SOFTWARE MANUAL

Congrego®

For all your data collection needs

Version: 1.2.8620

acoem

acoem.com

Ecotech Pty Ltd is now part of the Acoem Group and as such, the branding of our instruments & software has also changed to ‘Acoem’.

Over time we will be updating the content of all documents to reflect the Acoem branding convention.

In the interim, please note that while the cover of this document features Acoem branding, information contained within its pages still utilises the original ‘Ecotech’ name.

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Introduction

1 Introduction

Congrego®

For all your data collection needs

1.1 Welcome

Congratulations on purchasing your new Congrego® Data Logger and Station management system.
Congrego® is Acoem's next generation data logger; designed for fast, simple setup and intuitive control and management of monitoring systems.

To get up and running quickly try the *Quick Start Guide*.

While reading the manual and interacting with the application, please be aware that there are different versions of Congrego®.
The standard version of the application is fully featured but the Congrego® Lite version has a couple of restrictions, these are:

- Calibration points and sequences can not be used
- The number of supported channels is limited to 15

Logging in
Begin by switching on and starting up the host operating system.
For Acoem supplied hardware systems the default account will send you straight to the desktop, there is no password for this account.

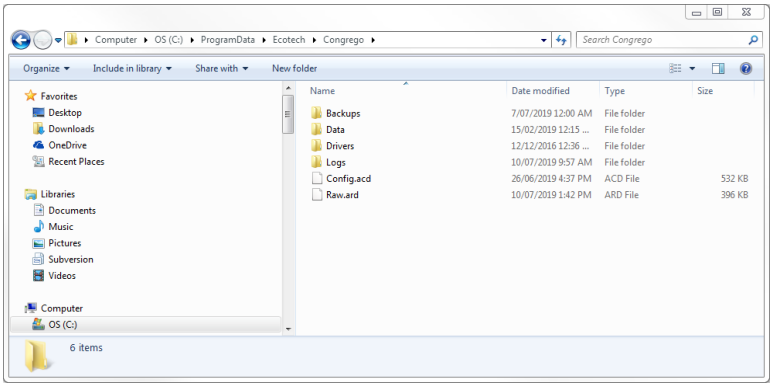
The user is free to set their own password for this account if required.

When the operating system is first started, the *Congrego® Guardian* service will ensure that the *Congrego® Server* is also started and both of these processes can be observed and controlled from the *Tray Application* 9.

1.2 Congrego® Architecture

Data Storage

Congrego® configuration files, stored data, backup files and other information can be found in the Congrego® Data Directory:
`<Host Drive>:\ProgramData\Ecotech\Congrego\`



ProgramData Directory

Congrego® uses three separate databases for three distinctly different purposes:

1. config.acd - A Sqlite database which stores the configuration information. It is read at startup and written to only when the user changes the configuration. Avoiding writes ensures durability.
2. raw.ard - A Sqlite database which stores the "running state" of Congrego®. This includes the raw values to repopulate rolling buffers when reloading. It also stores the last run time of backups, calibrations and data pushers. This file can be volatile, Congrego® will simply delete it and create a new one if it becomes corrupt.
3. xxx.ald - Log data files. This is the historical data logged by Congrego®. The application will write one file per day, split at midnight UTC. This data file also contains the operator logs.

SQLite databases are single file databases that Congrego® uses to store configuration, logged data and raw data. Databases are used to ensure the integrity of the data and provide many advantages over flat files. The database can not be read by a customer directly like a flat file can but data can be exported to a different file format for use in other applications.

Install and Uninstall

Installing a newer version

When installing a newer version of the application the installer will simply overwrite any existing application files that are found in the Windows *ProgramFiles* path directory.
No files in the *ProgramData* directory will be changed.

Uninstalling

If an uninstall is required then the application will be removed from the host system and the files in the Windows *ProgramFiles* path directory removed.
None of the configuration, data, driver or log files in the *ProgramData* path directory will be removed.

Manual Removal

If the user requires a clean start they can manually remove the files from the *ProgramData* path directory after an uninstall and then then reinstall the application. A new configuration file will be created.
In order to just start with a clean configuration without uninstalling and reinstalling the entire application, simply stop the services and manually delete the config.acd and raw.ard files.
Restarting the services will create a new configuration.

Clearing the Cache After an Update

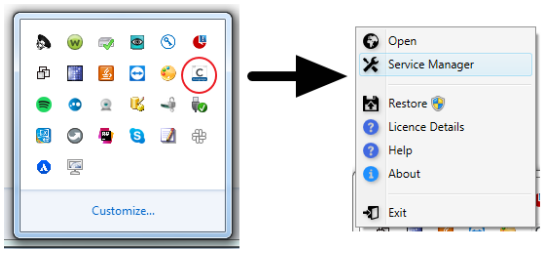
If the web browser window has been left open during an update installation then the browser cache needs to be cleared.
This is to ensure that the newest or updated files are retrieved from the server and that the browser is not using locally cached files.

For most browsers on the Microsoft Windows operating system a combination key press of the `CTRL` and `F5` keys will clear the cache and reload the web page.
For Apple Mac OS X the combination is `command + R`
For Linux operating systems it is just `F5`.

Tray Application

2 Tray Application

When the operating system on the host hardware is started the *Guardian Service* runs and will ensure that the *Congrego® Server* is started and is running.
To see the status of the *Congrego® Server* you can right-click on the Congrego® tray icon and open the *Service Manager* application:



Tray Icon and Menu

The menu items are as follows:

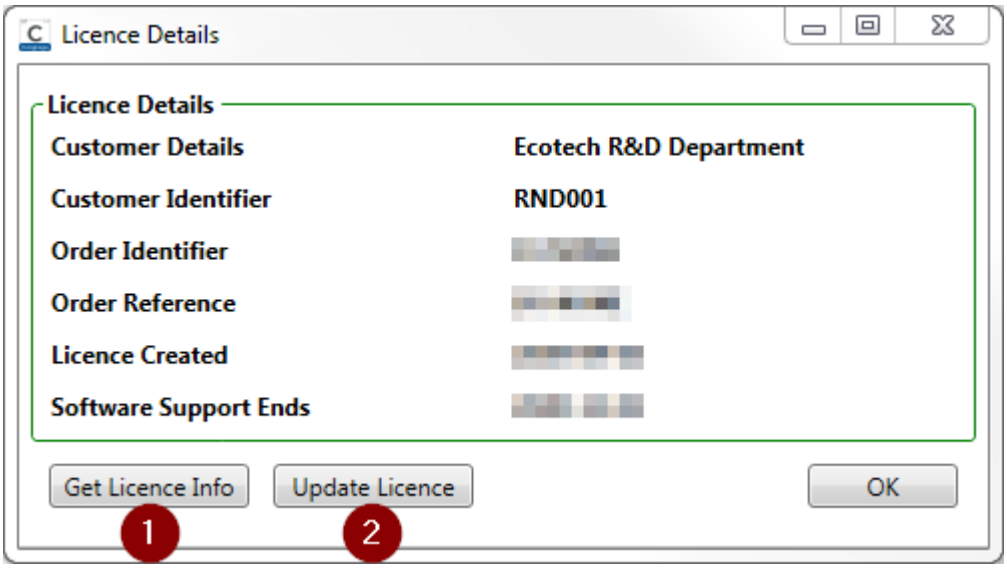
Open
This will open the default web browser on the host system and display the Congrego home screen.

Service Manager
The *Service Manager* lets a user observe the status of, and manually control, the *Guardian Service* (watchdog) and the *Application Service* (*Congrego® Server*).
Whenever power is restored to the host machine, the *Guardian Service* will check to ensure the server is running. Both of these services can be turned off and on manually from the *Service Manager Status* tab.
The *Service Manager Settings* tab allows users to alter the web port and the telnet port numbers used by Congrego® and external services.
There are also two check boxes to allow local user access and guest user access if required.
These settings should be left as default unless there are port number conflicts with other programs.

Restore
Selecting the *Restore* option will open a dialogue box that allows users to load a previously saved server configuration, as well as the options to load saved data and drivers.
This feature also allows users to load an automatically saved server backups or a pre-configured server configuration from another logger all-together; including instruments settings, channels data and drivers. i.e. a complete backup of a logger.
Select the source location for the saved configuration/data/driver files and choose which options to load.
Note that if choosing to load saved data, the user can choose to limit the data files to a certain number of days' worth of data.
The comments section will show any comments associated with the backup files selected.

Comments can be associated with the backup file at the time of saving.

Licence Details
Selecting *Licence Details* will display the current user licence details including the current expiry date for the optional *Software Support*.



Licence Details

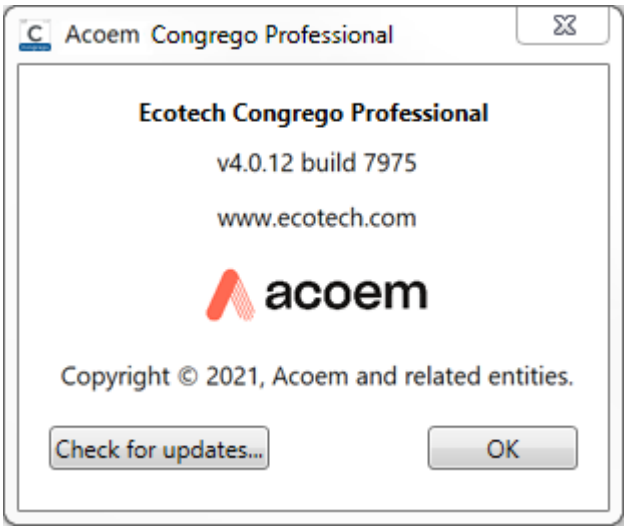
Updating a Licence
From this dialog the licence can also be updated, this is a two stage process:

1. Selecting *Get Licence Info* will generate a file containing the licence details, named in the format <Order Identifier>_<Customer Identifier>_<Dongle Hardware Identifier>.C2V
   a. Save this file on the host system and then email or send it to your sales representative or support provider as directed
   b. Acoem Australasia will generate an update file that will be returned to the customer, this file will have a .V2C extension
2. Select the *Update Licence* button and navigate to and select the returned .V2C file
   a. The licence hardware will be updated with the licence information contained in the file
   b. Close and reopen the *Licence Details* dialog to check that the licence information had been updated as expected

Each .V2C file is specific to the particular licence hardware that it was generated for and can not be applied to any other licence.
Tampering with or attempting to edit the .C2V or .V2C files will render them invalid.

Help
Invokes the HTML help in the default system browser

About
The *About* dialog shows the version and build number of the software



Software Details

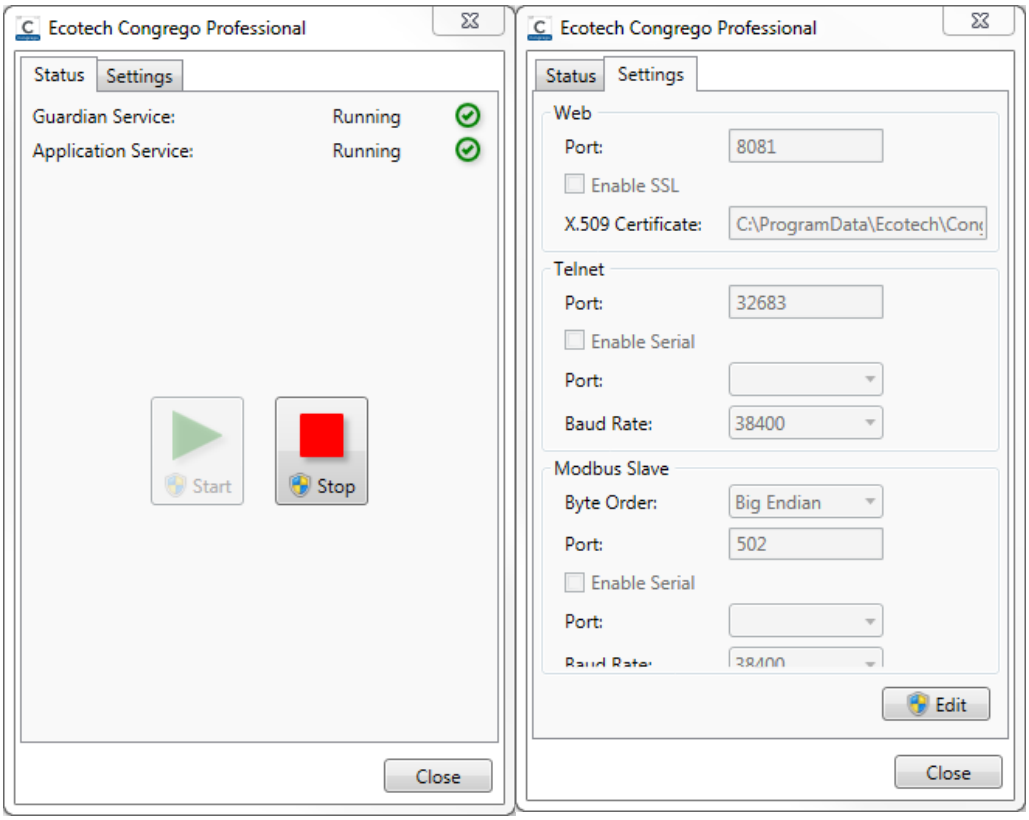
Clicking on the *Check for updates* button will cause the application to connect to the Acoem Australasia servers to check for an updated version of the Congrego® software.
The host computer must be connected to the internet to achieve this. If a newer version is available it can be downloaded and installed.

Exit
Will close the *Tray Application* but will not stop the Congrego® services.

2.1 Tray Application Service Manager

Service Manager
The *Service Manager* menu displays the status and settings dialog.

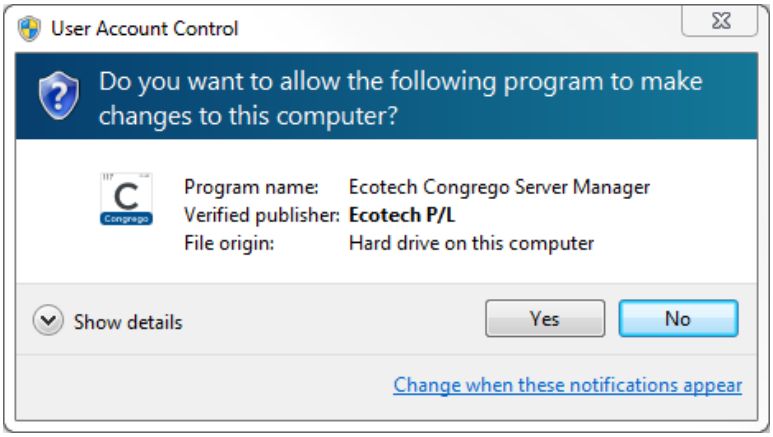
Note that in order to make any changes to the settings or to stop and start the services in the *Congrego Tray Application*, it must be run with local administrator privileges.
By default the tray application dialog will look like that shown below if running with local user permissions. The badge icon and grayed-out controls denoting that the application must be restarted with elevated permissions.



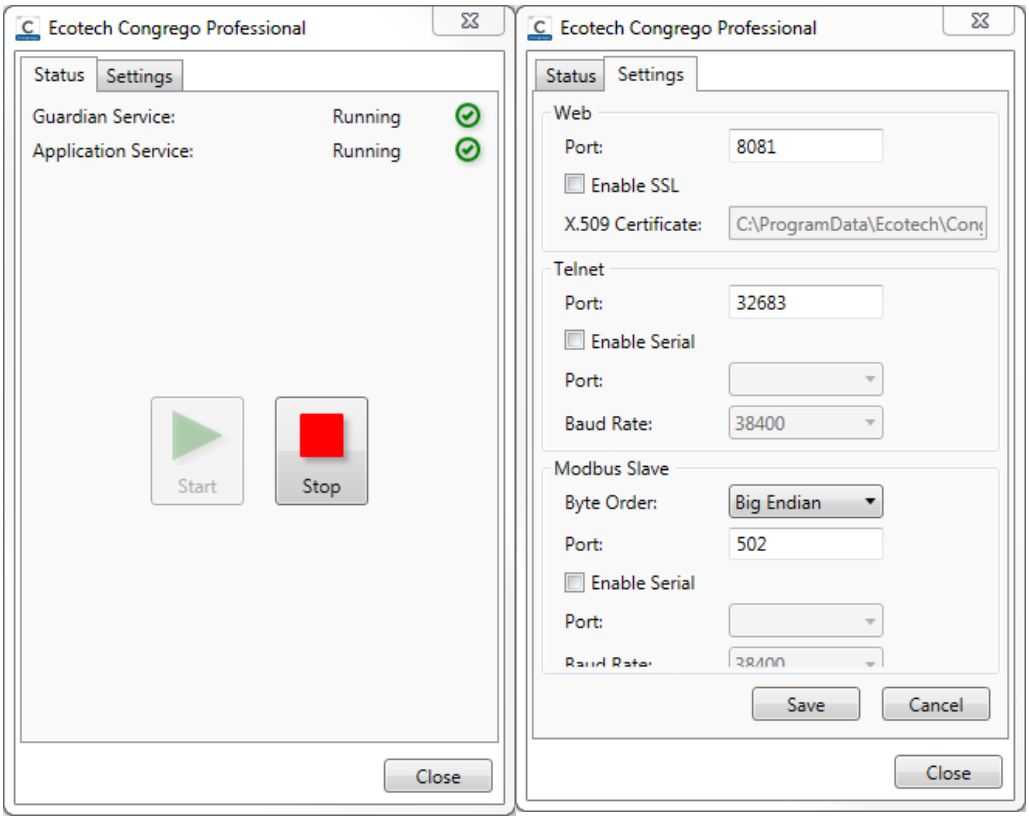
Status Tab *Settings Tab*

The tray application dialog is shown here running with local user permissions

Allow the program to make changes in order to access the services or settings:



User Account Control



Status Tab *Settings Tab*

The tray application dialog is shown here running with elevated permissions.

The *Status* tab shows the state of the *Guardian* and *Application* services. In this tab the user is able to stop and start the services should they wish to.

The *Settings* tab displays the ports that are used by the application, these are:

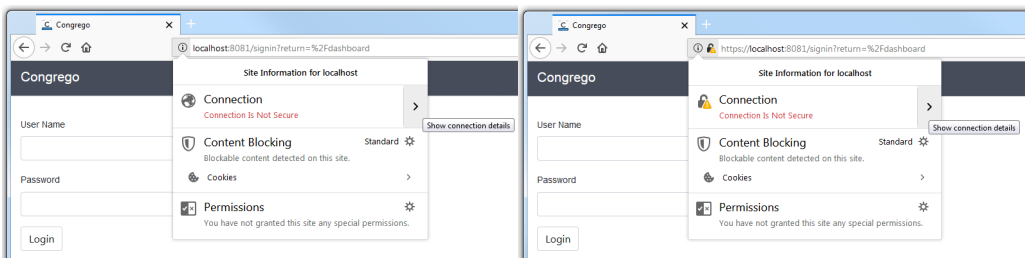
Web Settings

Port

The port that the web browser will use to display the web pages.

