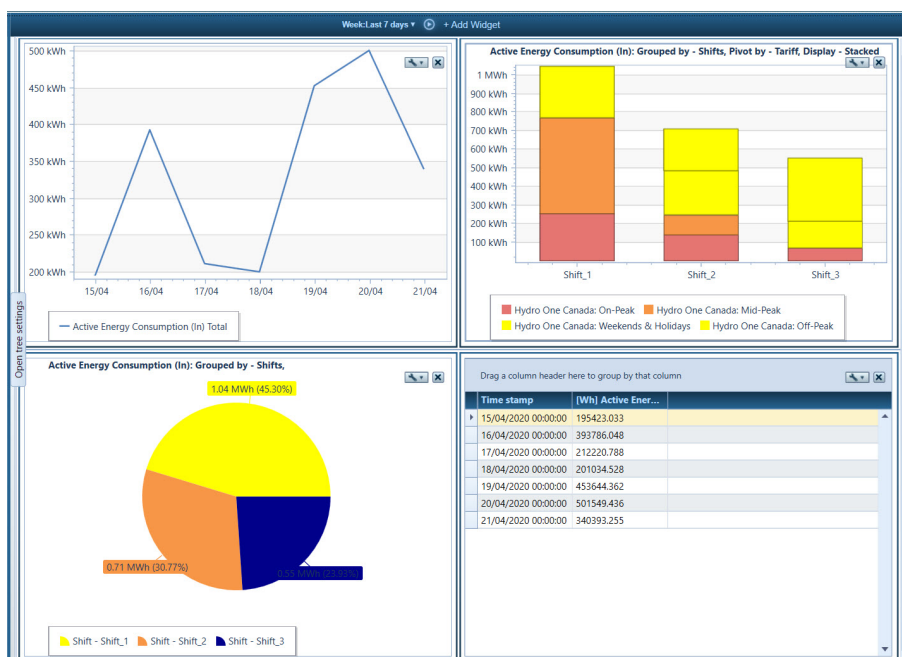
The screenshot shows the 'Add energy widget' configuration page. At the top, there is a breadcrumb trail: 'Add New Widget'. Below this, there are five tabs: 'Trends', 'Bars', 'Pie', 'Table', and 'Billing'. The 'Bars' tab is selected. Below the tabs, there is a section titled 'Create bar chart showing:' followed by a table with the following columns: 'Parameter', 'Phase/Charge', 'Grouped by', 'Pivot by', and 'Display'. The 'Parameter' column contains a list of energy parameters: 'Active Energy Consumption (In)', 'Reactive Energy Consumption (In)', 'Apparent Energy', 'Active Energy Production (Out)', 'Reactive Energy Production (Out)', and 'Cost'. Below the table, there is a section titled 'Selected parameters' with a 'Clear All' button. At the bottom right, there are three buttons: 'Back', 'Finish', and 'Cancel'.

6. Select the Widget type from the top bar: **Trends, Bars, Pie, Table, Billing**.
The available **Parameters**, what parameters to display, and how to display them, is according to the selected widget.
7. Select the **Parameter** to display, and when applicable, other selections per Parameter. The selected parameters, and what and how to display them are added to the Selected parameters bottom pane.
8. Click **Finish**.

At the top right corner of each widget are two icons for performing the following on the selected widget:

-  **Chart settings**
 - Add/Remove parameter
 - Export the chart to Excel and Copy the chart to the clipboard (for applicable widgets)
-  **Close** Close the widget

Widgets can be added to a selected dashboard by clicking **+Add Widget** on the Energy module toolbar. Multiple widgets can be added and displayed.



9. System Module

The System module is used to configure and monitor the PQSCADA Sapphire's objects. PQSCADA Sapphire supports two types of objects:

- **Instance** – representation of a physical computer on which PQSCADA Sapphire is running. PQSCADA Sapphire supports two types of instances:
 - **Local Machine** – PQSCADA Sapphire runs as a user process on the local machine (Express and Professional editions).
 - **Server** – PQSCADA Sapphire runs as a Windows service on a local or remote location (Enterprise edition).
- **Component** – A Component is a logical representation of a physical device. Components are hosted under an instance. PQSCADA Sapphire supports two main types of components:
 - **Investigation component** – created by fetching files manually.
 - **Auto Fetching component** – a component that supports various communication protocols to fetch data automatically (Professional and Enterprise editions only). The number of auto fetching components is defined in the specific License (e.g., the Enterprise License includes by default 20 auto fetching components. The user can request to increase).

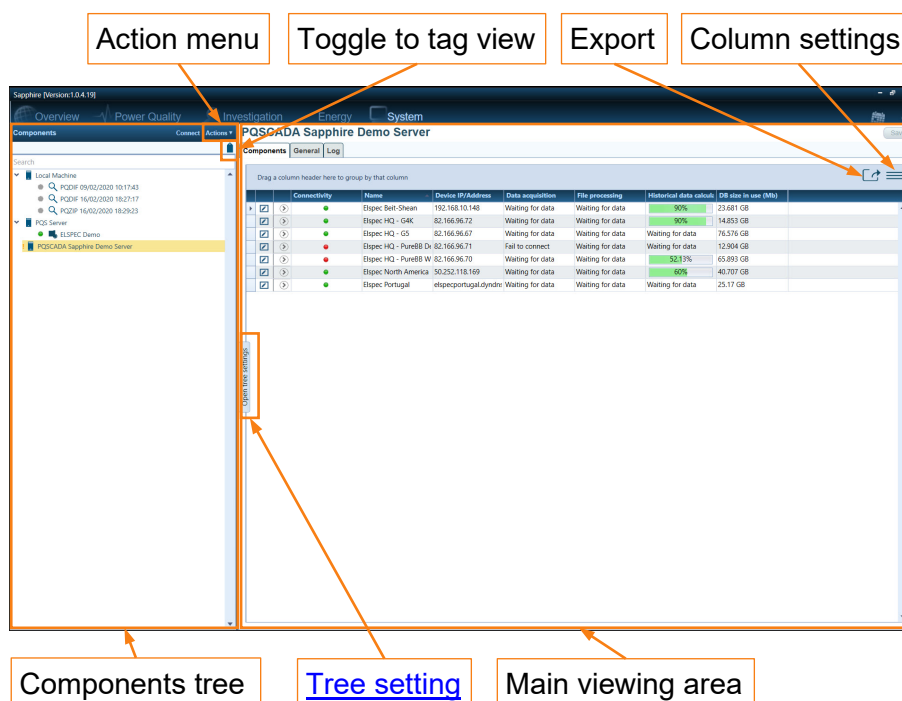


Figure 9-1. System Module

The **System module** screen is divided into two main sections that are divided by a splitter control line (a vertical line between the two sections).

The left section displays the connected **Instances** and their hosted **Components**. The right section displays the properties of the selected object.

The position of the splitter control can be changed by clicking and dragging the splitter control to the left or right with a pointing device.

9.1 Connect to a Server (Enterprise edition only)

1. Click the **Connect** button on the upper right corner of the **Components** tree to open the **Add Server** configuration window.

(The following is an example when connecting to the demonstration site, with “Demo” as the User name and Password).

2. Select and enter the following information:
 - **Server Address** – select the service URL. Click the **Scan for server** icon to search for active services in your network.
 - **Authentication** – select the authentication manager.
 - **User name** – select the username.
 - **Password** – select the password.
 - Mark the **Stay logged in** checkbox to keep PQSCADA Sapphire connected to this service.
3. Click **Add** to connect.

9.2 Disconnect Server (Enterprise edition only)

1. Right-click the server in the **Components** tree.
2. Select **Disconnect server**.

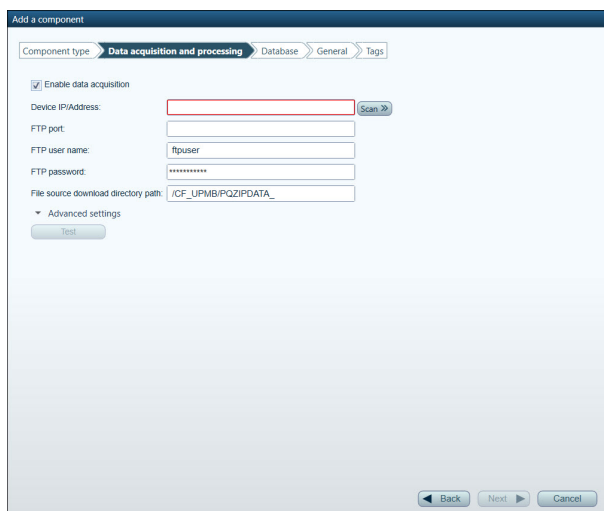
9.3 Log-In to a Server (Enterprise edition only)

1. Right-click on a server in the **Components** tree.
2. Select **Login** to open the Login configuration window.
3. Select and enter the following information:
 - **Authentication** – select the authentication manager.
 - **User name** – select the username.
 - **Password** – select the password.
 - Mark the **Stay logged in checkbox** to keep PQSCADA Sapphire connected to this service.
4. Click **Login** to connect.

9.4 Add a Component (Professional and Enterprise editions only)

➔ **Note:** PQSCADA Sapphire supports various component types. To integrate PQSCADA Sapphire with other component types of different vendors, call our support team.

1. Click **Actions** on the top right corner of the **Components** section and select **Add component** from the menu.
2. **Select a component type** from the dropdown list and click **Next**.



➔ **Notes:** For the purpose of this description we have added the BlackBox Fix G4 component. This will ensure that most steps in the wizard are fully explored.

The **Enable data acquisition** checkbox is marked by default, downloading data upon component creation.

3. Select and enter the following information:
 - **Device IP/Address** – enter the device IP address/URL or click **Scan >>** to search for devices connected to your network.
 - **FTP User name** – enter the FTP username. By default, the username is set to the default username of the selected device (e.g., for G4k device use ftpuser).

➔ **Note:** Each device has a default FTP username and password that can be changed by the user on the device. If not changed, leave the default.

- **FTP password** – enter the FTP password. By default, the password is set to the default password of the selected device (e.g. for G4K device use ftppassword).
 - **Files source download directory path** – Enter the path to the folder where the files are located. By default, the path is set to the default path of the selected device (e.g., for G4K device it is /CF_UPMB/PQZIPDATA_).
4. Click the **Advanced settings** expand arrow, for limiting the downloaded data to a specific time range.
 - a. Mark the **Start time** checkbox and enter date & time to begin the data acquisition.

- b. Mark the **End time** checkbox and enter date & time to exclude from the data acquisition.
5. Click the **Test** button, to verify the connection with the device.
6. Select the **Download mode** from the dropdown list (**All data/Only events**).
7. Click **Next**, to move to the tag page, where applicable, or click **Finish**, to add the new component

9.4.1 Database (Enterprise edition only)

1. Select and enter the following information:
 - **DB Type** – select the database type in which PQSCADA Sapphire will store your data. PQSCADA Sapphire supports two DB types:
 - ◆ SQLite
 - ◆ MS SQL Server (MSSQL)

If MSSQL was selected, configure the following options:

 - ◆ **DB URL** – enter the DB URL, or click the Browse button, to search for SQL service in your network.
 - ◆ **DB user name** – enter your DB username.
 - ◆ **Password**: enter your DB password.
2. Mark the **Save as default** checkbox to keep these settings as default. You can use set defaults next time to fill in the default settings.
3. Click **Test**, to verify the connection with the DB.
4. Click **Next** to move to the next step.

9.4.2 General

Give the component a name and click **Next**.

9.4.3 Tags

1. Configure the available [tags](#) if tags were configured in the **Instance** configuration.
2. Click **Finish**, to add the new component.

9.5 Attach a Component

An existing previously detached component can be attached to an instance. This may be particularly useful when exchanging processed data with colleagues, or when upgrading to a new computer.

To attach a component:

1. Right-click the instance and select **Attach a component**.
2. Select the **DB type – SQLite**, or **MSSQL** (Enterprise edition only).
 - If **MSSQL** was selected, enter the required connection details and click **Next** to display a list of available components. Mark the **Create component** checkbox next to each component you would like to attach and click **Finish**.
 - If **SQLite** was selected, select **Reattach existing components** and click **Next** to display a list of available components. Mark the **Create component** checkbox of each component you would like to attach and click **Finish**. Alternatively, you can directly import a database file (SQLite extension), and Sapphire will automatically build the required folders structure.

9.6 Detach Component

Detaching a component will remove it from the instance, However, database files and folders structure will remain intact. You can later [reattach](#) the component.

1. Right-click the component that you wish to detach and click **Detach**.
2. Confirm by clicking **Yes**.

9.7 Delete Data from a Component

1. Right-click the component you want to delete data from and select **Delete data from the database in the time range**.
2. In the Delete data from the database in the time range, select the following:
 - **Start time**
 - **End time**
 - Mark the **delete system events (Log)** checkbox to delete the events as well.
3. Click **Delete**.

9.8 Delete Component

Deleting a component will remove all database files and folders structure that is associated with the component. **This action is irreversible.**

1. Right-click the component that you wish to delete and click **Delete**.
2. Confirm by clicking **Yes**.


9.9 Instance Configuration


To change the Instance configuration, click on the Instance object in the **Components** tree. The available configuration tabs, based on the Instance type and the user authentication, are displayed.

9.9.1 Components

The Components tab displays data of all hosted components with statuses of the selected instances.


Components									
General Log									
Drag a column header here to group by that column									
	Connectivity	Name	Device IP/Address	Data acquisition	File processing	Historical data calcul	DB size in use (Mb)		
<input checked="" type="checkbox"/>	▶	●	Elspec Beit-Shean	192.168.10.148	Waiting for data	Waiting for data	Waiting for data	23,925 GB	
<input checked="" type="checkbox"/>	▶	●	Elspec HQ - G4K	82.166.96.72	Waiting for data	Waiting for data	Waiting for data	14,999 GB	
<input checked="" type="checkbox"/>	▶	●	Elspec HQ - G5	82.166.96.67	Waiting for data	Waiting for data	Waiting for data	77,064 GB	
<input checked="" type="checkbox"/>	▶	●	Elspec HQ - Pure88 Dk	82.166.96.71	Fail to connect	Waiting for data	Waiting for data	12,904 GB	
<input checked="" type="checkbox"/>	▶	●	Elspec HQ - Pure88 W	82.166.96.70	Waiting for data	Waiting for data	Waiting for data	66,625 GB	
<input checked="" type="checkbox"/>	▶	●	Elspec North America	50.252.118.169	Waiting for data	Waiting for data	Waiting for data	41,244 GB	
<input checked="" type="checkbox"/>	▶	●	Elspec Portugal	elspecportugal.dyndn	Waiting for data	Waiting for data	Waiting for data	25,17 GB	


Click the **Export**  icon to export the displayed table to an Excel file.

Click the **Column settings**  icon to select what columns to display. The available columns are according to the selected instance.

- **Connectivity** – represented as a color indicator:
 - **Green** – connection to the device is enabled and working.
 - **Red** – connection to the device is enabled but doesn't work.
 - **Gray** – connection to the device is disabled.
- **Name** – the name of the component.
- **Device IP/Address** – the IP address of the device.
- **Data acquisition** – displays the acquisition status of the component:
 - **Waiting for data** – downloading is finished, wait for the next connection attempt.
 - **Scanning folder** – component scans for new files in the device.
 - **Downloading** – percentage indication of the current file downloading progress.
 - **Disabled** – downloading is disabled.
 - **Fail to connect** – communication error.
- **Files processing** – displays the status of the component file processing.
- **Historical data calculation** – displays the status of the historical data calculation process.
- **DB size in use** – shows the DB size of the component.
- **Product serial**
- **HW version**
- **Site name**
- **Company name**

- **User name**
- **Product name**
- **DB type** – SQLite or MSSQL
- **Component type**
- **ID**
- **City**
- **Data availability** – the percentage of the available data (from the total), as set under client settings.




Click the expand  icon to the left of the component to display more information about the component.

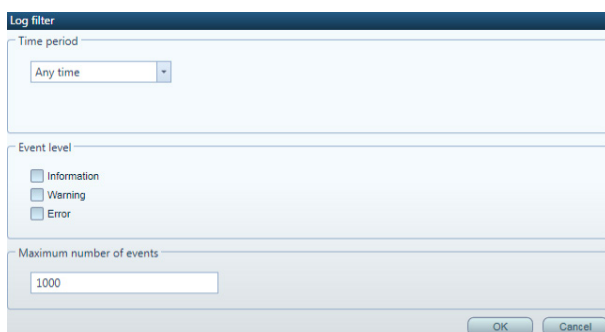
Click the **Edit**  icon to the left of the component to show the basic configuration of the component and to select if to enable data acquisition, file process, historical data calculation.

9.9.2 Log

The Log tab displays specific information related to log entries.

Components	Log	General	Data acquisition and processing	Power quality	Database	Tags	Unit configuration	Energy	Query settings
Drag a column header here to group by that column									
ID	Date and Time	Type	Generated by	Description	Server/Compos...	Server/Compos...			
5558	27/02/2020 18:07:54.704	Information	PQ Server	Finished to calculate...	ELSPEC Demo	1698a66c-0f5c-4b83...			
5557	27/02/2020 18:04:41.188	Warning	PQ Server	Power Quality...	ELSPEC Demo	1698a66c-0f5c-4b83...			
5556	27/02/2020 18:03:34.081	Warning	PQ Server	Power Quality...	ELSPEC Demo	1698a66c-0f5c-4b83...			
5555	27/02/2020 18:00:49.016	Information	PQ Server	Finished process file	ELSPEC Demo	1698a66c-0f5c-4b83...			
5553	27/02/2020 17:08:15.908	Information	PQ Server	Finished to calculate...	ELSPEC Demo	1698a66c-0f5c-4b83...			
5552	27/02/2020 17:05:26.571	Warning	PQ Server	Power Quality...	ELSPEC Demo	1698a66c-0f5c-4b83...			
5551	27/02/2020 17:04:48.973	Warning	PQ Server	Power Quality...	ELSPEC Demo	1698a66c-0f5c-4b83...			
5550	27/02/2020 17:02:25.998	Information	PQ Server	Finished process file	ELSPEC Demo	1698a66c-0f5c-4b83...			
5549	27/02/2020 16:49:10.353	Information	admin	Configuration...	ELSPEC Demo	1698a66c-0f5c-4b83...			
5548	27/02/2020 16:07:30.426	Information	PQ Server	Finished to calculate...	ELSPEC Demo	1698a66c-0f5c-4b83...			
5547	27/02/2020 16:04:31.393	Warning	PQ Server	Power Quality...	ELSPEC Demo	1698a66c-0f5c-4b83...			
5546	27/02/2020 16:02:13.857	Information	PQ Server	Finished process file	ELSPEC Demo	1698a66c-0f5c-4b83...			
5544	27/02/2020 15:06:39.448	Information	PQ Server	Finished to calculate...	ELSPEC Demo	1698a66c-0f5c-4b83...			
5543	27/02/2020 15:03:41.335	Warning	PQ Server	Power Quality...	ELSPEC Demo	1698a66c-0f5c-4b83...			
5542	27/02/2020 15:01:36.048	Information	PQ Server	Finished process file	ELSPEC Demo	1698a66c-0f5c-4b83...			
5541	27/02/2020 14:38:31.409	Error	PQ Server	Fail to connect the...	ELSPEC Demo	1698a66c-0f5c-4b83...			
5540	27/02/2020 14:06:03.869	Information	PQ Server	Finished to calculate...	ELSPEC Demo	1698a66c-0f5c-4b83...			
5539	27/02/2020 14:02:58.334	Warning	PQ Server	Power Quality...	ELSPEC Demo	1698a66c-0f5c-4b83...			
5538	27/02/2020 14:00:38.277	Information	PQ Server	Finished process file	ELSPEC Demo	1698a66c-0f5c-4b83...			
5537	27/02/2020 13:51:42.642	Error	PQ Server	Fail to connect the...	ELSPEC Demo	1698a66c-0f5c-4b83...			
5536	27/02/2020 13:06:45.855	Information	PQ Server	Finished to calculate...	ELSPEC Demo	1698a66c-0f5c-4b83...			
5535	27/02/2020 13:03:44.307	Warning	PQ Server	Power Quality...	ELSPEC Demo	1698a66c-0f5c-4b83...			
5534	27/02/2020 13:01:31.592	Information	PQ Server	Finished process file	ELSPEC Demo	1698a66c-0f5c-4b83...			
5533	27/02/2020 12:06:41.647	Information	PQ Server	Finished to calculate...	ELSPEC Demo	1698a66c-0f5c-4b83...			
5532	27/02/2020 12:03:20.026	Warning	PQ Server	Power Quality...	ELSPEC Demo	1698a66c-0f5c-4b83...			
5531	27/02/2020 12:01:10.948	Information	PQ Server	Finished process file	ELSPEC Demo	1698a66c-0f5c-4b83...			
Event ID: 5558 Generated by: PQ Server Date and Time: 27/02/2020 18:07:54.704 Details:									

- To refresh the log entries, click the **Refresh log**  icon on the top right corner of the main screen.
- To export the log entries, click the **Export to CSV**  icon on the top right of the main screen
- To narrow down the view click the **Log filter**  icon on the top right corner of the main view. The **Log filter** window is displayed.



