PowerShield.

# Link 4

# Battery Monitoring System

# User Guide

# Table of Contents

Part Number 6300-017H
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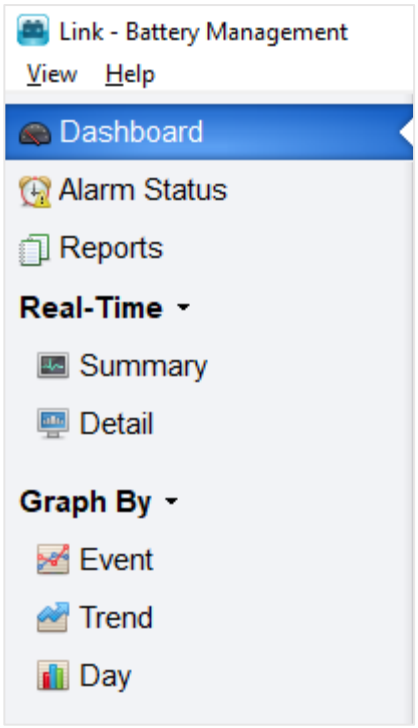
# Navigation

Link consists of a number of pages, each providing different functionality. These pages are shown in the menu in the left pane, simply click an icon to select each page. Within a page there are a range of tabs, buttons and drop-down selection lists, along with the battery data being displayed. In some places you will need to make a selection or enter information so Link can display the battery information you require.




**TIP 1:** See the ***General Settings*** and ***Admin Utility*** items in the ***Help*** menu for added functions like backing up your Link database and configuring email alarm alerts.

**TIP 2:** Some navigation & functions vary slightly between Standard Edition and Service Edition. This User Guide generally refers to behaviour of the Standard Edition. See the Installing Link Software section and the Link Service Edition section for more information.

# Installing Link Software

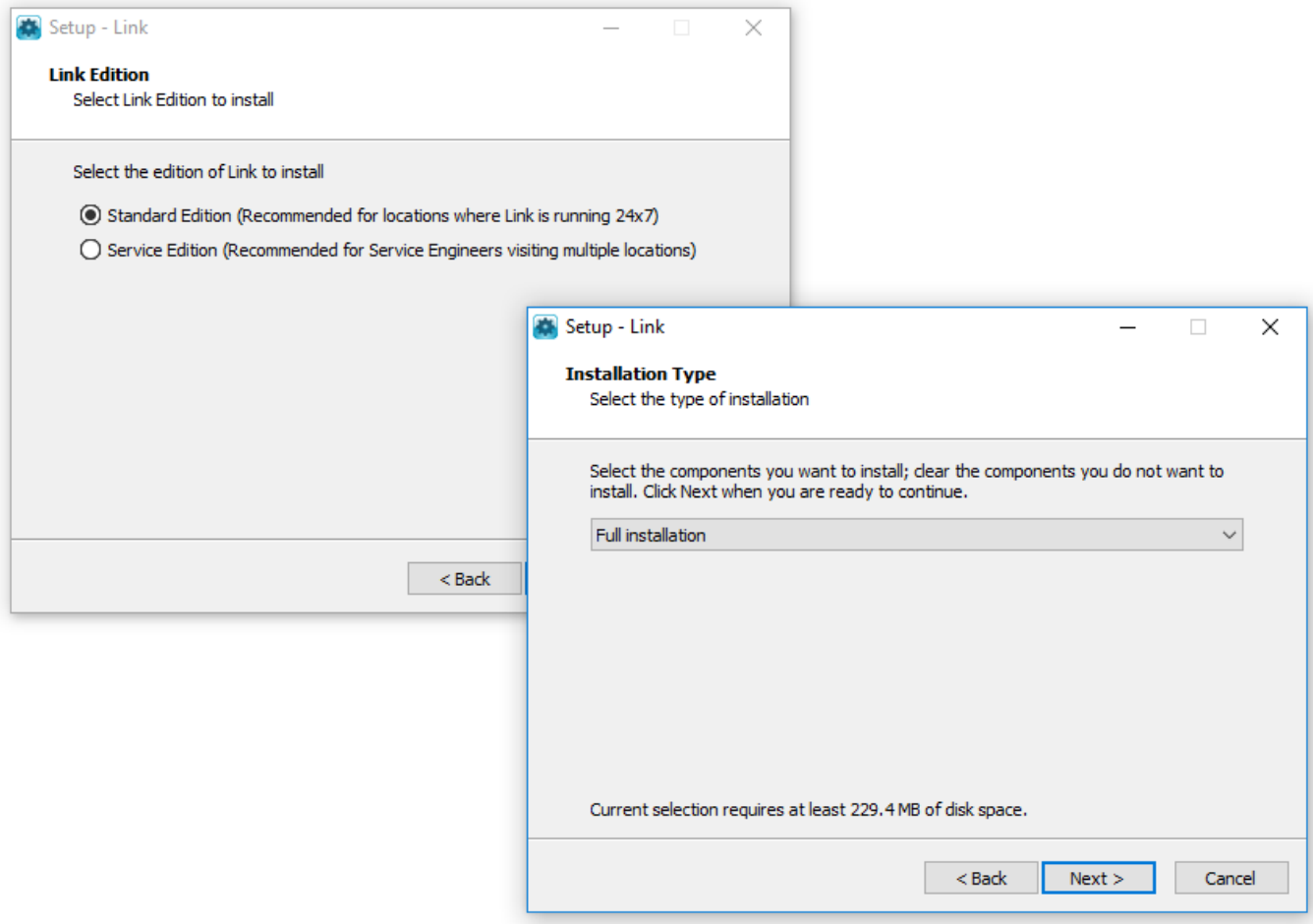
**Minimum requirements**

| | |
|---|---|
| Processor | Intel i3-8100 or faster |
| RAM | 8GB |
| Disk space | 30GB |
| Display | 1024 x 768 or 1366 x 768 |
| Desktop Operating System | Windows 10 or 11 |
| Server Operating System | Windows 2012 R2, 2016, 2019, 2022 |

**To Set up Link**

1. Run **Link Setup.exe** from the CD supplied with your PowerShield system
2. Follow the installation wizard steps to match your requirements

A Full Installation should be applied for normal operations.




**TIP 1:** If you get a User Account Control pop up screen click **Yes** to continue.

**TIP 2:** If you don't have the system USB flash drive, Link software is also available for download at www.powershield.com. Contact PowerShield for further assistance.

**TIP 3:** Install the Standard Edition for fixed PC's with Link running 24/7. Install the Service Edition for laptops with temporary activity and connections. Talk to PowerShield if you need to change from one edition to another.

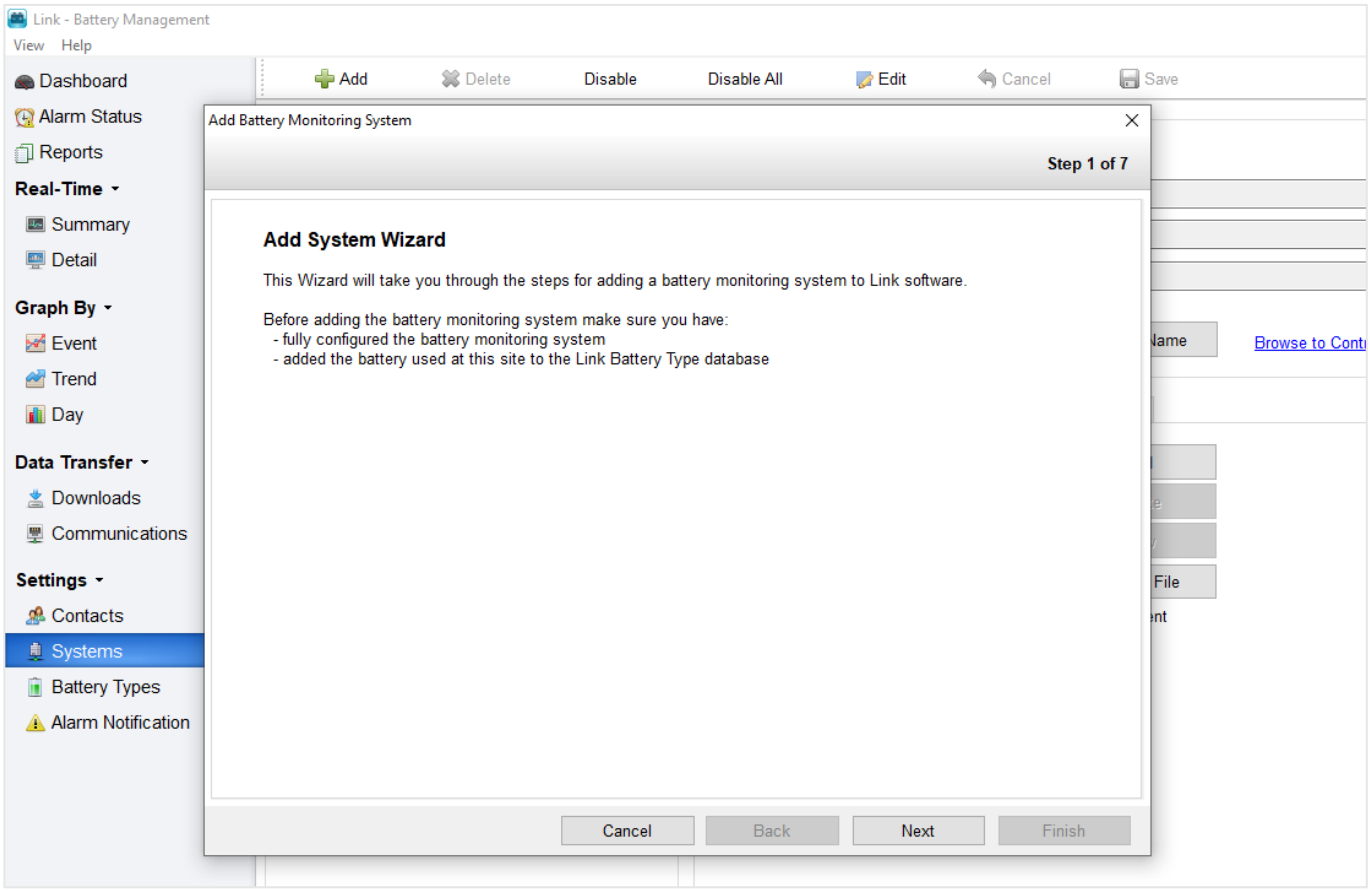
# Adding A New Battery Monitor System

You need to 'add' your battery monitor system to Link before you can view it. Note the battery monitor needs to be configured before it can be added to Link.
Each subsequent battery and battery monitoring system needs to be added to Link in the same manner.