Enable SSL and the X.509 Certificate

To enable SSL (Secure Sockets Layer), tick the box. Congrego® ships with a self-signed certificate that can be used to secure communication between the browser and the server.
If settings are changed here and applied the user will be prompted to restart the services. If SSL is enabled then attempting to contact the server over 'http' will result in the web page not being displayed as 'https' must now be used.



HTTP Connection *HTTPS Connection*

In the example here the http connection is showing that the connection between the browser and the server is not secure. Once SSL is enabled the site can be reached only by using https but the connection is still shown as not secure because we are using a self-signed certificate that the browser can not authenticate even though communication will be encrypted.

Acoem recommends that users provide their own certificate for secure communication.
The certificate must be PKCS#12 format with a .pfx file extension.

Telnet Settings

Port
The telnet port through which data may be served from the Congrego application to another such as the Acoem Airodis™ application.

Enable Serial
Selecting the *Enable Serial* box and setting the *Port* and *Baud Rate* allows a user the same access as they have via the *Telnet* functionality but over a serial connection. *Telnet* is always enabled and enabling the serial connection results in two separate sessions that will not interfere with each other. The same command set is valid over both connections.

Modbus Slave

Congrego® has the ability to act as a Modbus slave device. The Modbus slave service is configured to listen on port 502 (TCP and UDP) by default.

Byte Order
The Modbus slave supports two kinds of endianness:
- Big Endian (sometimes referred to as “MSB” or “ABCD”)
- Little Endian (sometimes referred to as “LSB” or “DCBA”)

This setting affects all channel values on all Modbus reports.

Port
This is the network listening port used for Modbus. The Modbus slave will listen on TCP and UDP over both IPv4 and IPv6 on every available network interface. You can communicate over the port with Modbus TCP.

Enable Serial
When checked, the Modbus slave will listen on the selected serial port using the Modbus RTU protocol. The user must select a COM port and specify the desired baud rate. All other RS-232 parameters are as follows:
- Data Bits = 8
- Parity = None
- Stop Bits = 1
- Handshake = None

Note that Modbus remains available over TCP/UDP when serial is enabled.
The Modbus slave identifier is defined in the *Report Settings*.

Web Interface

3 Web Interface

The *Web Interface* allows the configuration and editing of the server settings as well as allowing the user to view data.

Getting Started

Congrego® is organised as a web client - server system and can be accessed in multiple ways to manage the data server locally or remotely.

Accessing the logger locally

Users can access the logger client locally by either

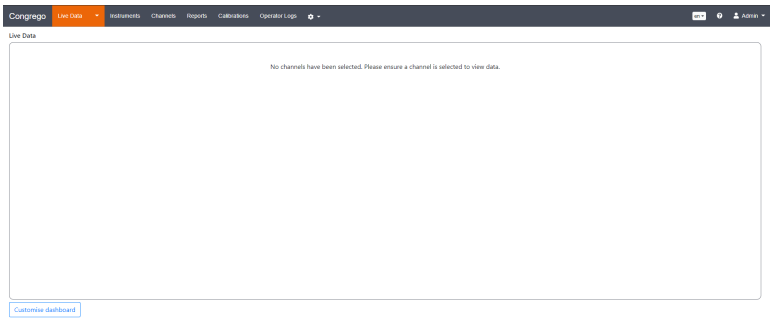
1. Click on the desktop icon which will open the web client
2. Select the *Open* menu item in the *Tray Application* to open the web client
3. Open a web browser and type in `http://localhost:8081` in the address bar (assuming the default web port of 8081 has not been changed)
4. Open a web browser and type in `http://<IP Address or Machine Name>:<Port Number>` if the server is running on another host machine.

The web client login screen will appear.
The default user access is:

Username `admin`

Password `admin`

If the logger has not yet been configured the dashboard will be blank.



Default Dashboard

Accessing the logger remotely

Congrego® uses a web client interface and so can be accessed remotely if the logger IP address is known.
Open a web browser and type in the address of the Congrego® logger including the port number (default is 8081).

Example:
`http://192.168.100.101:8081` into the address bar.
This will open the web client and perform in the same way as if the operator was accessing the server locally.

3.1 Home

The home bar allows the user to navigate the different pages of the web application.
This is the initial starting point for a user setting up the system for the first time.

The work flow for setting up a system is as shown here in the following order:

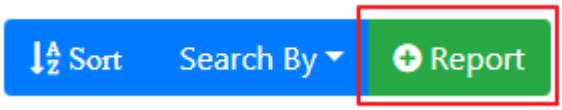
- Reports 18
- Instruments 23
- Channels 31
- Calibrations 53
- Dashboard 58
- Operator Logs 80
- Configuration 81

3.2 Reports

The *Reports* page allows the user to define the reports for the system and assign channels to the report.
By default on a new install there will be a single existing report, so the reports list will not be empty, and the user can start logging data as soon as an instrument is set up.

Adding a new report

To add a new report to the system select the Add Report 18 button and configure the settings.



Add Report

If there are no reports defined in the system then no logged data will be persisted.
Data to be persisted must be associated with one or more reports.

3.2.1 Report Setup

The *Report* dialog is displayed when creating a new report in the system

On a new install a default *Report* of five minutes duration is automatically created.
This report can be used or deleted depending on whether it is wanted or not.

General

Label

The *Label* field for the new report is a required field and is blank by default. The user will not be able to save this new report until all required fields are entered.

Interval

The use may enter the interval for the report in the *Interval* field, the resolution of the interval is specified in hours, minutes and seconds.

Start Offset

The report may have an offset time associated with it.
For example a report interval of 24 hours may be required but the user doesn't want the report to run from midnight to midnight but instead from 09:00 AM to 09:00 AM. In this case the user would enter an offset of 9 hours.
The offset may be specified in hours, minutes and seconds.

Enabled

This report can also be enabled or disabled by selecting or deselecting the *Enabled* tick box.

Modbus

See Modbus Slave Report 20 for details on exposing this report over Modbus.

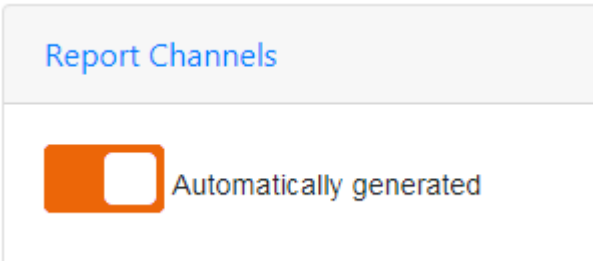
Report Channels

Automatically Generated / Manually Defined

This toggle switch allows for ease of use and advanced functionality

Automatically Generated

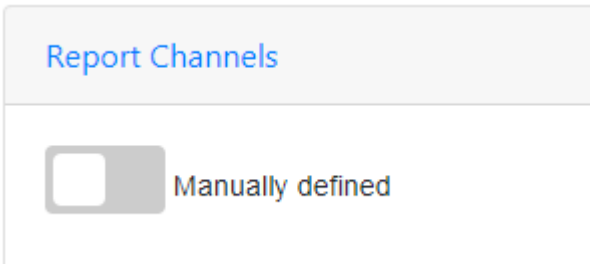
When in the *Automatically Generated* position, the toggle switch will automatically add any new channels to this report with the averaged aggregation applied.
If the channel is deemed to be a vector channel then the vector average aggregation is applied.



Automatically Generated Report Channels

The user should select this option if they may forget to add any new channels to the report and the only aggregation that is needed is *averaging*.

Manually Defined
The *Manually Defined* position allows the user to add individual channels to the report and to select all of the functions that they want applying to those channels.

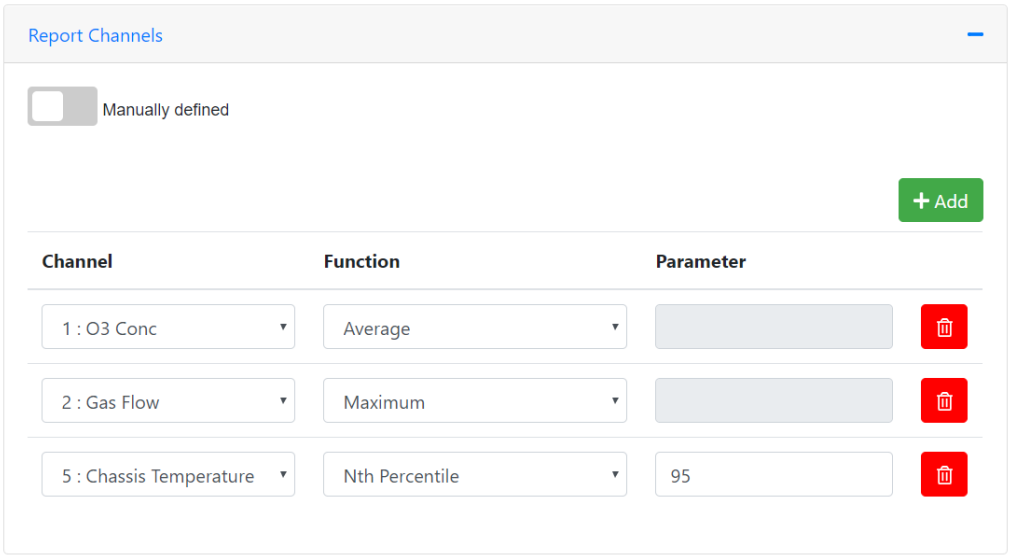


Manually Defined Report Channels

See Channel Functions for the types of functions supported.

This allows for a more fine-grained approach when setting up reports although it does make the user responsible for remembering to add any new channels in the system.

Use the *Add* button to add a new channel at the bottom of the list of current channels. Select the channel and aggregation function (if applicable) to be used.



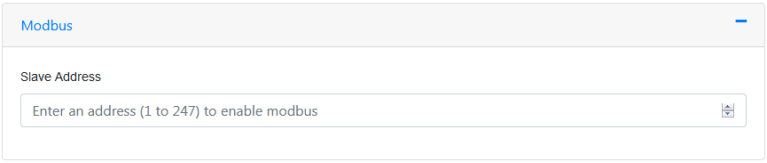
Example of a Manually Defined Channel

To remove a channel from the report, simply click on the *Remove* (Trashcan icon) button.

The settings must be saved before the new report is available for use. If no channels have been added to this new report then a warning will be displayed.

3.2.2 Creating a Modbus Slave Report

Any report can be exposed over Modbus by assigning a *Slave Address* in the report configuration.

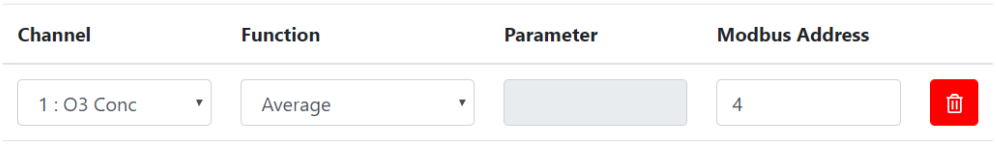


Modbus Slave Report

Once a slave address has been set, the report's channels will be mapped to registers on the Modbus slave.

Report Interval and Start Offset
When the registers are queried, the Modbus slave will return the report's most recent value, which will get updated at the same time new records are written to disk.
If data logging is disabled for a report, it becomes possible to set the report interval to zero ("00:00:00"). In this state, the Modbus values are updated in real-time.
Set the interval to zero if you wish to obtain instantaneous values over Modbus.

Report Channels
Add the desired channels to the report. Each channel can be given a Modbus address.



Each channel on a Modbus report uses 2 address spaces. This means each Modbus address MUST be 2 or greater apart from one another.

E.g. Sequential Modbus addresses must be numbered: 1, 3, 5, 7 OR 2, 4, 6, 8.

The simplest way to see the report channel ordering is using the 'GETCONFIG 108' command over telnet:

```
Report 4: [Modbus Report],PTOS,0004
Channel C1.Min: [O3 Conc (Min)],[ppm],,Min,2,0000
Channel C1.Max: [O3 Conc (Max)],[ppm],,Max,2,0001
Channel C1: [O3 Conc],[ppm],,Avg,2,0002
Channel C6.Latest: [Instrument Status (Latest)],,,Latest,2,0003
Channel C7: [Ambient Temp],[°C],,Avg,2,0004
```

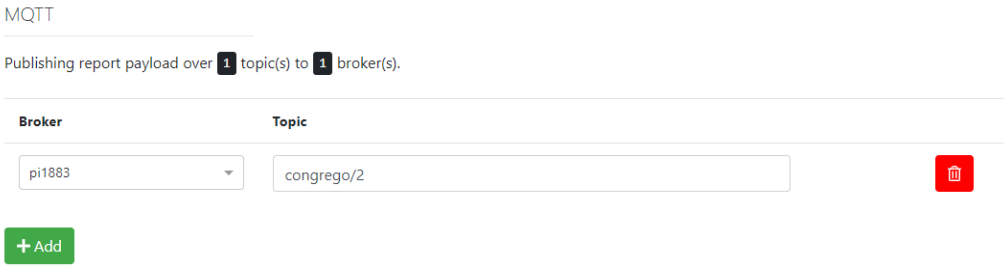
GETCONFIG Command

The right-hand column also provides sequential numbering which can be used to determine Modbus register addresses.
For the above example, this is how the Modbus registers would be assigned:

Ordinal	Report Channel	Modbus Data Address	Coil	Bad Status	Calibration Status	Input Register	Holding Register
0000	C1.Min	0x0000 – 0x0001	01	10001	10002	30001	40001 – 40002
0001	C1.Max	0x0002 – 0x0003	03	10003	10004	30003	40003 – 40004
0002	C1	0x0004 – 0x0005	05	10005	10006	30005	40005 – 40006
0003	C6.Latest	0x0006 – 0x0007	07	10007	10008	30007	40007 – 40008
0004	C7	0x0008 – 0x0009	09	10009	10010	30009	40009 – 40010

3.2.3 Creating a MQTT Report

Any report can be published to an MQTT broker as a topic.



Topic configuration

To publish a report press the Add button to add a new broker topic. Select a Broker from the broker list box and specify a topic. The topic can not be empty and should not start with an "/".
As a naming convention it is suggested to name the topic congrego followed by the report label.

Example

"congrego/5 Min"

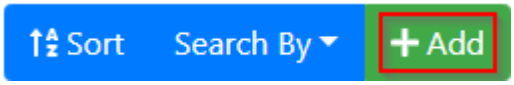
If multiple broker end points are configured the same report can be published to multiple brokers.
The MQTT broker connection uses the "Qualities of Service" default setting, this will ensure that the message is always delivered at least once.

3.3 Instruments

The *Instruments* page shows the list of instruments that are configured in the system. By default on a new system this list will be empty.

Adding a new instrument

Instruments are configured in the software using the *Instruments* tab. Instruments can be added and pre-configured prior to the instrument being physically connected but some automatic setup features will not be available, such as the *Discover Instruments* feature.
To add a new instrument select the *Add Instrument* button.



Add Instrument

The settings 24 can now be configured for the new instrument.

Editing an existing instrument

For an existing instrument, clicking on the instrument will allow its settings 24 to be edited.
Save changes once they are complete, or *Cancel* to discard them.

Deleting an instrument

To delete an existing instrument, select the instrument and then select the *Delete* button.

Delete Instrument

Confirmation of the deletion will be required.

Setting Up Instrument Configuration on a Different Computer

Sometimes if a station needs configuring it may be convenient to set the configuration up on another computer, e.g. a laptop, before applying the configuration to the target computer.
This is possible if the machine doing the configuring has a licence, here are a couple of tips that may help the process:

- Instrument connection types - For serial connections the configuring computer may not have the same physical serial ports as the target computer. This can be circumvented by selecting *TCP* or *Custom* as the connection type and continuing the configuration. For *USB* connections that rely on the physical connection being available too, the same method can be applied. Once out in the field on the target computer the settings can be changed to the appropriate connection type.
- Protocol types - for complex modbus systems where a modbus template driver is not already provided, the discrete registers can be set up in Congrego® with the instrument specifying *Generic Modbus* as the protocol type. The configuration can be verified and tested using a third party modbus tool, there are many readily available.
- The configuration can then be backed up 86 and restored on the target computer.

3.3.1 Instrument Settings

The Instrument dialog allows the user to set and edit the properties for a new or existing instrument.

Terminology used in this section:
TCP/IP = **T**ransmission **C**ontrol **P**rotocol/**I**nternet **P**rotocol - a set of network protocols that allows two or more computers to communicate
UDP = **U**ser **D**atagram **P**rotocol - an alternative communication protocol to TCP used for establishing low latency and loss-tolerant connections

General Settings

A number of required fields need filling by the user before the application will allow the settings to be saved. All fields are validated and any invalid fields are denoted by a red indicator around the control or field in question.

Manufacturer

The instrument manufacturer, or make, is selected from a prepopulated list. This is a required field.
If your instrument does not appear in the available instruments list then you may choose to add the unit as a *Generic* device and use an existing standard protocol to communicate such as Bayern-Hessen or Modbus.

Model

The manufacturer selection will influence the list of models available in the dropdown list. The user must select the instrument model from this list, this is a required field.

Note that once the *Manufacturer* and *Model* settings have been selected and the settings saved then it is not possible to change them at a later date for the instrument.
Instead a new instrument must be created with the new *Manufacturer* and *Model* settings.

Label
A unique label supplied by the user to allow easy identification of the instrument, this is a required field.
The label, which is usually automatically generated, is used as the identifier in Congrego®. However changing the label at a later date will not impact data storage and the new label will continue to be associated with the original channel.

Description
An optional free-text field allowing the user to enter a descriptive summary of the instrument or additional notes.

Protocol
The driver protocol selection is determined by the number of protocols implemented in the selected instruments driver. Many instruments may only support a single protocol while other support multiple protocols. The selection here is also determined by any restrictions on the protocols used in an existing network and the physical connection between the host computer and the instrument.

Serial Number
This is an optional field that allows the user to easily identify an instrument by its given serial number.

Enabled
This slider denotes if the instrument is enabled or not. A disabled instrument will no longer be polled.

Advanced Settings

TCP Passthrough Port
This is the TCP port through which a TCP connection can access a serial or USB device.
Note that the TCP passthrough component will not be enabled until the Enabled/Disabled toggle switch on the control is clicked. Any communication on this port will stop the polling of the instrument.

Clock Synchronisation
If clock synchronisation is enabled, then additional settings are shown. Here users can choose to set an allowable drift tolerance for the time synchronisation as well as the time zone and an offset.
Setting an offset for the time synchronisation allows users to set and maintain an instrument clock to be faster or slower than the actual (logger) time by a specific amount. This can be useful when communications to an instrument must not be performed at specific times (for example communication with a Spirant BAM at the start of the hour).