In the Log filter menu, do the following:

- a. Select the **Time period**.
- b. Select the **Event level**:
 - ◆ **Information** – includes general information on actions taken in PQSCADA Sapphire.
 - ◆ **Warning** – includes malfunctions that the PQSCADA Sapphire will resolve by itself.
 - ◆ **Error** – Includes malfunctions that the PQSCADA Sapphire was unable to resolve (e.g., failed Tasks due to an incorrect E-Mail address).
- c. Enter the **Maximum number of events** to be displayed.
- d. Click **OK**.

9.9.3 General

The General tab includes the following information for the selected Instance:

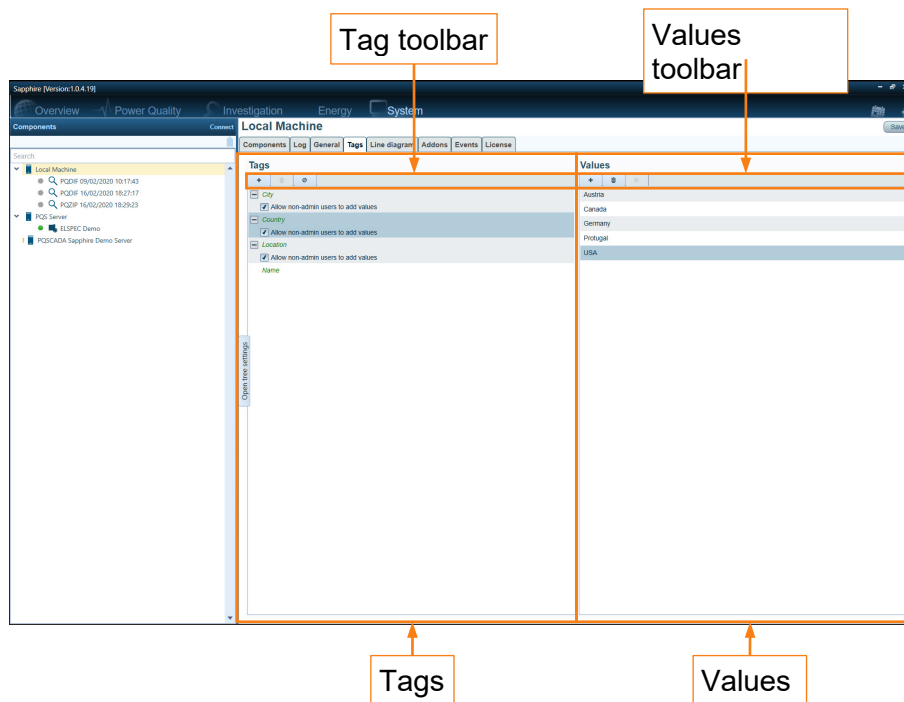
- **Name**
- **Server version**
- **Server URL**
- **Server ID**
- **Session timeout in hours**

To change the Instance name:

1. Type the Instance name in the **Name** text box.
2. Click the **Save** button to apply changes.


9.9.4 Tags

Tags in PQSCADA Sapphire are used to organize and group components. Components may be assigned to several different tags and vice-versa.




The Tags tab is divided into two sections – the left section displays a list of enabled tags, and the right section displays the values of each of those tags, while selected.

To enable tags:

1. Click **Add**  icon in the **Tags** toolbar to open the **Tag selection** window.
2. Mark the Tag checkboxes to enable.
3. Click **Add** to save and close the **Tag selection** window.
4. Click **Save** to apply the changes.


To disable tags:

1. Click the Tag you wish to disable.
2. Click the **Cancel**  icon in the Tags toolbar.
3. Click **Save** to apply the changes.


9.9.4.1 Configure a Tag

The tag includes a Name, Description, and a list of values. The tag values can be either a closed list, editable by the system admin only, or an open list editable by any user.



To set the tag list as open/closed:

1. Click the  icon next to the Tag name to expand the tag row.
2. Mark the **Allow non-admin users to add values** checkbox.
3. Click **Save** to apply changes.


To add values to a tag:

1. Click the **Add**  icon in the **Values** toolbar. The Tag value addition window will pop-up.
2. Enter the new value in the text box.
3. Click **OK**.
4. Click **Save** to apply the changes.

9.9.4.2 Add New Tag


1. Click the **Add**  icon in the **Tags** toolbar, to open the **Tag selection** window.
2. Click **Create tag** to display the **New tag configuration** data.
3. In the New tag configuration window, enter the following data:
 - **Name** – the name for the new tag.
 - **Description** – a description of the added tag.
 - Mark the checkbox if to **Allow non-admin users to add values**.
 - Type tag values in the text box and click **Add value**. They appear in the Values field and can be deleted by clicking the **Cancel**  icon.
 - Click **Add** to add the new tags to the tags list.
 - Click **Save** to apply changes.

9.9.4.3 Apply Tags to the Component Tree

1. Click on the **Open tree setting** button, located on the splitter control.
2. Select the Instance to apply the Tags on.
3. Mark the **Show tags** checkbox to enable Tags.
4. Mark the Tags checkboxes you want to display in the **Components** tree. A list of the selected tags will be displayed in the bottom part of the **Server and component tree setting** pane. By default, the tag hierarchy is set according to the selection order.
5. To filter tag values, click on the expand icon  next to the tag checkbox and uncheck the values to be filtered.
6. To change tags hierarchy, drag and drop tags (up or down) in the **Selected tag hierarchy** section.

9.9.5 Line Diagram


Line diagrams of Instances can be added.

1. Click the **Add**  icon on the upper left corner of the Instance section.
The Add line diagram window appears.
2. Click **Browse** to find the line diagram (AutoCAD DXF and DWG vector files).
3. Click **Upload**. The drawing is added.
4. Repeat to add more diagrams.


9.9.6 Secondary Servers (Enterprise edition only)

PQSCADA Sapphire allows the administrator to organize networked servers into a hierarchy. PQSCADA Sapphire servers are united into a master server – the secondary server hierarchy. Each PQSCADA Sapphire server can have more than one secondary server within a hierarchy.

9.9.6.1 Add Secondary Servers

1. Select the Secondary servers tab.
2. Click the **Add**  icon in the, to open the **Add Server** configuration window.
3. In the Add Server configuration window, do the following:
 - **Server Address** – select the server URL. Click Scan to search for active servers on your network.
 - **Authentication** – select the authentication provider.
 - **User name** – enter the Admin username.
 - **Password** – enter the Admin password.
4. Click **Add**.

To remove a Secondary Server:

1. Select the server you wish to remove from the **Secondary servers** table.
2. Click the **Delete**  icon to remove the secondary server.

9.9.7 Add-ons

PQSCADA Sapphire is a modular software enabling the user to extend the PQSCADA Sapphire capabilities to meet any application and/or requirement.


The PQSCADA Sapphire supports the following add-on extensions types:

- **Gateway** (Professional and Enterprise edition only): designed to extend PQSCADA Sapphire communication options. Modbus and IEC 61850 gateways are already implemented, and they are part of the professional and enterprise edition package.
- **Converter**: designed to extend PQSCADA Sapphire importing options. COMTRADE and PQDIF converters are already implemented and they are part of the PQSCADA Sapphire package for all editions.
- **Tasks**: designed to extend PQSCADA Sapphire's capabilities of reporting, exporting, and controlling. Various tasks were already implemented and part of the PQSCADA Sapphire package depends on the license edition.

The **Addons** tab displays a list of the installed add-ons in the Instance.

Addon name	Addon type	Addon status	Version	
PQDIF Converter	Converter	Valid	1.0.0.10	Uninstall
COMTRADE Conver...	Converter	Valid	1.0.0.13	Uninstall
Dewetron Gateway	Gateway	Valid	1.0.0.3	Uninstall
Modbus Gateway	Gateway	Valid	1.0.0.0	Uninstall
Elcom Gateway	Gateway	Valid	1.0.0.0	Uninstall
PQZ Gateway	Gateway	Valid	1.0.0.1	Uninstall
IEC61850 Gateway	Gateway	Valid	1.0.0.0	Uninstall
Notification	Task	Valid	1.0.0.5	Uninstall
Export PQDIF	Task	Valid	1.0.0.17	Uninstall
Export PQZ	Task	Valid	1.0.0.18	Uninstall
Export Excel	Task	Valid	1.0.0.31	Uninstall
NRS Report	Task	Valid	1.0.0.27	Uninstall
IEEE519Consumers...	Task	Valid	1.0.0.17	Uninstall
Export Comtrade	Task	Valid	1.0.0.19	Uninstall
Generic Report	Task	Valid	1.0.0.2	Uninstall
Export CSV	Task	Valid	1.0.0.12	Uninstall
EN50160 Report	Task	Valid	1.0.0.27	Uninstall
FOCT 32144-2013...	Task	Valid	1.0.0.17	Uninstall
Digital Event Notifi...	Task	Valid	1.0.0.1	Uninstall

9.9.7.1 Install a New Add-On

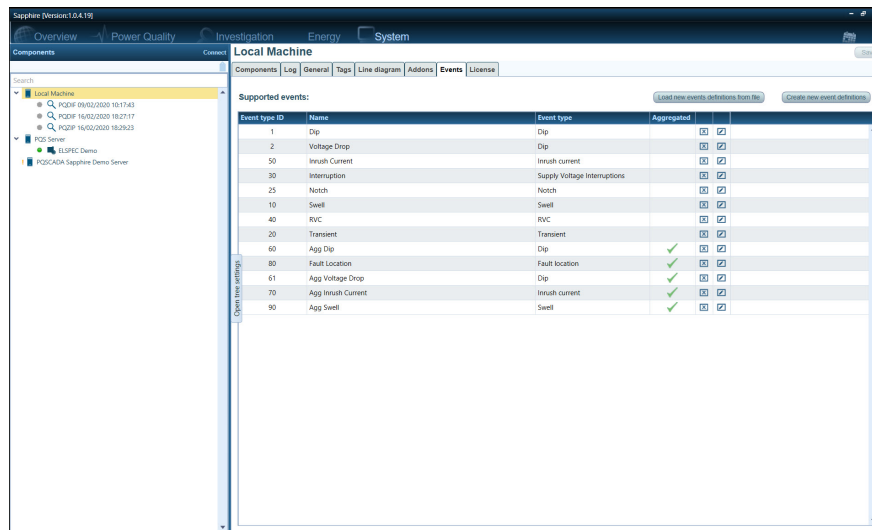
1. Click the **Install Addon** button at the upper right corner.
2. Click the **browse**  icon to open Windows Explorer.
3. Select the Addon installation files and wait for validation.
4. Click **Install addon** to start the installation.
5. Click **Close** to close the Install add-on window.

To uninstall an Addon

1. Click the **Uninstall** button from the addons table.
2. Click **Yes** in the **Uninstall addon** pop-up window.
3. Click **Close** to close the Uninstall addon pop-up window.

9.9.8 Events

The Events tab displays a list of all the Supported events for the Instance.



- New events definitions can be loaded from a file by clicking **Load new events definitions from file**.
- New event definitions can be created by clicking **Create new event definitions** to launch the **Create new event** wizard.

When creating a new event, the event type can be defined as an **Aggregated** event that combines configurations (to combine up to 4 event types).

➔ **Note:** To assign an event to a component, go to [Events](#) configuration under the [Power Quality tab](#) on the component configuration.

9.9.8.1 Create a New Dip Event

1. On the Event type page, select **Dip**.
2. Click **Next** to go to the Event configuration page.
3. On the Event configuration window, configure the following options:
 - **Event name** – type the event name.
 - **User tag** – used to distinguish between events of the same type.
 - **Threshold [% of Ref]** – defines the trigger level limit that starts the event (percentages of the reference nominal).
 - **Hysteresis [% of Ref]** – defines the end event limit in the percentage of nominal. End event limit = Thresholds + Hysteresis.
 - **Cancel [% of Ref]** – defines the limit in which an event will be canceled.
 - **Min. duration [ms]** – defines the time length (in milliseconds) a parameter may pass out of bounds without failing.
 - **Max. duration [ms]** – defines the maximum time allowed (in milliseconds) for an event to be active before it is canceled.
4. Click **Finish** to save changes.

➔ **Note:** A Dip event is automatically assigned to all voltage channels in the component, according to the configured feeder topology.

9.9.8.2 Create a New Swell Event

1. On the Event type page, select **Swell**.
2. Click **Next** to go to the Event configuration page.
3. On the Event configuration window, configure the following options:
 - **Event name** – type the event name.
 - **User tag** – used to distinguish between events of the same type.
 - **Threshold [% of Ref]** – defines the trigger level limit that starts the event (percentages of the reference nominal).
 - **Hysteresis [% of Ref]** – defines the end event limit in the percentage of nominal. End event limit = Thresholds + Hysteresis.
 - **Cancel [% of Ref]** – defines the limit in which an event will be canceled
 - **Min. duration [ms]** – defines the time length (in milliseconds) a parameter may pass out of bounds without failing.
 - **Max. duration [ms]** – defines the maximum time allowed (in milliseconds) for an event to be active before it is canceled.
4. Click **Finish** to save changes.



Note: A Swell event is automatically assigned to all voltage channels in the component, according to the configured feeder topology.

9.9.8.3 Create a New Supply Voltage Interruption Event


1. On the Event type page, select **Interruption**.
2. Click **Next** to go to the Event configuration page.
3. On the Event configuration window, configure the following options:
 - **Event name** – type the event name.
 - **User tag** – used to distinguish between events of the same type.
 - **Threshold [% of Ref]** – defines the trigger level limit that starts the event (percentages of the reference nominal).
 - **Hysteresis [% of Ref]** – defines the end event limit in the percentage of nominal. End event limit = Thresholds + Hysteresis.
 - **Cancel [% of Ref]** – defines the limit in which an event will be canceled
 - **Min. duration [ms]** – defines the time length (in milliseconds) a parameter may pass out of bounds without failing.
 - **Max. duration [ms]** – defines the maximum time allowed (in milliseconds) for an event to be active before it is canceled.
4. Click **Finish** to save changes.



Note: An Interruption event is automatically assigned to all voltage channels in the component, according to the configured feeder topology.


9.9.8.4 Create New RVC Event

1. On the Event type page, select **RVC**.
2. Click **Next** to go to the Event configuration page.
3. On the Event configuration window, configure the following options:
 - **Event name** – type the event name.
 - **User tag** – used to distinguish between events of the same type.
 - **Threshold [% of Ref]** – An RMS voltage is in a steady-state condition if all 1/2 cycle 100/120 RMS values (50/60 Hz respectively) remain within the RVC threshold from the average of those 100/120 RMS values. The RVC threshold is set by the user as a percentage of Nominal.
 - **End Threshold [% of Ref]** – define the end event limit.
 - **Cancel Dip [% of Ref]** – defines the lower limit to cancel an event.
 - **Cancel Swell [% of Ref]** – defines the upper limit to cancel an event.
 - **Delta steady-state [%]** – define the maximum allowed difference between two steady-state conditions. Leave 0 to disable this condition.
4. Click **Finish** to save changes.

 **Note:** RVC event is automatically assigned to all voltage channels in the component, according to the configured feeder topology.

9.9.8.5 Create a New Transient event

1. On the Event type page, select **Transient**.
2. Click **Next** to go to the Event configuration page.
1. On the Event configuration window, configure the following options:
 - **Transient type** – select Transient or Notch.
 - **Event name** – type the event name here.
 - **User tag** – user tag is used to distinguish between events of the same type.
 - **Envelope [% of Ref]** – Transient event triggered when the measured waveform crosses a virtual envelope. Envelope size defined in percentage from the nominal waveform peak.
 - **Max duration [ms]** – if a parameter stays in an event condition longer than the configured Max duration, the event will be canceled.
2. Click **Finish** to save changes.

 **Notes:** The Transient event is automatically assigned to all voltage channels in the component, according to the configured feeder topology.

9.9.8.6 Create a new Custom Event

1. On the Event type page, select **Custom event**.
2. Click **Next** to go to the General page.
3. On the General page, configure the following options:
 - **Event name**
 - **User tag**
 - **Min duration [ms]**
 - **Min duration [ms]**
4. Click **Next** to go to the Activate page.
5. On the Activate page do the following:
 - a. Click the **Parameter A** button. The **Select parameter** window opens. Select a **Parameter**.
 - b. Select an operator from the dropdown list, a number, and a **% or +** from the dropdown menu.
 - c. Select if from **Nominal, Previous sample, or Average**.
 - d. According to the selection, enter the **Min duration value [ms]** and the **Number of samples for average reference**.
6. Click **Next** to open the Deactivate page.
7. On the Deactivate page repeat the steps as in the Activate page.
8. Click **Next** to open the Cancel page.
9. On the Cancel page, either mark the **Enable cancelation** checkbox and enter values as in the above or leave unchecked to disable cancelation.
10. Click **Finish** to save changes.

9.9.8.7 Create an Aggregated Event

1. On the Event type page, select **Aggregated event**.
2. Click **Next** to go to the Aggregated event configuration page.
3. On the Event configuration window, configure the following options:
 - **Event name** – type a name for the event.
 - Select the Logic operator between events (And/Not/Or).
 - Select the event type from the dropdown list.
4. Mark if to **Match groups**.

The selected power topology rules the usage of phase to neutral or phase to phase parameters. Therefore, if not checked, an event will be triggered, for example, when there is a dip on V1N and swell in V12 (differential channel). When **Match groups** is marked, it will trigger an event only when the configured events are from the same topology group (V12, V23, V31 or V1N, V2N, V3N).
5. Click **Finish** to save changes.

9.9.9 License

Displays the license type, expiration date, issued to, and License ID.

9.9.10 Server Communication (Enterprise edition only)

Displays the Protocol type and port. For the https protocol, it also displays the Certificate.

- **HTTP** – for unsecured communication. By default, PQSCADA Sapphire service binds to port 80. If port 80 is already in use, the service automatically falls back to port 8080 and then to port 8081. The port can be manually configured in the HTTP port field.
- **HTTPS** – for secured communication. By default, PQSCADA Sapphire service binds to port 443. If port 443 is already in use, the port can be manually configured in the HTTPS port field. A valid certificate must be installed on the server machine and selected in the Certificate field.

9.9.11 E-mail Configuration (Enterprise edition only)

1. Enter the following configurations according to your SMTP server:
 - **SMTP gateway** – enter the SMTP server hostname or IP address.
 - **SMTP port** – enter the SMTP server port.
If the SMTP server requires authentication:
 - ◆ **Username** – the email username
 - ◆ **Password** – the email password.
 - **From** – email source (example: John@yourdomain.com).
 - **Enable SSL** – mark if your SMTP server requires encryption.
 - **Allow attachments** – mark to allow PQSCADA to attach files to emails.
2. Enter an **email address** and click **Test email configuration**.
3. Click **Save**, to apply changes.

9.9.12 SMS Configuration (Enterprise edition only)

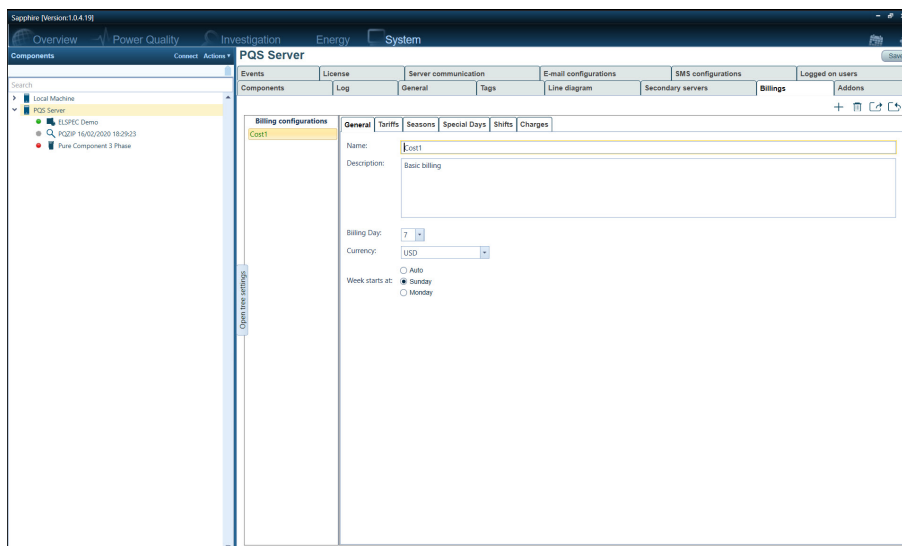
1. Enter the following configuration according to your modem:
 - **Modem port** – the serial com port to which your modem is connected.
 - **Baud rate** – the Baud rate supported by your modem.
 - **Data bits** – the number of bits per one character of data supported by your modem.
 - **Parity** – the number of check bits supported by your modem.
 - **Flow control** – the flow control supported by your modem.
 - **Send attempts** – number of times PQSCADA Sapphire will send the SMS before failure.
2. Enter a **phone number** and click **Test SMS configurations**.
3. Click **Save**, to apply changes.