1. Go to the ***Settings >> Systems*** page
2. Click the **Add** button

The ***Add System Wizard*** will guide you through the steps required – simply follow the prompts.

**TIP 1:** The battery monitor should be fully configured before it is added to Link.




**TIP 2:** Earlier versions of Link used the terms '*Site*' and '*Sitename*' to identify an individual battery monitoring system. Link now uses the term '*System*'.

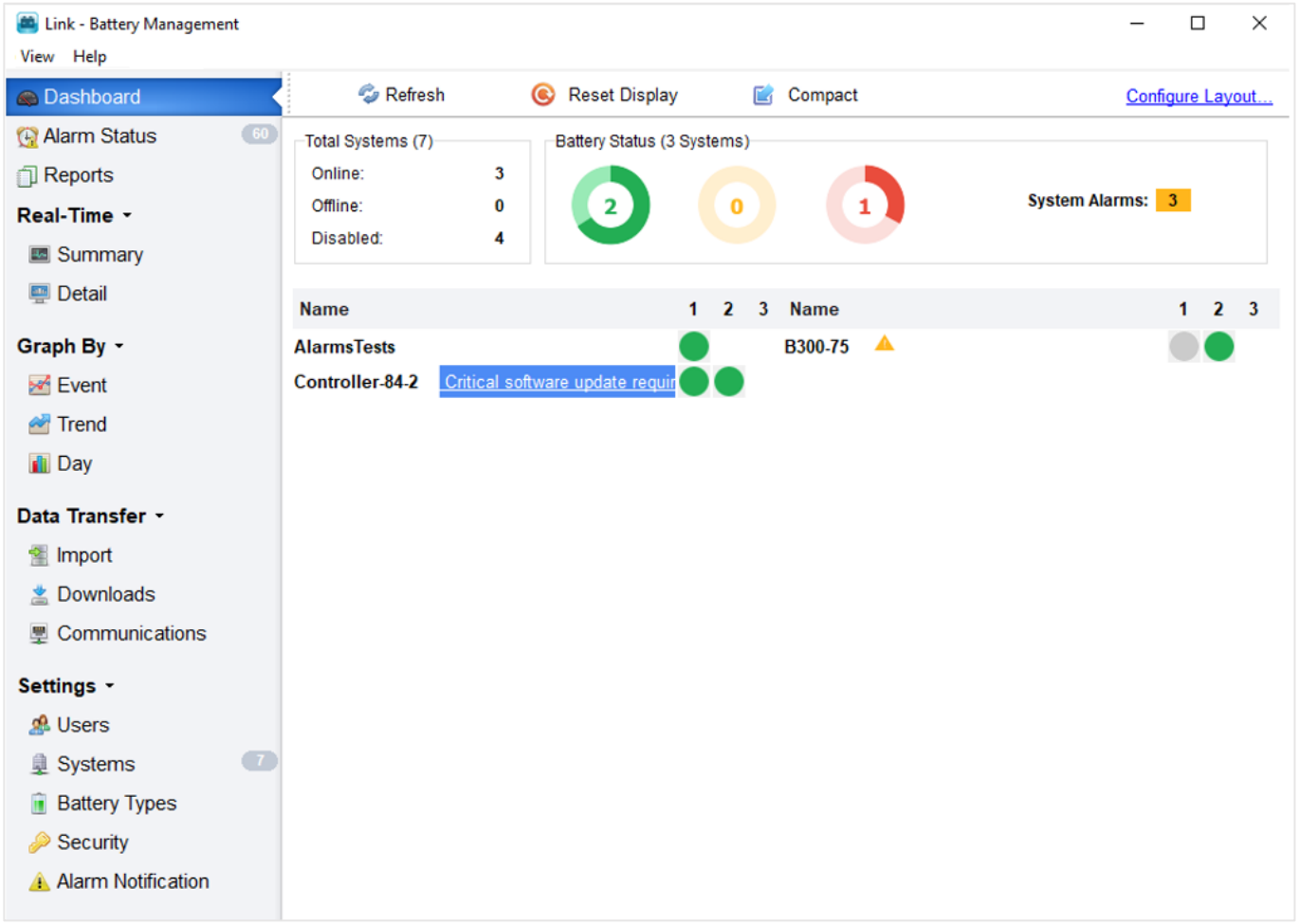
**TIP 3:** When adding a Controller that is configured for HTTPS, make sure you select the HTTPS protocol in the ***Add System Wizard***.

# Viewing All Your Batteries

The ***Dashboard*** page shows the current status of all battery systems and displays all alarms that require attention.

Click on the various icons for a particular system to:

- View real time data for the individual batteries in a string
- Hover over the string icons to view a list of alarm information for the system




**TIP 1:** The coloured ***Dashboard*** indicators show the present status with respect to any alarm limits set.

**TIP 2:** Clicking on the indicator for a particular string will take you direct to the ***Real-Time >> Detail*** for that string.

**TIP 3:** The Service Edition only shows systems that are currently enabled.

# Dashboard String Alarm State Indicators

The dashboard string states are represented by a number of different colours and symbols, depending on which system type (Sentinel or PowerShield 8) has been configured.

## PowerShield 8 String States

| String State | Description |
|---|---|
| *Green* | No alarms have been activated for any reading on this string. |
| *Yellow* | A warning alarm has been activated on this string, but no critical alarms have been activated. |
| *Red* | There is a minimum of one critical alarm on this string, as well potential warning alarms. This notification will also flash, and will flash in sync if an audible alarm sound has been configured. |
| *Light Grey* | The system is either offline or has been disabled. |

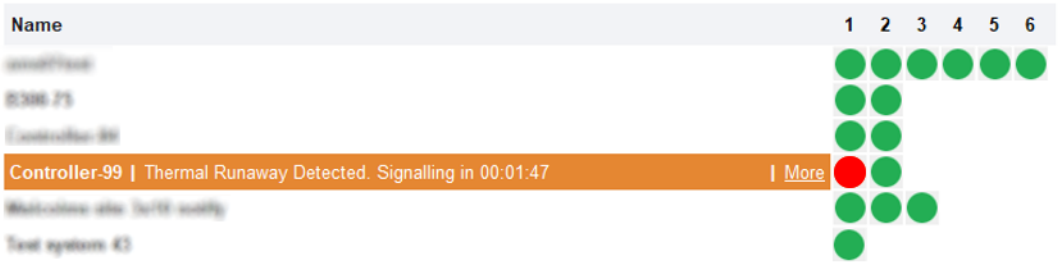
## Sentinel String States

| String State | Description |
|---|---|
| *Green* | No readings within the string are outside of limits. |
| *Red* | At least one reading within the string lies outside of limits. |
| *Rotating* | The string is currently being checked. |
| *Down Arrow* | The system cannot be updated whilst memories for this string are being downloaded. |
| *Light Grey* | The system is either offline or has been disabled. |

## Thermal Runaway Indication

When a system has detected battery thermal runaway condition it is highlighted in the dashboard page. It will be orange for detected and red for detected and signalled.

For details on the thermal runaway protection functionality see the PowerShield 8 Configuration manual (6300-103).



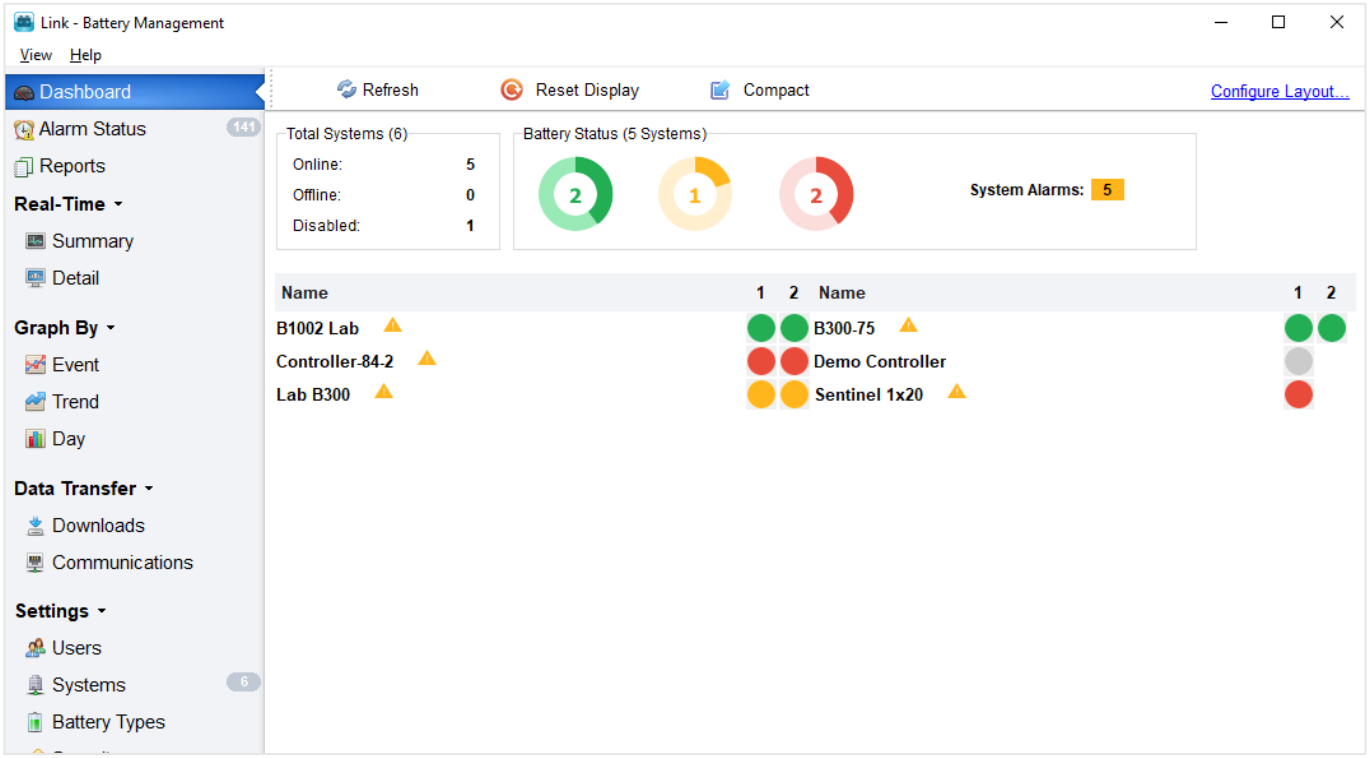

## Audible Alarms

An audible alarm may be configured to play whenever an alarm is triggered by clicking ***Configure Layout >> Dashboard*** and ticking the ***Play sound when alarm occurs*** checkbox. Clicking the ***Loop sound*** checkbox will allow the user to set the alarm to play repeatedly until it is reset by the user. Clicking the **Open** button will allow the user to browse for and specify a different sound file to play whenever an alarm is activated.