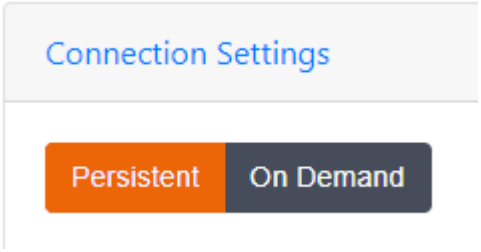
Time Zone
Make a selection from the available options.

Clock Drift Tolerance
This value, in seconds, determined how far the instrument clock is allowed to drift before it is corrected.

Clock Offset
This value, in seconds, is the offset to be applied to the instrument clock in relation to the system clock.

Connection Settings

Persistent or On-Demand



Persistant or On Demand

For *Persistent* connections, the logger holds the comm port open and regularly communicates with the instrument. *On Demand* connections will only open the port when required for communication.

Device ID
This is the instrument's communication ID and should match the analyser settings.
Some instruments require an identifier if there are multiple instruments of the same type on the same connection e.g. when instruments are multi-dropped.

Ensure that the device identifier supplied here is within the supported range for that type of instrument.
This is a free-text field and validation is not performed as the identifier is specific to the instrument type.

Device Arguments
Typically only used for TCP and custom connections. This allows for additional instructions to be entered in the communication string.

Polling Interval
The polling interval is specified in seconds and is the duration between successive polls of the instrument. This is typically ten seconds.

Polling Timeout
This is the allowed time for a response from the instrument (typically one second). If the logger does not receive a response from the instrument within the timeout period, it will make several further attempts and then stop and mark the instrument as *Offline*.

Discovered Instruments Function

If connecting to an Acoem product via USB or TCP, the *Discovered Instruments* feature may appear as an option.
Congrego® can automatically scan and find available Acoem products connected to the logger through USB and TCP connections. Simply click on the “refresh” button on the right hand side of the bar, Congrego® will search for connected instruments and populate the drop-down menu. Select the correct discovered instrument from the menu.

Discovered Instruments

Connection Type Selection

Connection

This is the physical connection between the host computer and the instrument. The user may select an option and usually the default will be the settings available in the selected driver. The settings fields will change according to the connection selection.

Connection Types

Connection Types:
RS-232 27
TCP 28
UDP 28
USB 28
Custom 28

RS-232 Serial Port

This is the communication port on the host machine through which communication with the instrument is performed. If a port has not already been selected the field will be empty and clicking in the control will show a dropdown list of all of the available ports on the host machine.
These settings should match the analyser settings.

Baud Rate

The baud rate is the maximum rate, measured in bits per second, for serial transmission of data between the host machine and the instrument. The rates are predefined and available in the dropdown list.

Data Bits

This is the number of bits in the message that contain data. This selection is available from the dropdown list.

Parity

Parity is a method for detecting errors in the transmission. The number of bits used in the parity check can be selected from the dropdown list.

Stop Bits
The stop bits denote the end of the transmission, this value is selected from the dropdown list.

Handshake
Software flow control (handshaking) can be selected from the dropdown list.

USB

The user must first select the connection type as USB and then use the *Discovered Instruments* feature.
Congrego® will search for the available USB connections and will populate the connection settings once the instrument has been selected from the drop-down menu.
Ensure the appropriate USB driver for the instrument has been previously installed.

TCP

Host
Enter the IP address of the instrument in this field. Depending on the user network configuration the host name of the instrument may also be used e.g. `myinstrument.mydomain.local`

Port
Enter the port number on the instrument that communication will take place through.
Where possible the default port numbers for the instrument will be set automatically by Congrego®.
Set the correct IP address and ensure the port number is correct for the instrument.
For TCP connections, the Discover Instruments feature can be used to automatically add instruments when connecting to most Acoem products.

UDP

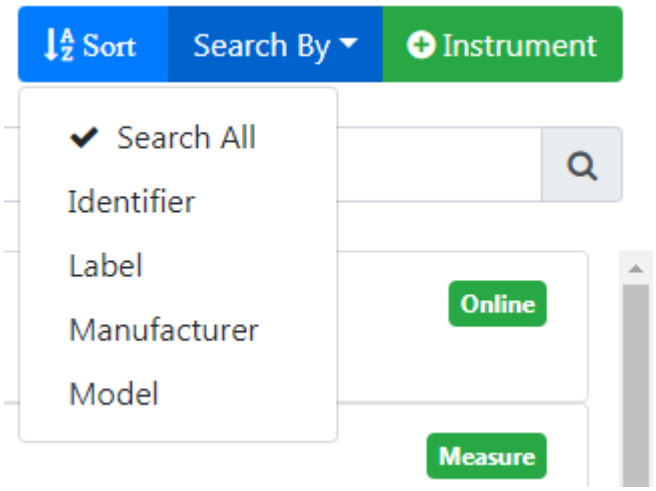
Host and **Port** - see TCP 28 settings.
For UDP connections, the *Discover Instruments* feature can be used to automatically add instruments when connecting to most Acoem products.

Custom

Custom connections allows for several specific and unique instrument inputs such as the Yocto Watchdog.

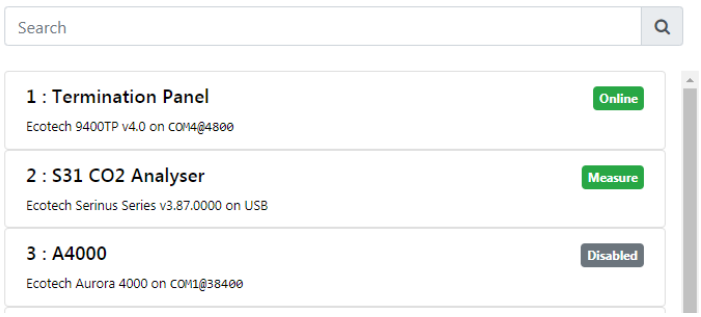
Saving the New Instrument

Once the instrument setup is completed, select Save from the top of the menu. Note that the Save button is only available once all of the necessary parameters have been completed.
Once saved, the server will re-start and the new instrument will appear in the instrument list, including a description of the instrument and the connection properties.
The instrument list can be sorted alphabetically using the menu at the top of the list. Users can also filter the instruments displayed using the Search feature.



Search Options

For each analyser in the list, a *Status Bar* will also be displayed:

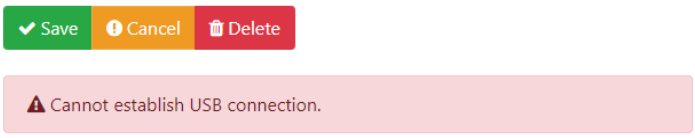


Status Example

It is important to note that the status that is shown is the status that Congrego® has last set the instrument to, if it can be set. If the status of the instrument is changed directly on the instrument by an operator then this will not be reflected in the status shown by Congrego®. Currently the status updates are one-way, Congrego® to instrument.

Online	Instrument is available (communication type set to *On Demand*)
Offline	Instrument is not communicating
Disabled	Instrument is set to *Disabled* in the *Instrument* menu

If the *Instrument Status* is displayed as *Offline*, select the instrument and an error message will be displayed at the top of the *Instrument Settings* menu on the right. 'Online' may be substituted with the instrument's state (such as 'measure', or 'calibration') for instruments which support states.



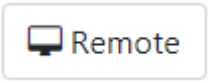
Instrument Error Example

Saved Instruments

For each connected Instrument, two new menu items will be displayed.

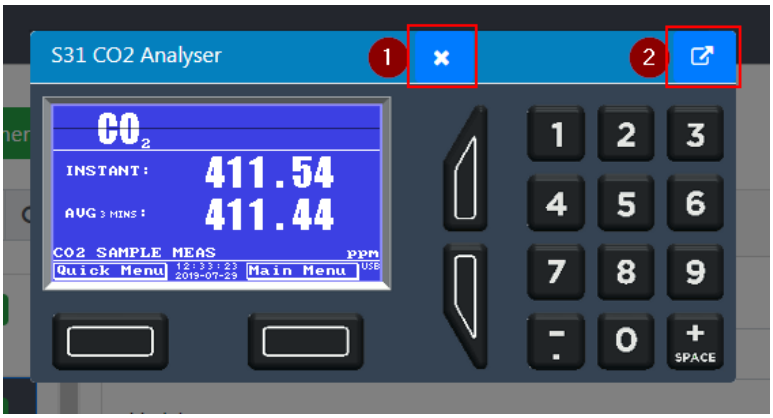
Remote

Remote control is available for some instruments supported by Congrego®.
If remote control is available on the connected instrument then the *Remote* button will be displayed.



Remote Control Button

Clicking the button will establish a connection with the instrument, if the communication settings are configured correctly, and the remote screen will be displayed.



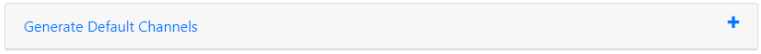
Remote Screen (Serinus series example)

Functionality will differ on the remote screen depending on the instrument type but for each screen

- Button 1 will close the remote connection
- Button 2 will open the remote screen in a new tab in the browser

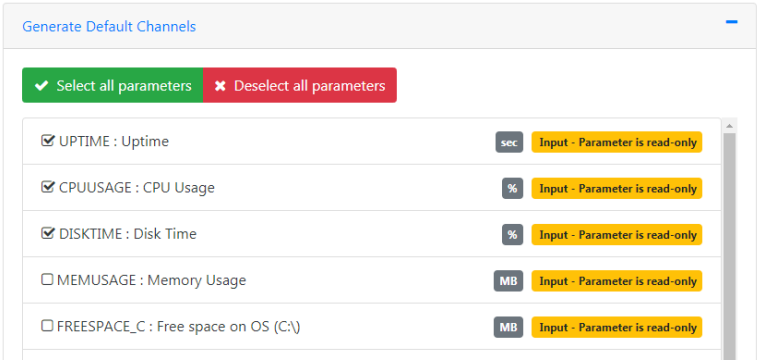
Generate Default Channels

The Generate Default Channels feature allows a user to quickly bulk add channels for the newly connected instrument instead of having to add them individually.



Generate Default Channels

Each instrument driver will specify what channels are available on the instrument. By expanding the *Generate Default Channels* section the user can select the channels that they want to add.



Generate Default Channels Selection

Select the channels that are to be added and save the *Instrument* settings.

On saving the selected channels will be added to any report that has the Automatically Generated 19 option enabled.

3.4 Channels

Once an instrument has been added to the system the channels on that instrument that are of interest to the user can be configured.
In addition *Calculated* channels can also be defined.

From the *Home* page the user selects the *Channels* menu in order to display the *Channels* page.

Note that the Congrego® Lite licence only allows the addition of 15 channels in the system. This limit does not include *Calculated Channels*.
Any channels that exceed this limit will be marked as *'Unlicensed'* and will be internally disabled.
Disabled channels can not be used in *Calculated Channel* calculations.

Adding Channels to the Server

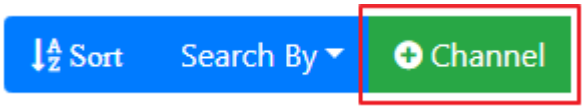
There are two ways to create channels in Congrego®, either manually creating each channel to be logged from the instruments; or by using the *Generate Default Channels* feature in the *Instrument* menu.

Generate Default Channels

A key time-saving feature, this option allows users to automatically generate a suite of standard channels for each instrument installed. These channels are automatically added to the *Channels* tab and can be edited further once saved.
To generate the standard channels for an instrument, open the *Instruments* tab and select the specific instrument.
At the bottom of the *Instrument Setup* page, select or expand the *Generate Default Channels* list menu.
Select either the entire list of standard channels associated with the instrument or use the check boxes to select individual channels.
Return to the top of the menu and save the changes, the selected standard channels will now appear in the *Channels* tab and can be further edited.

Manually Adding Channels

To manually add channels to the server, begin by opening the *Channels* tab.
Note: If you previously chose to generate default channels during your instrument setup, you will see a list of already configured standard channels.
You can easily modify these channels by selecting the channel and modifying the options (on the right).
When adding new channels, there are four different channel types to choose from. Setup menu options will change depending on the channel type. Begin by clicking the *Add Channel* button and selecting the appropriate channel type.

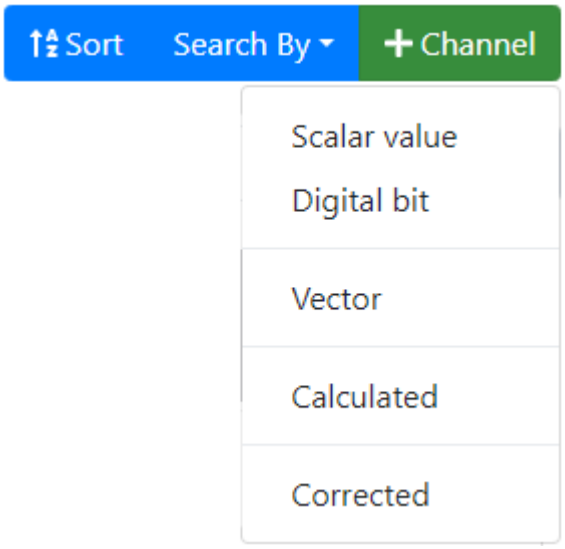


Add Channel

Configure Channels

By default the channel list will be empty. Click on the *New Channel* button to start adding channels.

The *Add Channel* menu presents the user with the choice of channel type.



Scalar 33
Digital 37
Vector 41
Calculated 44
Corrected 49

3.4.1 Scalar Channels

A scalar channel is a standard type of channel input that is a scalar number such as a gas concentration or temperature value.

General Settings

Instrument
Select the *Instrument* from this dropdown list in order to select the parameter in the next field. This selection is effectively a filter.

Parameter
Choose the parameter you wish to record from the instrument. Where possible this list is pre-populated with known available channels.
If the desired parameter is not available set the channel to *User Defined.*

Label
The label for the new channel e.g. SO2 concentration

Description
This is a free-text description field for use by the user and is not a required field.

Minimum Capture %
The *Minimum Capture %* describes the minimum amount of data Congrego® will accept to generate a valid average for a report.
The default value is 75% samples to create a valid average.

Working Units of Measurement
The units used for the channel data. This can be different to the units displayed on the analyser itself.
For Acoem Serinus® analysers, Congrego® will determine the units being used by the instrument and correctly adjust the results to match the desired logged units.

Example - a Serinus® 40 NOx analyser is set to ppb but data is to be logged in ppm.
Simply set the units to ppm in the channel settings and Congrego® will correctly convert the data to ppm without the need for multipliers and offsets.

Instrument Units of Measurement
This field will only appear for instruments that can change the units on their parameters. Used in conjunction with the *Working Units of Measurement* field, this field must be manually updated if the units on the instrument are changed. The *Working Units of Measurement* field will use this field to do any conversion necessary. In short, the *Instrument Units of Measurement* field must match the units set on the instrument.

Example - A temperature sensor was set up to record or send data in °C, the initial units for Instrument and Working Units will be °C.
At a later date an operator changes the instrument units to record or send data in °F, the Instrument Units filed must be set to °F, but if the Working Units are still set to °C, the data will be stored and displayed in °C.

Decimal Places
The number of decimal places recorded by the logger

Multiplier and Offset
Allows users to apply a multiplier and/or offset to a logged channel.
Typically used for meteorological data such as temperature and humidity.

Enable Channel
Users can enable or disable the channel with this toggle switch without having to delete channels and instruments.

User Defined
Manually input the parameter ID or register to be logged and set the units and direction for the channel

User Defined Parameter

Alarms

This section allows you to specify thresholds and conditions that can change the status of the channel depending on the value of it.

High Alarm
Congrego® will display the channel status as High Alarm if the channel result is above the set value and the real time channel data display will change colour. Additionally the data will be flagged as being in a High Alarm state.

Low Alarm
Congrego® will display the channel status as Low Alarm if the channel result is below the set value and the real time channel data display will change colour. Additionally the data will be flagged as being in a Low Alarm state.

Minimum Value
Allows users to define a minimum value for a parameter. When the value falls below this threshold, the channel will be flagged as Limit Exceeded until it comes above the specified threshold. In addition, if the Minimum Value Override is set, it will be used instead of the actual value.

Minimum Value Override
Allows users to define the displayed result if the channel values is below the set Minimum Value

Maximum Value
Allows users to define a maximum value for a parameter. When the value goes above this threshold, the channel will be flagged as Limit Exceeded until it comes below the specified threshold. In addition, if the Maximum Value Override is set, it will be used instead of the actual value.

Maximum Value Override
Allows users to define the displayed result if the channel value is above the set Maximum Value

Nullify
Allows users to null the result instead of overriding it. This effectively "drops" the data when the Minimum/Maximum value is reached depending on what has been selected.


Note that the Min/Max value and Override settings have the ability to change the status of the data.
The logic applied is as follows:

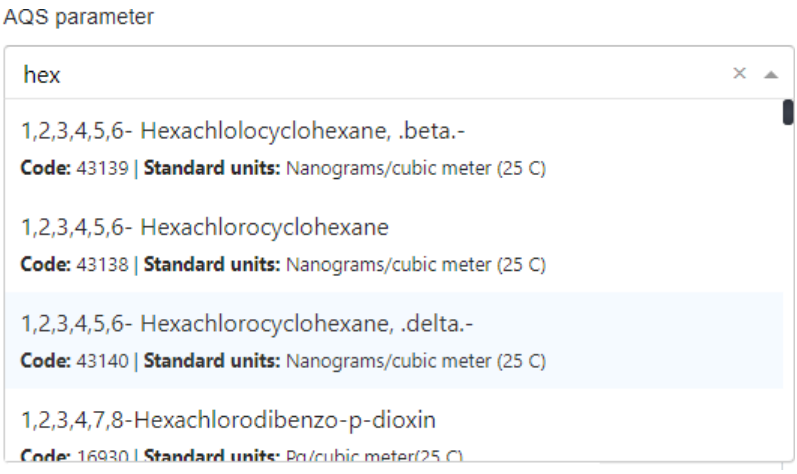
If the Min or Max value IS specified for a channel but the Override is NOT specified, then the data status will be changed to Invalid.
If the Min or Max value IS specified for a channel and the Override IS specified, then the data status will be changed to Limit Exceeded.
If the High or Low alarm thresholds are set then the Alarm flag will be applied to the status if the threshold is exceeded.

The Min/Max Value and Min/Max Value Override will cause the actual parameter value to be changed when it is out of range.
The logic applied is:

```
If (value < MinValue) then value = MinValueOverride
If (value > MaxValue) then value = MaxValueOverride
```

Advanced Setup
The advanced channel setup menu allows additional setting for each channel depending on instrument type.