9.9.13 Logged-On Users (Enterprise edition only)


Displays a list of currently logged on users.

9.9.14 Billings

The Billing tab enables adding and configuring different electricity consumption billing methods and charges for use by the PQSCADA Energy module.



To add a new billing:

1. Click the **Add new Billing**  icon.
2. Give a **Name** to the added billing in the TOU Configuration Name pop-up.
3. Added billings are displayed in the **Billing configurations** pane.

9.9.14.1 General

1. If required, modify the billing **Name**.
2. Add a **Description**.
3. Select the **Billing Day** of the month from the dropdown list (1–28).
4. Select the **Currency** from the dropdown list.
5. Select the **Week start at** to select the day the week starts.


9.9.14.2 Tariffs


Different tariffs can be configured for a single billing configuration. The tariffs can include past/future Tariff changes.

1. Give the tariff a **Name**.
2. Select the **Units** (\$ or %).
3. Select the **Color** for the tariff.
4. Select the **Start date**.
5. Type the value (price) for the **Tariff**.


6. Click the **Add**  icon within the created tariff to add more tariffs under the same Tariff name (different Start date and/or Tariff).
7. Click the **Add**  icon of the Tariff tab to add and configure more tariffs with different names.
8. To delete a tariff, click the **Delete**  icon (in the tariff or the Tariffs tab).

9.9.14.3 Seasons

1. Give a Name for the season.
2. Configure the Start Day by selecting the day and month or by defining the starting day.
3. Configure the End Day by selecting the day and month or by defining the starting day.
4. Click the **Add**  icon to add and configure more seasons.



To delete a created season, select it and click the **Delete**  icon.


9.9.14.4 Special Days

1. Give a Name for the special days.
2. Configure the Start Day and the End Day for the special days. The days can be configured by date (day and month) or by selecting an appearance (First/Second/Third/Fourth/Last) of a day in a month.
3. Click the **Add**  icon to add more special days.


To delete a created special day, select it and click the **Delete**  icon.

9.9.14.5 Shifts

1. Click the **Add**  icon to add shifts (note that their total duration cannot exceed 24 hours).
2. Configure the Shifts (**Name**, **Start** time, **Duration**, and **Color**).
Edit the shift duration before editing its Start time.
3. Click the **Add**  icon to add more shifts.

To delete a created shift, select the shift and click the **Delete**  icon.

9.9.14.6 Charges



1. Click the expand  icon to show the fields to edit.
2. Give a Name to the charges.
3. Select the **Charge Type** from the dropdown list. The parameters and fields change according to the selected Charge Type.


9.9.14.6.1 Consumption

Charges are based on energy consumption.

1. Select the **Units** from the dropdown list.
2. Select the **Calculation method** from the dropdown list:
 - **TOU** – Time of Use. This is a rate plan in which rates vary according to the time of day, season, and day type (weekday or weekend/holiday). Higher rates are charged during the peak demand hours and lower rates during off-peak (low) demand hours. This rate structure provides price signals to energy users to shift energy use from peak hours to off-peak hours. The example below shows the pricing for an illustrative time-of-use rate plan. Red indicates high price periods (On-Peak), yellow indicates moderate price periods (Mid-Peak), and green indicates low price periods (Off Peak).

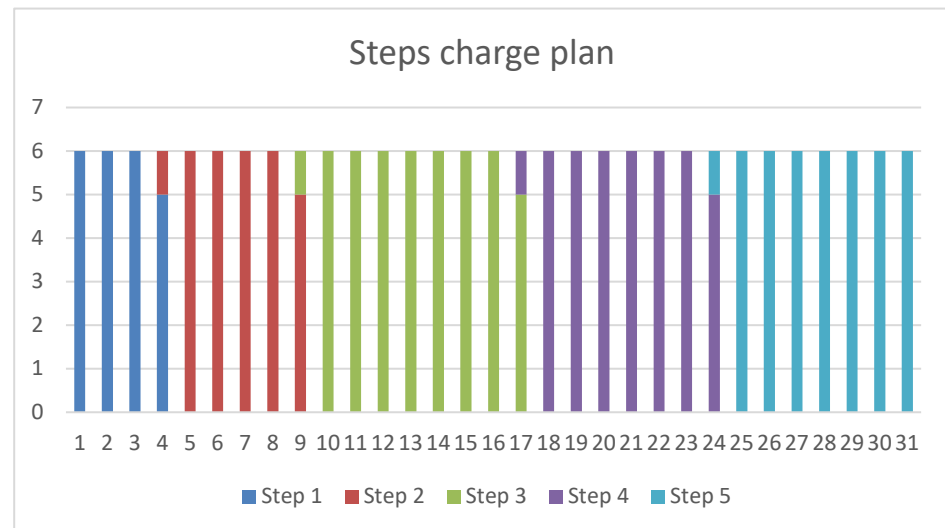
Time of day	Weekdays	Weekends	Special days\ Holydays
00:00 – 06:00	Off-Peak	Off-Peak	Off-Peak
06:00 – 17:00	Mid-peak	Off-Peak	Off-Peak
17:00 – 21:00	On-Peak	Off-Peak	Off-Peak
21:00 – 00:00	Mid-peak	Off-Peak	Off-Peak

- i. Add **Seasons** (see section 9.9.14.3):
 - ❖ Select the **Season** from the dropdown list (see section 9.9.14.3).
 - ❖ Select the **Week Structure** from the dropdown list.
 - ❖ Double-clicking a Week Structure opens a floating window to **Add a New Day Structure** (**Start** time and **Tariff** from the dropdown list), with the option to save as a template.
- ii. Add **Special days** from the dropdown list (see section 9.9.14.4).
 - ❖ Double-clicking a Week Structure opens a floating window to **Add a New Day Structure** (**Start** time and **Tariff** from the dropdown list), with the option to save as a template.
- **Steps** – This is a rate plan in which rates vary according to predetermined steps of consumption. When using only the Steps rate plan, there is no need to define Seasons, Special days, and Shifts.
 - i. Edit the first step (**From**, **To**) and select the **Tariff** (created in the Tariffs tab, see section 9.9.14.2) for the step.
 - ii. Click the **Add**  icon to add more steps.
 - To delete a created step, select it and click the **Delete**  icon.

The created Steps can be saved as a template by clicking the **Save as template**  icon.


The example below shows the pricing for an illustrative Steps rate plan.


Each step represents the measured kWh in the precondition rate limits. The 1st step represents the charge price for each kWh between 0–23, 2nd for each kWh between 23–53, 3rd for each kWh between 53–101, 4th for each kWh between 101–143, and the 5th for each kWh from 143 to 186.




9.9.14.6.2 Demand

Charges applied to the electric bills of commercial and industrial customers, based on the highest amount of power demand during any (typically 15-minute) interval during the billing period.

1. Select the **Units** from the dropdown list.
2. Select the **Demand Calculation**- Current.
3. Edit the first step (**From, To**) and select the **Tariff** (created in the Tariffs tab, see section 9.9.14.2) for the step.
4. Click the **Add**  icon to add more steps.

To delete a created step, select it and click the **Delete**  icon.

The created Steps can be saved as a template by clicking the **Save as template**  icon.

9.9.14.6.3 Fix

A type of charge. The Fix charge type can be used as a monthly "subscription fee" or can be used to create a refund or any other type of a fixed value charge.

1. Select a **Tariff** from the dropdown list (see section 9.9.14.2).
2. Select the **Demand calculation** duration (**Day, Month**) for the fixed cost.

9.9.14.6.4 Tax

A type of charge that is usually added to one off the above rate plans. With this charge, you can add the required taxes to the billing (e.g., VAT).

Select a **Tariff** from the dropdown list (see section 9.9.14.2).

9.9.14.6.5 Penalties

A type of charge that is usually added to one off the above rate plans, as a penalty if the set charge values are exceeded.

1. Select the Penalty parameter from the dropdown list.

- **Consumption**

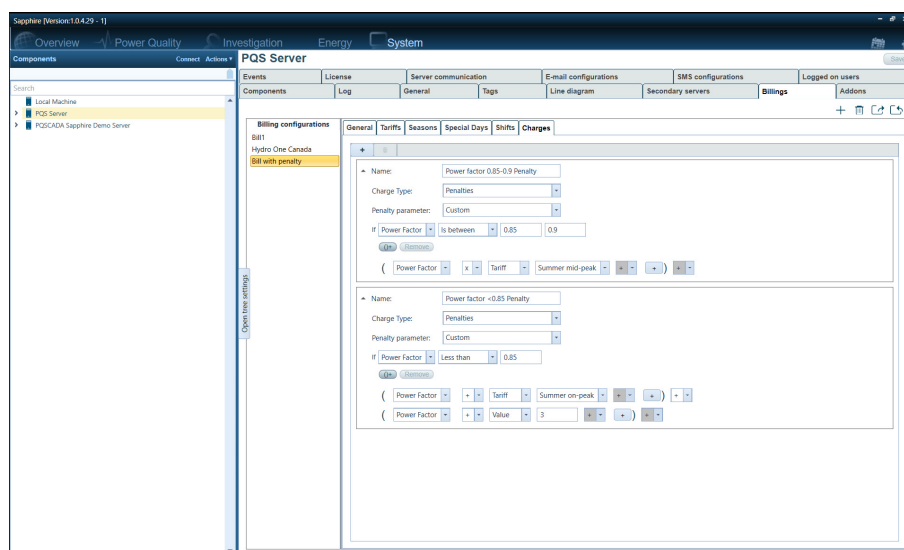
- i. Select the **Units** from the dropdown list.
- ii. Select a **Tariff** from the dropdown list (see section 9.9.14.2).
- iii. Define the consumption **From** and **To** values.


- **Demand**

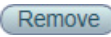
- i. Select the **Units** from the dropdown list.
- ii. Select a **Tariff** from the dropdown list (see section 9.9.14.2).
- iii. Define the consumption **From** and **To** values.

- **Custom**


Define the logic and formula for a custom penalty.



Formulas can be extended by clicking the **bracket**  icon.



To remove the formula extension, either right-click the extension line and click **Remove** or click the line and click the **Remove**  button.

9.9.14.6.6 Add Charges


Click the **Add**  icon to add and configure additional Charges.

9.9.14.6.7 Export and Import Billings

Created billings can be exported and imported.

- To export a billing, click the **Export Billing**  icon. The browser opens to select the name and location for saving the exported billing.
- To import a billing, click the **Import Billing**  icon. The browser opens to select the billing to import.

9.9.14.7 Remove Billings

1. Select the Billing configuration to delete.
2. Click the **Remove Billing**  icon.

9.10 Component Configuration

A Component is a logical representation of a physical device – a set of configuration parameters that are defined in two XML files:


- **Common** – set of configurations that apply to all component types (e.g., component name).
- **Specific** – set of configurations that apply to a specific component type (e.g., a device IP address, which is a specific configuration parameter for components that support LAN communication).

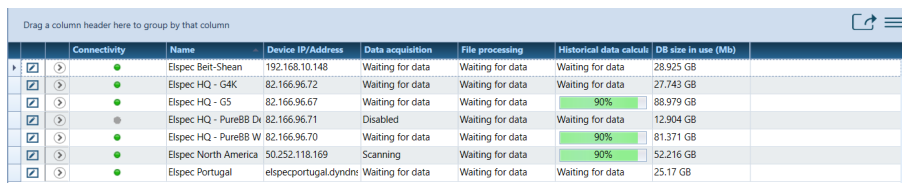
The configuration parameters are connected to a component configuration tab in the PQSCADA Sapphire (e.g., General, Data acquisition and processing, etc.). Therefore, different component types include different configuration parameters and different configuration tabs.

To view/modify the components configuration, click on the component object in the **Components** tree. The available configuration tabs are based on the component type and on user authentication.

9.10.1 Component

The component tab display general statuses of the selected component:


The following screenshot shows the commonly used columns. More or other columns can be displayed by clicking the **Column setting**  icon and marking the required columns to display.



	Connectivity	Name	Device IP/Address	Data acquisition	File processing	Historical data calcul	DB size in use (Mb)
<input checked="" type="checkbox"/>	●	Elspec Beit-Shean	192.168.10.148	Waiting for data	Waiting for data	Waiting for data	28.925 GB
<input checked="" type="checkbox"/>	●	Elspec HQ - G4K	82.166.96.72	Waiting for data	Waiting for data	Waiting for data	27.743 GB
<input checked="" type="checkbox"/>	●	Elspec HQ - G5	82.166.96.67	Waiting for data	Waiting for data	<div style="width: 90%; background-color: green;">90%</div>	88.979 GB
<input checked="" type="checkbox"/>	●	Elspec HQ - PureBB Di	82.166.96.71	Disabled	Waiting for data	Waiting for data	12.904 GB
<input checked="" type="checkbox"/>	●	Elspec HQ - PureBB W	82.166.96.70	Waiting for data	Waiting for data	<div style="width: 90%; background-color: green;">90%</div>	81.371 GB
<input checked="" type="checkbox"/>	●	Elspec North America	50.252.118.169	Scanning	Waiting for data	<div style="width: 90%; background-color: green;">90%</div>	52.216 GB
<input checked="" type="checkbox"/>	●	Elspec Portugal	elspecportugal.dyndns	Waiting for data	Waiting for data	Waiting for data	25.17 GB

- **Connectivity** – represented as a color indicator:
 - Green – connection to the device is enabled and working.
 - Red – connection to the device is enabled but does not work.
 - Gray – connection to the device is disabled.
- **Name** – the name of the component.
- **Device IP/Address** – the IP address of the device.
- **Data acquisition** – this column shows the acquisition status of the component:
 - **Waiting for data** – downloading is finished, wait for the next connection attempt.
 - **Scanning folder** – the component scans for new files in the device.
 - **Downloading** – the percentage indication of the current file downloading progress
 - **Disabled** – downloading is disabled.
 - **Failed to connect** – communication error.

- **Files processing** – this column shows the status of the file processing of the component.
- **Historical data calculation** – this column shows the status of the historical data calculation process.
- **DB size in use** – this column shows the DB size of the component.


Click the expand icon  to expand the table for more information.

Connectivity	Component name	Device IP	Data acquisition	File processing	Historical data calcul	Database usage
	Elspec Beit-Shean	192.168.10.95	Waiting for data	Waiting for data	Waiting for data	12.543 GB
<p>Component name Elspec Beit-Shean</p> <p>Device IP 192.168.10.95</p> <p>Downloading rate</p> <p>Currently processed file FF_7F0F49_20161226_131500_310_300_4PQZip</p> <p>Files to process 0</p> <p>Estimated historical data calculation time</p> <p>Binary start time 08/05/2016 14:42:54</p> <p>Binary end time 26/12/2016 15:20:00</p> <p>Historical start time 08/05/2016 14:42:00</p> <p>Historical end time 26/12/2016 15:20:00</p> <p>Historical data calculation state Idle</p> <p>Limit DB size (Mb) No limits</p> <p>License DB limit duration (month) No limits</p> <p>Disk free size (Mb) 260582</p>						

9.10.2 Log


The Log tab enables seeing specific information related to log entries.

ID	Date and Time	Type	Generated by	Description	Server/Compone...	Server/Compone...
5250	23/02/2020 10:15:23.504	Information	PQ Server	Finished to calculate...	ELSPEC Demo	1698a6fc-0f5c-4b83...
5249	23/02/2020 10:13:25.867	Warning	PQ Server	Power Quality...	ELSPEC Demo	1698a6fc-0f5c-4b83...
5248	23/02/2020 10:12:50.432	Warning	PQ Server	Power Quality...	ELSPEC Demo	1698a6fc-0f5c-4b83...
5247	23/02/2020 10:12:16.091	Warning	PQ Server	Power Quality...	ELSPEC Demo	1698a6fc-0f5c-4b83...
5246	23/02/2020 10:11:39.831	Warning	PQ Server	Power Quality...	ELSPEC Demo	1698a6fc-0f5c-4b83...
5243	23/02/2020 10:01:11.605	Information	PQ Server	Finished process file	ELSPEC Demo	1698a6fc-0f5c-4b83...
5242	23/02/2020 09:51:28.991	Information	PQ Server	Finished process file	ELSPEC Demo	1698a6fc-0f5c-4b83...
5241	23/02/2020 09:51:11.251	Information	PQ Server	Finished process file	ELSPEC Demo	1698a6fc-0f5c-4b83...
5240	23/02/2020 09:50:57.224	Information	PQ Server	Finished process file	ELSPEC Demo	1698a6fc-0f5c-4b83...
5239	23/02/2020 09:50:34.454	Information	PQ Server	Finished process file	ELSPEC Demo	1698a6fc-0f5c-4b83...

To narrow down your view, click **Tool**  icon at the upper right of the main view area to set a filter to the log.

Log filter

Time period

Any time 

Event level

Information

Warning


Error

Maximum number of events

1000

OK Cancel

1. In the Log filter menu, select the following:
 - **Time period**
 - **Event level:**
 - ◆ **Information** – includes general information on actions taken in PQSCADA Sapphire.

- ◆ **Warning** – includes any malfunction- that the PQSCADA Sapphire will resolve by itself.
 - ◆ **Error** – Includes malfunctions that the PQSCADA Sapphire was unable to resolve. For example, failed Tasks due to an incorrect email address.
2. Select the **Maximum number of events** to be displayed.
 3. Click **OK**.
 4. To refresh the **Log** entries, click the **Refresh**  icon.

9.10.3 General

The Component General tab includes editable fields and informative fields. The available fields vary according to the component.

- **Component type** – informative only.
- **Name** – the component name. By default, the investigation component name is set as the date & time of the component creation.
- **ID** – each component has a unique ID provided by PQSCADA Sapphire (Informative only).
- **Use custom time zone** – mark the checkbox to select a time zone from the dropdown list. The default time is that of the operating system.
- **Geographic coordinates** – enter the geographic coordinates for the correct display on the map.
- **Product name** – the name of the product (informative only).
- **Product serial** – product serial no. of the physical device (Informative only).
- **Site name** – the name of the site (informative only).
- **HW version** – HW version of the physical device (Informative only).
- **Product version** – product version of the physical device (Informative only).
- **Site description** – a description for the site (Informative only).
- **Operator name** – the name of the operator (Informative only).
- **Company name** – the name of the company (Informative only).

Additional informative fields may be presented, depending on component type.

9.10.4 Data Acquisition and Processing

Acquisition of data can be achieved by downloading files, data streaming, or all the above. For example, acquiring data from G4K devices is possible by downloading PQZIP files using FTP and streaming real-time data by MODBUS.

The following description is for the BlackBox Fix G4 component type, ensuring most of the options in the Data acquisition and processing tab are fully explored; however, the available parameters and fields depend on the component type.

Data Acquisition:

- **Enable data acquisition** – mark the Enable data acquisition checkbox to enable file downloading.
- **Device IP/Address** – the device IP address. If required, click **Scan** to search for other devices in your network.
- **File source download directory path** – the path to the folder where the files are located. By default, the path is set to the default path of the selected device (e.g. for the G4K device it is /CF_UPMB/PQZIPDATA_).
- **FTP port** – the FTP port for downloading/reading data from the instrument.
- **FTP user name** – the FTP site username for downloading/reading data from the instrument.
- **FTP password** – the FTP site password for downloading/reading data from the instrument.
- **Test** – click the **Test** button to verify the connection to the device.
- **Gateway** – the gateway method is defined in the [component XML configuration file](#) and is presented as information. The gateway communication for G4K devices is Modbus or Json. Therefore, Port, Slave ID, and Modbus mapping need to be configured. For G5DFR and PureBB components, the gateway is PQZ and the username and password need to be configured.
- **Limit download period** – use these settings to limit the downloaded data to a specific time range:
 - Mark the **Start time** box and enter the date & time to exclude data from the previous date. If it is not defined, the component will pull all the data from the device, from the oldest to the newest, and will continue pulling every newly generated file.
 - Mark the **End time** box and enter date & time to exclude data from a later date.
 - Mark the **Enable schedule** to select days and **Start time/End time** for configuring the download period.
- **Advanced settings:**
 - **Fetch files every (min)** – set the fetching period. The default is 2 minutes.
 - **Override existing database records with the newest data** – new data fetched to a component overrides existing data. Uncheck to discard new data with overlapping timestamps with existing data in the database.