Whenever a critical or system alarm is activated, an audible alarm will be activated by Link if the ***Play sound when alarm occurs*** checkbox has been checked. If the alarm has been set to loop, it will continue to remain active until the user resets it by clicking the **Reset Display** button on the ***Dashboard***.

# Monitor System Alarm Indication

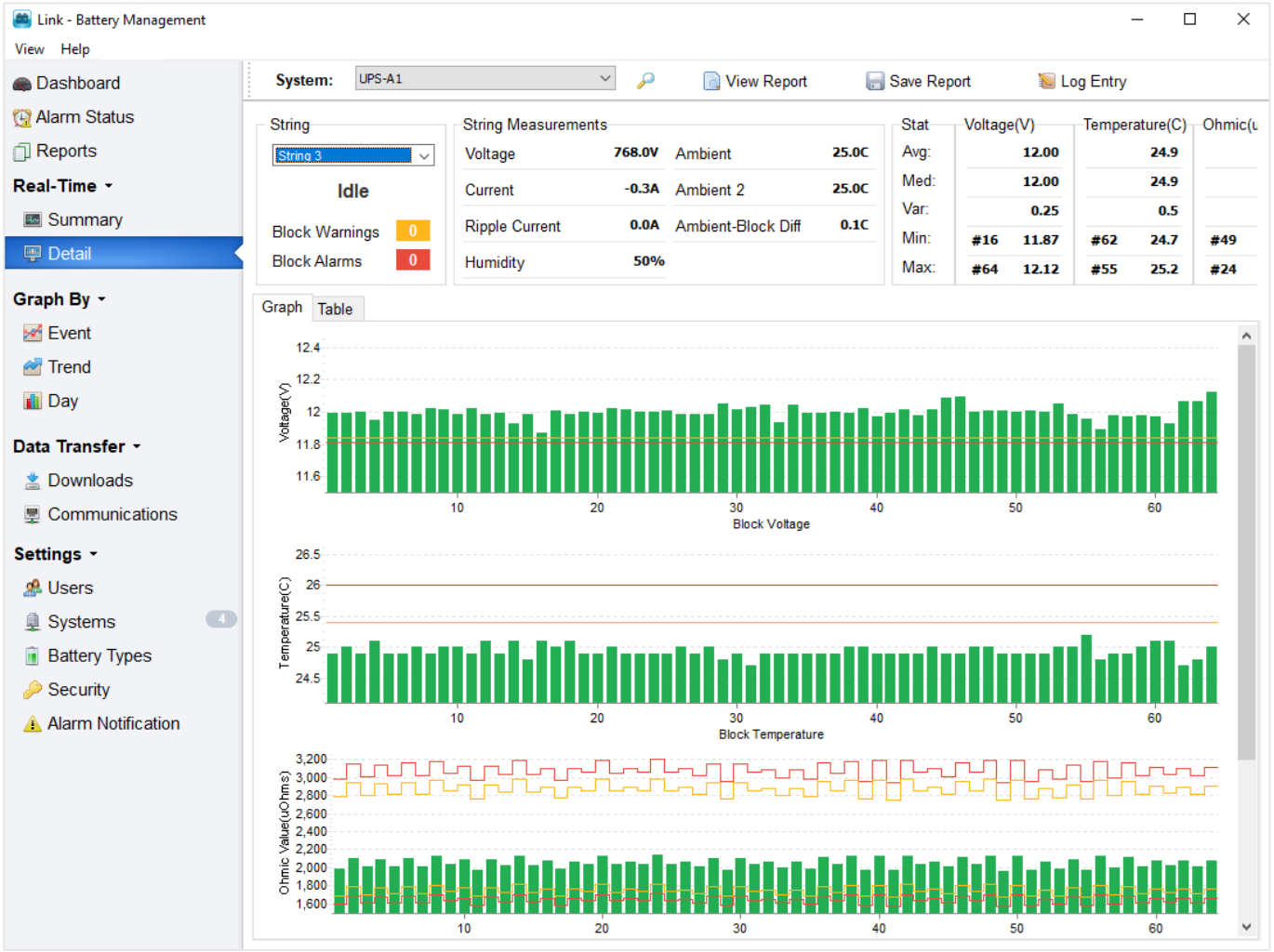
The ***'yellow triangle'*** icon on the Dashboard indicates a system alarm present on the Monitor.
The icon flashes if a new system alarm was detected in the most recent Dashboard poll, when a subsequent Dashboard poll occurs and the alarm is still present the icon will change to a solid state.



# Viewing An Individual Battery

This page provides the user with the latest measurements for individual battery voltage, ohmic value and temperature. Note that Link automatically displays the parameters that the battery monitor is configured with – not all systems provide all parameters.

1. Go to the ***Real-Time >> Detail*** page
2. Select the ***System*** name to view from the drop-down list
3. Select the ***String*** name from the drop-down list for the battery you wish to view




You may also:

- View the actual measurements (***Table*** tab)
- Save the measurements to a report in either PDF or CSV format (**Save Report**)

**TIP 1:** Link is designed for connection to multiple battery systems – remember to select the system you wish to view.

**TIP 2:** The battery voltages are shown live and updated at the battery monitor every four seconds. Ohmic is updated once per day or as per operator settings.

**TIP 3:** You may also access this screen directly by clicking on the green or red indicator for a particular string at the ***Dashboard*****.**

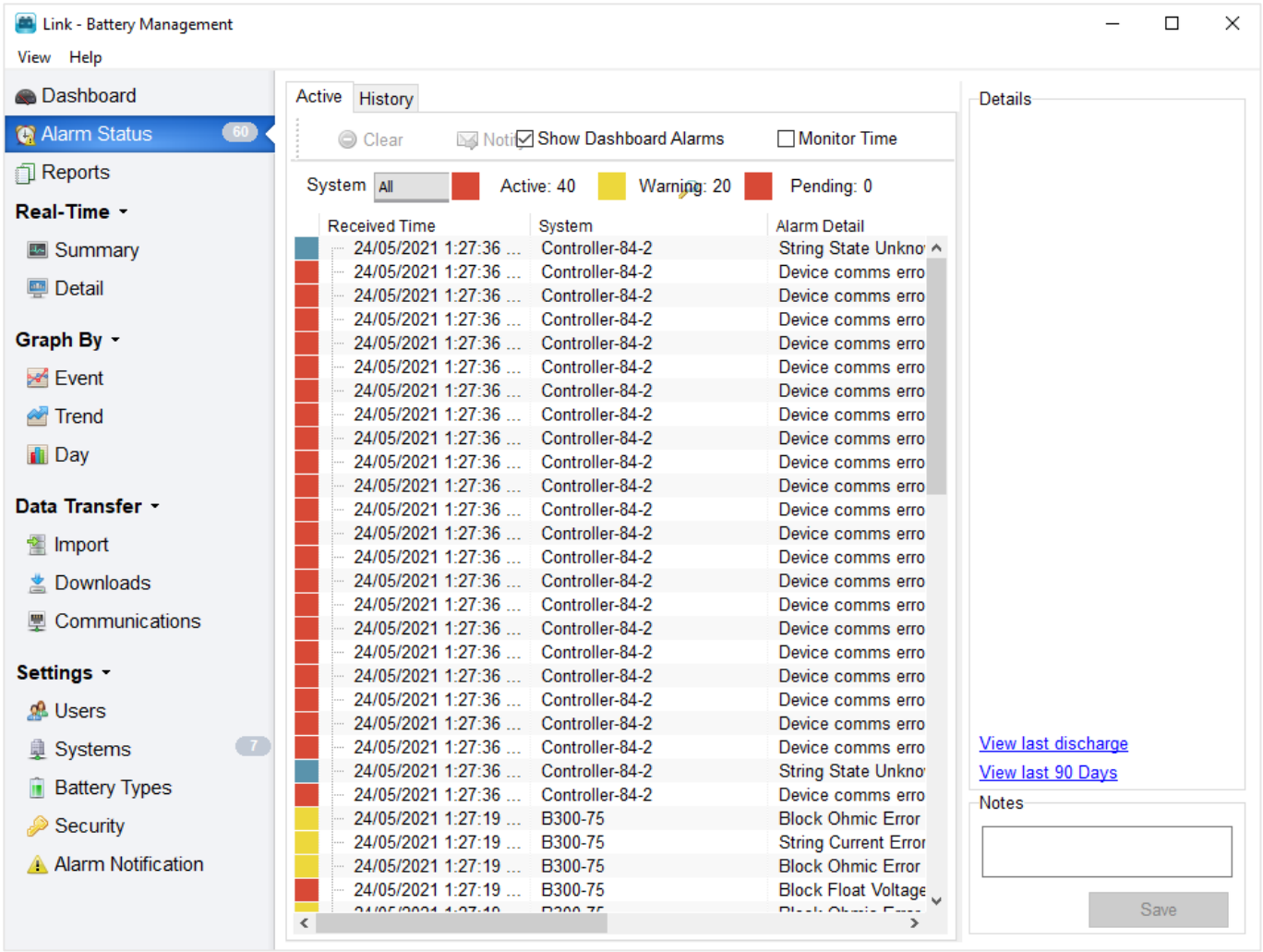
# Alarms

This page provides the user with details of any current alarms. See the section about Link Alarm Clearing behaviour as the alarm behaviour is different depending on battery monitor model.

Clearing an alarm:

1. Go to the ***Alarm Status*** page
2. (Sentinel only) Select the alarm to be cleared from the list of Active alarms on the ***Active*** tab
3. Click the **Clear** button

Please note you cannot clear an alarm on a PowerShield 8 Controller as it clears them automatically. When an alarm is deactivated from the PowerShield 8 Controller it is automatically registered as archived within Link.




Note that the Link ***Dashboard*** may also generate alarms for Sentinel monitors. When the ***Dashboard*** is run, it takes each measurement and cross-checks them with their reference limits. If the measurements are outside the range of their reference limits, an alarm is sounded and is subsequently added to the list.