AQS Parameter
The AQS parameter is used to classify or identify the instrument channel using the USA EPA AQS parameters list (AQS parameters list)
This is an optional field that can be filled by selecting one of the entries in the available list. The list is searchable using the name/description or the code.
Details on the AQS and Channel mapping can be obtained by using the `GETCONFIG` telnet command.



AQS Parameter

Molecular Formula/Weight
Input the molecular weight for a gas channel. Congrego® can use this to perform automatic conversion from volumetric units to mass units.

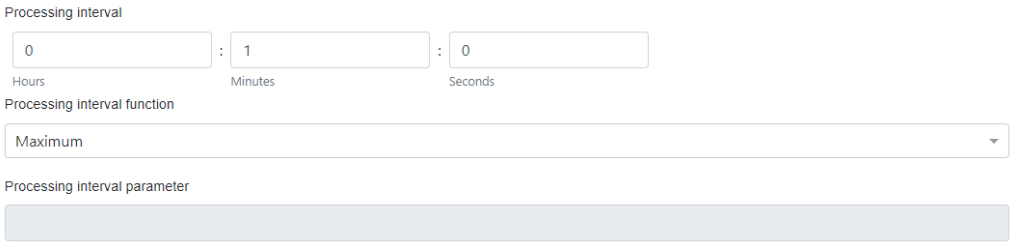
> Note that this parameter is not applicable to Digital channels.

Elevation
The elevation of the site in metres. This value is not used by Congrego® and is for reference only.

Processing Interval
When a processing interval is defined, Congrego® will apply a function to this period on the channel, on a dashboard widget or in a report.
By default the function will be *Average*, in effect this turns the channel into a rolling average value representation.
If this interval is not set, then Congrego® will use the latest parameter value on the dashboard, and the parent report's period for report values.
If the latest value and a rolling average value is required then the channel can be duplicated and the *Processing Interval* set in one.

Other functions are available in the dropdown, the *Processing Interval Parameter* field is only required for functions that need an additional parameter

e.g. *Nth Minimum*



Processing Interval Function

Start-up Value
This value is used to prime the parameter value on start-up (first connect).
This is useful for setting analog outputs to a known state on start-up. As a safeguard for example, should the Calibration sequence run into issues when run and Congrego® has to be restarted, an analogue output that was set to a value during the sequence will be set back to this known value when the application restarts.
Note that this parameter is not applicable to all Channel types.

3.4.2 Digital Channels

This is to add a digital input such as an alarm signal from an analyser.

General Settings

Instrument
Select the *Instrument* from this dropdown list in order to select the parameter in the next field. This selection is effectively a filter.

Parameter
Choose the parameter you wish to record from the instrument. Where possible this list is pre-populated with known available channels.
If the desired parameter is not available set the channel to *User Defined.*

Label
The label for the new channel e.g. Switch State

Description
This is a free-text description field for use by the user and is not a required field.

Minimum Capture %
The *Minimum Capture %* describes the minimum amount of data Congrego® will accept to generate a valid average for a report.
The default value is 75% samples to create a valid average.

True Text
This field allows the user to define the result in a textual format if the digital bit is “ON” (non-zero)

False Text
This field allows users to define the result in a textual format if the digital bit is “OFF” (zero)

Enable Channel
Users can enable or disable the channel with this toggle switch without having to delete channels and instruments.

User Defined
Manually input the parameter ID or register to be logged and set the units and direction for the channel

User Defined Parameter

Alarms

This section allows you to specify thresholds and conditions that can change the status of the channel depending on the value of it.

High Alarm
Congrego® will display the channel status as High Alarm if the channel result is above the set value and the real time channel data display will change colour. Additionally the data will be flagged as being in a High Alarm state.

Low Alarm
Congrego® will display the channel status as Low Alarm if the channel result is below the set value and the real time channel data display will change colour. Additionally the data will be flagged as being in a Low Alarm state.

Minimum Value
Allows users to define a minimum value for a parameter. When the value falls below this threshold, the channel will be flagged as Limit Exceeded until it comes above the specified threshold. In addition, if the Minimum Value Override is set, it will be used instead of the actual value.

Minimum Value Override
Allows users to define the displayed result if the channel values is below the set Minimum Value

Maximum Value
Allows users to define a maximum value for a parameter. When the value goes above this threshold, the channel will be flagged as Limit Exceeded until it comes below the specified threshold. In addition, if the Maximum Value

Override is set, it will be used instead of the actual value.

Maximum Value Override
Allows users to define the displayed result if the channel value is above the set Maximum Value

Nullify
Allows users to null the result instead of overriding it. This effectively "drops" the data when the Minimum/Maximum value is reached depending on what has been selected.

Note that the Min/Max value and Override settings have the ability to change the status of the data.
The logic applied is as follows:

If the Min or Max value IS specified for a channel but the Override is NOT specified, then the data status will be changed to Invalid.
If the Min or Max value IS specified for a channel and the Override IS specified, then the data status will be changed to Limit Exceeded.
If the High or Low alarm thresholds are set then the Alarm flag will be applied to the status if the threshold is exceeded.

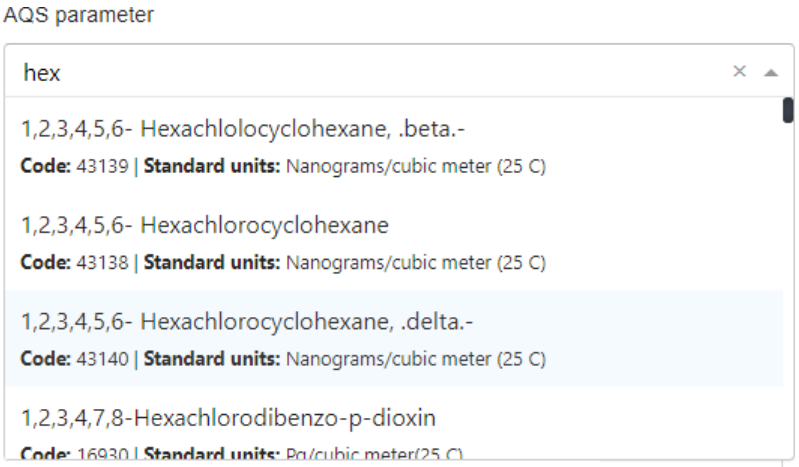
The Min/Max Value and Min/Max Value Override will cause the actual parameter value to be changed when it is out of range.
The logic applied is:

```
If (value < MinValue) then value = MinValueOverride
If (value > MaxValue) then value = MaxValueOverride
```

Advanced Setup

The advanced channel setup menu allows additional setting for each channel depending on instrument type.

AQS Parameter
The AQS parameter is used to classify or identify the instrument channel using the USA EPA AQS parameters list (AQS parameters list)
This is an optional field that can be filled by selecting one of the entries in the available list. The list is searchable using the name/description or the code.
Details on the AQS and Channel mapping can be obtained by using the `GETCONFIG` telnet command.



AQS Parameter

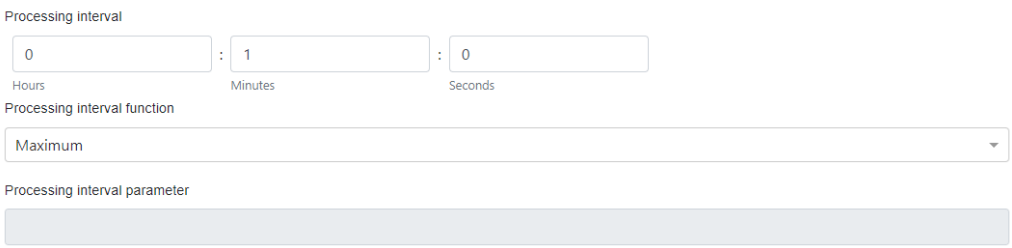
Molecular Formula/Weight
Input the molecular weight for a gas channel. Congrego® can use this to perform automatic conversion from volumetric units to mass units.

> Note that this parameter is not applicable to Digital channels.

Elevation
The elevation of the site in metres. This value is not used by Congrego® and is for reference only.

Processing Interval
When a processing interval is defined, Congrego® will apply a function to this period on the channel, on a dashboard widget or in a report.
By default the function will be *Average*, in effect this turns the channel into a rolling average value representation.
If this interval is not set, then Congrego® will use the latest parameter value on the dashboard, and the parent report's period for report values.
If the latest value and a rolling average value is required then the channel can be duplicated and the *Processing Interval* set in one.

Other functions are available in the dropdown, the *Processing Interval Parameter* field is only required for functions that need an additional parameter e.g. *Nth Minimum*



Processing Interval Function

Start-up Value
This value is used to prime the parameter value on start-up (first connect).
This is useful for setting analog outputs to a known state on start-up. As a safeguard for example, should the Calibration sequence run into issues when run and Congrego® has to be restarted, an analogue output that was set to a value during the sequence will be set back to this known value when the application restarts.
Note that this parameter is not applicable to all Channel types.

3.4.3 Vector Channels

A vector channel is a channel type used for inputs that are vector paired, such as wind speed and wind direction channels.
Vector channels can only be created from existing channels.

General Settings

Primary Channel
Select the primary channel to be logged in a vector pair, such as the raw wind speed channel when creating a new vector wind speed channel.

Secondary Channel
Select the secondary channel used in the vector pair, such as the raw wind direction when creating a new vector wind speed channel.

Label
The label for the new channel e.g. Switch State

Description
This is a free-text description field for use by the user and is not a required field.

Minimum Capture %
The *Minimum Capture %* describes the minimum amount of data Congrego® will accept to generate a valid average for a report.
The default value is 75% samples to create a valid average.

Working Units of Measurement
The units used for the channel data. This can be different to the units displayed on the analyser itself.
For Acoem Serinus® analysers, Congrego® will determine the units being used by the instrument and correctly adjust the results to match the desired logged units.

Example - a Serinus® 40 NOx analyser is set to ppb but data is to be logged in ppm.
Simply set the units to ppm in the channel settings and Congrego® will correctly convert the data to ppm without the need for multipliers and offsets.

Decimal Places
The number of decimal places recorded by the logger

Enable Channel
Users can enable or disable the channel with this toggle switch without having to delete channels and instruments.

Alarms

This section allows you to specify thresholds and conditions that can change the status of the channel depending on the value of it.

High Alarm
Congrego® will display the channel status as High Alarm if the channel result is above the set value and the real time channel data display will change colour. Additionally the data will be flagged as being in a High Alarm state.

Low Alarm
Congrego® will display the channel status as Low Alarm if the channel result is below the set value and the real time channel data display will change colour. Additionally the data will be flagged as being in a Low Alarm state.

Minimum Value
Allows users to define a minimum value for a parameter. When the value falls below this threshold, the channel will be flagged as Limit Exceeded until it comes above the specified threshold. In addition, if the Minimum Value Override is set, it will be used instead of the actual value.

Minimum Value Override
Allows users to define the displayed result if the channel values is below the set Minimum Value

Maximum Value
Allows users to define a maximum value for a parameter. When the value goes above this threshold, the channel will be flagged as Limit Exceeded until it comes below the specified threshold. In addition, if the Maximum Value Override is set, it will be used instead of the actual value.

Maximum Value Override
Allows users to define the displayed result if the channel value is above the set Maximum Value

Nullify
Allows users to null the result instead of overriding it. This effectively "drops" the data when the Minimum/Maximum value is reached depending on what has been selected.

Note that the Min/Max value and Override settings have the ability to change the status of the data.
The logic applied is as follows:

If the Min or Max value IS specified for a channel but the Override is NOT specified, then the data status will be changed to Invalid.
If the Min or Max value IS specified for a channel and the Override IS specified, then the data status will be changed to Limit Exceeded.
If the High or Low alarm thresholds are set then the Alarm flag will be applied to the status if the threshold is exceeded.

The Min/Max Value and Min/Max Value Override will cause the actual parameter value to be changed when it is out of range.
The logic applied is:

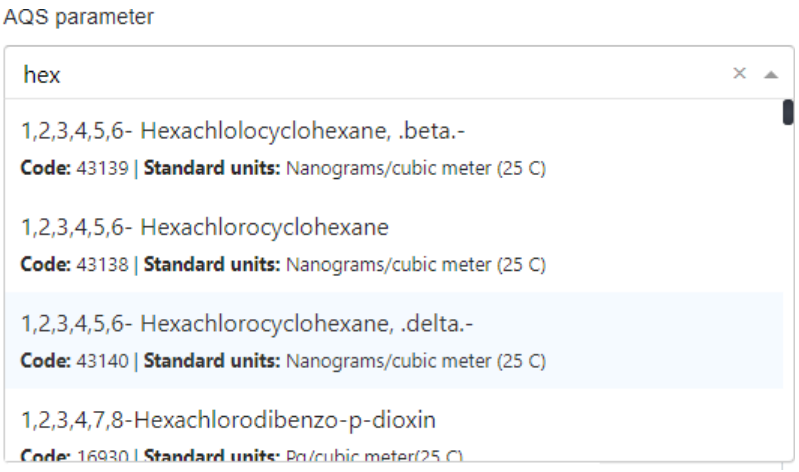
```
If (value < MinValue) then value = MinValueOverride
If (value > MaxValue) then value = MaxValueOverride
```

Advanced Setup

The advanced channel setup menu allows additional setting for each channel depending on instrument type.

AQS Parameter

The AQS parameter is used to classify or identify the instrument channel using the USA EPA AQS parameters list (AQS parameters list)
This is an optional field that can be filled by selecting one of the entries in the available list. The list is searchable using the name/description or the code.
Details on the AQS and Channel mapping can be obtained by using the `GETCONFIG` telnet command.



AQS Parameter

Molecular Formula/Weight

Input the molecular weight for a gas channel. Congrego® can use this to perform automatic conversion from volumetric units to mass units.

Note that this parameter is not applicable to Digital channels.

Elevation

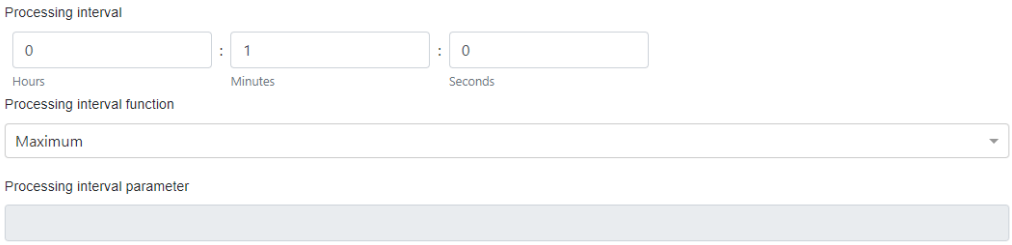
The elevation of the site in metres. This value is not used by Congrego® and is for reference only.

Processing Interval

When a processing interval is defined, Congrego® will apply a function to this period on the channel, on a dashboard widget or in a report.
By default the function will be *Average*, in effect this turns the channel into a

rolling average value representation.
If this interval is not set, then Congrego® will use the latest parameter value on the dashboard, and the parent report's period for report values.
If the latest value and a rolling average value is required then the channel can be duplicated and the *Processing Interval* set in one.

Other functions are available in the dropdown, the *Processing Interval Parameter* field is only required for functions that need an additional parameter e.g. *Nth Minimum*



Processing Interval Function

Start-up Value
This value is used to prime the parameter value on start-up (first connect).
This is useful for setting analog outputs to a known state on start-up. As a safeguard for example, should the Calibration sequence run into issues when run and Congrego® has to be restarted, an analogue output that was set to a value during the sequence will be set back to this known value when the application restarts.
Note that this parameter is not applicable to all Channel types.

3.4.4 Calculated Channels

A *Calculated Channel* is a channel based on a user defined calculation such as a differential temperature calculation or dew-point calculation.

General Settings

Label
The label for the new channel e.g. SO2 concentration

Description
This is a free-text description field for use by the user and is not a required field.

Minimum Capture %
The *Minimum Capture %* describes the minimum amount of data Congrego® will accept to generate a valid average for a report.
The default value is 75% samples to create a valid average.

Working Units of Measurement
The units used for the channel data. This can be different to the units displayed on the analyser itself. For Acoem Serinus® analysers, Congrego® will

determine the units being used by the instrument and correctly adjust the results to match the desired logged units.

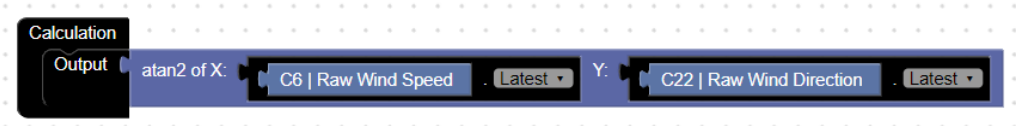
> Example - a Serinus® 40 NOx analyser is set to ppb but data is to be logged in ppm. Simply set the units to ppm in the channel settings and Congrego® will correctly convert the data to ppm without the need for multipliers and offsets.

Decimal Places
The number of decimal places recorded by the logger

Enable Channel
Users can enable or disable the channel with this toggle switch without having to delete channels and instruments.

Calculation
The calculation section has two different types. Legacy formula and the logic blocks, where formula is more suited to existing calculations and logic for a more visual and interactive creation.

Logic Block
The logic block for calculated channels is an easy visual scripting language that allows a user to define an output for a calculated channel.



Logic Block Calculation Example

This calculation will be run every interval the same as any other calculated channel.

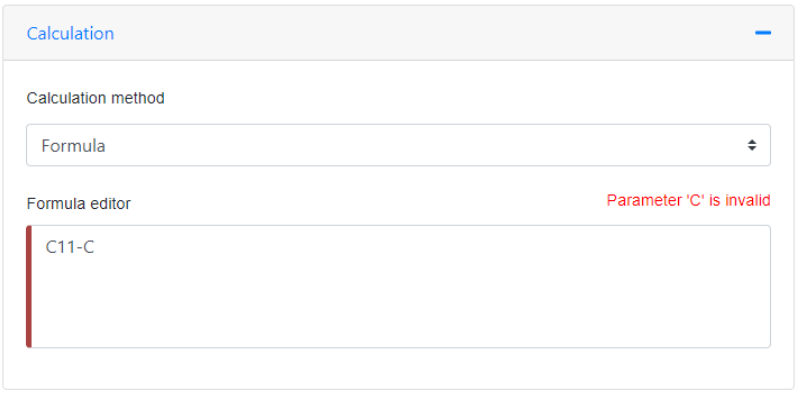
There are limitations imposed on the calculations, these are:
- **Time constraint** - The calculation must execute successfully within one second (No loops or infinite logic allowed)
- **Recursive** - Functions can't call each other in a cyclic fashion.

There are a range of mathematical blocks, variables and functions that can be used to create calculations to meet most needs.