- **Allow files download while scanning with multiple FTP connections** – if multiple FTP connections are available, check to allow scan and download simultaneously.
- **Website username** – the username to access the device web UI.
- **Website password** – the password to access the device web UI.
- **Website port:**
 - ◆ **Save files to backup folder** – check to keep PQZIP files on the instance machine.
- **Download mode** – select from the dropdown list:
 - ◆ **All data** to download all compressed pqzip files when available.
 - ◆ **Only events** that will be “pushed” when occurring. In this mode, the data availability will be faster and not when the file is scheduled to be closed and scanned by the PQSCADA component.
- **Firmware upgrade and Configuration update:**

Settings for users with many similar units. The PQSCADA allows creating an upgrade/configuration task to upgrade/configure all units by a single task. The following parameters enable the user to set the details of the firmware/configuration files.

 - **Firmware upgrade IP**
 - **Firmware upgrade port**
 - **Firmware upgrade path**
 - **Firmware upgrade user name**
 - **Firmware upgrade password**
 - **Configuration update IP**
 - **Configuration update port**
 - **Configuration update path**
 - **Configuration update user name**
 - **Configuration update password**
- **Data Processing:**
 - **Enable file process** – mark the checkbox to enable the processing and storage of [binary](#) data.
 - **Enable historical data calculation** – mark the checkbox to enable the calculation of [summary](#) data.
 - **Firmware upgrade connection type** – select the connection type for upgrading the component firmware.

9.10.5 Power Quality

The Power quality tab includes four sections that are displayed as a horizontal stackable list with expand/collapse functionality. The sections define the **Compliance**, **Events**, **Parameters**, and **Energy** to be calculated and stored as part of the [acquisition process](#) (see section 9.10.4 above).

Note that calculating can extend the processing time.

Selecting a section expands the view showing the content within.

9.10.5.1 Compliance

The compliance section has two columns: **Recalculate** and **Compliance**. The Compliance column includes a list of supported compliance standards.

1. Mark the compliance you want to apply to the component.
2. Mark **Recalculate** if you want the Instance to [recalculate](#) the data for the selected compliance (it may take a while).
3. Click **Save** on the top right of the screen to apply changes.

When marking **Recalculate**, the **Save configuration** window will pop-up. Under the save configuration window, do the following:

- a. Select the **Start time** for the [recalculation](#).
- b. Select the **End time** for the [recalculation](#).
- c. To prioritize the [recalculation](#) over the acquisition process, mark the **Discard the data in the processing phase** checkbox.

Parameters (e.g., voltage RMS) and events (e.g., dip) that are required for the compliance process will automatically be selected in the **Parameters** and **Events** sections and will be highlighted in yellow.

9.10.5.2 Events

The Event section displays a list of events, which are preconfigured in the [Instance Events](#) tab (see section 9.9.8). Events are acquired by PQSCADA Sapphire in one of the following modes:

- **Fetch from device** – PQSCADA Sapphire acquires the events logs directly from the device.
- **Calculate by PQS server** – PQSCADA detects and logs the events from the stored historical data. The events logs are additionally acquired directly from the device.
- **Do not calculate** – for events created on the PQSCADA under the server.

Events highlighted in yellow are required by the selected compliance standard.

1. Select the logging **Mode** for each of the listed events.
2. Check **Recalculate** if you want the Instance to [recalculate](#) the event detection. Applies to events in **Calculate by PQS server** mode.

If recalculation is not selected, the component will calculate the event only on the newly received data.

3. Click **Save** to apply changes.
4. If the **Recalculate** checkbox is marked, the save configuration window will pop-up. Under the save configuration window, do the following:
 - a. Select the **Start time** for the [recalculation](#).
 - b. Select the **End time** for the [recalculation](#).
 - c. To prioritize the [recalculation](#) over the acquisition process, mark the **Discard the data in processing phase** checkbox.

9.10.5.3 Parameters

The Parameters section displays a table with a list of parameters Group and its supported resolutions.

RMS, for example, refers to all RMS data from all channels, voltage, and/or current. Parameter Group can support multiple resolutions, such as 1/2 cycle, 10/12 cycles, 150/180 cycles, etc.

This section applies to the [Summary](#) data only (see Appendix A.1).

Parameters highlighted in yellow are required by the selected compliance standard and cannot be disabled.



Note: In most cases, the default calculated parameters are used. When a specific parameter that its calculation is not enabled by default is needed, the user can enable its calculation. Enabling all parameters will overload the system and the processing might take an extremely long time.

1. For the required cell in the table, select the operation mode according to the component type. The options may vary:
 - **Calculate historical data by Instance** – the instance will calculate and store [summary](#) data based on the stored [binary](#) data.
 - **Calculated by device** – [Summary](#) data is fetched from the file.
 - **Fetch historical from device** – [Summary](#) data will be fetched directly from the device using the component gateway.
 - **Fetch instance data from device** – PQSCADA Sapphire will fetch real-time high-resolution data from the device, using the component gateway. [Summary](#) data will be calculated by PQSCADA Sapphire. For example, PQSCADA Sapphire will fetch RMS V1 at a 1-second resolution as Instance data and will calculate and store summaries for every 1 minute.
 - **Receive report from device** – acquire data using the report option of the IEC61850 protocol.
 - **Do not calculate** – PQSCADA Sapphire will not calculate nor fetch any [summary](#) data.
 - **Do not calculate and delete** – PQSCADA Sapphire will not calculate [summaries](#) for future data and will delete [summaries](#) stored in the database
2. Check **Recalculate** if you want the instance to [recalculate](#) a parameter.
3. Click **Save** to apply changes.

4. If **Recalculate** was marked, the save configuration window will pop-up. Under the save configuration window, do the following:
 - a. Select the **Start time** for the [recalculation](#).
 - b. Select the **End time** for the [recalculation](#).
 - c. To prioritize the [recalculation](#) over the acquisition process, mark the **start recalculation and discard the data in the processing phase** checkbox.

9.10.5.4 Energy

The load current demand is used by some of the system modules (for example, to define the allowed harmonics limits within the IEEE519 power quality report).

The load current is calculated as the flow of current during the peak demand during the month. The value that is used will be the maximum value from the last 12 readings (so it is basically calculated over 12 months).

The Energy section enables setting the **Maximum demand load current calculation type**. Select the method from the dropdown list:

- **Auto** – when selecting Auto, mark according to what the calculation should be performed: **By Total** or **By phase**.

The system will use this calculation method when the last 12-months data is available; else, it will adjust itself to provide the value from the available data (less than 12 months).

- **Manual** – when selecting Manual, enter a value in the **Demand load current value** field.

Using the manual option allows the user to manually set a constant value so the system will not calculate it.

9.10.6 Database

The Database tab includes the following configurations:

- **DB type** – Choose **MSSQL** or **SQL light**.
- **DB URL** – Enter the DB URL address.
- **DB limit size (Mb)** – mark DB limit size to allow the instance to truncate older data once the database size limit is reached.
- **DB limit data duration (days)** – mark DB limit data duration to define the number of days to truncate older data once the duration limit is reached.

9.10.7 Tags

The tags tab lists the [enabled tags](#) of the instance (see section 9.9.4).

Select tag(s) from the dropdown list(s).

9.10.8 Unit Configuration

The Unit configuration tab defines the Channel Configuration mapping of a component containing waveform data. The Unit configuration tab is divided into 3 sections: **Physical channels**, **Auxiliary channels**, and **Virtual channels** displayed as a horizontal stacked list using the show/hide functionality. Clicking a section expands it, showing the content within.

The Unit configuration tab has two states:

- **Synchronize with component** – PQSCADA Sapphire imports the channel mapping configuration from the physical device. This is the default state. When marked, the data within the following sections are informative only.
- **Unsynchronized with component** – PQSCADA Sapphire ignores the channel mapping of the physical device. This state is mostly used to fix/modify misconfigurations and/or wrong connections as a post-process.

9.10.8.1 Physical Channels

The physical channels section includes a list of the device's physical channels and their properties. On the bottom is the Nominal frequency (Hz).

Channel	Signal type	Primary	Secondary	Phase shift	DC offset
Physical voltage channel 1	Voltage	400	400	0	0
Physical voltage channel 2	Voltage	400	400	0	0
Physical voltage channel 3	Voltage	400	400	0	0
Physical voltage channel 4	Voltage	400	400	0	0
Physical current channel 1	Current	50	50	0	0
Physical current channel 2	Current	50	50	0	0
Physical current channel 3	Current	50	50	0	0
Physical current channel 4	Current	50	50	0	0

Nominal frequency (Hz)



Note: Physical channels store the waveform data as recorded by the physical device.

- **Channel** – displays the name of the physical channel.
- **Signal type** – the signal type of the physical channel (e.g., voltage, current).
- **Primary** – the primary value (mainly for transformers).
- **Secondary** – the secondary measured value (mainly for transformers).
- **Phase shift** – enter a value if a shift in the waveform is required.
- **DC offset** – enter a value if a DC offset in the waveform is required.

9.10.8.2 Auxiliary Channels

The Auxiliary channels section includes a list of the device auxiliary channels and their properties. PQSCADA Sapphire supports 5 types of auxiliary channels: **Analog input, Analog output, Digital input, Digital output, and Relay.**

Analog input channels:

ID	Name	Analog min	Analog max	Channel units	Resolution	Round at	Converted min	Converted max	Units
260	Analog Input 1	0.004	0.02	A	0	Round	0.004	0.02	A Add custom unit
261	Analog Input 2	0.004	0.02	A	0	Round	0.004	0.02	A Add custom unit
262	Analog Input 3	0.004	0.02	A	0	Round	0.004	0.02	A Add custom unit
263	Analog Input 4	0.004	0.02	A	0	Round	0.004	0.02	A Add custom unit

Analog output channels:

ID	Name	Analog min	Analog max	Channel units	Resolution	Round at	Converted min	Converted max	Units
300	Analog output 1	0.004	0.02	A	0	Round	0.004	0.02	A Add custom unit
301	Analog output 2	0.004	0.02	A	0	Round	0.004	0.02	A Add custom unit
302	Analog output 3	0.004	0.02	A	0	Round	0.004	0.02	A Add custom unit
303	Analog output 4	0.004	0.02	A	0	Round	0.004	0.02	A Add custom unit

Digital input channels:

ID	Name
100	Digital input 1
101	Digital input 2
102	Digital input 3
103	Digital input 4
104	Digital input 5
105	Digital input 6
106	Digital input 7
107	Digital input 8

- **Analog input and output channels**
 - **ID** – displays the channel ID number.
 - **Name** – the new channel name.
 - **Analog min.** – the minimum value of the analog input (e.g., 4 mA).
 - **Analog max.** – the maximum value of the analog input (e.g., 20 mA).
 - **Channel units** – select the units to display the measurement. This combo box contains a list of optional units (e.g., Hz, °C, etc.).
 - **Resolution** – used for user parameters. For example, if the converted min & max defines 0–60 Celsius (temperature) and the user sets a resolution of 60, the Y-axis will have steps of 1C and if the set resolution is set to 120, the steps on the Y-axis will be 0.5.
 - **Round at** – for rounding the measured value (Round/Round up).
 - **Converted min.** – select the value to display when the reading is equal to the analog min value.
 - **Converted max.** – select the value to display when the reading is equal to the analog max value.
 - **Units** – click on Add custom unit and enter the new unit type.
- **Digital input and output channels**
 - **ID** – displays the channel ID number.
 - **Name** – the new channel name.
- **Relay channels**
 - **ID** – displays the channel ID number.
 - **Name** – the new channel name.

9.10.8.3 Virtual Channels

This section is used to map physical channels to power topologies.

The screenshot shows two tables in the software interface. The top table is for 'Network 1' and the bottom table is for 'Feeder 1'.

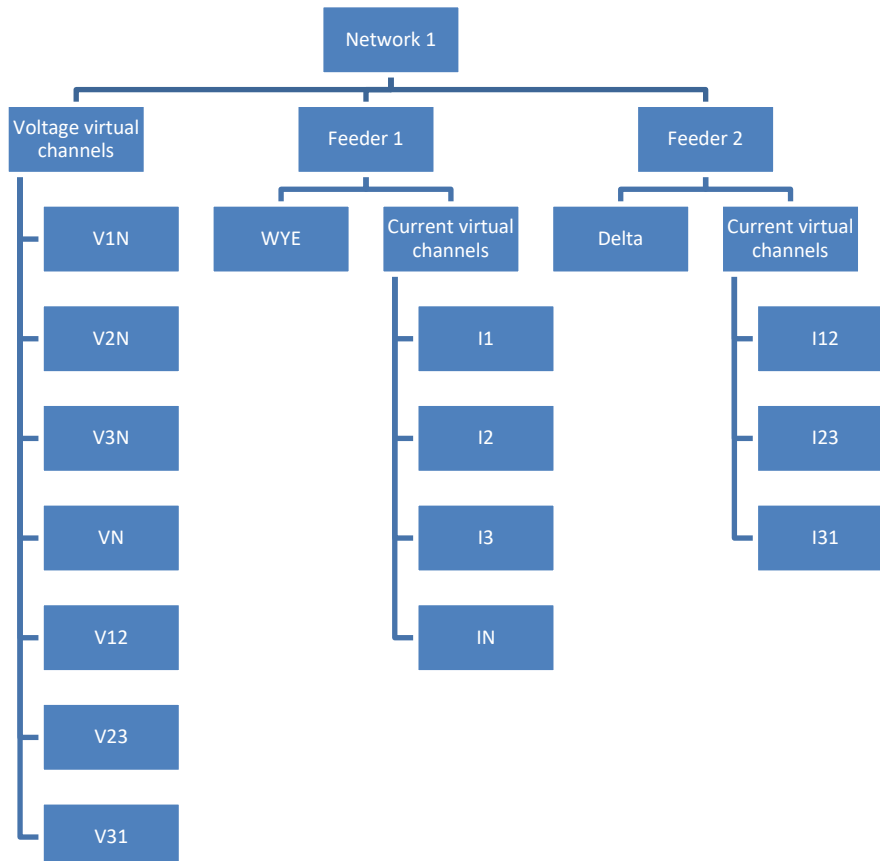
ID	Tag	Name	Nominal	Physical 1	Factor 1	Physical 2	Factor 2	Physical 3	Factor 3	Physical 4	Factor 4
1	V1N	V1N	230.9	Physical voltage channel 1	1						
2	V2N	V2N	230.9	Physical voltage channel 2	1						
3	V3N	V3N	230.9	Physical voltage channel 3	1						
4	VN	VN	230.9	Physical voltage channel 4	1						
12	V12	V12	399.931	Physical voltage channel 1	1	Physical voltage channel 2	-1				
13	V23	V23	399.931	Physical voltage channel 2	1	Physical voltage channel 3	-1				
14	V31	V31	399.931	Physical voltage channel 3	1	Physical voltage channel 1	-1				

ID	Tag	Name	Nominal	Physical 1	Factor 1	Physical 2	Factor 2	Physical 3	Factor 3	Physical 4	Factor 4
5	I1	I1	80	Physical current channel 1	1						
6	I2	I2	80	Physical current channel 2	1						
7	I3	I3	80	Physical current channel 3	1						
8	IN	IN	80	Physical current channel 4	1						


The power topology elements are:

- **Network** – the network properties are voltage, virtual channels, and feeders.
- **Feeder** – the feeder properties are current, virtual channels, and power topology (WYE, Delta).
- **Virtual channel** – the virtual channel properties are Nominal and mathematical summation of physical channels with scaling factors.

Following is an example of a single network with 2 feeders:



To add/modify voltage virtual channels for the network:

1. Under **Virtual channels**, Click the **Add channel**  icon. A Network with one voltage channel and one feeder will be created by default.
2. Configure the following:
 - **Tag** – Tag is used for classifying the virtual channel to a specific phase. This combo box contains possible tagging options.
 - **Name** – enter the name of the virtual channel.
 - **Nominal** – enter the nominal value of the virtual channel.
 - **Physical** – select a physical channel. These combo boxes contain a list of physical channels.
 - **Factor** – enter the factor to multiply the physical channel with. To reverse the polarity of a channel, enter (-1).

$$\text{Virtual Channel} = \sum_{N=1}^4 (\text{Physical})_N \times (\text{Factor})_N$$

3. Set the **Topology** under the Feeder (WYE, Delta).
4. Add/modify current virtual channels for the feeder.
5. Click **Save**, to apply changes.
6. Under the save configuration, do the following
 - a. Mark the **new time** checkbox.
 - b. Enter the time to apply the new configuration from.
 - c. Click **Save** to apply changes and start [Recalculation](#) (see Appendix A.2).

9.10.9 Energy

The Energy tab defines how billing is calculated. Edit the fields as required.

- **Energy billing interval** – this is a sliding window. The window width for calculating the Energy (for example 15 minutes).
- **Energy billing sub interval** – the sub-interval is the refresh rate (for example, 1 minute).

Using the above two sample values, assuming the first window is calculated over 10:00–10:15, the second window will be calculated over 10:01-10:16, and so on.

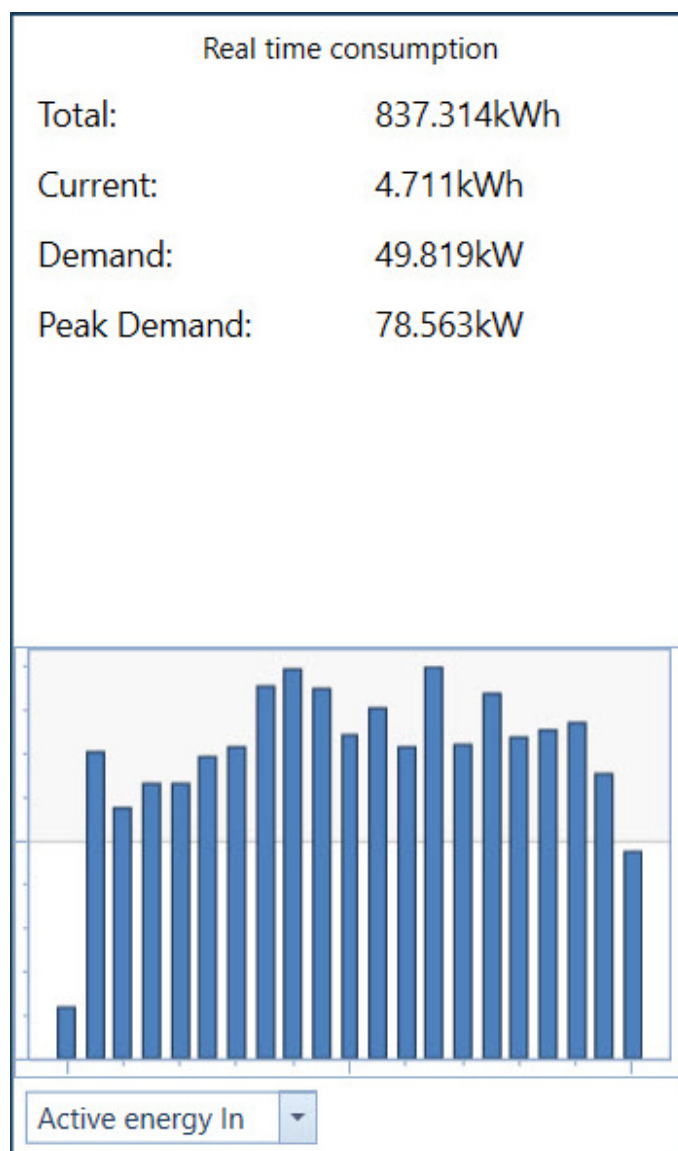
- **Billing per feeder** – select the Billing template for each Feeder from the dropdown list, as defined in the System module Billing tab (see section 9.9.14).

For some components, it is according to its topology (WYE/Delta).

- **Energy limits** – enter values for the following limits:
 - Active energy in low limit
 - Active energy in high limit
 - Active energy out low limit

- Active energy out high limit
- Reactive energy in low limit
- Reactive energy in high limit
- Reactive energy out low limit
- Reactive energy out high limit
- Apparent energy low limit
- Apparent energy high limit

The limits are displayed graphically on the charts of the Energy module (right widget from Figure 8-1).



9.10.10 Query Settings


The Query Settings tab enables changing the scale factors and clock settings and includes the following configurations:

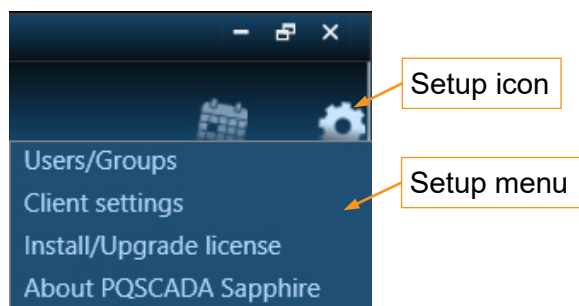
- **Time synchronization** – this configuration is useful in case the data time is not correct or needs to be shifted back or forward. It will apply only to the component and not to the data source – Device.
 - a. Mark the **Time shift** checkbox to enable time-shifting.
 - b. Select the time shift direction: **Forward** or **Back**.
 - c. Enter the amount of time to shift in the time picker.
- **Primary PT** – enter the new primary PT value.
- **Secondary PT** – enter the new secondary PT value.
- **Primary CT** – enter the new primary CT value.
- **Secondary CT** – enter the new secondary CT value.
- Mark the **Change neutral setting** checkbox if a Neutral channel requires different scaling factors.
 - **Primary CT for neutral channel** – enter the new Primary CT for the neutral channel.
 - **Secondary CT for neutral channel** – enter the new secondary CT for the neutral channel.
 - **V to I ratio** – enter the new V to I ratio of the clamps.
 - Click **Save** to apply changes.