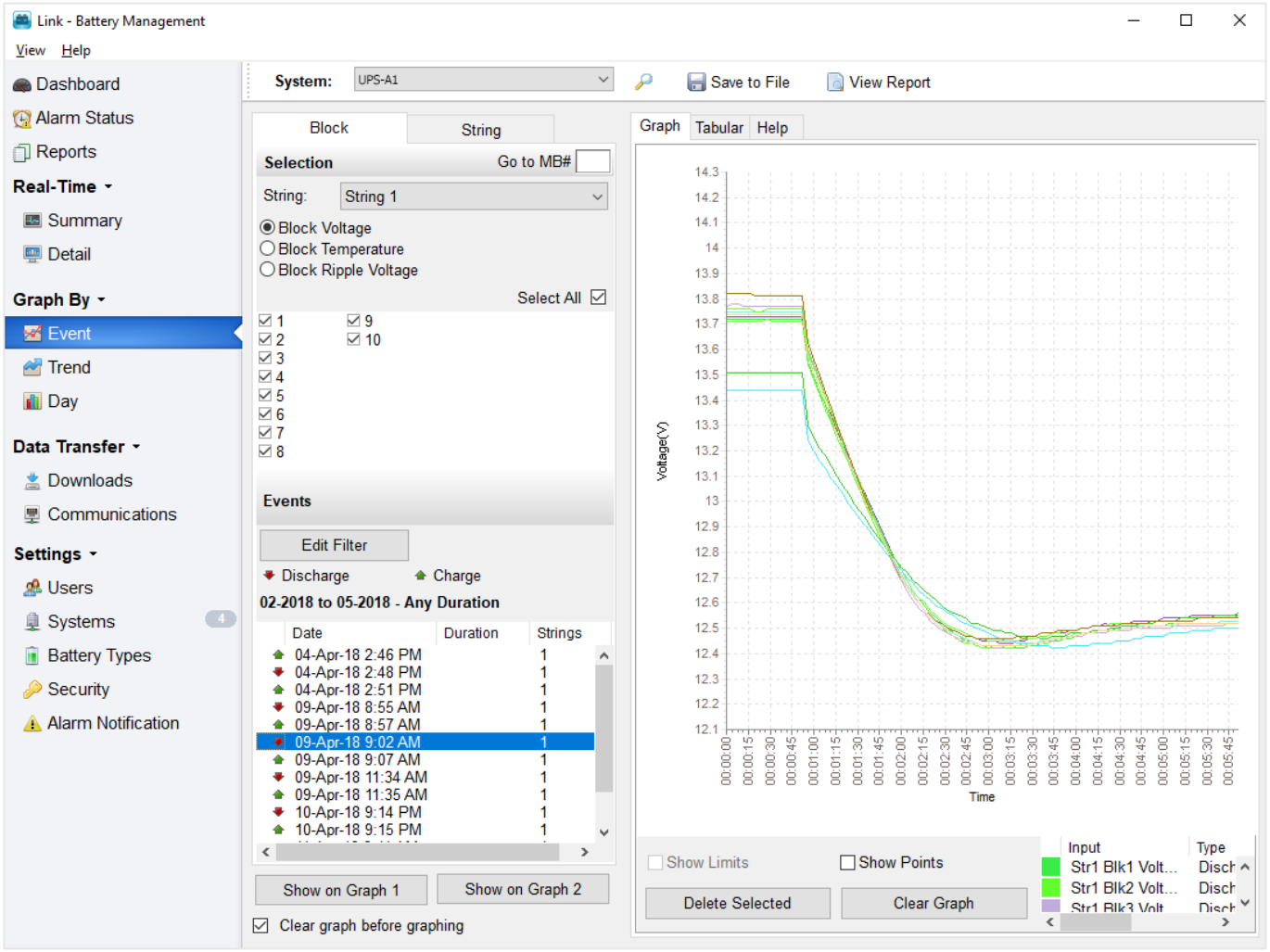
**TIP 1:** More specific details for a selected alarm and its history are listed in the ***Details*** box on the right of the page. Refer to the ***Help*** tab for more detail about alarm states.

**TIP 2:** You can also view old alarms via the ***History*** tab.

# Graphing A Recorded Discharge

To Graph a recorded discharge, you must ensure that Link has downloaded the discharge from the battery monitor.

1. Go to the ***Graph By >> Event*** page
2. Select the ***System*** name to view from the drop-down list
3. Select the other parameters you wish to view – string number, battery number, measurement type – Voltage or Temperature
4. Select the event date you wish to view from the events list
5. Click **Show on Graph 1**

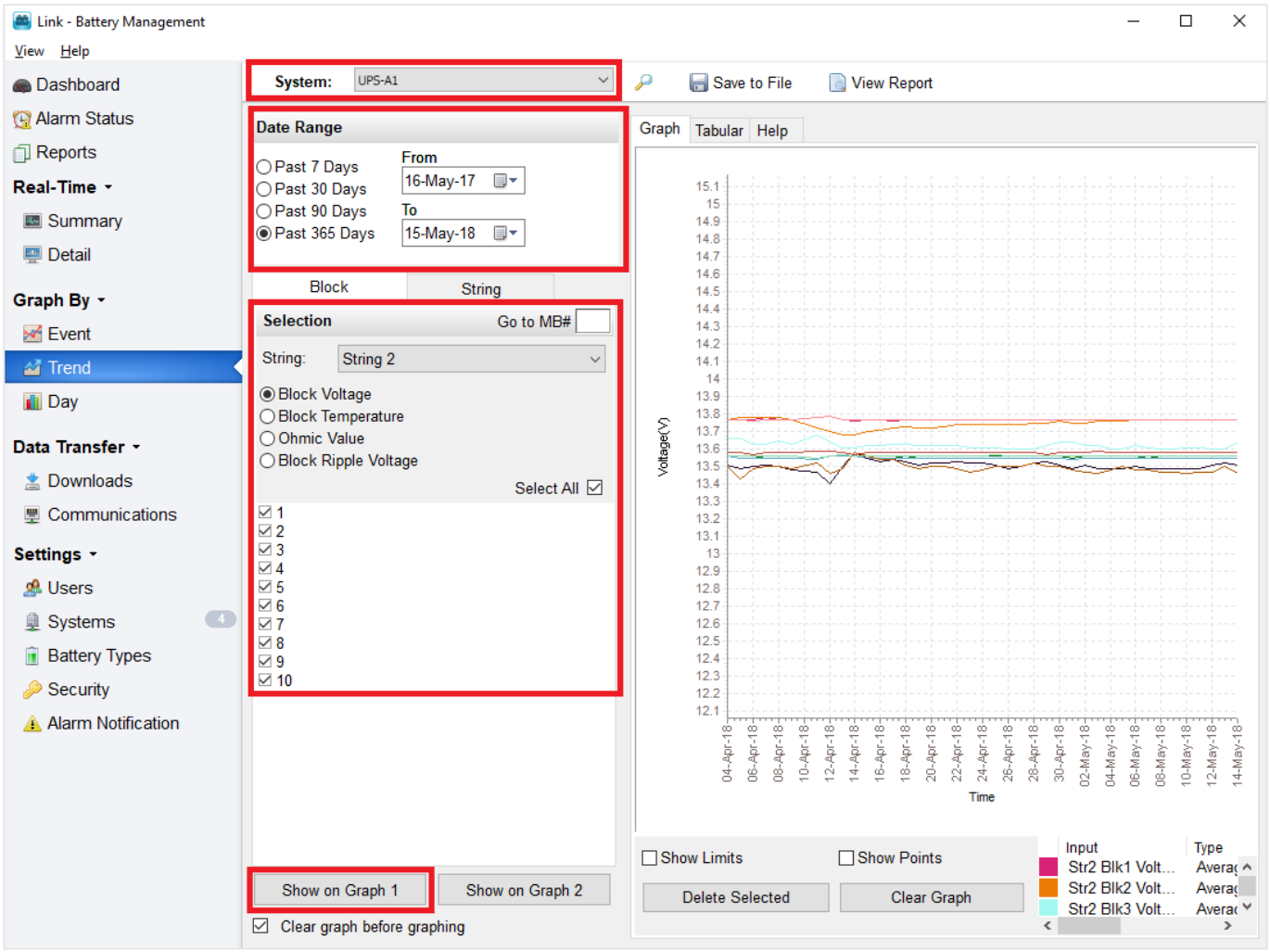



**TIP 1:** The discharge data set MUST be transferred from the monitor to the Link database (an automatic process at the end of the discharge) prior to disconnection. If you cannot find the event in the event list or are unsure, you can view and 'force' this transfer at the ***Data Transfer >> Downloads*** page if the monitor is still connected.

**TIP 2:** You can display measurements in Graph 1 or Graph 2 so that different measurement parameters can be visually compared. For example, graph all Block voltages on Graph 1 and the String Current on Graph 2.

# Analysing Trends Of Your Batteries

1. Go to the ***Graph By >> Trend*** page
2. Select the ***System*** name to view from the drop-down list
3. Select the date range you wish to analyse
4. Select the string number
5. Select the other parameters you wish to view – battery number, measurement type
6. Click **Show on Graph 1**




**TIP 1:** You can also access this page by clicking on an individual battery voltage bar in the ***Real-Time >> Detail*** screen.