Formula Editor
In the *Formula Editor* field, type in the desired equation referencing existing channels using the format Cxxx where C is channel and xxx is the channel number.

> Example: Differential temperature calculation where Channel 9 is temperature at 10m and Channel 11 is logging temperature at 2m could be written as:
> C11-C9

If there is a logic error, a message is displayed in red in the right hand corner of the formula field.



Calculation Error

Syntax and Available Operands 105

Alarms

This section allows you to specify thresholds and conditions that can change the status of the channel depending on the value of it.

High Alarm

Congrego® will display the channel status as High Alarm if the channel result is above the set value and the real time channel data display will change colour. Additionally the data will be flagged as being in a High Alarm state.

Low Alarm

Congrego® will display the channel status as Low Alarm if the channel result is below the set value and the real time channel data display will change colour. Additionally the data will be flagged as being in a Low Alarm state.

Minimum Value

Allows users to define a minimum value for a parameter. When the value falls below this threshold, the channel will be flagged as Limit Exceeded until it comes above the specified threshold. In addition, if the Minimum Value Override is set, it will be used instead of the actual value.

Minimum Value Override

Allows users to define the displayed result if the channel values is below the set Minimum Value

Maximum Value

Allows users to define a maximum value for a parameter. When the value goes above this threshold, the channel will be flagged as Limit Exceeded until it comes below the specified threshold. In addition, if the Maximum Value Override is set, it will be used instead of the actual value.

Maximum Value Override

Allows users to define the displayed result if the channel value is above the set Maximum Value

Nullify
Allows users to null the result instead of overriding it. This effectively "drops" the data when the Minimum/Maximum value is reached depending on what has been selected.

Note that the Min/Max value and Override settings have the ability to change the status of the data.
The logic applied is as follows:

If the Min or Max value IS specified for a channel but the Override is NOT specified, then the data status will be changed to Invalid.
If the Min or Max value IS specified for a channel and the Override IS specified, then the data status will be changed to Limit Exceeded.
If the High or Low alarm thresholds are set then the Alarm flag will be applied to the status if the threshold is exceeded.

The Min/Max Value and Min/Max Value Override will cause the actual parameter value to be changed when it is out of range.
The logic applied is:

```
If (value < MinValue) then value = MinValueOverride
If (value > MaxValue) then value = MaxValueOverride
```

Advanced Setup

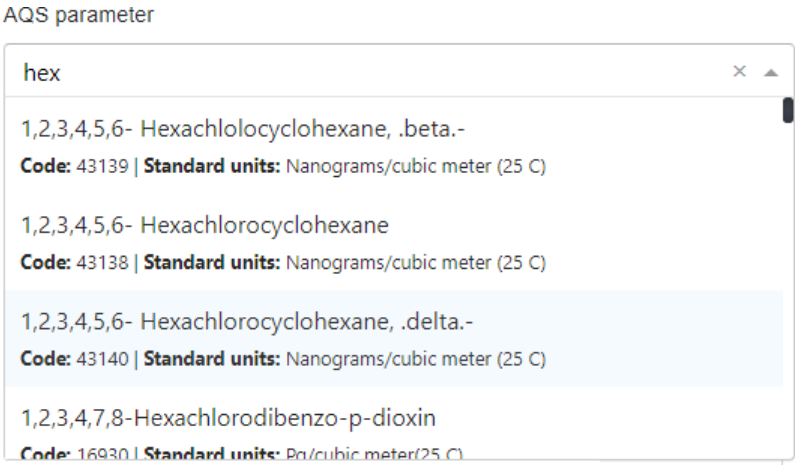
The advanced channel setup menu allows additional setting for each channel depending on instrument type.

Output Channel
This optional field selects the Channel that will be used as an output for the result of the Calculation Formula.

Note that only "Output" and "Bidirectional" channels are available for selection.

For example a Calculation could be written to output a "1" to a channel that controls a digital switch or valve.

AQS Parameter
The AQS parameter is used to classify or identify the instrument channel using the USA EPA AQS parameters list (AQS parameters list)
This is an optional field that can be filled by selecting one of the entries in the available list. The list is searchable using the name/description or the code.
Details on the AQS and Channel mapping can be obtained by using the `GETCONFIG` telnet command.



AQS Parameter

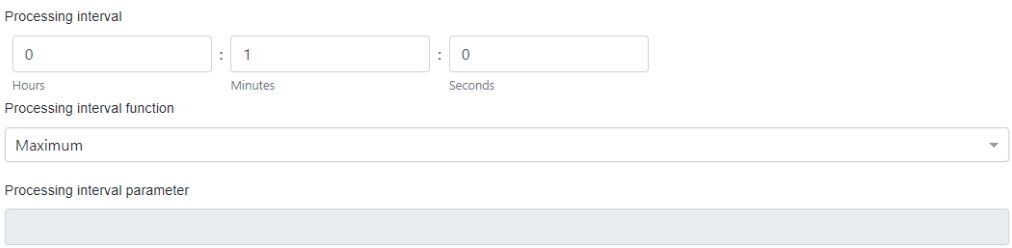
Molecular Formula/Weight
Input the molecular weight for a gas channel. Congrego® can use this to perform automatic conversion from volumetric units to mass units.

Note that this parameter is not applicable to Digital channels.

Elevation
The elevation of the site in metres. This value is not used by Congrego® and is for reference only.

Processing Interval
When a processing interval is defined, Congrego® will apply a function to this period on the channel, on a dashboard widget or in a report.
By default the function will be *Average*, in effect this turns the channel into a rolling average value representation.
If this interval is not set, then Congrego® will use the latest parameter value on the dashboard, and the parent report's period for report values.
If the latest value and a rolling average value is required then the channel can be duplicated and the *Processing Interval* set in one.

Other functions are available in the dropdown, the *Processing Interval Parameter* field is only required for functions that need an additional parameter e.g. *Nth Minimum*



Processing Interval Function

Start-up Value
This value is used to prime the parameter value on start-up (first connect).
This is useful for setting analog outputs to a known state on start-up. As a safeguard for example, should the Calibration sequence run into issues when run and Congrego® has to be restarted, an analogue output that was set to a value during the sequence will be set back to this known value when the application restarts.
Note that this parameter is not applicable to all Channel types.

3.4.5 Corrected Channels

A *Corrected Channel* is primarily used in BAMs to apply a real time correction coefficient to the mass calculation.
The output of this channel will be the *Mass Channel* value with the correction coefficient applied, the coefficient value itself is not an output.

General Settings

Reports
The *Report*, and thus the period, that should be used for the *Mass Channel* source.

Mass Channel
The mass channel source on the instrument.

Optical Channel
The optical channel source that may be on the same instrument e.g. the BAM Real-Time module or a co-located instrument.

Coefficient Minimum
A hard minimum value for the coefficient calculation value

Coefficient Maximum
A hard maximum value for the coefficient calculation value

Label
The label for the new channel e.g. PM10 Corrected

Description
This is a free-text description field for use by the user and is not a required field.

Minimum Capture %
The *Minimum Capture %* describes the minimum amount of data Congrego® will accept to generate a valid average for a report.
The default value is 75% samples to create a valid average.

Working Units of Measure
The units used for the channel data. This can be different to the units displayed on the analyser itself. For Acoem Serinus® analysers, Congrego® will determine the units being used by the instrument and correctly adjust the results to match the desired logged units.

Example - a Serinus® 40 NOx analyser is set to ppb but data is to be logged in ppm. Simply set the units to ppm in the channel settings and Congrego® will correctly convert the data to ppm without the need for multipliers and offsets.

Decimal Places
The number of decimal places recorded by the logger

Enable Channel
Users can enable or disable the channel with this toggle switch without having to delete channels and instruments.

Alarms

This section allows you to specify thresholds and conditions that can change the status of the channel depending on the value of it.

High Alarm
Congrego® will display the channel status as High Alarm if the channel result is above the set value and the real time channel data display will change colour. Additionally the data will be flagged as being in a High Alarm state.

Low Alarm
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Minimum Value
Allows users to define a minimum value for a parameter. When the value falls below this threshold, the channel will be flagged as Limit Exceeded until it comes above the specified threshold. In addition, if the Minimum Value Override is set, it will be used instead of the actual value.

Minimum Value Override
Allows users to define the displayed result if the channel values is below the set Minimum Value

Maximum Value
Allows users to define a maximum value for a parameter. When the value goes above this threshold, the channel will be flagged as Limit Exceeded until it comes below the specified threshold. In addition, if the Maximum Value Override is set, it will be used instead of the actual value.

Maximum Value Override
Allows users to define the displayed result if the channel value is above the set Maximum Value

Nullify
Allows users to null the result instead of overriding it. This effectively "drops" the data when the Minimum/Maximum value is reached depending on what has been selected.

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The logic applied is as follows:

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The logic applied is:

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If (value < MinValue) then value = MinValueOverride
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```

Advanced Setup

The advanced channel setup menu allows additional setting for each channel depending on instrument type.

Output Channel

This optional field selects the Channel that will be used as an output for the result of the Calculation Formula.

Note that only "Output" and "Bidirectional" channels are available for selection.

For example a Calculation could be written to output a "1" to a channel that controls a digital switch or valve.

AQS Parameter

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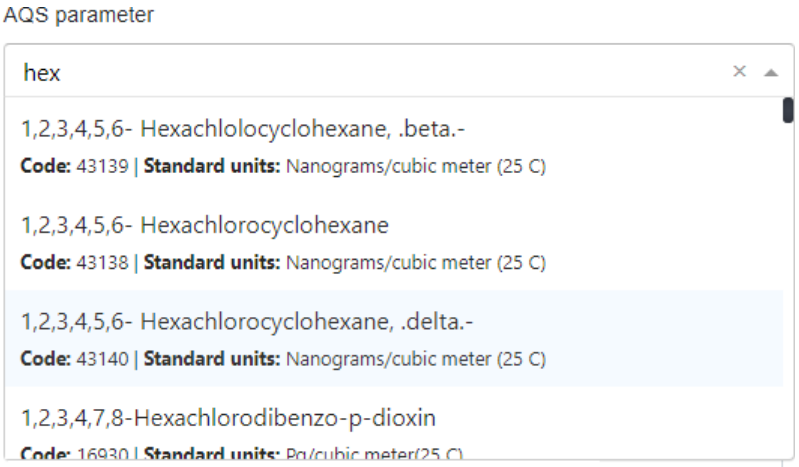
This is an optional field that can be filled by selecting one of the entries in the available list. The list is searchable using the name/description or the code.
Details on the AQS and Channel mapping can be obtained by using the `GETCONFIG` telnet command.



AQS Parameter

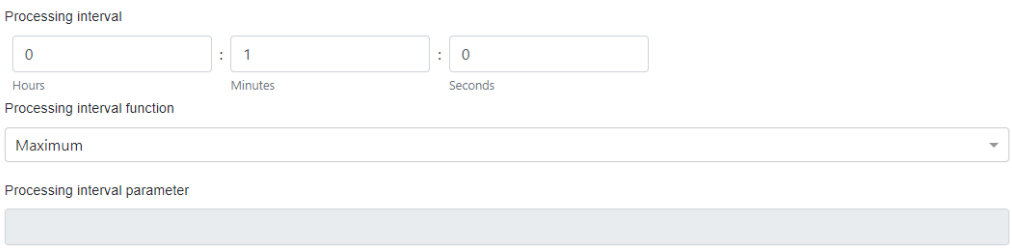
Molecular Formula/Weight
Input the molecular weight for a gas channel. Congrego® can use this to perform automatic conversion from volumetric units to mass units.

> Note that this parameter is not applicable to Digital channels.

Elevation
The elevation of the site in metres. This value is not used by Congrego® and is for reference only.

Processing Interval
When a processing interval is defined, Congrego® will apply a function to this period on the channel, on a dashboard widget or in a report.
By default the function will be *Average*, in effect this turns the channel into a rolling average value representation.
If this interval is not set, then Congrego® will use the latest parameter value on the dashboard, and the parent report's period for report values.
If the latest value and a rolling average value is required then the channel can be duplicated and the *Processing Interval* set in one.

Other functions are available in the dropdown, the *Processing Interval Parameter* field is only required for functions that need an additional parameter e.g. *Nth Minimum*



Processing Interval Function

Start-up Value
This value is used to prime the parameter value on start-up (first connect).
This is useful for setting analog outputs to a known state on start-up. As a safeguard for example, should the Calibration sequence run into issues when run and Congrego® has to be restarted, an analogue output that was set to a value during the sequence will be set back to this known value when the application restarts.
Note that this parameter is not applicable to all Channel types.

3.5 Calibrations

Calibration checks and processes are an essential part of system operations. Congrego®'s ability to control and trigger instruments and devices in the system allows operators to design calibration sequences and processes that can be run either manually or automatically using the scheduler.

> Note that the Congrego® Lite licence does not allow the use of *Calibrations*.

The *Calibrations* tab is where users can define and manage these automated calibration checks. Users can create calibration sequences with calibration points, digital triggers and other functions.
There are no limitations to the number of sequences that can be created, or the number of points within a sequence.
Manual control of calibration sequences and points is through the *Calibrations Widget* on the *Dashboard*.

Creating a Calibration Sequence

To create a new calibration or process, select the *Add Calibration* button and complete the setup to define the instruments involved, the data to be flagged, the specific processes to occur and the schedule to be used for each new calibration sequence.

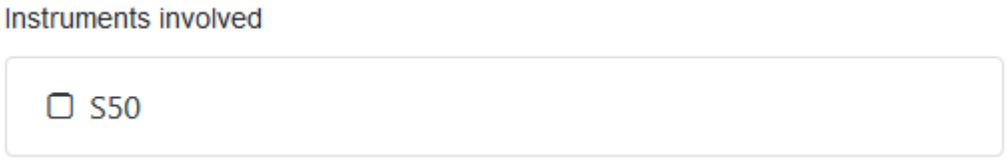
Add Calibration

General

Label
Create a label for the new process. Example: Daily Z/S

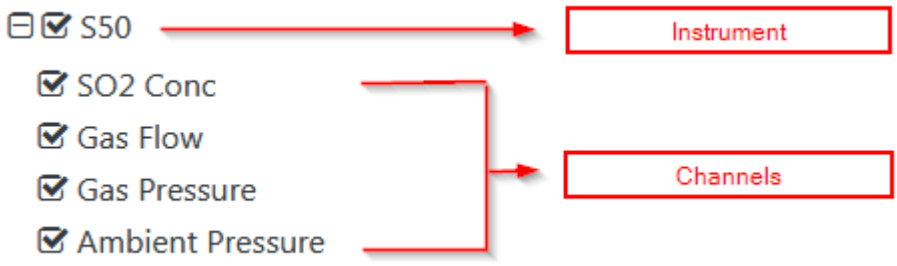
Description
A general description for the process example: daily zero and span check

Instruments Involved
Use the check-boxes to select all of the instruments that will be impacted by, and involved in, the process. This list informs the point configuration menu selections (don't forget the calibrator).



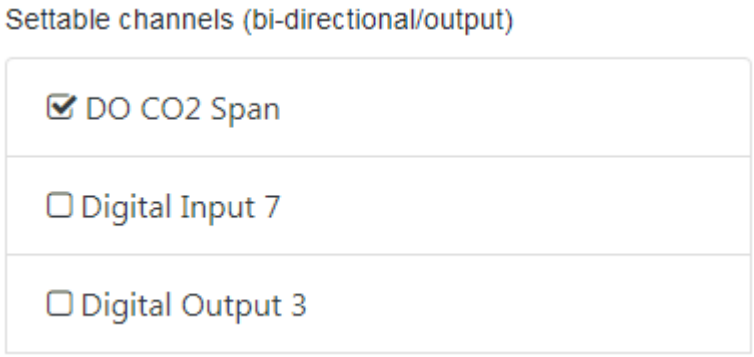
Instruments Involved

Channels Affected by Calibration
Select all of the channels which will have data impacted by the process i.e. All of the channels you wish to have flagged as being *In Calibration* when the process is running.
This will typically mean gas analyser concentration channels are checked but not the ambient pressure or chassis temperature channels etc.
When making a selection, users can either select all of the channels associated with an instrument by selecting the instrument box or select individual channels by selecting each channel box.



Select Channels

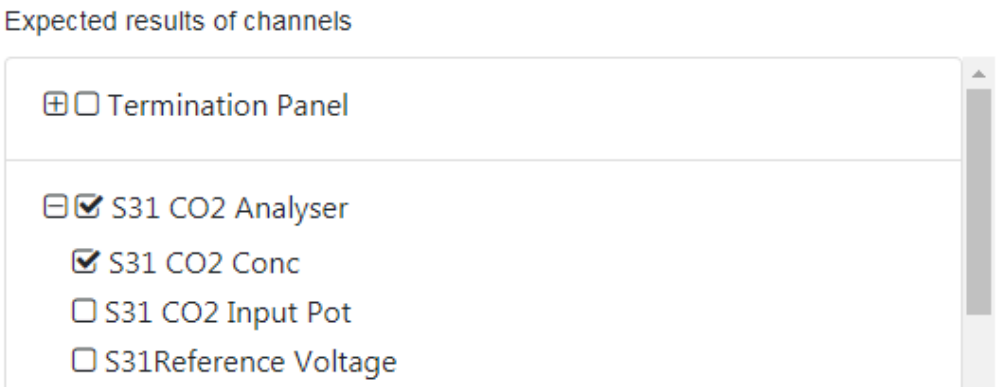
Settable Channels (Bi-Directional/Output)
The *Settable Channels* section shows any channels in the system that are either bi-directional or output channels and as such can be assigned a value e.g. a digital output channel.



Settable Channels

Selecting a channel or channels in this section will make the selections available in the *Points Configuration* and will allow the channel to be set to a specified value during that point.

Expected Results of Channels
Select all of the channels that will have an expected result. e.g. the gas concentrations should have an expected value for a particular calibration point.

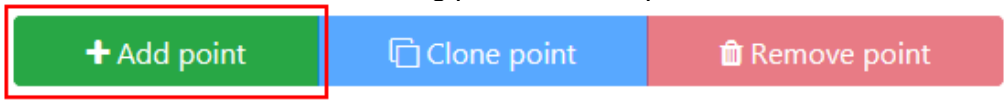


Expected Results Channel Selection

This will inform the *Point Configuration* setup and can be used to determine some automatic alarms.

Point Configuration

In the *Point Configuration* menu, users create points they wish to run in the calibration sequence.
Each point includes instructions to all of the instruments involved as well as the expected results for channels selected in the *General Setup* menu.
To create a new point for the calibration sequence, users can select the *Add Point* button and complete the setup to create a new point, or use the *Clone* button and add and edit an existing point in the sequence.