 **Notes:**

- ◆ Query settings apply to the [Summary](#) data only (see Appendix A.1). Therefore, some parameters may not be recoverable in all situations.
- ◆ To apply scaling factors, swap phases, and reverse polarity on the waveform data. For full recovery, follow the steps in the [Unit configuration](#) tab (see section 9.10.8).

10. Setup

The setup icon is located on the upper right corner of the PQSCADA Sapphire application. Clicking the **Setup**  icon opens the setup menu.



➔ **Note:** When there is an update to the PQSCADA Sapphire application, the Setup icon will have an orange color (see section 10.5 for details).

10.1 Users/Groups

The setup **Users/Groups** screen is divided into two main sections – the left section displays the **Server** object and **Users/Groups** objects, and the right section displays the properties of each of those objects, while they are selected.

The Enterprise edition works only in security mode. This means that to connect to the PQS Enterprise server, the user needs to provide valid credentials (User name and Password). The PQSCADA security scheme includes definitions for users and groups.

Click the **Setup active directory integration** button to create those users/groups.

Note that the PQSCADA client displays modules regarding user permissions and the PQSCADA5 server checks that the user's requests have right permissions.

10.1.1 Authentication Providers

PQSCADA Sapphire supports three types of authentication providers for users and groups:

- **PQSCADA Sapphire authentication** – users and groups are created and managed internally, on the application level.
In a hierarchical structure of primary and secondary servers, authentication between the instances themselves is based on this type.
- **Local machine authentication** – users and groups are created and managed locally on the operating system level, recognized by PQSCADA Sapphire and can be assigned with permissions and roles.
- **Active Directory authentication** – users and groups are created and managed externally by an administrator on the Domain level, recognized by PQSCADA Sapphire, and can be assigned with permissions and roles.

To utilize Active Directory authentication, the domain name needs to be configured, with a valid username and password, which will be used for binding to Active Directory. This configuration is done on the server object.

10.1.2 Creating Users

Click **Actions** and select **Add user** from the menu. Select the appropriate Authentication Provider (see [Authentication Providers](#)) and click **Next**.

- If **PQSCADA Sapphire authentication** is selected, select the User type (**Admin/Non-Admin/Device Notification**) and click **Next**. Enter a **User name** and **Password**, confirm the password, add an **email** address, and select a **Priority** from the dropdown list. Click **Next**. Add to groups (not mandatory) by selecting the group(s) from the **Available groups** list and clicking the arrow to add selected group to the **Member of** field. Click **Finish**.
- If **Local machine authentication** or **Active Directory authentication** is selected, choose a user from the drop-down menu, add a valid email address, select the User type (Admin/Non-Admin) and add to groups (not mandatory). Click **Finish**. User name and password are configured on the operating system level or the domain level, respectively.

10.1.3 Creating Groups

Click **Actions** and select the **Add group**. Select the appropriate Authentication Provider (see [Authentication Providers](#)) and click **Next**.

- If **PQSCADA Sapphire authentication** is selected, select the **Group type** (**Admin/Non-Admin**) and click **Next**. Enter the **Group name** then click **Next**. Add users by selecting the group(s) from the **Available users** list and clicking the arrow to add a selected user to the **Members** field. Click **Finish**.
- If **Local machine authentication** or **Active Directory authentication** is selected, select a group from the drop-down menu, then select a Group type (Admin/Non-Admin) and click **Close**. The name of the group and member users are configured on the operating system level or on the domain level, respectively.

10.1.4 Assigning Permissions to Groups and Users

PQSCADA Sapphire has a sophisticated security module, allowing the creation of a highly granular access policy. This policy is configured on the Permissions tab after adding a new **User** or **Group**.

Manage rules		
Manage conditions		
Tag	Value	Permission
Country	Germany	Read
Manage conditions		
Tag	Value	Permission
Country	Germany AND	Read/Write
Voltage	230 AND	
Location	North	
Manage conditions		
Tag	Value	Permission
Country	Germany AND	Deny
Location	South AND	
Voltage	400	

10.1.4.1 Rules

For each Group or User object, one or multiple rules can be created.

The logical operator between multiple rules is 'OR'.

Within each rule, one or multiple conditions can be created. The logical operator between multiple conditions is 'AND'.

Conditions are Tag-oriented, which means that for every combination of Tag and Value – Read, Read/Write, or Deny permissions can be assigned.

Example:

The user "David" has Read permissions on all components that are associated with the Country tag Germany.

Furthermore, on components that are associated with voltage tag 230 and location tag North, this user has Read/Write permissions.

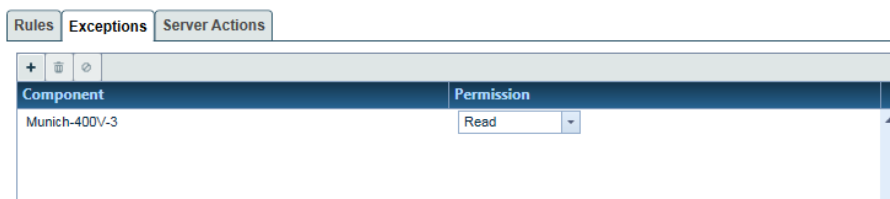
However, on components that are associated with voltage tag 400 and location tag South, this user has a Deny permission, which means he cannot see any data stored in them.

10.1.4.2 Exceptions

Unlike rules and conditions, exceptions are component-oriented, which means that for each component that exists on the system, Read, Read/Write or Deny. permissions can be directly assigned. Exceptions take precedence over Rules, allowing for further fine-tuning of permissions.

Example:

The user “David” has a Read Exception permission on the component Munich-400V-3 that is associated with both Voltage tag 400 and Location tag South. Normally, this user would have been denied access to this component (as per the previous example); however, since an Exception was created – he can now gain access.



10.1.4.3 Server Actions

Non-administrative users can be delegated to perform certain actions that would otherwise require administrative permissions over the system:

- **Query period limit**
- **Create components**
- **Add/Remove tasks**

10.2 Client Settings

The setup **Client Setting** screen is divided into two main sections that are divided by a splitter control line (a vertical line between the two sections).

The left section displays Client Settings groups, and the right section displays the properties of each of those groups, while selected.

The position of the splitter control can be changed by clicking and dragging the splitter control to the left or right with a pointing device.



Note: After modifying client settings, the application will need to be restarted for the changed settings to take effect.

10.2.1 Localization Settings

- **Day and Time display format** – select one of the options below:
 - **Auto culture** – to use windows configurations.
 - **Custom culture** – select one of the options in the drop-down menu to set the date and time format by country.
 - **Manual** – to set your own Date and Time format.
- **UTC offset** – select one of the options below as the client time zone:
 - **Time zone** – to use your local computer time zone.
 - **Custom time zone** – select one of the options in the drop-down menu to set the time zone by country.
 - **Manual** – to set the UTC offset manually.
- **Calendar** – select the first day of the week. Selecting Auto will use Windows configuration.
- **Language** – select the language of the client. Selecting Auto will use Windows configuration.
- **Precision settings** – configure the options below:
 - **Decimal places for number** – select the number of figures to display after the decimal point for absolute numbers.
 - **Decimal places for percentage** – select the number of figures to display after the decimal point for percentage numbers.

10.2.2 Proxy Settings

Some organizations use proxy servers as an intermediary between user's computers and the Internet. Proxy servers are used to control access to the Internet, to optimize bandwidth usage, and enhance security.

PQSCADA Sapphire may require access to the Internet for the following reasons:

- Version update notifications.
- Map data retrieval in the Overview screen (Enterprise and Professional editions only).
- Connecting to remote PQSCADA Sapphire servers, as a client.

The following options are available:

- **No Proxy:** connect directly to the Internet. No additional configuration is required.
- **Use system proxy settings:** PQSCADA Sapphire uses the same proxy settings as configured in Windows' Internet Options, Connections tab, LAN Settings.
- **Manual proxy configuration:** select this option if the use of a Proxy server is required for PQSCADA Sapphire, but this requirement is different from that of the operating system (i.e., the operating system connects directly to the internet, or by using another, different Proxy server).

In this case, additional configuration is required – **Proxy server** Hostname and **Port**.

The **No Proxy for** is a bypass list, enabling to specify hostnames and IP addresses that will not be proxied.

If the **Bypass proxy server for local addresses** checkbox is marked, connections to other hosts on your local network will not be proxied.

- **Network Credentials:** depending on the proxy server configuration and the requirement for authentication, the following authentication methods are available:
 - **Windows Authentication** – PQSCADA Sapphire uses your Windows logon credentials for authentication. This method is mostly used in domain environments.
- **Manual** –manually enter a valid username and password. Mark the **Save credentials** checkbox to save the credentials.

10.2.3 Investigation Settings

Set the following values for performing investigations:

- **Default charts display mode** – select the default display mode when opening a new Chart.
 - **Normalize** – voltage and current will be normalized to the nominal values. Power will be normalized to the product of Voltage × Current nominals.
 - **Regular** – displays absolute data.
- **Default charts curve mode** – select the default curve mode from the dropdown menu (the mode can be changed from the chart settings icon):
 - **Enable** – creates a continuous curve from the chart point values (not used when the chart Resolution is set to Auto).
 - **Disable** – displays the points as discrete values on the chart.
- **Default number of ranges** – controls the number of the displayed bars in a statistics chart (5–50).
- **Default trend charts horizontal crosshair mode** – select the crosshair to display (**Vertical + Horizontal** or **Vertical**).
- **Default power factor display mode** – select one of the options in the drop-down menu:
 - **Load** – if the readings are conducted on a load.
 - **Source** – if the readings are conducted on a generator.
- **Default charts angle Mode** – select how angles will be displayed in a chart.
- **Default calculation base mode** – Base resolution is the native time interval of a parameter. For example, RMS can be calculated every 1/2 cycle or 10/12 cycles. Therefore, 1-minute aggregated values can be calculated based on a 1/2 cycle or 10/12 cycles. The results of these two aggregations can be different. For min/max values, the based resolution is even more critical. PQSCADA Sapphire supports multiple base resolutions for a single parameter. The following options are available:
 - **Auto** – PQSCADA will select the base resolution automatically according to a selected parameter. For min/max values, PQSCADA will select the highest resolution available in the database. For average values, PQSCADA Sapphire will select the closest resolution to the selected.
 - **Manual** – based resolution will be selected by the user on the parameter selection page of the [add new chart wizard](#).
- **Default energy chart layout** – select the chart type to display (Stacked Bars, Side-by-Side bars, Trend, Pie).
- **Chart export settings** – enter a size in pixel of the exported image of a chart.
- **View export settings** – enter a size in pixel of the viewed image of a chart.
- **Default charts background color** – select the color of the chart background.
- **Event approach** – select if the event should be displayed as **Polyphase** or **By channel**.

- **Unit settings** – mark the checkbox if to scale units in Excel exports.
- **Phase color definitions** – select the displayed color of each one of the phases, frequency channel, auxiliary channels, and total parameters. Selecting the **Advanced** tab enables defining colors per Parameter, Parameter, Phase, and Quantity.

10.2.4 PQ Settings

The PQ Settings has two parameters that can be marked:

- **Synchronized power quality requests to compliance evaluation window** – this parameter rules the power quality module.
- **Run single report for each window** – this parameter rules the number of exported reports.

The PDF report will be generated according to how the above parameters are marked:

Whenever **Run single report for each window** is marked, and the Power Quality module has one period (no sliding window), a single report file will be generated.

When **Synchronized power quality requests to compliance evaluation window** is marked, and **Run single report for each window** is not marked, and the Power Quality module has more than one period (sliding window), a single PDF report file will be generated, which will include separate reports for each period.

When both the **Synchronized power quality requests to compliance evaluation window** and **Run single report for each window** are marked, and the Power Quality module has more than one period (sliding window), separate PDF report files will be the generated; one for each period (one for every 7 days with a 24-hour sliding window).

10.2.5 System Module Settings

Select the **Data availability** period from the dropdown menu.

This value is related to the available data in the System module under the component tab and will be used as the referenced 100% (see section 9.9.1).

10.3 About PSQADA Sapphire

Click the **Setup** icon and select **About PSQADA Sapphire**, to see the Version and Update of the installed application.

10.4 Install/Upgrade License

Click the **Setup** icon and select **Install/Upgrade license** to upgrade the license of the installed application. For more details, see section 4.3 above.

10.5 Download New Update

When the Setup icon has an orange color, an update to the PQSCADA Sapphire application is available.

1. Click the Setup icon and select the **Download new update** line.
A short version of the available update Release Notes is described and below is a shortcut to the Release Notes.
2. Click the **Download & install** button to install the update.
The download begins and the window “Update installation” appears.
3. Verify the Client installation path is correct and click **Update** to update the application.
The client is closed, and the application is updated.
4. Click **Close** on the “Update installation” window.
5. Restart the PQSACAD Sapphire application.

11. Scheduler

The Scheduler module enables monitoring **Tasks** that are currently running, scheduled to run, or have run already. The scheduler module can also be used to add, modify, delete, stop, and resume tasks.

Tasks are add-ons, such as a report, that runs on an individual process. PQSCADA Sapphire supports three types of tasks: Control and Maintenance, Exports, and Reports.

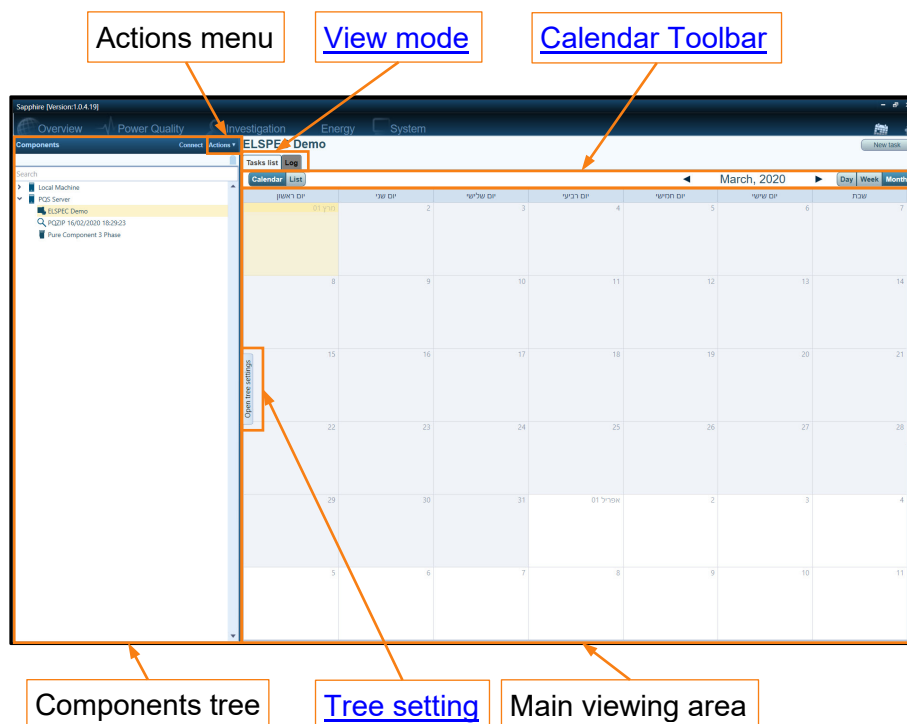


Figure 11-1. Scheduler

The **Scheduler module** screen is divided into two main sections that are divided by a splitter control line (a vertical line between the two sections).

The left section displays the connected instances and their hosted components, and the right section displays the configured tasks of the selected object.

The position of the splitter control can be changed by clicking and dragging the splitter control to the left or right with a pointing device.

11.1 Add or Disconnect a Server

On the Components section top-right the following can be performed:

- Click **Connect** to Add a Server.
- Click **Actions** and select **Disconnect server** to disconnect a connected server.

11.2 View Mode

Use the View mode to toggle between [Tasks list](#) and [Log](#) views.

11.2.1 Tasks List

Tasks List enables monitoring the status of currently configured tasks of a selected object/s.

Task Name	Task Type	Task Run Type	Task Status	Next Execution			
CSV	CSV Export	Schedule	Idle	15/01/2017 00:00:00			
EN50160	EN50160 Report	Schedule	Idle	15/01/2017 00:00:00			
SMS notification	Notification	Event	Idle	On next event			
excel	Excel Export	No trigger	Succeeded	Never			

- **Task Name** – displays the name of the task.
- **Task Type** – displays the task type.
- **Task Run Type** – displays the trigger for the task:
 - **Schedule** – for reoccurring tasks.
 - **Event** – the task is triggered by an event.
 - **No Trigger** – a single run task.
- **Task Status** – displays the status of the last operation:
 - **Idle** – the task was not triggered yet.
 - **Succeeded** – task operation was successful.
 - **Failed** – task operation/output failed.
- **Next Execution** – date and time for the next operation.
- **Attachment** – click the attachment icon to open the attached file.
- **Rerun** – for single running tasks, click the rerun icon to rerun the task.
- **Delete** – click the delete icon to delete a task from an instance.

11.2.2 Log

The Log mode displays logs of executed and scheduled tasks in two ways: **Calendar** and **List**.

11.2.2.1 Calendar Toolbar

The calendar settings can be changed from the Calendar toolbar.

	Toggle view mode – Toggle between Calendar and List views.
	Calendar Date – move left or right to change the calendar date.
	Calendar period – Toggle between calendar periods of Day, Week, Month.

11.3 Adding a Task

1. Launch the Add task wizard by one of the following methods:
 - Click **New task** at the top right corner of the main viewing area.
 - Click the **Actions** menu and select **Add task** from the menu.
 - Right-click on the instance and select **Add task**.
2. Select the **Task group** (see details in following sections):
 - **Control and Maintenance**
 - **Exports**
 - **Reports**

The Add new task wizard includes two stages:

1. Scheduler settings – the schedule is an instance service that triggers the task add-on based on the scheduler settings.
2. Add-on settings – the wizard imports the configuration required by the task add-on. For example, in an export task, the exported parameters belong to the Add-on settings.

11.3.1 Export Task

11.3.1.1 Task Group and Type

1. Mark the **Export** task group.



2. Click **Next** to go to the **Task Type** page.

➔ **Note:** The available task type options depend on the [installed add-ons](#).

3. Mark the required **Task type**.
4. Click **Next** to uploads the Add-on configuration and go to the **Task initial configuration** page.

➔ **Notes:**

- ◆ Uploading the Task add-on for the first time may take a few minutes.
- ◆ Once the Task add-on is uploaded, going back to the Task Type page is no longer available.

11.3.1.2 Task Initial Configuration

➔ **Note:** The following description is for when the CSV Task is selected. This ensures that all the steps in the wizard are fully explored.

1. Configure the following options on the Initial configuration page:
 - **Task Name** – enter a name for the task.
 - **Select CSV Separator** – select the CSV separator character from the dropdown list.
2. Mark **Create file per component** or **Combine data from all components into a single file**, according to the requested file type.
3. If the user would like to change the default destination folder, click the **Advanced file saving options** expand arrow.

Mark the **Set output folder manually** checkbox to set the following:

- **Server output folder** – select this option to save the task output on the instance machine. Make sure that PQSCADA Sapphire's instance has permission to store files in the configured path.
 - **FTP output folder** – select this option to save the task output on a remote FTP server. You will need to enter the FTP details.
4. Click **Next** to open the **Task run type** page.
 5. Select one of the following options on the **Task run type** page:
 - **Single Task Run** – PQSCADA Sapphire will run the task one time only.
 - **Schedule Task Run** (enterprise edition only) – Allows to create a task once; and then, have it executed automatically after a designated time interval.
 - **Event Base Task Run** (enterprise edition only) – Allows defining events that, when met, start the task execution.
 6. Click **Next** to open the **Running time configuration** page.

11.3.1.3 Running Time Configuration

➔ **Note:** The Running time configuration page displays the configurable fields according to the selected Task run type. The following is for when selecting Schedule Task Run (enterprise edition only).