**TIP 2:** You can print and save the graph by right clicking on the graph and making the desired selection.

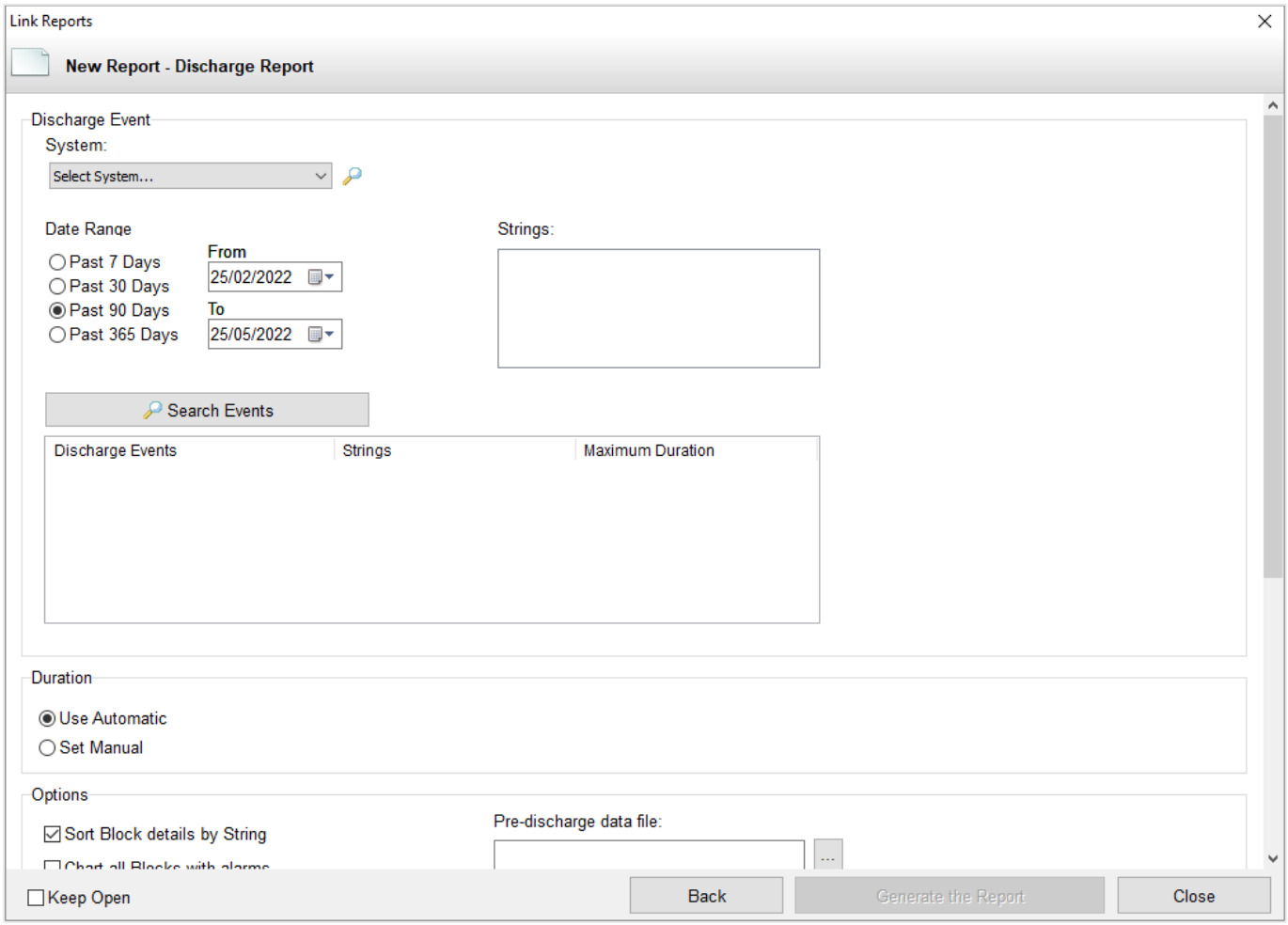
**TIP 3:** Click on an item graph line to highlight and determine a particular item number in the graph key.

**TIP 4**: You can view the measurements from a particular day and time at the ***Graph By >> Day*** page.

# Creating A Discharge Report

The data for all reports is derived from the battery monitor. Ensure that sufficient time is allowed for data to be transferred to the Link database before creating a report.

1. Go to the ***Reports*** page
2. Click the **New** button to generate a new report and select **Discharge** from the list of Report Types
3. Select the *System* name you wish to report on from the drop-down list on the ***Discharge Report*** page
4. Select the relevant string(s) and click **Search Events**
5. Select the event date you wish to view from the events list
6. Click **Generate the Report** to proceed



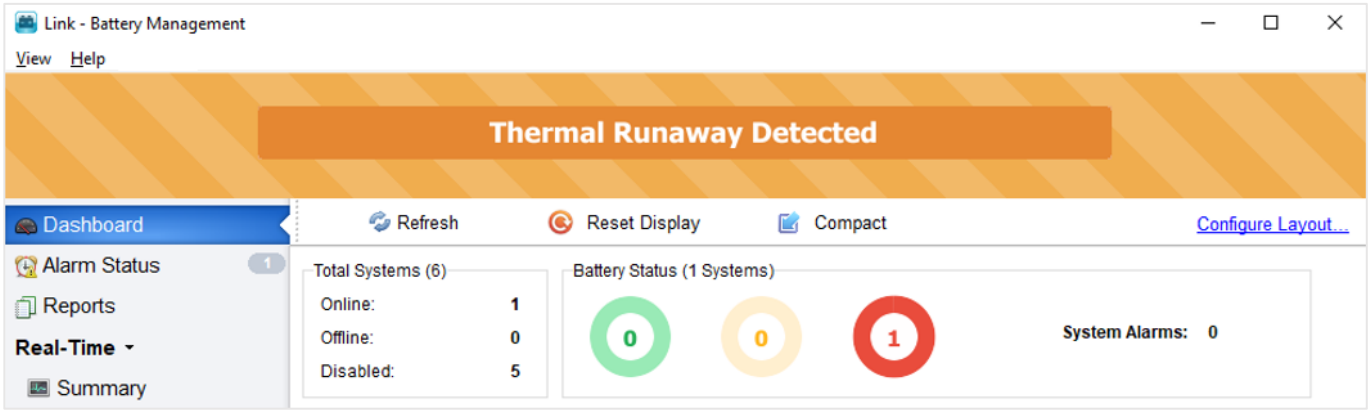

**TIP 1:** You can generate a Discharge Report 'offline' without being connected to a monitor. However, the discharge data set MUST have been transferred from the monitor to the Link database (an automatic process at the end of the discharge) prior to disconnection. If you cannot find the event in the event list or are unsure, you can view and 'force' this transfer at the ***Data Transfer >> Downloads*** page, if the monitor is still connected.

**TIP 2:** The report will use the alarm limits set on the monitor, or you can adjust these when creating the report by selecting ***Create Custom Limits***.

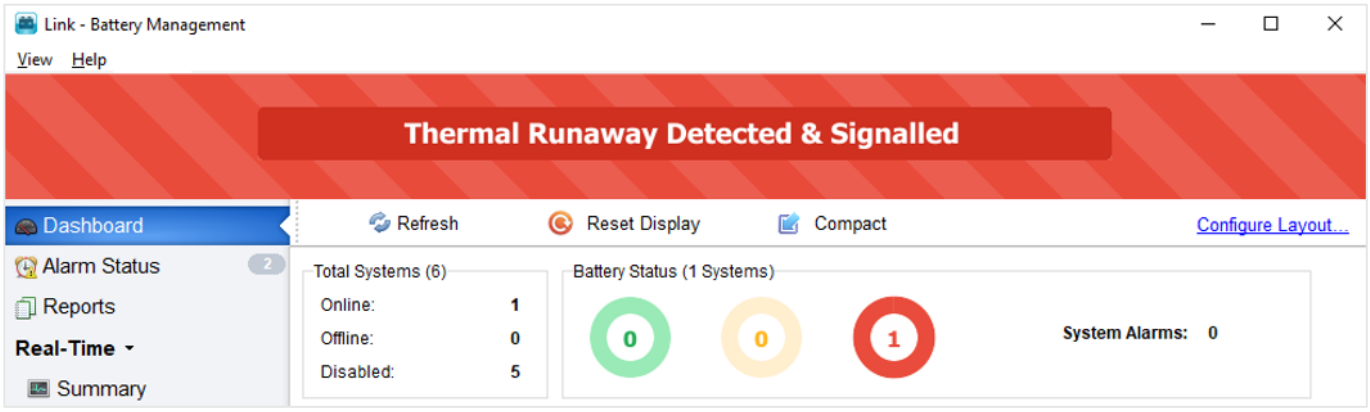
# Thermal Runaway Protection

The PowerShield 8 Controllers have battery thermal runaway protection feature. The thermal runaway detection functionality is part of the Controller but the thermal runaway protection signalling is optional.
When thermal runaway is detected a banner appears below the main Link menu regardless of the page you are on. For details on the thermal runaway protection functionality see the PowerShield 8 Configuration manual (6300-103).

When thermal runaway is detected the orange banner appears as shown below.




When the PowerShield 8 Controller has detected thermal runaway and has sent the control signal to isolate the battery string or step down the battery charger the red banner appears as shown below.



# Link Alarm Clearing Behaviour

Link automatically clears battery alarms for the Sentinel to provide up-to-date battery status. This function is not required for the PowerShield 8 Controller as it clears its own alarms.

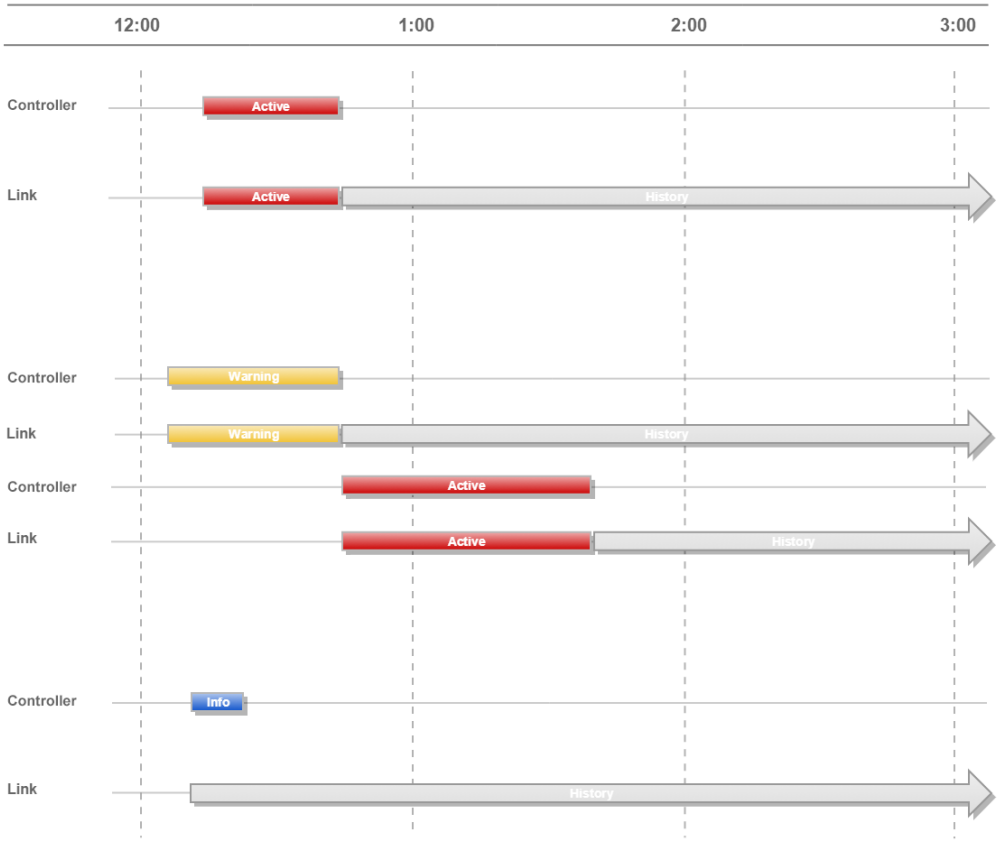
Alarm types:

- Battery alarms relate directly to the battery system and its environment
- System alarms (which are not automatically cleared) relate to proper operation of the battery monitor and must be cleared manually

Auto-clear functions only occur within the Standard Edition on Sentinel monitors.