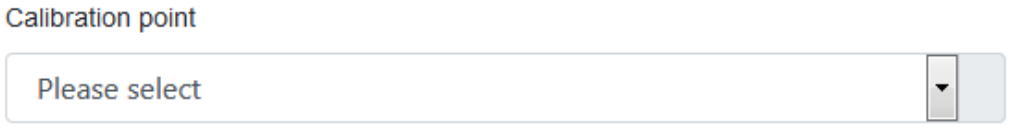
Point Button Options

Creating a new point

Use the *Add Point* button to create a new point and complete the setup menu.

Calibration Point

All of the available calibration points in the sequence will appear in the drop-down menu. This will let users select an existing point to modify. When adding the first point, this list will be blank, go to the *Point Type*.



Calibration Points

Point Type

Here users define what sort of point is being configured, either a zero, a span or a stabilization point. This choice lets Congrego® delineate results within a sequence and allows for quick searches of span or zero results.

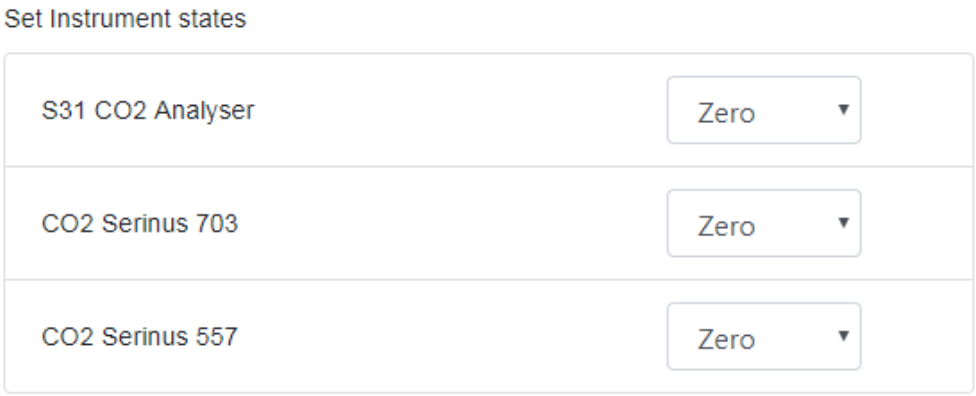
Point Label

Create a descriptive label for the point, example: Span 400ppb

Average
Select the averaging period to be used when storing the point result, example: When set to 2 minutes, Congrego® will average the results for the last 2 minutes of the point and record this as the result.
Note that the duration is displayed in milliseconds and the time picker has selections for Hours : Minutes : Seconds.

Duration
Choose how long the point should run for.
Note that the duration is displayed in milliseconds and the time picker has selections for Hours : Minutes : Seconds.

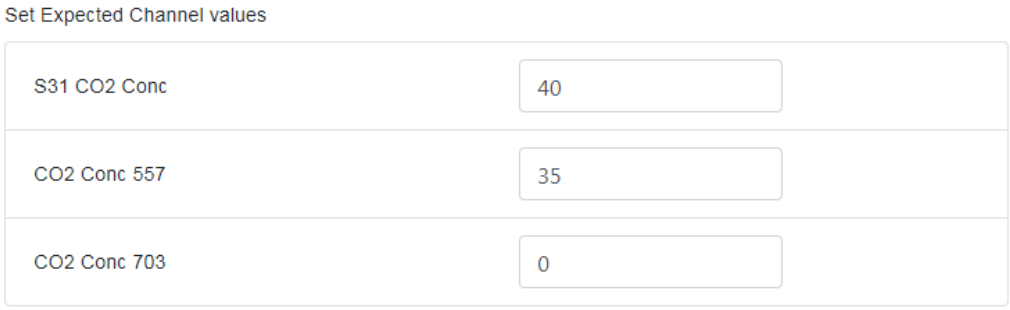
Set Instrument States
All of the instruments selected in the *Instruments Involved* section of the *Setup Menu* will appear in the list.
For each instrument, choose which state it should be in while the point is running example: Zero Mode, Span Mode or Measure Mode. The options will change for different instruments and are defined in the instrument driver.



Set Instrument States

For calibrators, choose which of the pre-defined calibration points, setup on the calibrator itself, should be running when the *Calibration Point* is active example: Idle Mode, Point 3, Point 7, Stop.

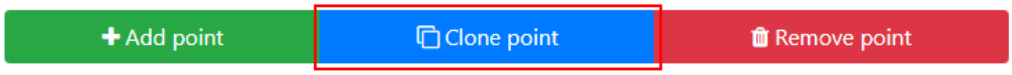
Set Expected Channel Values
Set the expected result for the point for each of the channels selected in the *Expected Results* of *Channels* setup menu. Example: NO2 channel should have a result of 400 during the Span point.
When the point setup has been completed, users can choose to add further new points to the sequence or clone the point and edit it to create more points.



Expected Channel Values

Cloning a Point

Cloning points allows users to fast-track the calibration sequence setup process.
First select the point to be cloned/copied from the available points in the drop-down menu, then select the *Clone Point* button.
The cloned point can now be edited as required.

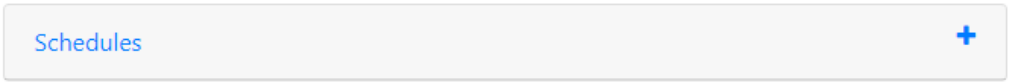


Clone Point

Once the calibration sequence has been setup, users can choose to save the calibration using the *Save* button as an un-scheduled calibration, which can be operated manually, or create a schedule for the calibration sequence.

Schedules

A calibration sequence can be automated to run on a user defined schedule, with many options to define limitations within a schedule, such as run every day except Sundays.
To create a schedule for a calibration sequence, select the calibration from the available menu on the left and expand the *Schedules Setup Menu* on the right.
To create a new schedule, use the plus button on the right of the drop down menu and complete the configuration.

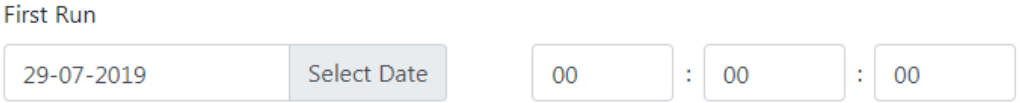


Add Schedule

Note that multiple schedules can be created for a sequence.

First Run

Choose the start date and the start time for the schedule. This date can be set in the past.

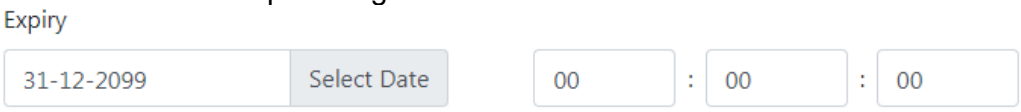


Schedule First Run

Expiry

Choose the date and time for the schedule to end. It is not possible to set the

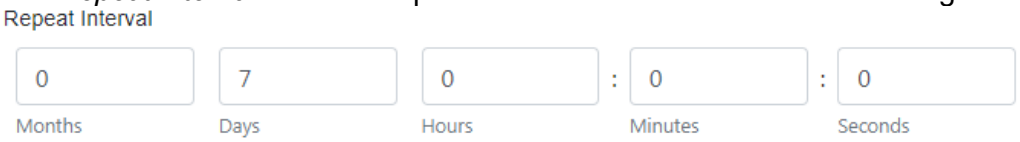
end date as blank, but users may choose a date far in the future to ensure the schedule doesn't stop running.



Schedule Expiry

Repeat Interval

The *Repeat Interval* defines the period after which the schedule will run again.



Schedule Repeat Interval - 7 Day Example

Run Filters

The filters determine when the schedule will and won't run, there are four available:

- *Day Of Week* - Any day or a specific day of the week
- *Day Of Month* - Any day, the final day of the month or a specific day
- *Week Of Month* - Any week, the final week or a specific week
- *Month Of Year* - Any month or a specific month

Schedule Missed

If an event occurs that prevents a schedule from running, such as a power failure, choose what to do when the system is operating again:

- *Don't Run* - Don't try and catch up on the missed schedule(s)
- *Run Once* - Run the schedule once
- *Run Every Interval* - Run the schedule for every repeat interval missed up to the current time

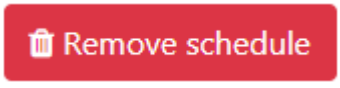
Enable/Disable

Use this switch to disable a schedule temporarily.

Removing a Schedule

Users can choose to remove or delete a schedule.

To remove a schedule, choose *Remove Schedule* at the bottom of the menu.



Remove Schedule

The schedule will be removed but this change will not be persisted until the *Save* button is selected.

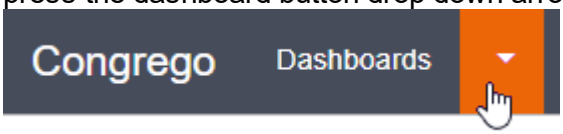
3.6 Congrego® Dashboard

The *Congrego*® Dashboard is the landing page for users when they first sign in.

It provides a tailored way to view live data, manage processes (such as calibration control) and look at historical records.

Multiple dashboards

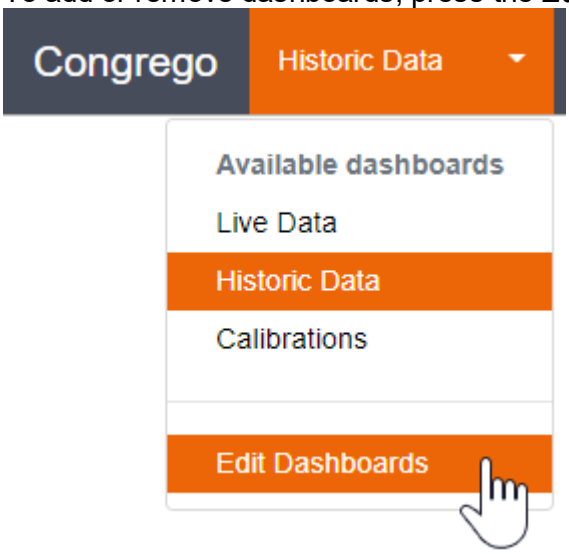
Congrego® allows for multiple dashboards, to view all available dashboards, press the dashboard button drop down arrow



Pressing drop down arrow

Once pressed, you can switch between existing dashboards

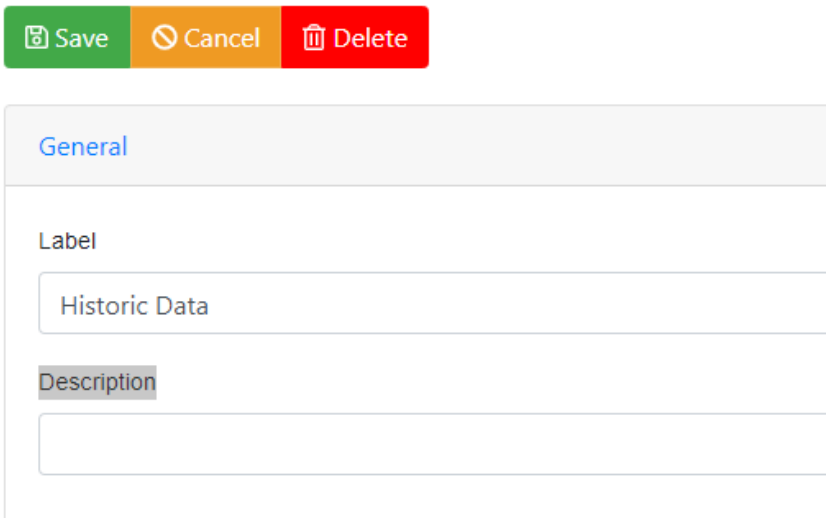
To add or remove dashboards, press the *Edit Dashboards* menu item



Viewing all current dashboards

Once *Edit Dashboards* is selected the following screen will allow you to add or remove dashboards.

In order to edit or remove a dashboard, select a dashboard from the list.



Editing an existing dashboard

The '*Live Data*' dashboard can not be deleted.
Multiple dashboards are allowed, there is no limit imposed on the number of dashboards that can be configured.

If you want to add a dashboard, press the '*Add*' button located on the top.

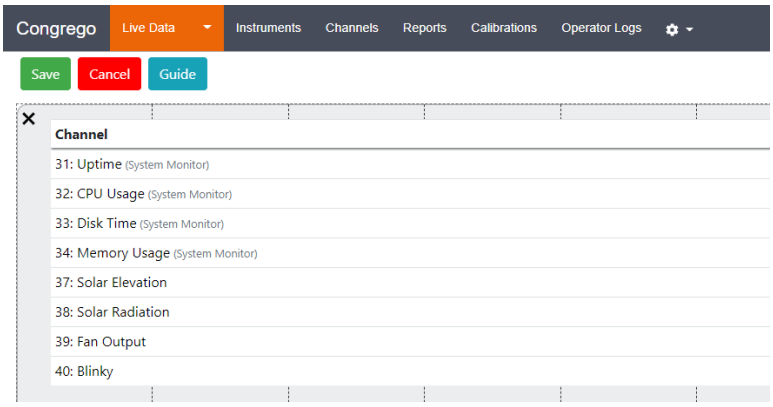
Enter a label fr the dashboard (which must be unique), save the new dashboard and then navigate to it and configure it with widgets.

Customising the dashboard

The dashboard uses an array of different “widgets” to define and control data views, each providing different formats and display options such as real-time graphs and calibration controls.
To begin customising your display scheme, scroll down to the bottom of the dashboard and select

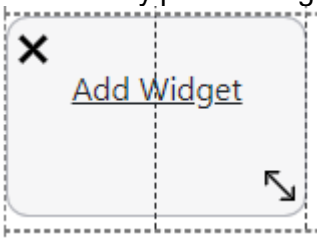
Customise Dashboard Button

A gridded display will show, this is the dashboard setup page.



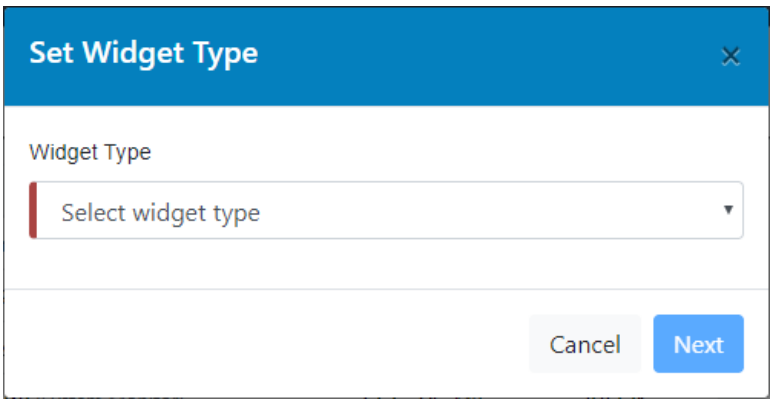
Edit Dashboard

From the setup page widgets are added and managed. To add a new widget, click on any part of the grid and the *Add Widget* option will appear.



Add Widget

Click on the *Add Widget* text to open the widget selection menu and choose the desired data display type from the drop-down menu.



Select Widget Type

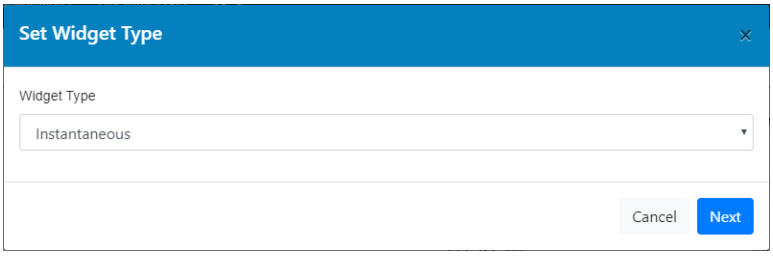
Follow the prompts to complete the setup and position and resize the data display as desired. Save the new dashboard setup when completed.
Widgets (data displays) can be moved, resized, edited or deleted at any time from the *Dashboard Setup Menu* (accessible via the *Customise Dashboard* button).

Dashboard Widgets

3.6.1 Instantaneous Widget

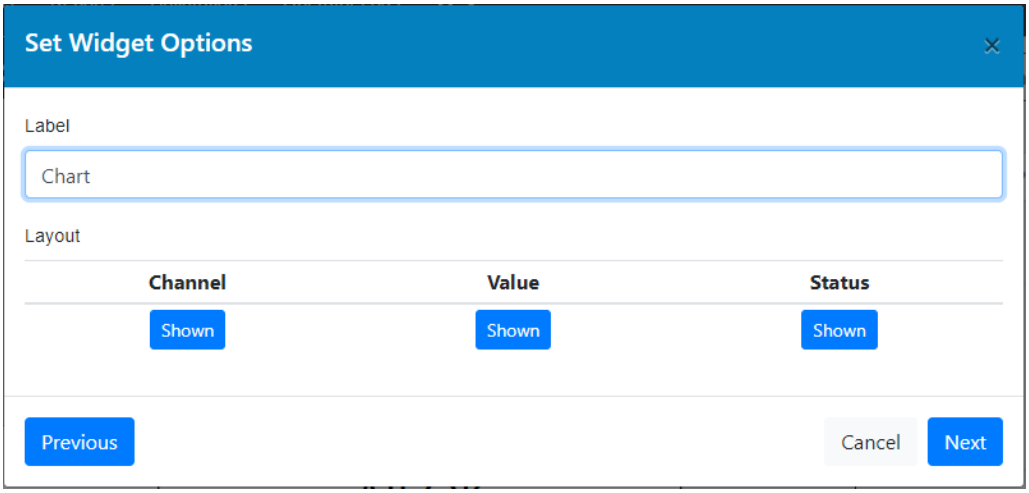
This widget automatically displays all of the current available channels setup in Congrego® as a live table of data.

Select the widget type from the drop down box.



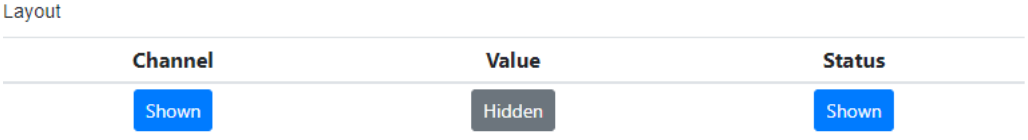
Selecting Instantaneous Widget

You can optionally name your instantaneous widget, or leave it empty for none.