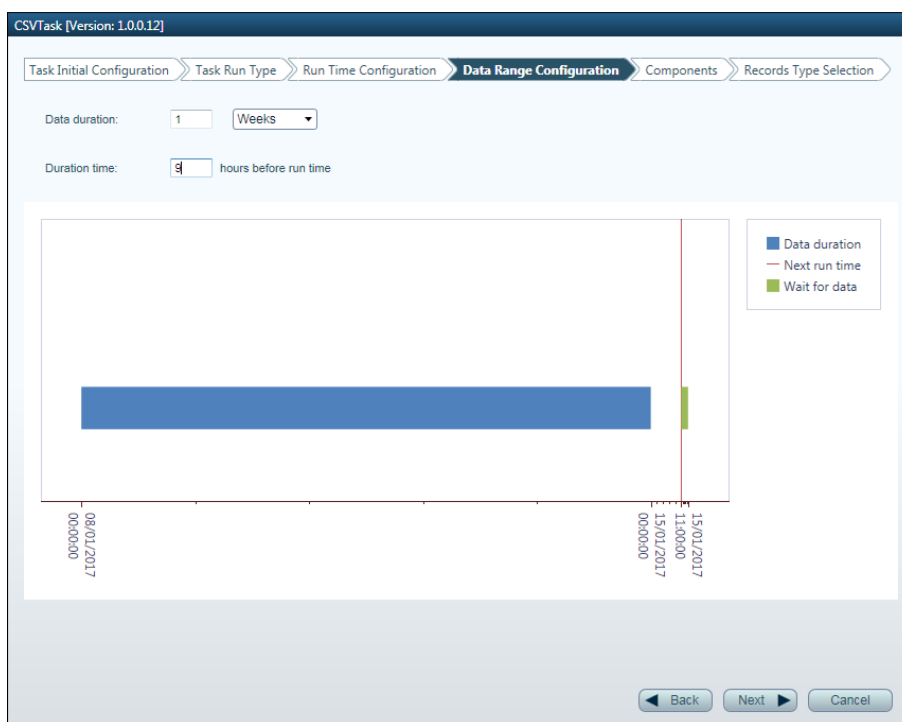
1. Configure the following options:

- **Recurrence Pattern** – select how often the task will be executed: hourly, daily, weekly, monthly, or yearly.
- **Range of Recurrence** – use Range of Recurrence to specify when the recurring Task starts and ends. By Default, a recurrence is set to **Now** and **No end time**, respectively.
- **Run Time** – use to specify when to execute the task, in case not all periods data is available.
 - ◆ **Wait for data up to** – use this option to delay the execution time in case that part of the data is missing.
 - ◆ **Start at** – the time to execute the task.
- **Advance Task Offset Settings** – use this option to set a time offset different from the Instance machine.

In the example above, the task will be executed every Sunday at 9:00 AM UTC (Coordinate Universal Time). Furthermore, if at 9:00 AM data is not available, the task execution will be delayed by up to two hours. At the end of the two hours, the task will be executed regardless of data availability.

2. Click **Next** to open the **Data range configuration** page.

11.3.1.4 Data Range Configuration



1. Configure the following options:
 - **Data Duration** – set the data duration to be exported.
 - **Data end time** – set the end time relative to the Run Time (configured in the Run-Time Configuration page).

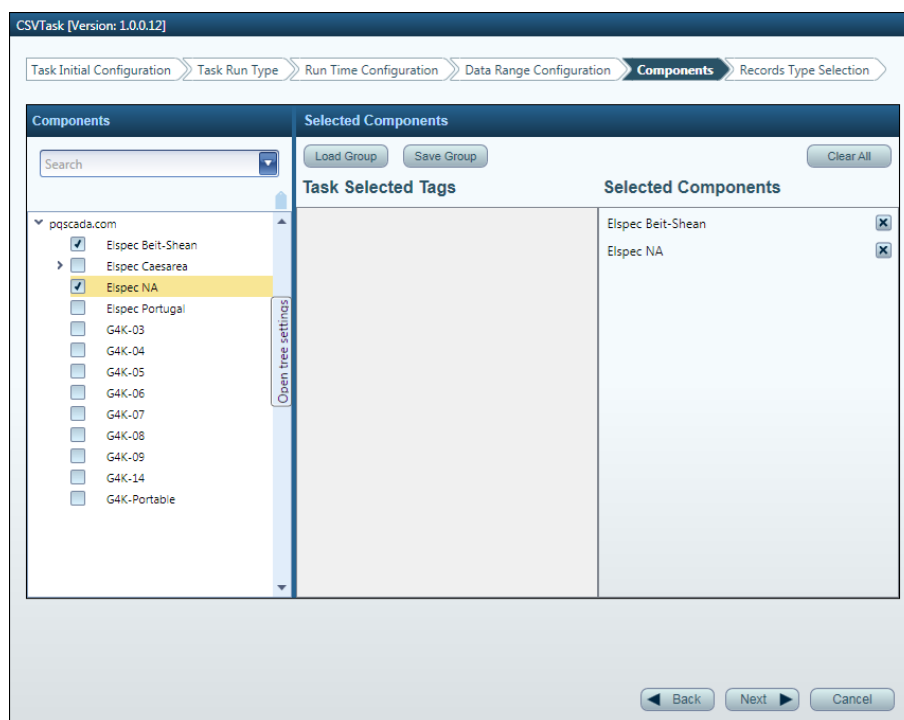
In the example above, the **Data duration** is set to 1 week, and the **Data End time** to 9 hours. Therefore, every Sunday at 9:00-11:00 (as per the previous example), the export task will be executed. The exported file will contain the data from the last week of midnight to midnight.
2. Click **Next** to open the **Components** page.

11.3.1.5 Components

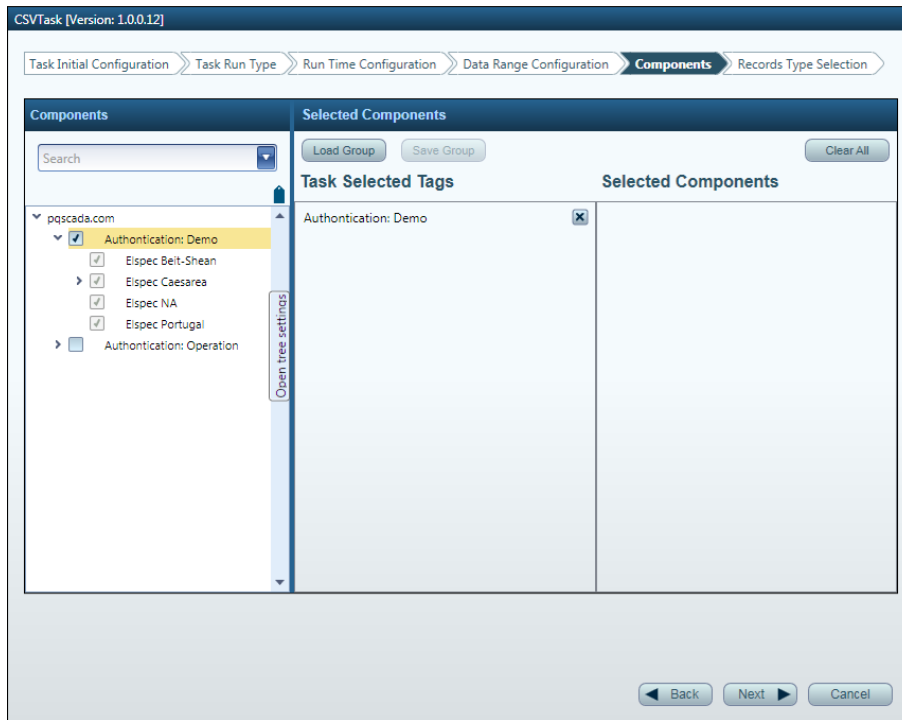
1. Select the components to execute the task on in one of the following ways:

- **Component selection** – The task will be executed on individual components. Select components in one of the following ways:
 - ◆ Mark the component checkboxes in the **Components** section on the left side of the Components page.
 - ◆ Click the **Tag** icon to sort the components by tags. To reset tags, click on [Open tree settings](#).
 - ◆ Click the **Load Group** button in the **Selected Components** section.

A list of the selected components will appear in the **Selected Components** column. To save the selected list, click **Save Group**.

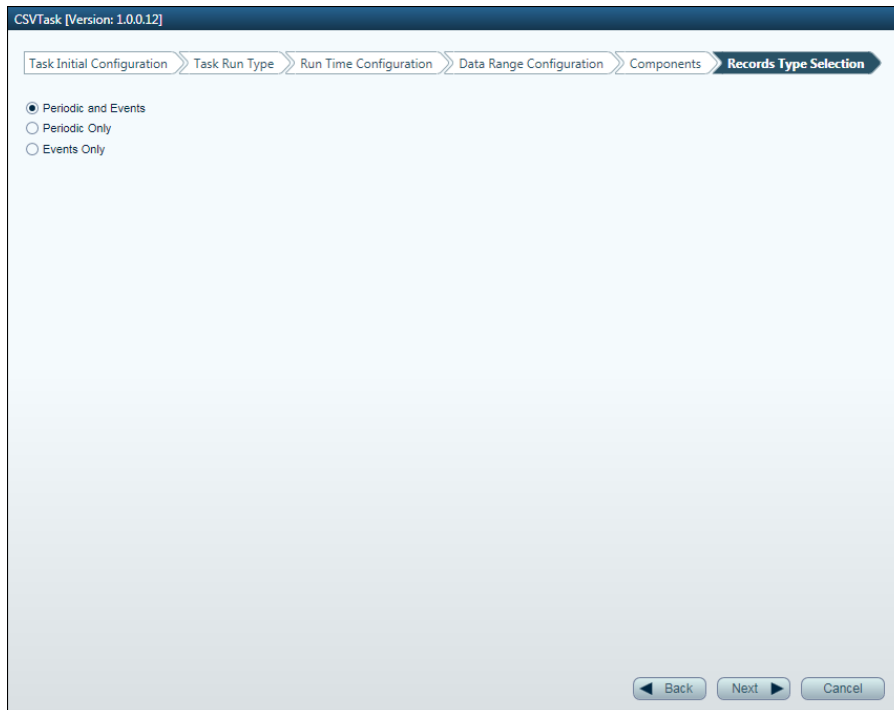


- **Tags selection** – The task will be assigned on all components configured to the selected tag. To select tags, do the following:
 - i. Click the **Tag** icon to sort the components by tags. To reset tags, click on [Open tree settings](#).
 - ii. Mark the Tag checkboxes in the **Components** section.A list of the selected tags will appear on the **Task Selected Tags** column.



2. Click **Next** to open the **Records type selection** page.

11.3.1.6 Records type selection



1. Select one of the following options:
 - **Periodic and Events** – use to export both low-resolution parameters for the entire task data duration, and high-resolution parameters and waveform for events occurred during the task data duration.
 - **Periodic Only** – used to export parameters continuously for the entire task data duration.

- **Events Only** – use only to export high-resolution parameters and waveform for events that occurred during the Task Data Duration. Each event is a data record with a duration equal to the event duration plus pre/post margins.

2. Click **Next** to open the **Low-resolution Parameters for periodic** page.

11.3.1.7 Low-Resolution Parameters for Periodic

➔ **Note:** For the purpose of this description the **Periodic** and **Events** were selected. This will ensure that all the steps in the wizard are fully explored.

Parameter	Phase	Quantity	Selected Parameters
Search...	V1N	Min/Max	RMS, V1N, Min/Max, 10 Minutes
Reactive Power - Harmonics Aggregation	V2N	Average	RMS, V2N, Min/Max, 10 Minutes
Reactive Power - per Harmonic	V3N		RMS, V3N, Min/Max, 10 Minutes
RMS	VN		RMS, V1N, Average, 10 Minutes
RMS - Fundamental	V12		RMS, V2N, Average, 10 Minutes
RMS - non-Fundamental	V23		RMS, V3N, Average, 10 Minutes
THD	V31		
THD - Even Harmonics	I1		
THD - Odd Harmonics	I2		
Voltage and Current - Harmonics Amplitude	I3		
Voltage and Current - Harmonics Amplitude (%)	IN		
Zero Sequence (U0)	IAuxiliary		
Zero Sequence Unbalance (U0/U1)			

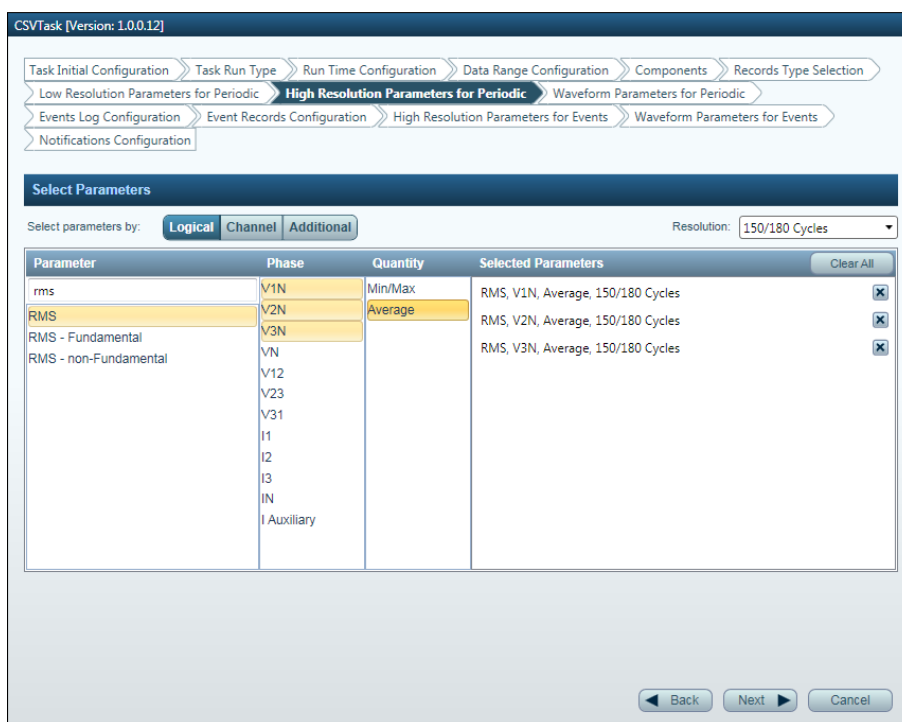
1. Select how parameters are tagged:
 - **Logical** – parameters are logically tagged.
 - **Channels** – parameters are stored without any power topology and can be sorted by channel number.
 - **Additional** – non-power needs verb parameters (e.g., temperature).
2. Select the **Resolution** from the dropdown menu on the upper right corner.
3. Select the **Parameter** in the parameter column. The list of available parameters is dynamic and depends on the selected component, time interval, and task type.
4. Select the **Phase** from the Phase column. A second click cancels the selection. Multiple phases can be selected.

A list of the selected parameters will appear in the right column.

➔ **Notes:**

- ◆ For the CSV export task, low resolution will be exported as a single file.
 - ◆ In the Excel export task, low-resolution parameters will be exported to a dedicated sheet.
5. Click **Next** to open the **High-resolution parameters for periodic** page.

11.3.1.8 High-Resolution Parameters for Periodic



1. Select how parameters are tagged:
 - **Logical** – parameters are logically tagged.
 - **Channels** – parameters are stored without any power topology and can be sorted by channel number.
 - **Additional** – non-power parameters such as temperature, pressure, etc.
2. Select the **Resolution** from the dropdown menu on the upper right corner. The max. number of exported points per parameter is limited to 1,000,000.
3. Select the **Parameter** in the parameter column. The list of available parameters is dynamic and depends on the selected component, time interval, and task type.
4. Select the **Phase** from the phrase column. A second click cancels the selection. Multiple phases can be selected.

A list of the selected parameters will be presented in the right column.

➔ Notes:

- ◆ For the CSV export task, high resolution is exported as a single file.
 - ◆ In the Excel export task, high-resolution parameters are exported to a dedicated sheet.
5. Click **Next** to open the **Waveform parameters for periodic** page.

11.3.1.9 Waveform Parameters for Periodic

CSVTask [Version: 1.0.0.12]

Task Initial Configuration > Task Run Type > Run Time Configuration > Data Range Configuration > Components > Records Type Selection > Low Resolution Parameters for Periodic > High Resolution Parameters for Periodic > **Waveform Parameters for Periodic** > Events Log Configuration > Event Records Configuration > High Resolution Parameters for Events > Waveform Parameters for Events > Notifications Configuration

Select Parameters

Select parameters by: **Logical** Channel Resolution: 64 Samples Per Cycle

Parameter	Phase	Selected Parameters	Clear All
Search...			
Harmonics Waveform			
Waveform			
Waveform - Fundamental			

Number of points above 1,000,000 is not recommended. Please choose lower resolution or change running times

Back Next Cancel

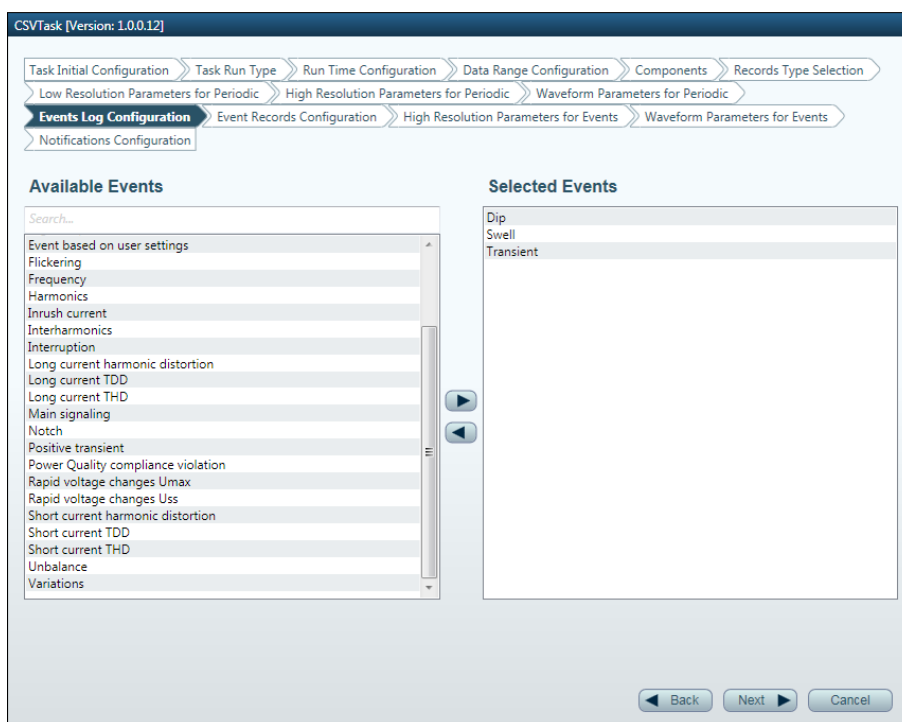
1. Select how parameters are tagged:
 - **Logical** – parameters are logically tagged.
 - **Channels** – parameters are stored without any power topology and can be sorted by channel number.
 - **Additional** – non-power parameters such as temperature, pressure, etc.
2. Select the **Resolution** from the dropdown menu on the upper right corner. The max. number of exported points per parameter is limited to 1,000,000.
3. Select the **Parameter** in the parameter column. The list of available parameters is dynamic and depends on the selected component, time interval, and task type.
4. Select the **Phase** from the phrase column. A second click cancels the selection. Multiple phases can be selected.

A list of the selected parameters will be presented on the left column.

➡ Notes:

- ◆ For the CSV export task, waveform data are exported as a single file.
 - ◆ In the Excel export task, waveform data are exported to a dedicated sheet.
5. Click **Next** to open the **Events log configuration** page.

11.3.1.10 Events Log Configuration

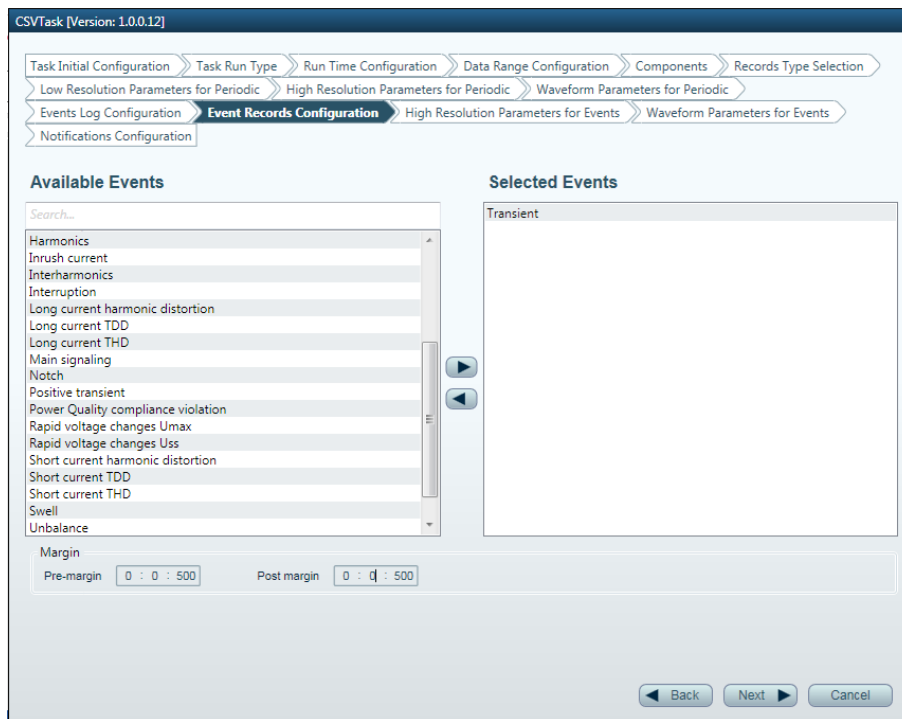


1. Select the events to include in the event log table by double-clicking the event type from the **Available events** list.