## Alarm Behaviour – PowerShield 8 Controller

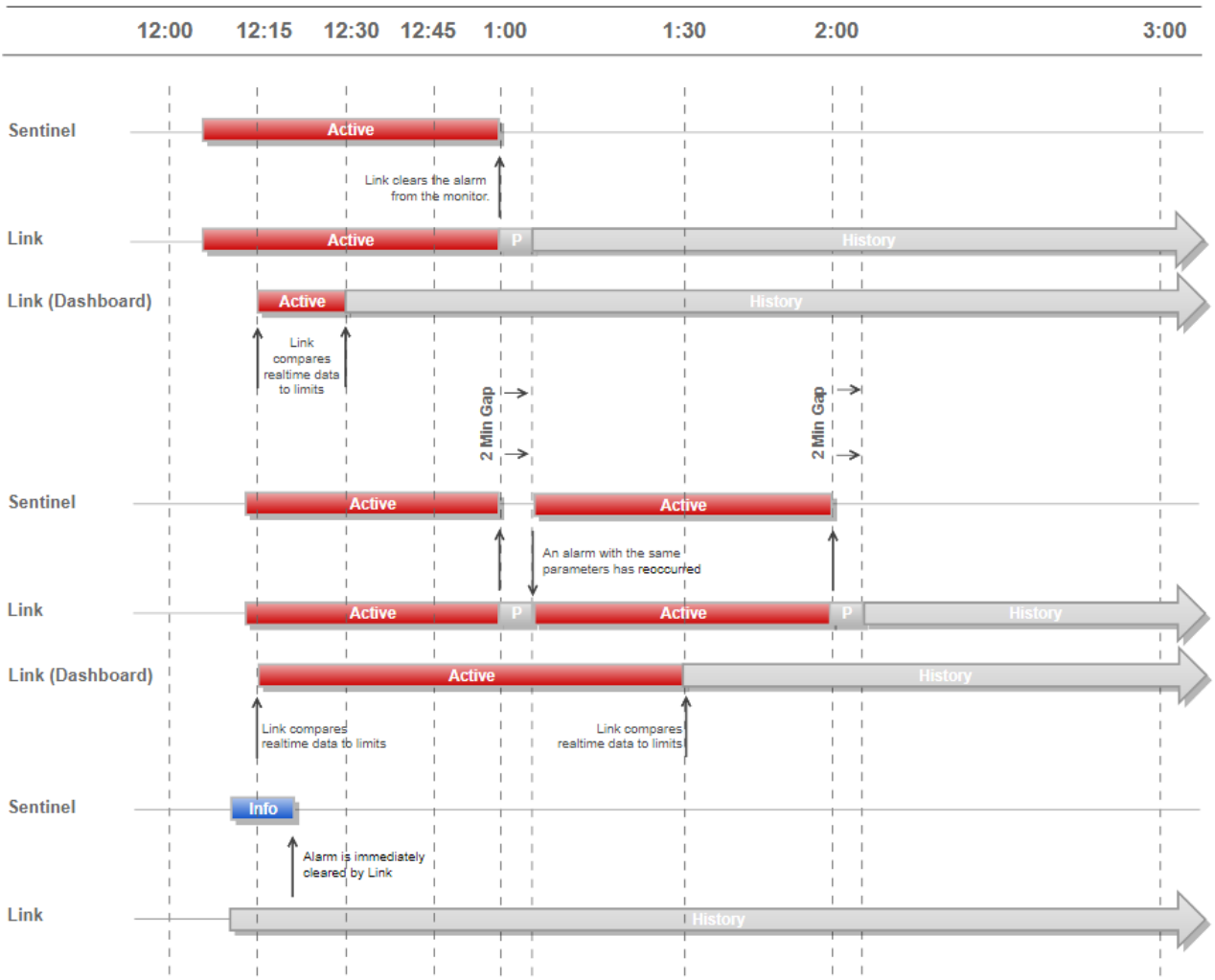
When an alarm is cleared by the PowerShield 8 Controller, the alarm record in Link will automatically move into the ‘archived’ state.



# Alarm Behaviour – Sentinel

The Link application will clear alarms from the Sentinel on an hourly schedule. If the alarm is triggered again within a period of two minutes after its initial deactivation it will once again enter 'an active' state. During the two-minute period the alarm is in the 'pending' state. If it is not triggered within the two minute time frame it will enter into the 'archived' state.

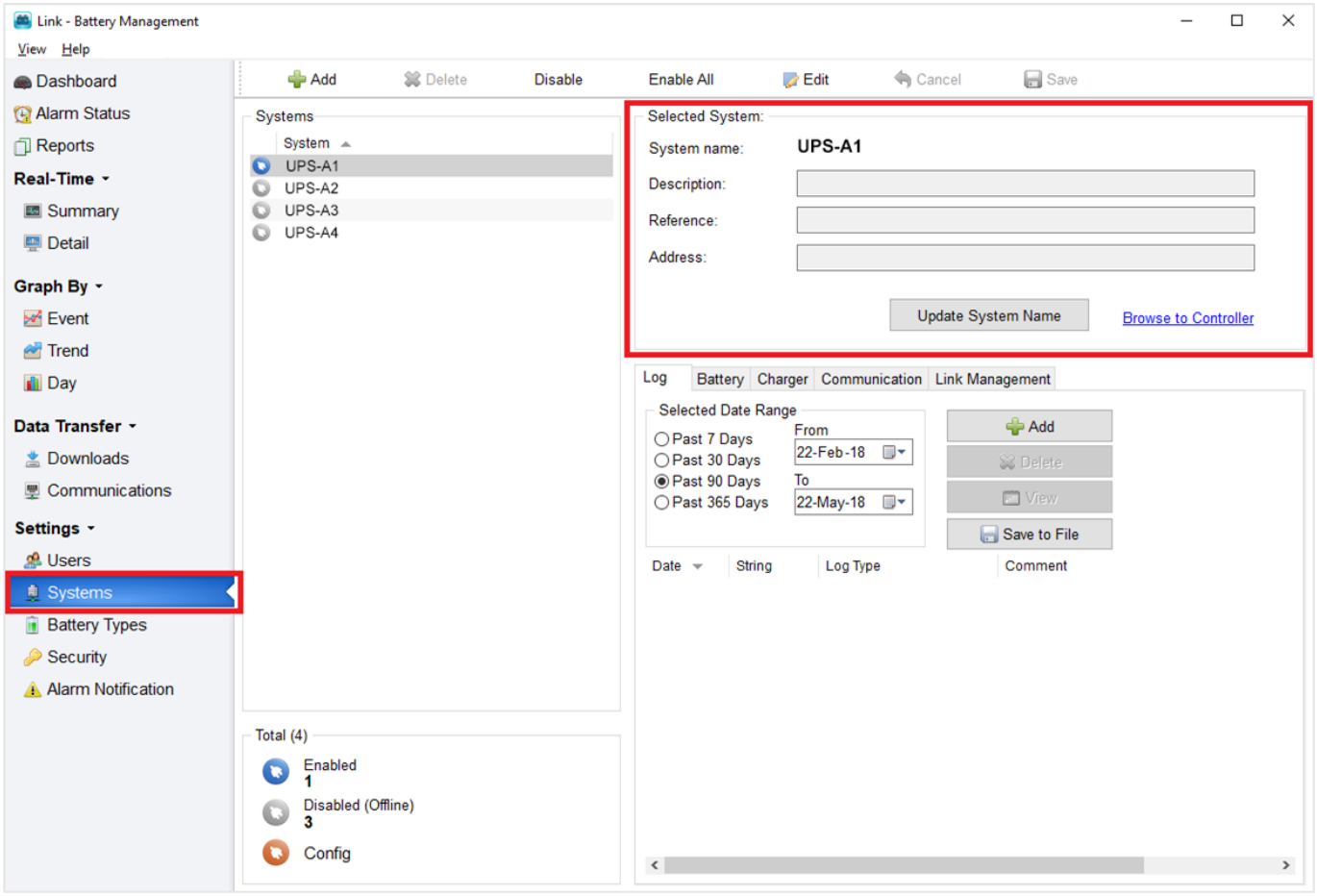
Every 15 minutes, the ***Dashboard*** will check the real time readings and compare it to the last set of downloaded limits. If the reading is outside the limits, an alarm will be activated. The ***Dashboard*** will automatically clear the alarm when the reading is within the limits.