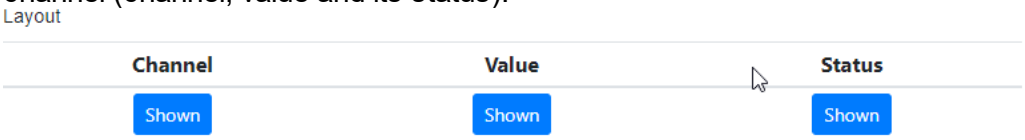


Adding a label to the widget

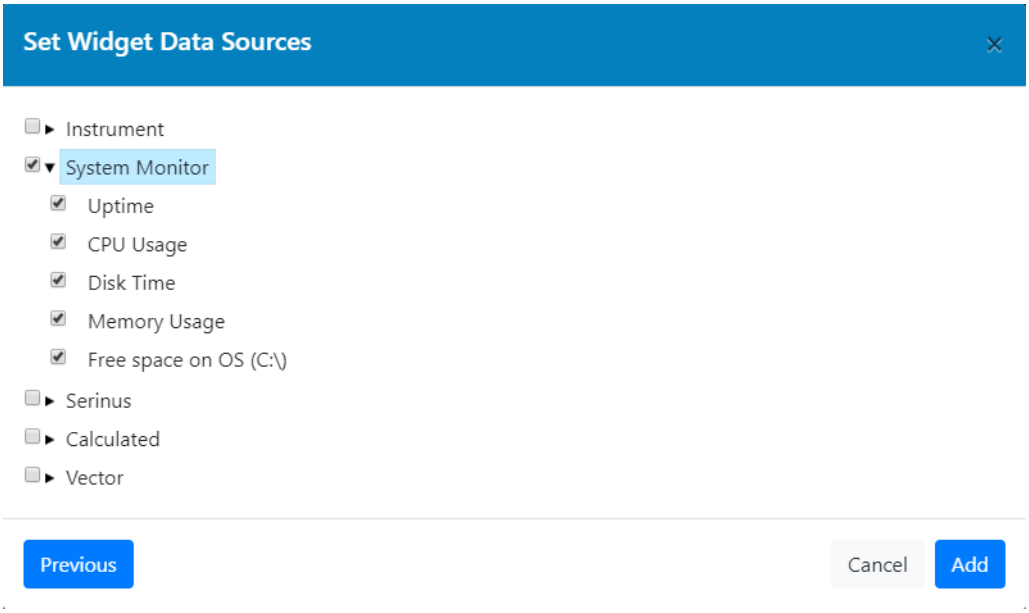
The layout can be changed to reflect your needs, hiding columns you don't want to be shown.
For instance, the following will hide the value section and only show the channel and its status.
In order to do this, you click on the 'Shown' and 'Hidden' buttons to change them.



Or you can choose it leave it default, which will show everything about the channel (channel, value and its status).



Select the channels you want the widget to display, you can either select channels individually or select whole sources.



Widget channel sources

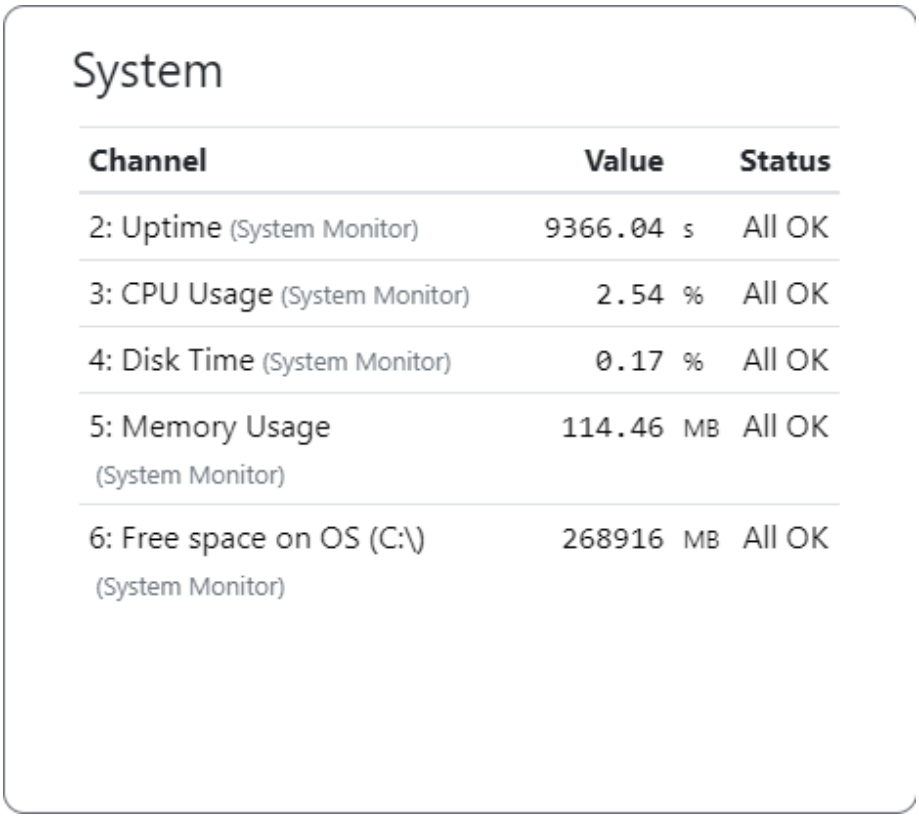
Note that if no channels are selected then ALL of the channels will be shown in the widget by default.
Remember that multiple widgets of the same type can be created to group specific channel sets together and avoid long channel lists that require the user to use the scroll bars to navigate through.

Press 'Add' to see your widget in the dashboard.

No additional configuration is needed for this widget, if the number of rows exceeds the height of the widget then scroll bars will automatically appear.
The widget can now be re-sized (using the arrow), moved (by selecting and drag-and-drop) or edited (by clicking on the ellipses).

The live view includes the channel label and result as well as the current status of the channel.
The channel colour will change for status events such as *In Calibration*, *In Maintenance* or *Instrument Fault*.
The table is updated every time the channel is polled.

Once saved, your widget should appear as such:

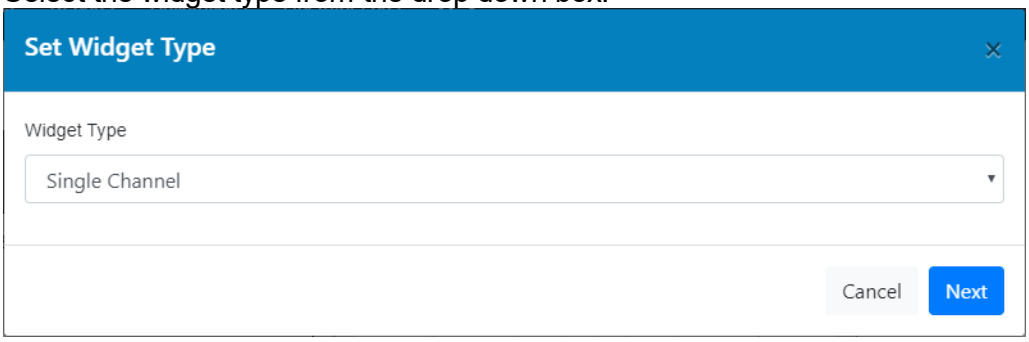


Instantaneous widget displaying the channels specified

3.6.2 Single Channel Widget

This widget allows users to display live data for a single channel.

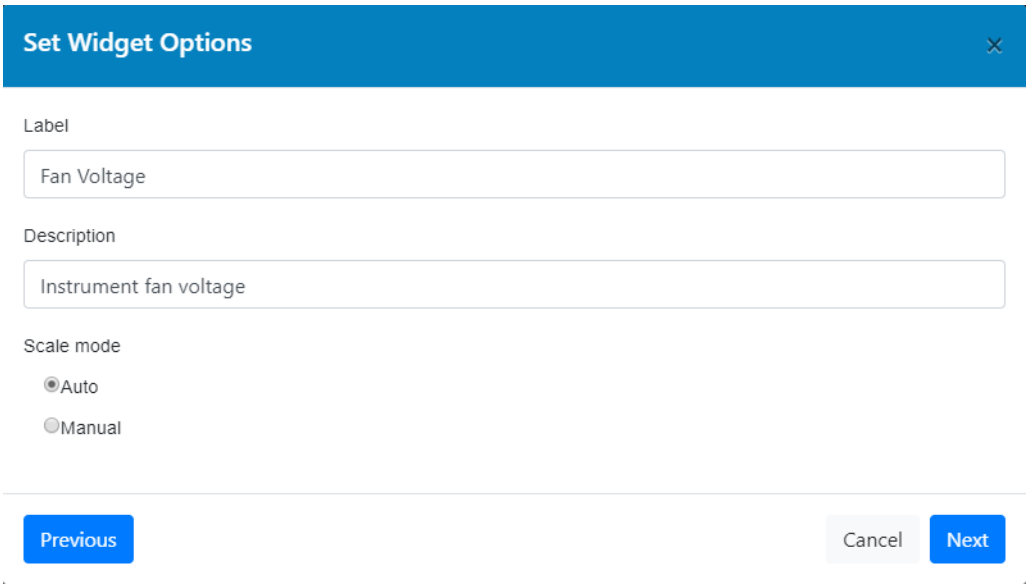
Select the widget type from the drop down box.



Selecting single channel widget type

Fill in the channel label, this will be shown above the value.

If you want to display more information, the description can either be hidden (left empty) or used to explain further context, it's displayed under the title but above the data



Configuring single channel widget options

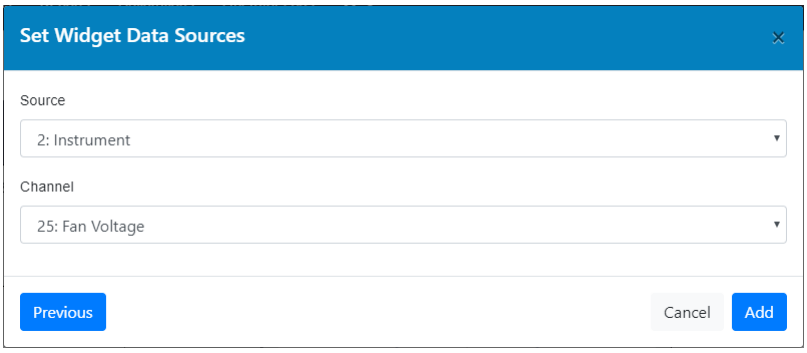
The 'Scale mode' section specifies how the widget and information will be shown on the dashboard. The 'Auto' mode will scale it proportionally to the size of the widget.
'Manual' mode allows for finer control, the font sizes in pixels can be specified, or just left empty for auto scaling.

Setting a component size to '0' will hide the component.

Press 'Next' to continue on to the data source selector.

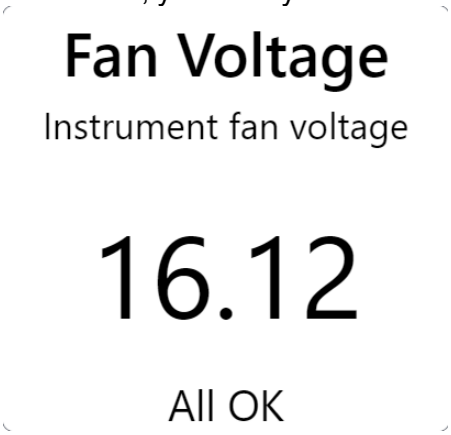
Manual scale mode

Select the source type (Instrument, Calculated or Vector) from the first drop down.
Followed by your desired channel from the second drop down.



Specifying the desired channel

Once you press 'Add' and save the dashboard via the buttons on the top left of the screen, your newly created widget will be shown.

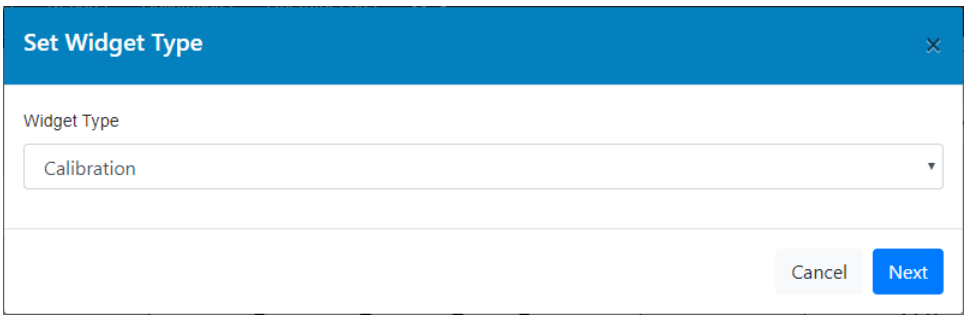


The final widget

3.6.3 Calibration Widget

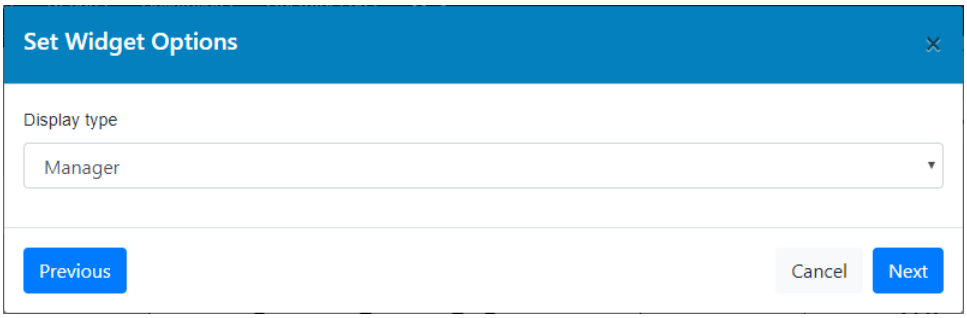
The calibrations widget provides a way for users to control and operate calibration and sequences directly from the dashboard.

Select the calibration widget type



Select either the Manger or Status display type:

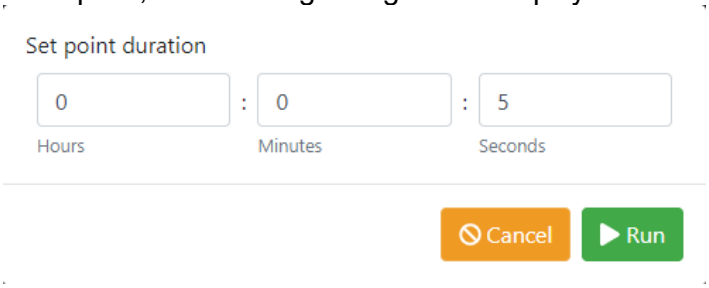
- Manager - A control panel for calibrations. Allows the running of entire calibration sequences or just individual points. A user can monitor the progress throughout.
- Status - A visual widget with no direct interaction. It shows upcoming calibrations and when a calibration is running it will provide a visual progress bar and status.



There are no data sources for this widget. Once the widget is configured, position appropriately and then save the dashboard to view.

In order to run a calibration, you will need a configured Calibration[53] and then use the manager widget in order to start it using the 'Run' button.

Individual points can also be run in the manager widget by selecting 'Show points' on the left of a calibration.
Points can be run the same way as a calibration sequence. When choosing to run a point, the following dialog will be displayed.



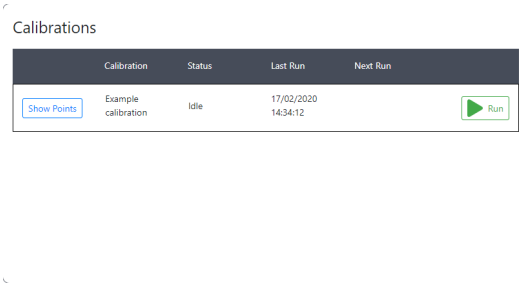
Point duration dialog

This dialog will allow you to specify a custom duration for that individual point (It won't affect future calibrations).

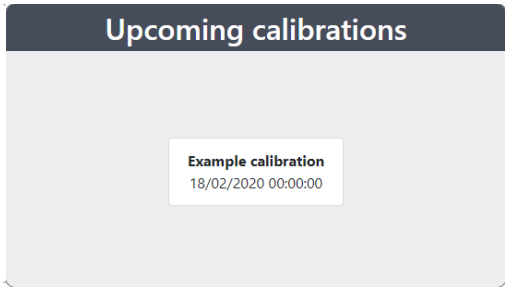
Note that only one calibration can run at any given time.
Modifying the dashboard and saving it will cancel any currently running calibration.

Examples of the widgets are displayed here:

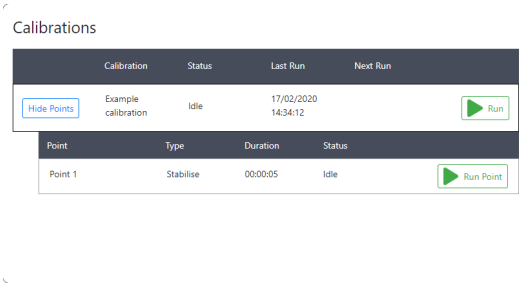
Manager Status



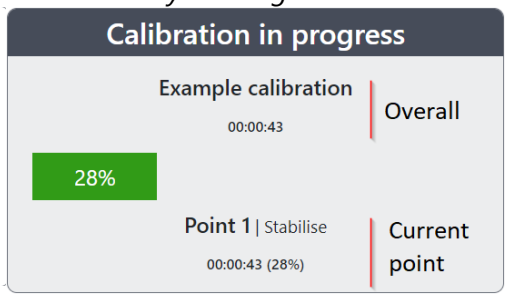
The manager calibration widget with a calibration.



The status calibration wiget with no currently running calibration.



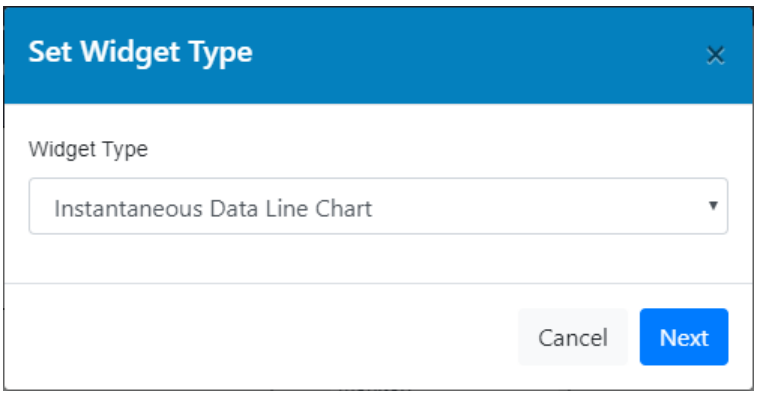
The manager calibration widget with its points expanded.



The status calibration widget displaying the currently running calibration.