Notes:

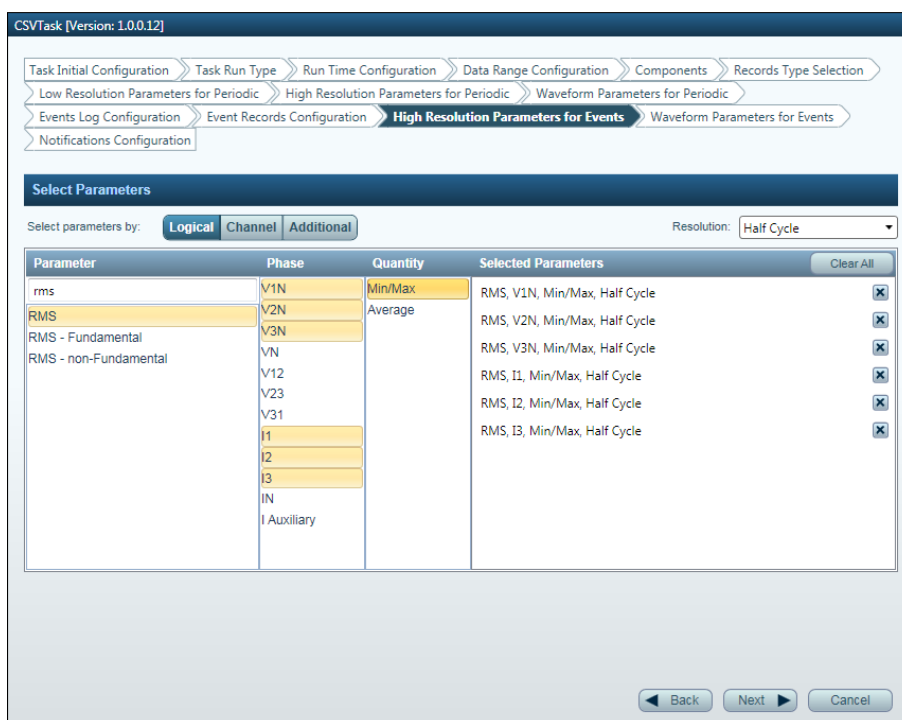
- ◆ For the CSV export task, the events log list is exported as a single file.
 - ◆ In the Excel export task, the events log list is exported to a dedicated sheet.
2. Click **Next** to open the **Events records configuration** page.

11.3.1.11 Event Records Configuration



1. Select events that will trigger events records by double-clicking on the event type from the **Available events** list.
2. Set **Pre/Post margins** on the bottom part of the page.
3. Click **Next** to open the **High-resolution parameters for events** page.

11.3.1.12 High-Resolution Parameters for Events



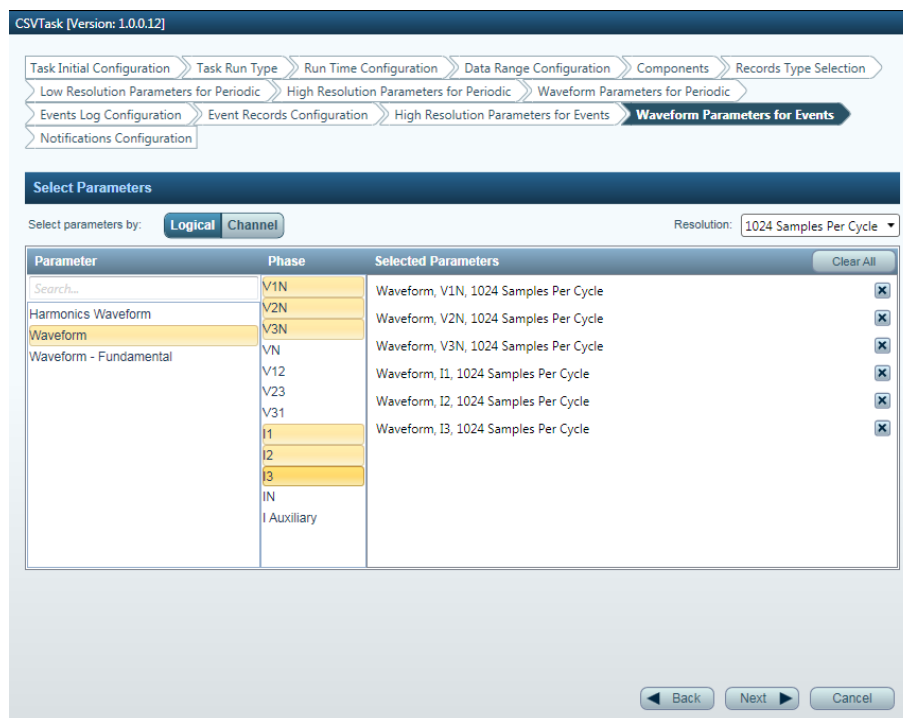
1. Select how parameters are tagged:
 - **Logical** – parameters are logically tagged.
 - **Channels** – parameters are stored without any power topology and can be sorted by channel number.
 - **Additional** – non-power parameters such as temperature, pressure, etc.
2. Select the **Resolution** from the dropdown menu on the upper right corner.
3. Select the **Parameter** in the parameter column. The list of available parameters is dynamic and depends on the selected component, time interval, and task type
4. Select the **Phase** from the phase column. A second click cancels the selection. Multiple phases can be selected.

A list of the selected parameters will be presented on the left column.

➔ Notes:

- ◆ In the CSV export task, each event record generates two files: high resolution and waveform.
 - ◆ In the Excel export task, all events records generate a single file. The file includes two sheets for each event record: high resolution and waveform.
 - ◆ The max. number of exported points per parameter is limited to 1,000,000. If the event duration is too long, PQSCADA will only export the first 1,000,000 points.
5. Click **Next** to open the **Waveform parameters for events** page.

11.3.1.13 Waveform Parameters for Events



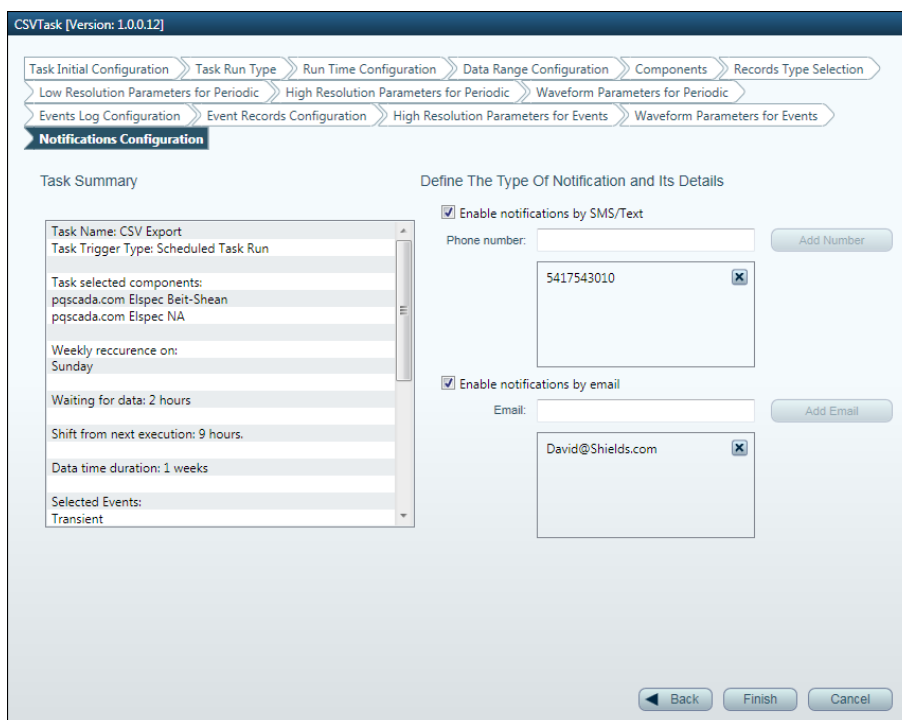
1. Select how parameters are tagged:
 - **Logical** – parameters are logically tagged.
 - **Channels** – parameters are stored without any power topology and can be sorted by channel number.
 - **Additional** – non-power parameters such as temperature, pressure, etc.
2. Select the **Resolution** from the dropdown menu on the upper right corner.
3. Select the **Parameter** in the parameter column. The list of available parameters is dynamic and depends on the selected component, time interval, and task type.
4. Select the **Phase** from the phase column. A second click cancels the selection. Multiple phases can be selected.

A list of the selected parameters will be presented on the left column.

➡ Notes:

- ◆ In the CSV export task, each event record generates two files: high resolution and waveform.
 - ◆ In the Excel export task, all events records generate a single file. The file includes two sheets for each event record: high resolution and waveform.
 - ◆ Max number of exported points per parameter is limited to 1,000,000. In case the event duration is too long, PQSCADA will only export the first 1,000,000 points.
5. Click **Next** to open the **Notification Configuration** page.

11.3.1.14 Notification Configuration



1. Define the type of notification and its details:



Note: Do not use the enable email/SMS notification if the email/SMS was not configured and tested.

- **Enable notification by SMS/Text** – mark the **Enable notification by SMS/Text** checkbox and add cell phone numbers, to send text message notifications on task execution.
- **Enable notification by email** – mark the **Enable notification by email** to send email notifications and attachments (if [enabled](#)) on task execution.

2. Click **Finish** to apply the changes.

11.3.2 Report Task

11.3.2.1 Task Group and Type

1. Mark the **Report** task group.



2. Click **Next** to open the **Task Type** page.
 1. Select one of the displayed options. The available options depend on the [installed add-ons](#).
 2. Click **Next** to upload the Add-on configuration and go to the **Task Initial configuration** page.

➡ **Notes:**

- ◆ Uploading the task add-on for the first time can take a few minutes.
- ◆ Once the task add-on is uploaded, going back to the Task type page is no longer possible.
- ◆ For the purpose of this example, it is assumed that task EN50160 was selected. This will ensure that all steps in the wizard are fully explored.

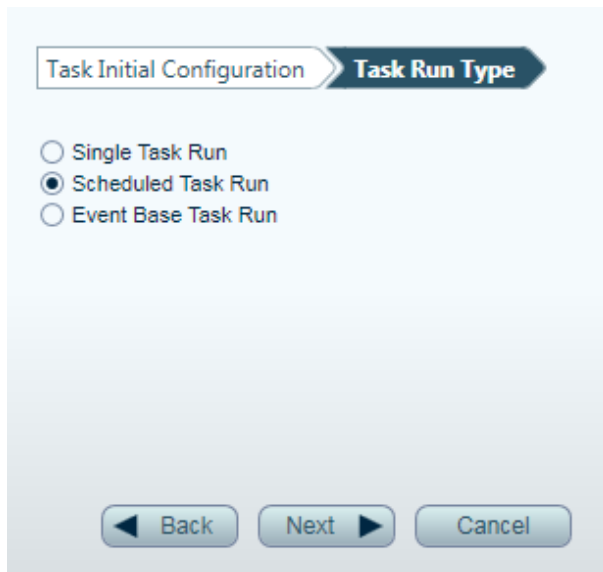
11.3.2.2 Task Initial Configuration

1. Configure the following options:
 - **Task Name** – enter the task name.
2. If the user would like to change the default destination folder, click the **Advanced file saving options** expand arrow.

Mark the **Set output folder manually** checkbox to set the following:

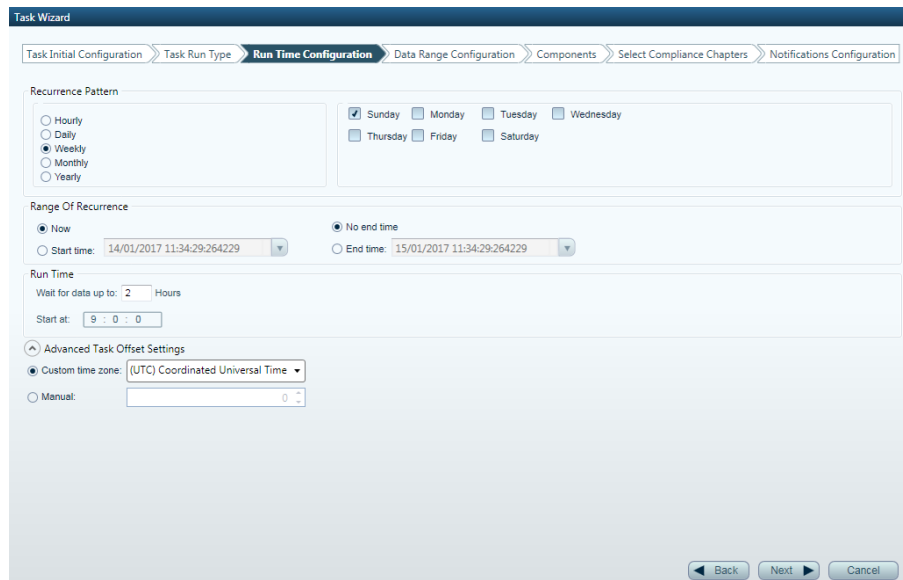
- **Server output folder** – select this option to save task output on the instance machine. Make sure that the PQSCADA Sapphire instance has permission to store files in the configured path.
 - **FTP output folder** – select this option to save the task output of a remote FTP server.
3. Click **Next** to go to the **Task Run Type** page.

11.3.2.3 Task Run Type



1. Select one of the following options:
 - **Single Task Run** – Runs the task one time only.
 - **Schedule Task Run** (enterprise edition only) – Creates a task once, and then execute it automatically according to the designated time interval.
 - **Event Base Task Run** (enterprise edition only) – Defines events that when met, start the task execution.
2. Click **Next** to go to the **Run Time Configuration** page.

11.3.2.4 Run Time Configuration



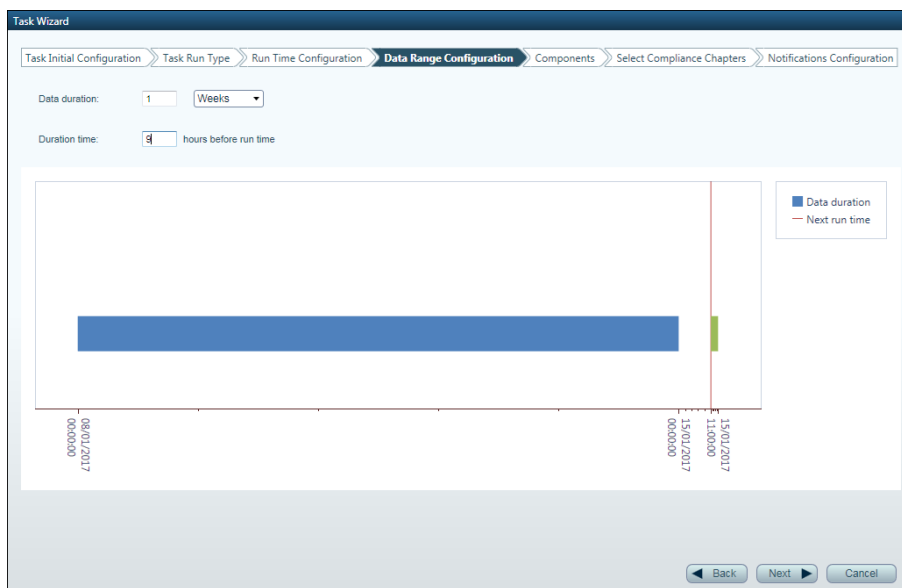
1. Configure the following options:
 - **Recurrence Pattern** – select the frequency of the task execution: hourly, daily, weekly, monthly, or yearly.
 - **Range of Recurrence** – use to specify the start/end time of the recurring task. By default, recurrence is set to **Now** and **No end time** respectively.

- **Run Time** – use to specify when to execute the task:
 - ◆ **Wait for data up to** – use to delay the execution time in case of missing data.
 - ◆ **Start at** – use to set up the time to execute the task.
- **Advance Task Offset Settings** – use to set the time offset from the Instance machine.

In the example above, the task will be executed every Sunday at 9:00 AM UTC (Coordinate Universal Time). If at 9:00 AM data is not available, the task execution will be delayed by up to two hours. At the end of the two hours, the task will be executed regardless of data availability.

2. Click **Next** to go to the **Data Range Configuration** page.

11.3.2.5 Data Range Configuration

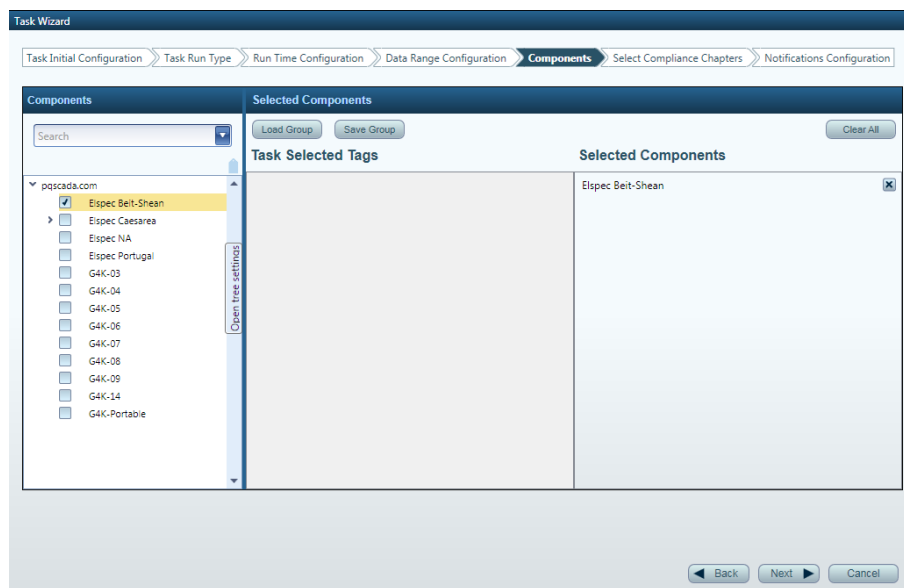


1. Configure the following options:
 - **Data Duration** – set the data duration for export.
 - **Data end time** – set the end time relative to the Run Time (configured in the Run Time Configuration page).

In the example below, Data duration is set to 1 week and Data End Time to 9 hours. Therefore, every Sunday at 9:00-11:00 (as per the previous example), the export task will be executed. The exported file will contain the data of the last week from midnight to midnight.

2. Click **Next** to go to the **Components** page.


11.3.2.6 Components



1. Select the components to execute the task with from one of the following options:

- **Component selection** – The task will be executed on individual components. Select a component in one of the following options:


- ◆ Mark the component boxes in the **Components** section on the left side of the **Component** page.

Click the **Tag**  icon to sort components by tags. To reset tags, click on [Open tree settings](#).

- ◆ Click **Load Group** in the **Selected Components** section on the right side of the **Components** page.

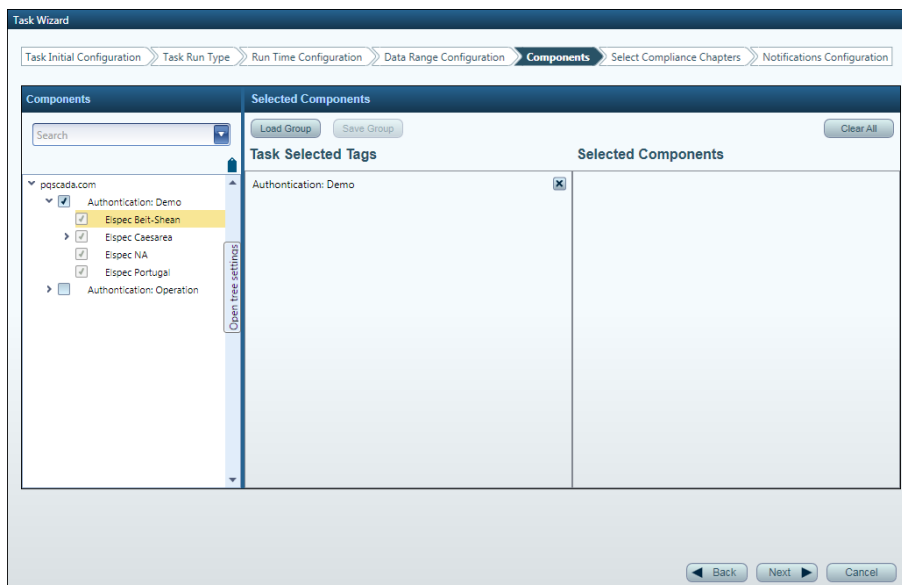
A list of the selected components will appear on the **Selected Components** column. To save the selected list, click **Save Group**.