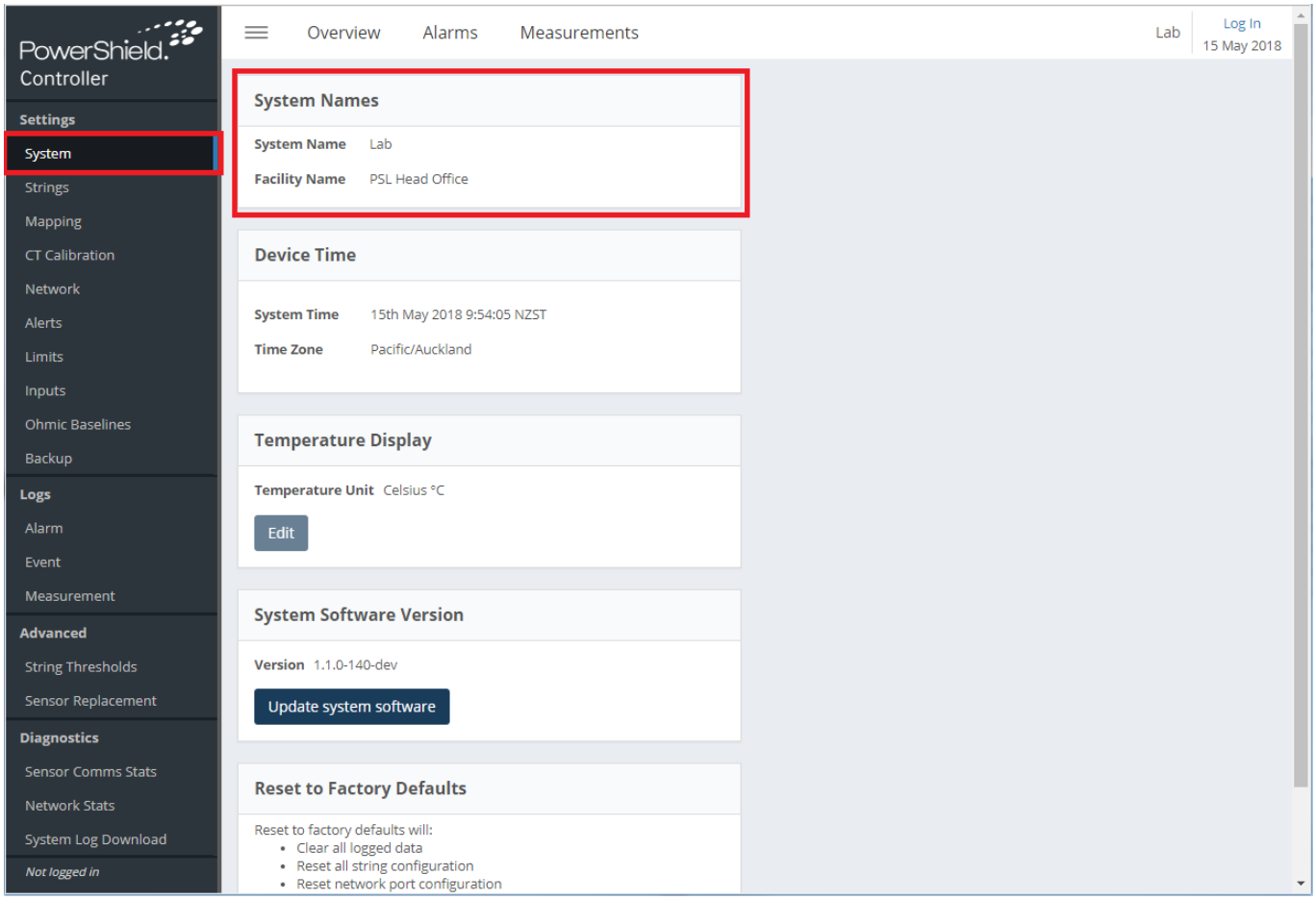

**TIP 1:** You can adjust the alarm clearing schedule with the ***Admin Utility*** accessible from the ***Help*** menu.

# PowerShield 8 Controller System Name Change Procedure

The system name of a PowerShield 8 Controller can be changed indirectly via the ***Systems*** tab:



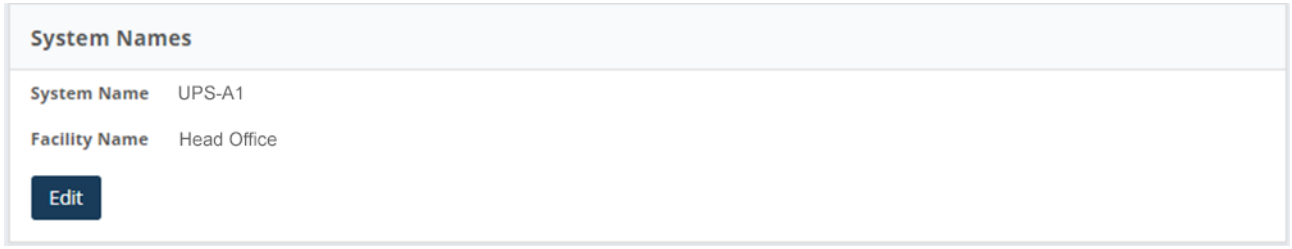
At the top right of the screen is the ***Selected System*** box. Click the ***Browse to Controller*** link at the bottom right-hand corner of the box to open the PowerShield 8 Controller user interface.



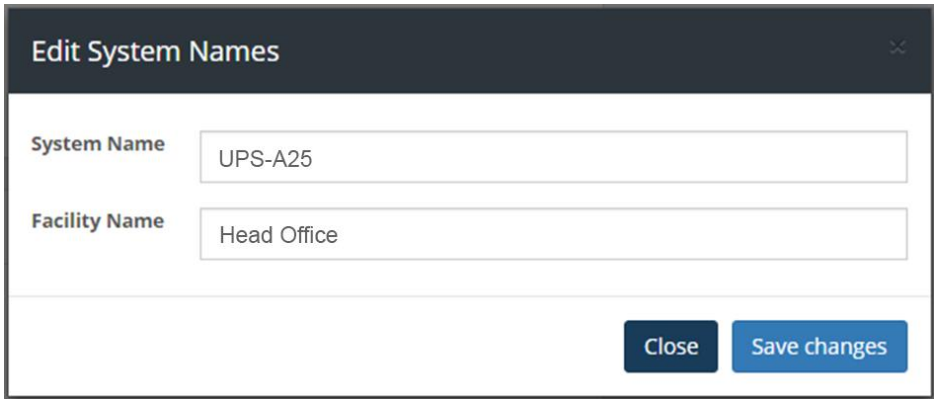

Click the ***System*** tab on the navigation bar to open the ***System*** menu.

In order to change the system name, the user will first have to log in using the web link in the top right-hand corner of the browser window, then enter the appropriate login name and password. The default login name is “Installer.” The default password is “battech.” Click **Submit** to log in.

Once the user has successfully logged in an **Edit** button should appear within the ***System Names*** box. Click the **Edit** button to open the ***Edit System Names*** dialog box.

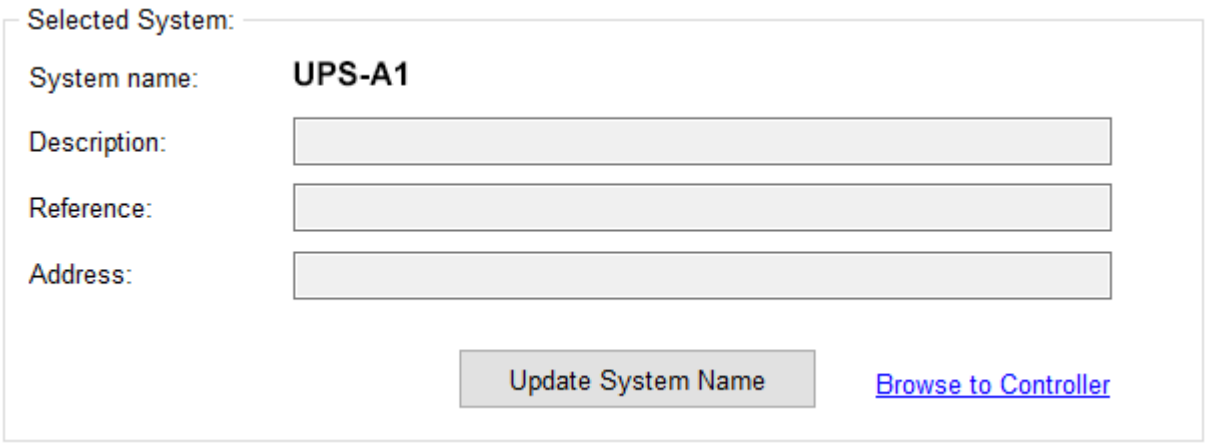



Here the user may change both the name of the system as well as the facility in which the system has been installed by clicking the mouse in the appropriate text box.




Click **Save changes** to save any changes made. Click **Close** to close the dialog box.

Return to the ***Systems*** screen in Link. Click **Update System Name** to synchronise the new system name settings with Link.



# Link Service Edition

Link offers two different operating modes – a Standard Edition for fixed PC's with Link running 24/7, and a Service Edition for laptops with temporary connections, typically accessing Monitors via the Service Port. Some navigation and functions vary slightly between the two editions. This User Guide generally refers to behaviour of the Standard Edition – however the major functional differences are highlighted here.

Link Service Edition:

- Starts in the ***Settings >> System*** page
- Only shows Enabled systems on the ***Dashboard***
- Allows creation of multiple systems with same communication parameters
- Has automatic date & time synchronisation disabled *
- Has the ***Dashboard*** poll disabled. A status update must be 'forced' by the operator *
- Alarm auto-clearing functionality is turned off *
- Has automatic memory downloads disabled for trend data. Memory downloads must be 'forced' by the operator.
- Deleting memories from Sentinels after download is turned off *
- Has automatic memory downloads delayed for event data. A warning panel will appear advising that downloads will start soon
- Memory downloads can be 'forced' by the operator, and an option is given to delete/not delete from the monitor after download
- Disables communication with all monitor systems when Link Client is closed
- Link Server is in sleep mode when Link Client is not running

* Relates to functionality only applicable to Sentinel systems.

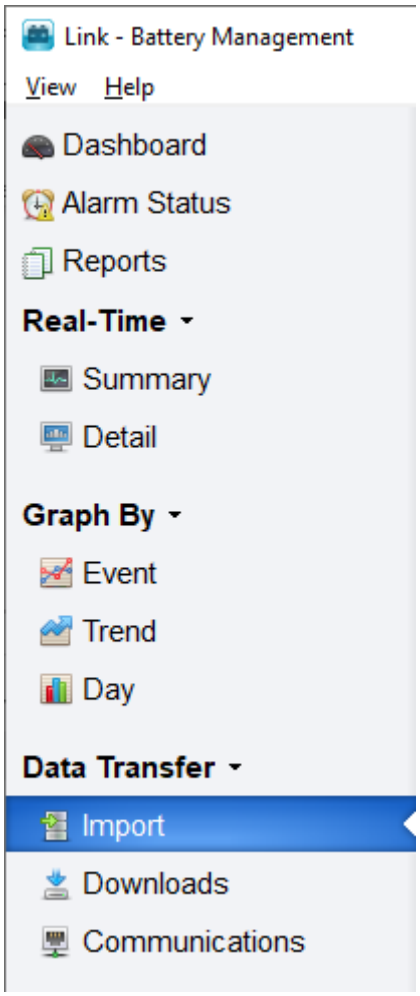
**TIP 1:** The Service Edition is recommended for service personnel making temporary connections. Full functionality is available, but automated background processes are disabled or delayed to provide best speed and prevent unwanted or conflicting actions.

# Importing Controller Measurement Logs

Measurement Logs downloaded via the web interface on the Controller, can be imported into Link, allowing use of the analysis and reporting tools in Link. Typically, measurement data held on the Controller is downloaded to Link directly when a connection is made, however Link may not be running at all locations. The Import feature allows for data collected using the Measurement Log Download function of the Controller to be shared with anyone running Link.

The Import feature can only import the Zip file Measurement Log files created by a PowerShield8 Controller.

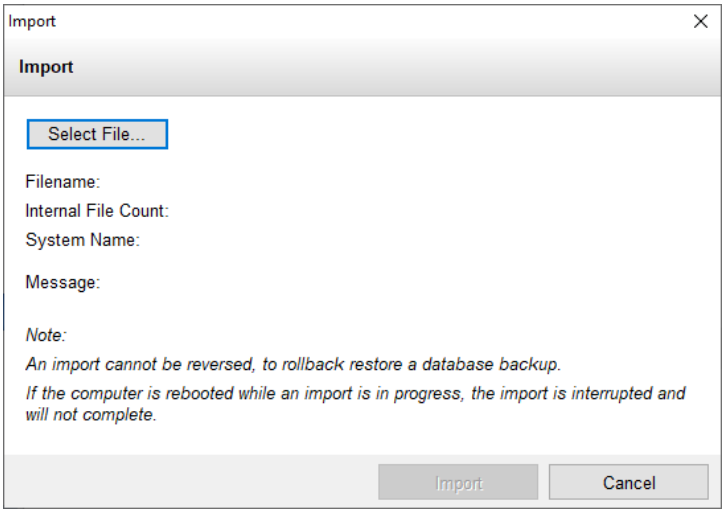
The Import feature is available in the Link Service Edition only and is located under the Data Transfer menu.



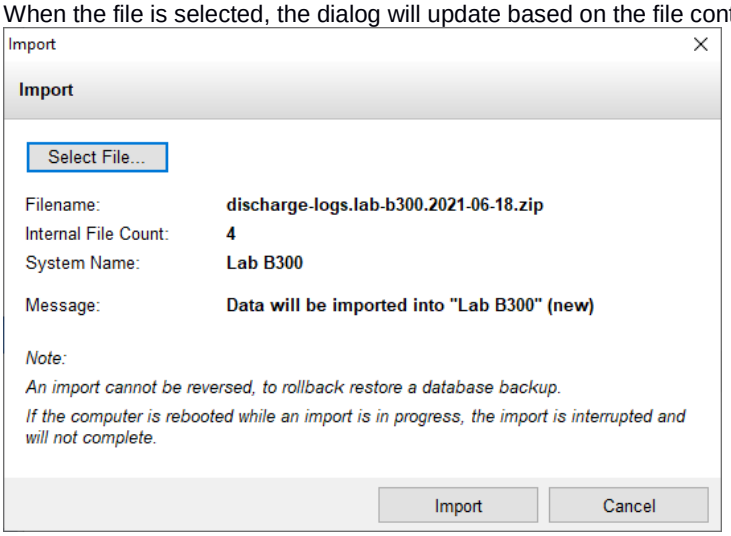

**TIP 1:** Importing measurement data is a time consuming task (processor and disk intensive) therefore only import the events or yearly periods of interest. This can be done by only downloading the items of interest from the Controller, or alternatively editing the Measurement Log Zip file, deleting the files that are not of interest.
**TIP 2:** Minimise Link while importing and move to a different task, so the import is done in the background

The method to import a file is as follows:

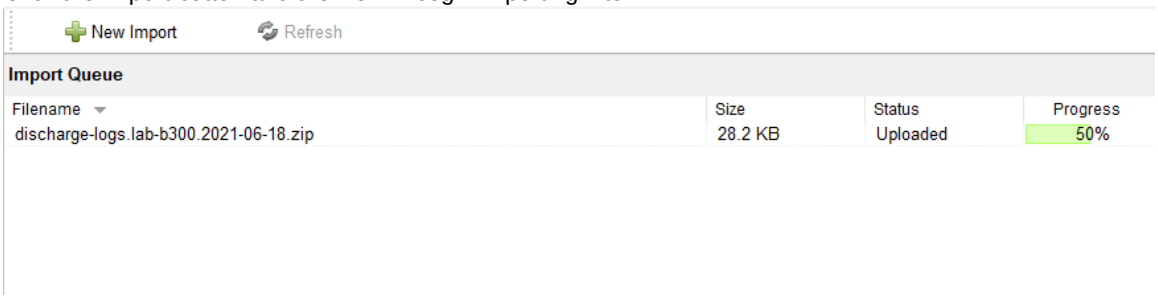
1. Go to the ***Data Transfer >> Import*** page
2. Click the Select File button and navigate to the file that is to be imported



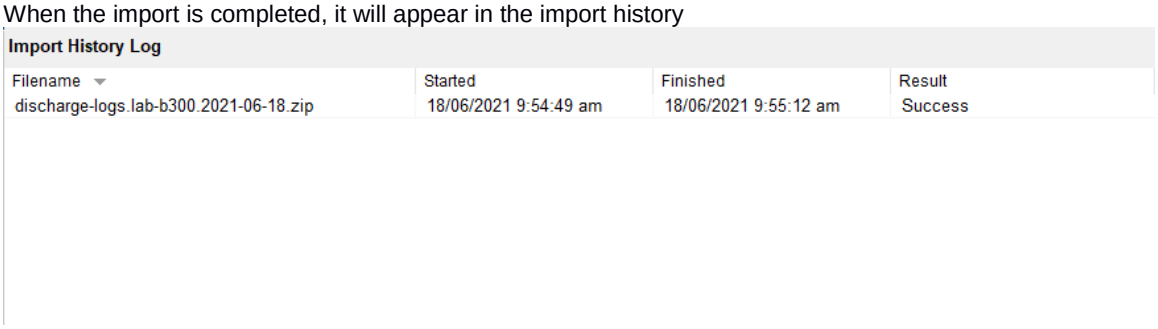

3. When the file is selected, the dialog will update based on the file contents




4. Click the Import button and the file will begin importing into Link




5. When the import is completed, it will appear in the import history



**TIP 3:** To delete items from the Import History Log, select the item and press the DELETE key on your keyboard. This removes the item from the list only, the imported data is not affected.

# List of Alarm Types

## PowerShield 8

Below is a list of the alarm types for the PowerShield 8 system.

There are three states of alarm severity – Critical, Warning and Info. A 'High' alarm indicates that the reading for a particular alarm type has exceeded the maximum value. A 'Low' alarm indicates that the value for a particular alarm type has dropped below the minimum value. Alarm types may be triggered by 'High' alarms, 'Low' alarms, or both. Alarm types may trigger Critical alarms, Warning alarms, or both. An Info severity alarm provides information on the current state of the four String State alarm types.

For variation alarms, the term 'variation' refers to the difference between the largest and the smallest value for a string.

For example, the smallest block voltage in a string is 13.12V and the largest 13.94V.
Therefore the variation is 0.82V (13.94V - 13.12V).

| Alarm Type | Severity | | |
|---|---|---|---|
| | Critical | Warning | Info |
| *String State Charge* | - | - | √ |
| *String State Discharge* | - | - | √ |
| *String State Float* | - | - | √ |
| *String State Idle* | - | - | √ |
| *Block Charge Voltage* | High | High | - |
| *Block Discharge Voltage* | Low | Low | - |
| *Block Float Voltage* | Low/High | Low/High | - |
| *Block Idle Voltage* | Low | Low | - |
| *Block Float Ripple Voltage* | - | High | - |
| *Block Charge Temperature* | Low/High | Low/High | - |
| *Block Discharge Temperature* | Low/High | Low/High | - |
| *Block Float Temperature* | Low/High | Low/High | - |
| *Block Idle Temperature* | Low/High | Low/High | - |
| *Block Ohmic* | Low/High | Low/High | - |
| *Block Discharge Voltage Variation* | High | High | - |
| *Block Float Voltage Variation* | High | High | - |
| *Block Charge Temperature Variation* | High | High | - |
| *Block Discharge Temperature Variation* | High | High | - |
| *Block Float Temperature Variation* | High | High | - |
| *Block Idle Temperature Variation* | High | High | - |
| *Block Ohmic Variation* | High | High | - |
| *String Charge Current* | High | - | - |
| *String Float Current* | High | - | - |
| *String Discharge Current* | Low | - | - |
| *String Float Ripple Current* | High | High | - |
| *String Charge Voltage* | High | High | - |
| *String Float Voltage* | Low/High | Low/High | - |
| *String Idle Voltage* | Low | Low | - |
| *String Discharge Voltage* | Low | Low | - |

| Alarm Type | Severity | | |
|---|---|---|---|
| | Critical | Warning | Info |
| *Ambient Temperature* | Low/High | Low/High | - |
| *Ambient Temperature Variation* | - | High | - |
| *Ambient-Block Temperature Difference* | High | High | - |
| *Humidity* | High | High | - |
| *Discharge Period* | √ | √ | - |
| *Charge Period* | √ | √ | - |
| *Ohmic Schedule* | √ | - | - |
| *Digital Input* | √ | - | - |
| *TRP Over Temperature* | √ | - | - |
| *Fast TRP Temperature Rise* | √ | - | - |
| *TRP Thermal Runaway Signalled* | √ | - | - |
| *Block Voltage Error* | - | √ | - |
| *Block Temperature Error* | - | √ | - |
| *Block Ohmic Error* | - | √ | - |
| *Block Comms Error* | - | √ | - |
| *String Current Error* | - | √ | - |
| *String Ripple Current Error* | - | √ | - |
| *Ambient Temperature Error* | - | √ | - |
| *Out of Disk Space* | √ | - | - |
| *Low Disk Space* | √ | - | - |
| *High CPU Temperature* | √ | - | - |
| *String State Unknown* | √ | - | - |
| *mSensor Status Error* | √ | - | - |
| *Device Comms Error* | √ | - | - |
| *Hub Status Error* | √ | - | - |
| *Disk Health* | √ | - | - |

## Sentinel

Below is a list of the alarm types for the Sentinel monitor.

| Alarm Type | Note |
|---|---|
| *Monoblock Voltage* | - |
| *Temperature* | - |
| *Current* | String current is outside the limits |
| *String Voltage* | - |
| *String State* | String has transitioned into a different string state |
| *Monoblock Variation* | - |
| *Digital Input* | Input is in alarm state |
| *Block Ohmic* | - |
| *Monoblock Ohmic Variation* | - |
| *Monoblock Temperature* | - |
| *Block Temperature Variation* | - |
| *Monoblock Idle Voltage* | - |
| *Memory Format Error* | Monitor memory is not formatted or corrupt |
| *Communications Failure* | A communications error between Link and the Sentinel unit has occurred |
| *Missing B1K* | Link is unable to communicate with the Sentinel |
| *Slave Offline* | A Monitor slave unit is offline |
| *Email Failure* | Email communication error |
| *Notification Disable* | Notifications have been disabled on the Monitor |
| *Download Error* | Link was unable to download one or more memories from a Monitor |
| *System Name Error* | System name of unit mismatches that of Link |
| *Mail Error* | Link email dispatcher error |
| *Time Synchronization Error* | Sentinel has failed to synchronise the time with Link |
| *Disk Space* | Computer running the Link application is out of disk space |