- **Tags selection** – The task will be assigned to all components configured to the selected tag. To select tags, do the following:

i. Click the **Tag**  icon to sort the components by tags. To reset tags, click on [Open tree settings](#).

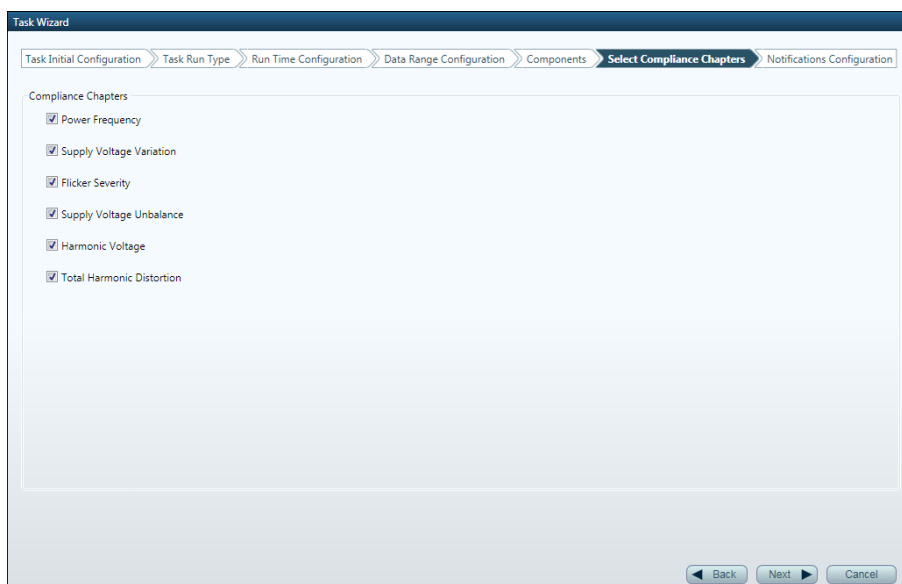
ii. Check the tags boxes in the **Component** section.

A list of the selected tags will appear on the **Task Selected Tags** column.



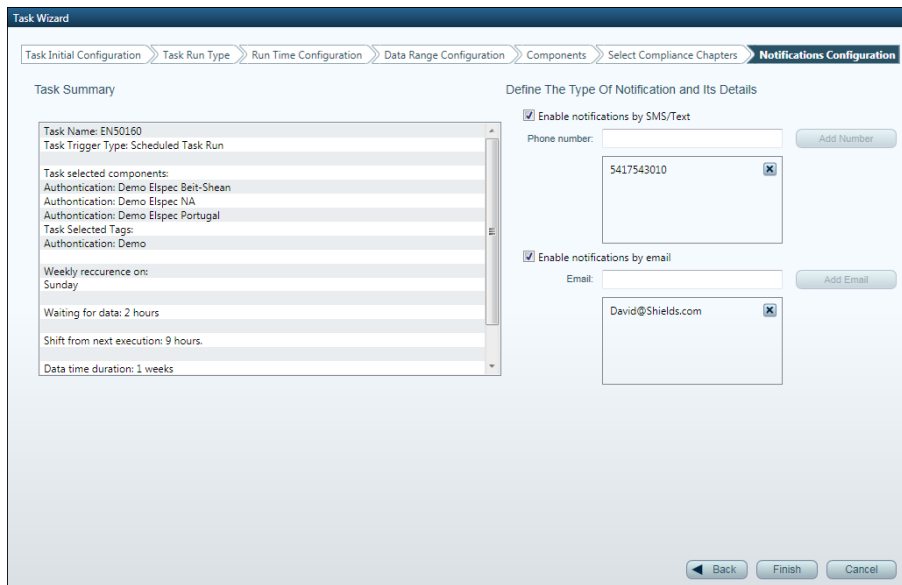
2. Click **Next** to go to the **Select Compliance Chapters** page.

11.3.2.7 Select Compliance Chapters



1. Select the **Compliance Chapters** to include in the report.
2. Click **Next** to go to the **Notification Configuration** page.

11.3.2.8 Notification Configuration



1. Configure the following options:



Note: Do not use the enable email/SMS notification if the email/SMS was not configured and tested.

- **Enable notification by SMS/Text** – check Enable notification by SMS/Text box and add cell phone numbers to send text message notification on task execution.
- **Enable notification by email** – check Enable notification by email to send email notification and attachment (if [enabled](#)) on task execution.

2. Click **Finish** to apply the changes.

11.3.3 Control and Maintenance Task (Enterprise edition only)

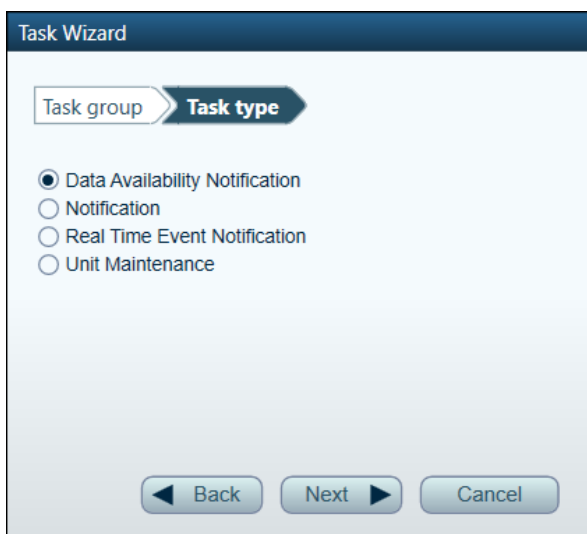
This Control and Maintenance task is used to configure notifications and can be used by customers to upgrade all their units by one task instead of performing a single firmware upgrade to each of the units, or for configuring physical devices.

11.3.3.1 Task Group and Type

1. Select the **Control and Maintenance** option.



2. Click **Next** to go to the **Task Type** page.



1. Select one of the four displayed task types. The available types depend on the [installed add-ons](#).

In the first three task types, the task configuration begins with selecting the components and ends with the notification configuration (selecting the email/text notification).

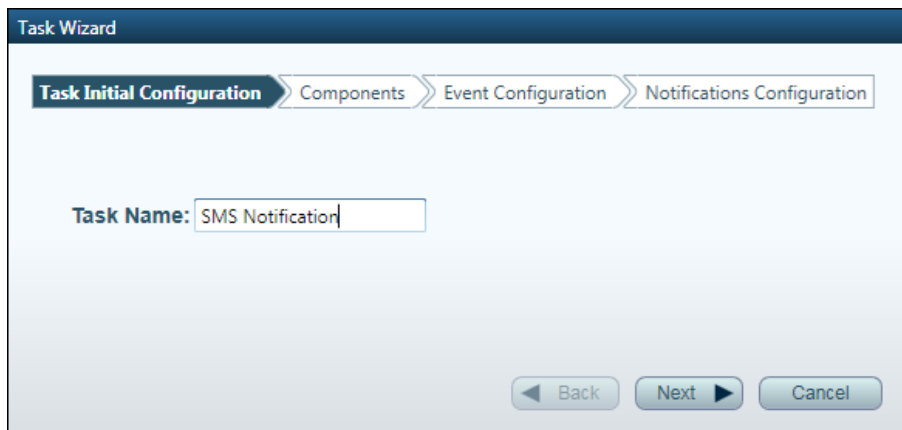
For the Unit Maintenance task type, see details in section 11.3.3.5.

2. Click **Next** to upload the Add-on configuration, beginning with the **Task Initial configuration** page. The page will be according to the selected Task type.

➡ **Notes:**

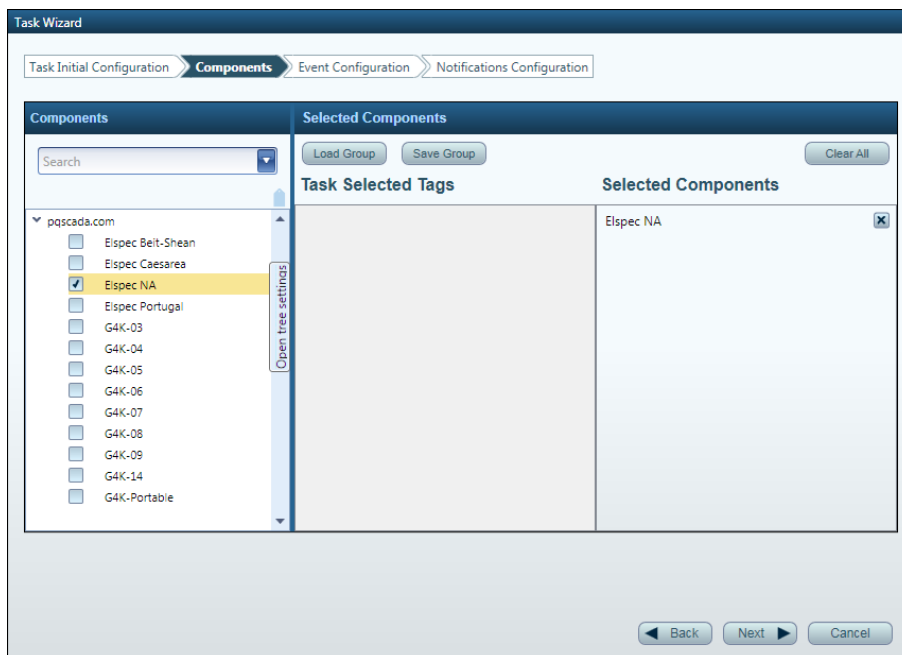
- ◆ Uploading the task add-on for the first time can take a few minutes.
- ◆ Once the task add-on is uploaded, going back to the Task type page is no longer available.
- ◆ For the purpose of this description, it is assumed that the EN50160 task is selected. This will ensure that all the wizard steps are fully explored.

11.3.3.2 Task Initial Configuration



1. Enter the **Task Name**.
2. Click **Next** to go to the **Components** page.

11.3.3.3 Components



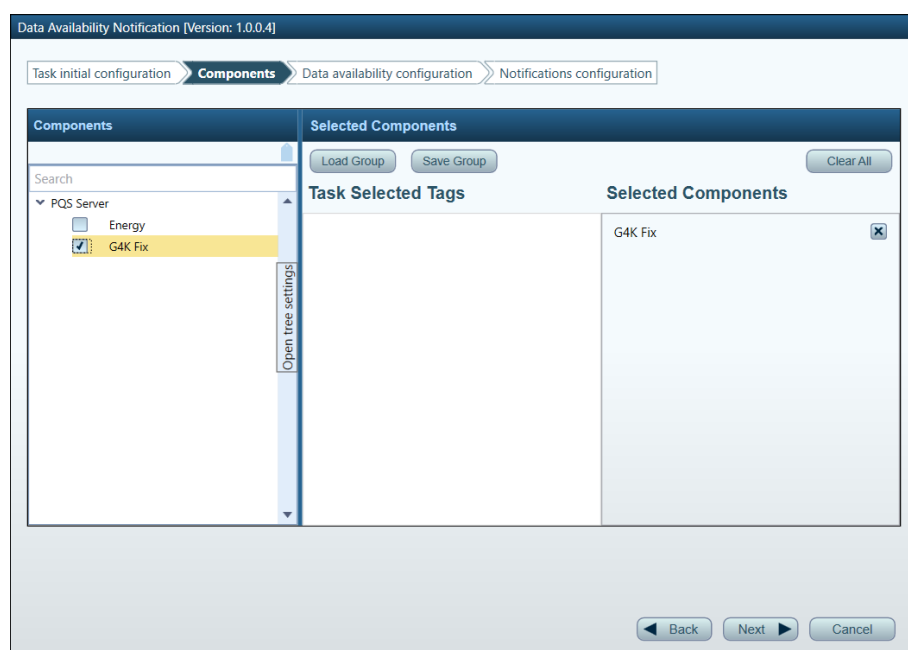
1. Select the components to execute the task on, with one of the following options:
 - **Component selection** – the task will be executed on individual components. select the component with one of the following options:

- ◆ Mark the component checkboxes in the **Component** section on the left of the **Components** page. Click the **Tag** icon to sort components by tags. To reset tags, click the [Open tree settings](#).
- ◆ Click **Load Group** in the **Selected Component** section on the right of the **Component** page.

A list of the selected components will appear on the Selected Components column. To save the selected list, click **Save Group**.

- **Tags selection** – the task will be assigned on all components configured to the selected Tag. To select tags, do the following:
 - i. Click the **Tag** icon to sort the components by tags. To reset tags, click [Open tree settings](#).
 - ii. Check the Tags boxes in the **Components** section on the left of the **Components** page.

A list of the selected tags will appear in the **Task Selected Tags** column.



2. Click **Next** to go to the next configuration page.

The next configuration page depends on the selected Control and Maintenance Task type (see step 2 in section 11.3.3.1 above).

11.3.3.4 Task Type Configuration

The task configuration page and details depend on the selected Control and Maintenance task type.

Configure the task details and click **Next**.

11.3.3.4.1 Data Availability Notification

The **Data availability configuration** page enables configuring the data availability duration and the notification trigger (data availability percentage and the time delay of the available data).

The screenshot shows the 'Data Availability Notification [Version: 1.0.0.4]' configuration window. It features a breadcrumb trail: 'Task initial configuration' > 'Components' > 'Data availability configuration' > 'Notifications configuration'. The 'Data availability configuration' step is active. The configuration includes three input fields: 'Calculate Data Availability for the most recent' set to 24 hours, 'Trigger a notification if Data Availability is less than' set to 100%, and 'Trigger a notification if latest available data is older than' set to 1 hour. At the bottom right, there are 'Back', 'Next', and 'Cancel' buttons.

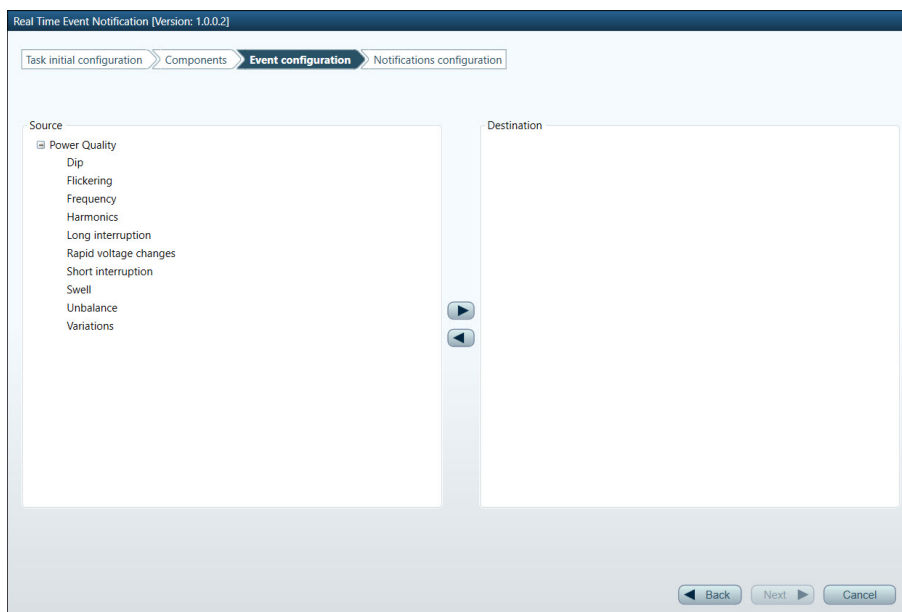
11.3.3.4.2 Notification

The **Event configuration** page enables configuring the source that should trigger the event (including non-power quality events such as system).

The screenshot shows the 'Notification [Version: 1.0.0.17]' configuration window. It features a breadcrumb trail: 'Task initial configuration' > 'Components' > 'Event configuration' > 'Notifications configuration'. The 'Event configuration' step is active. The configuration is split into two panes: 'Source' and 'Destination'. The 'Source' pane contains a list of event sources: 'System', 'Power Quality', 'Digital I/O, Analog I/O and Relay', and 'Custom'. The 'Destination' pane is currently empty. A double-headed arrow is positioned between the two panes. At the bottom right, there are 'Back', 'Next', and 'Cancel' buttons.

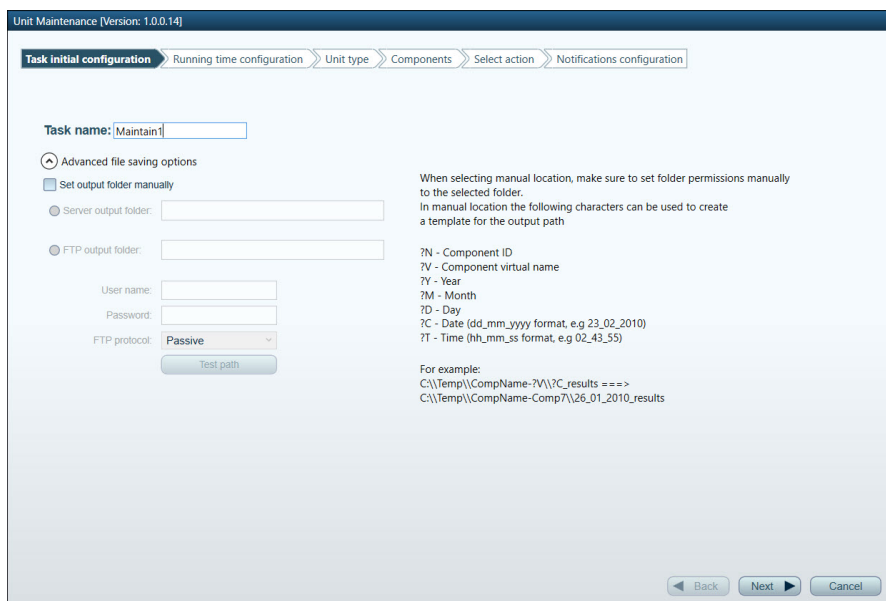
11.3.3.4.3 Real Time Event Notification

The **Event configuration** page enables configuring the power quality event that will trigger the event (only power quality events).



11.3.3.5 Unit Maintenance

Selecting the **Unit Maintenance** task type enables configuring components and firmware (fw) upgrade tasks.



1. Enter the **Task Name**.
2. If the user would like to change the default destination folder, click the **Advanced file saving options** expand arrow.

Mark the **Set output folder manually** checkbox to set the following:

- **Server output folder** – select this option to save the task output on the instance machine. Make sure that PQSCADA Sapphire's instance has permission to store files in the configured path.

- **FTP output folder** – select this option to save the task output on a remote FTP server. You will need to enter the FTP details.
3. Click **Next** to go to the **Running time configuration** page.
4. Select task running time from one of the following:
 - **Now**
 - **Running time** – select the date and time from the dropdown calendar.
5. Click **Next** to go to the **Unit type** page.
6. Select the unit type from the dropdown list.
7. Click **Next** to go to the **Components** page.
8. Select the Components (see details in section 11.3.3.3 above).
9. Click **Next** to go to the **Select action** page and mark on or both of the following actions:
 - **Configuration file** and browse to the location (path) of the fw/cnfg file.
 - **Upgrade file** and browse to the location (path) of the fw/cnfg file.
10. Click **Next** to go to the **Notifications Configuration** page.

11.3.3.6 Notification Configuration

1. Configure the type of notification and details:
 - **Enable notification by SMS/Text** – mark **Enable notification by SMS/Text** checkbox and add cell phone numbers to send text message notification on task execution.
 - **Enable notification by email** – mark **Enable notification by email** to send email notification and attachment (if [enabled](#)) on task execution.
2. Click **Finish** to apply changes.

11.4 Modifying a Task

1. Toggle to **Tasks List** view on the Scheduler's main viewing area.
2. Double click the Task to modify.
3. Follow the wizard instructions.

11.5 Deleting a Task

1. Toggle to **Tasks List** view on the Scheduler's main viewing area.
2. Delete a task in one of the following options:
 - Right-click the task and select **Delete**.
 - Click **X** on the delete column of the task to delete.

11.6 Opening an Attachment

1. Toggle to **Log** view on the Scheduler main viewing area.
2. Double click the **Task log**.

12. Appendices

Appendix A. Historical Data

A.1. Binary and Summary Data

PQSCADA Sapphire contains two types of Data:

- **Binary** – waveform data stored in chunks of 1 minute.
- **Summary** – calculated parameters stored as min., max., and average values of different time intervals.

The summary data may include thousands of parameters calculated from the binary data, fetched instance data, or directly acquired from a device.

The Binary data response will be for less than 3 hours requests, and Summary data will be for more than 3 hours requests.

A.2. Recalculation Process

Recalculation is used in one or more of the following options:

- Adding/removing new power quality parameters to the summary data.
- Adding/modify/removing events from a component.
- Adding/modifying/removing compliance standard to a component.
- Changing the unit configuration due to misconfiguration or wrong installation.

The recalculation process will recalculate the selected parameters/event/compliance from the waveform data. In the case of a unit configuration change, the recalculation will apply to all the historical data.