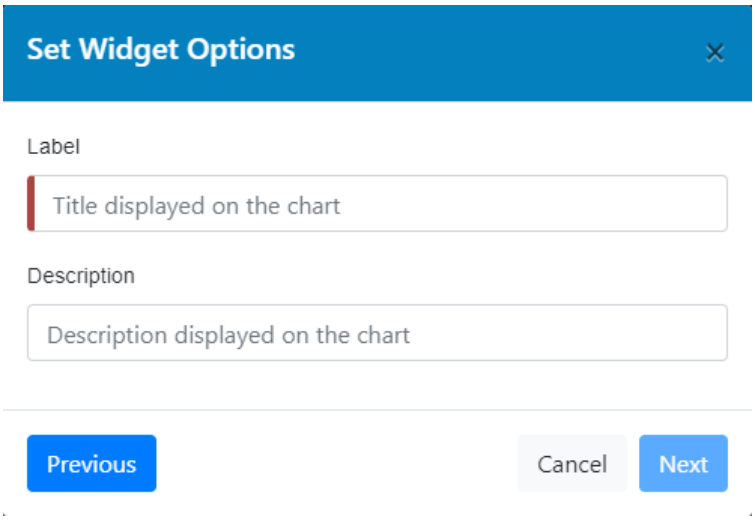
3.6.4 Instantaneous Data Line Chart Widget

This widget provides a real-time line chart of data from up to 6 user defined channels per graph.
Open the *Dashboard Customisation* screen and add the widget to the dashboard by selecting the real time line chart option from the drop-down menu.

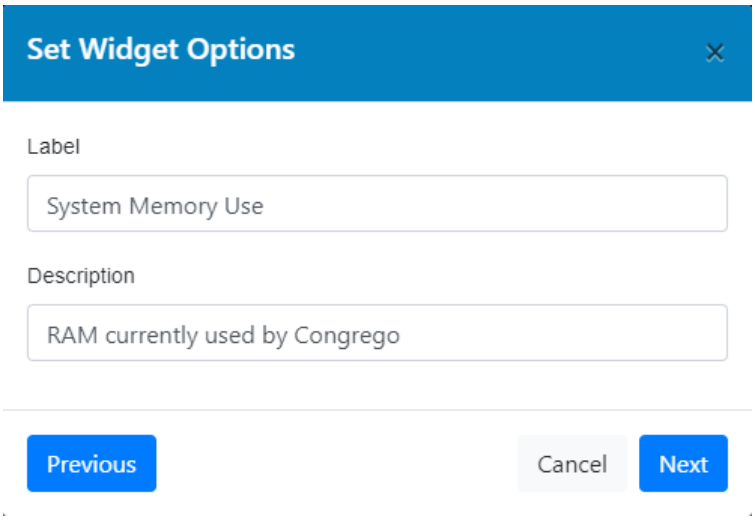


Instantaneous Data Line Chart

Choose the title and description for the chart.

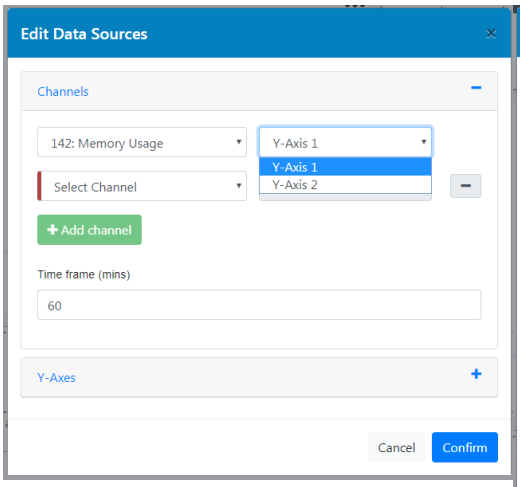


Widget name and description

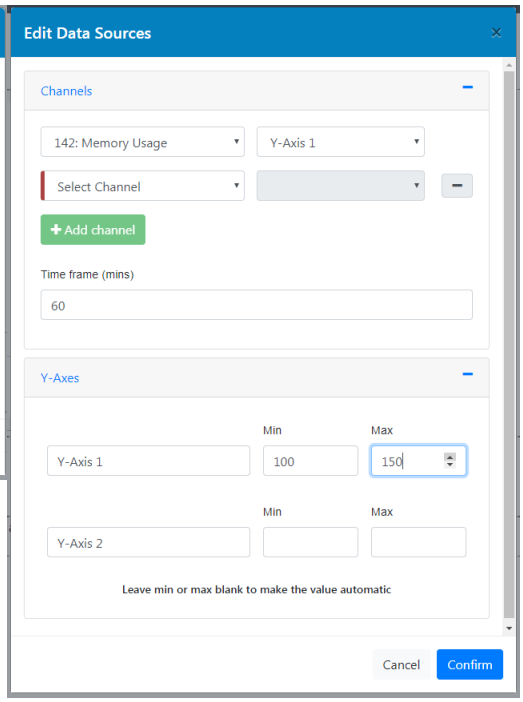


Filled widget name and description details

Then select the channel data to be displayed using the drop-down menus. For each channel, select one of two Y-axis scales to be used.
To set the two Y-axis scales, expand the Y-axis (image) menu and input the desired ranges for each axis.
If the range values are left blank then Congrego® will auto adjust the ranges to suit the data.



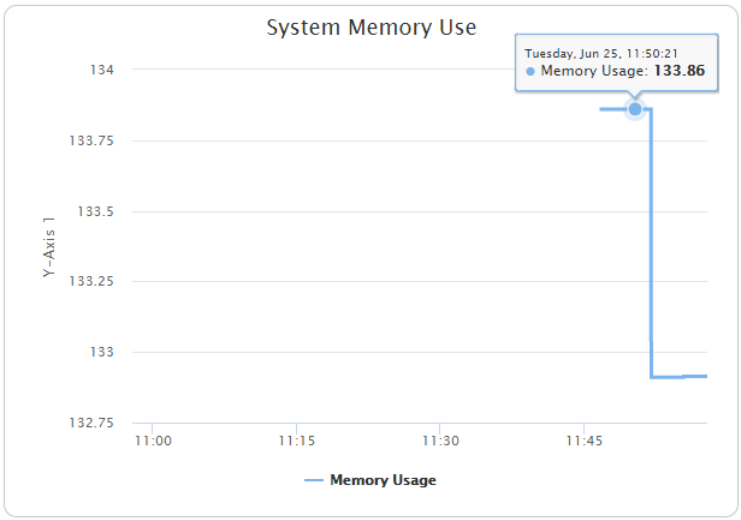
Select Y axis to use



Add Y axis range values

Adjust position of the widget and then click 'Save' button on the top left of the dashboard.

Once the widget has been saved, the selected channel data will be displayed as a real-time line chart. The colours used for each channel are not currently editable.
By hovering the mouse pointer over the real-time graphics, users can also observe specific values for specific channel data, with the channel information, result, time and date displayed for the point of the line graph selected.

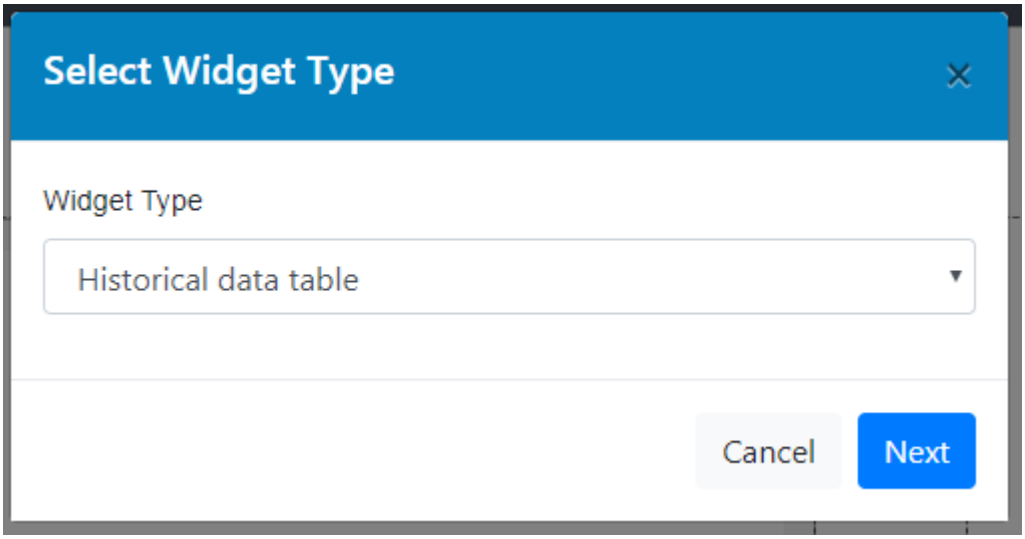


Instantaneous Data Line Chart

3.6.5 Historical Data Table Widget

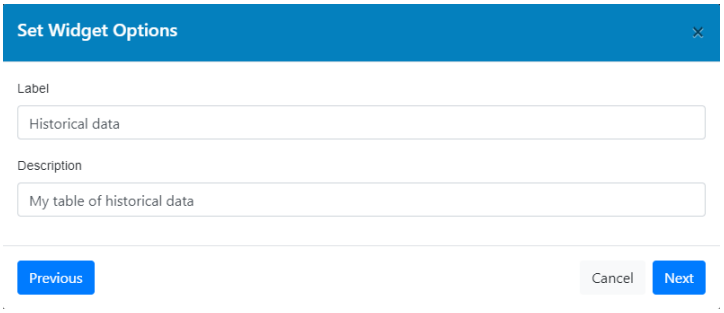
Adding the *Historical Data Table* widget to the dashboard allows users to call up historical data for a selected period, based on the *Report Data*.

Select the widget type.



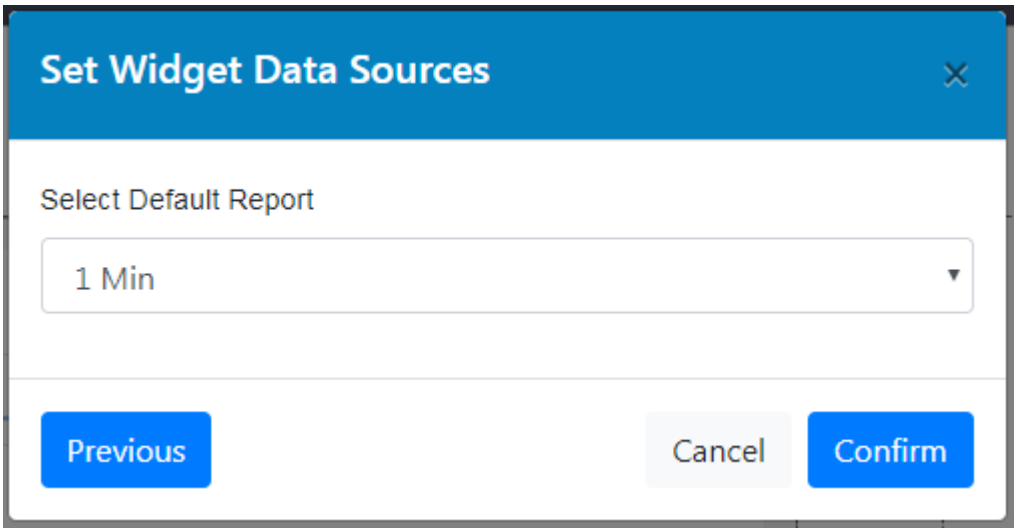
Historical Data Table

Add the widget details.



Historical Data Table Details

Select the report for the data.

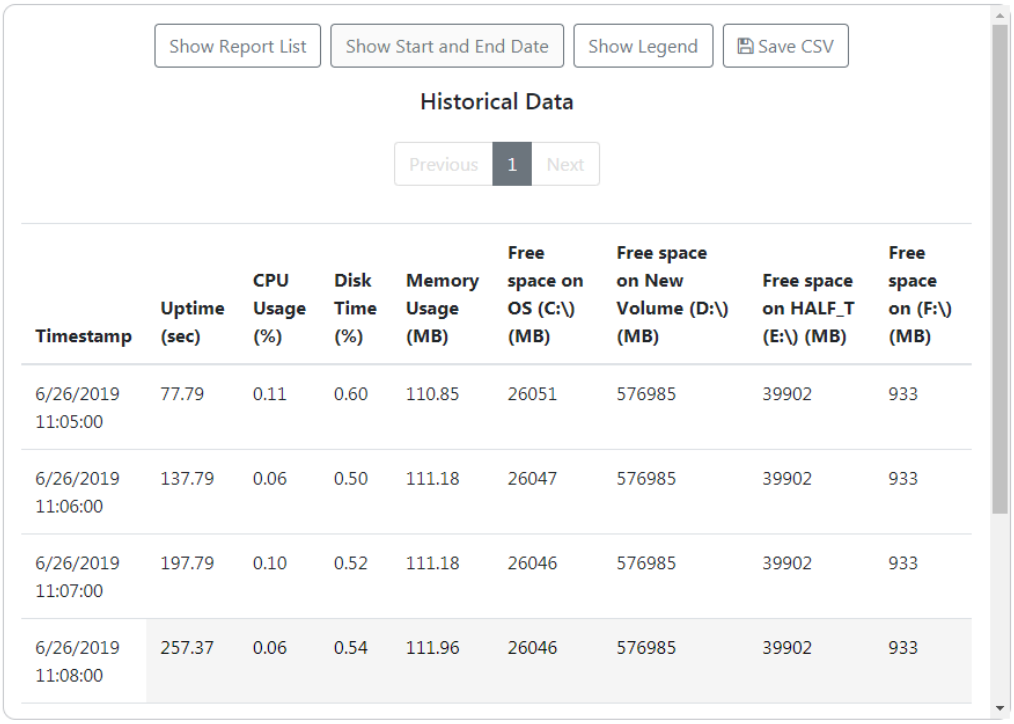


Historical Data Report Selection

Check the preview and make any size or data source adjustments.

Save the widget and the *Historical Data Table* will be shown on the dashboard with all of the channels displayed.
The time/date range is defaulted to the current day.

Once added, the *Historical Data Table* is a permanent feature of the dashboard with settings that can be altered directly from the *Dashboard* view rather than the customized setup view.



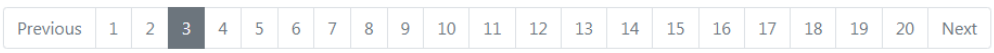
Timestamp	Uptime (sec)	CPU Usage (%)	Disk Time (%)	Memory Usage (MB)	Free space on OS (C:\) (MB)	Free space on New Volume (D:\) (MB)	Free space on HALF_T (E:\) (MB)	Free space on (F:\) (MB)
6/26/2019 11:05:00	77.79	0.11	0.60	110.85	26051	576985	39902	933
6/26/2019 11:06:00	137.79	0.06	0.50	111.18	26047	576985	39902	933
6/26/2019 11:07:00	197.79	0.10	0.52	111.18	26046	576985	39902	933
6/26/2019 11:08:00	257.37	0.06	0.54	111.96	26046	576985	39902	933

Historical Data Table Widget

Adjustments can be made directly from the live dashboard by using the menu options.

Additional Menu Items

The page selection allows users to skip through the different pages of data displayed in the table.
Each page size is defined by the size of the widget on the dashboard and the amount of data to be displayed according to the start date and end date.

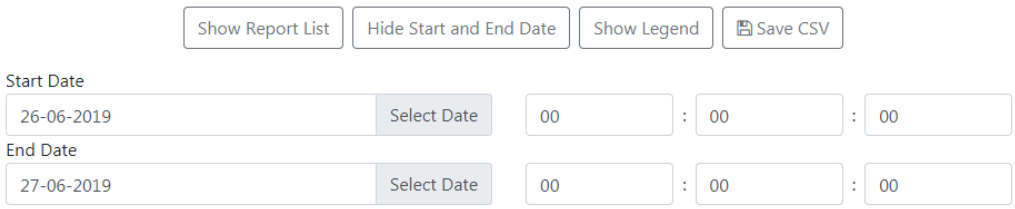


Page Selection

Show Report List displays a drop-down menu for users to select the source report to be used for the table.

Report Selection

Show Start and End Date allows users to choose the start date and end data for data to be displayed in the table, including the exact time in a 24 hour clock HH:MM:SS format.



Start and End Time Selection

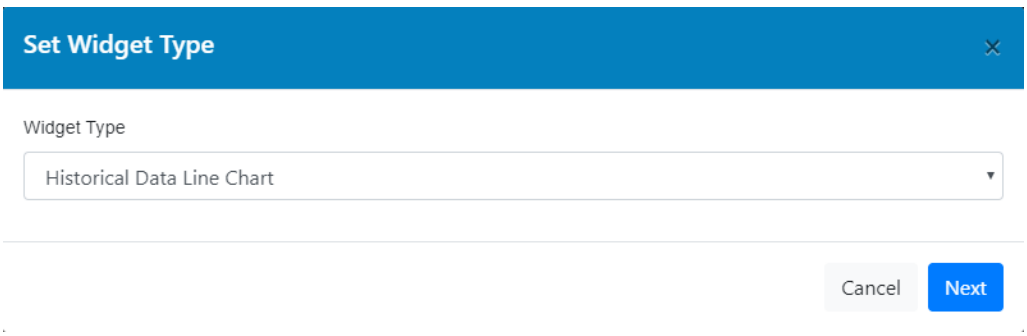
Show Legend displays a table of the colours that are associated with each status flag.
The *Historical Data Table* displays data in different colours to denote different status flags.

Legend

Save CSV will automatically download a CSV (comma-separated values) file of the data currently displayed in the *Historical Data Table* widget to the local machine.
This file can then be opened with programs like Microsoft Excel and alternatives.

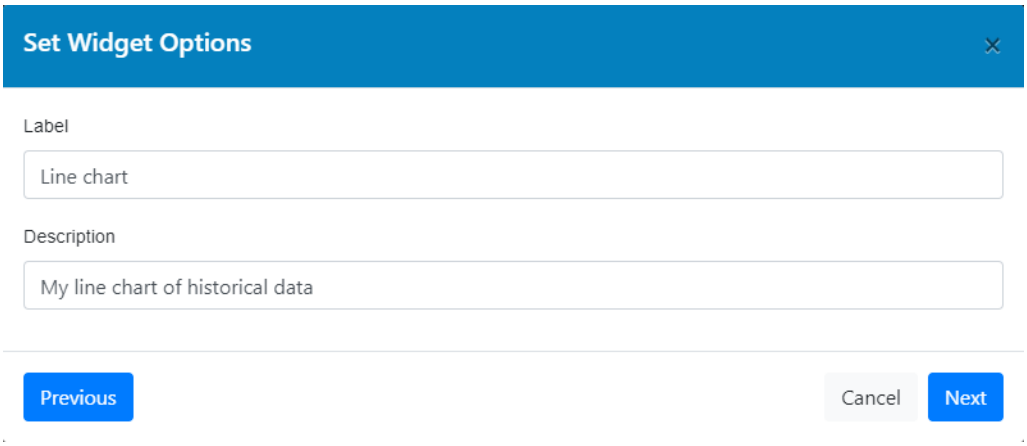
3.6.6 Historical Data Line Chart Widget

Adding the *Historical Line Chart* widget to the dashboard allows users to produce a historical data plot for a selected period, based on the *Report Data*.
Select the widget type.



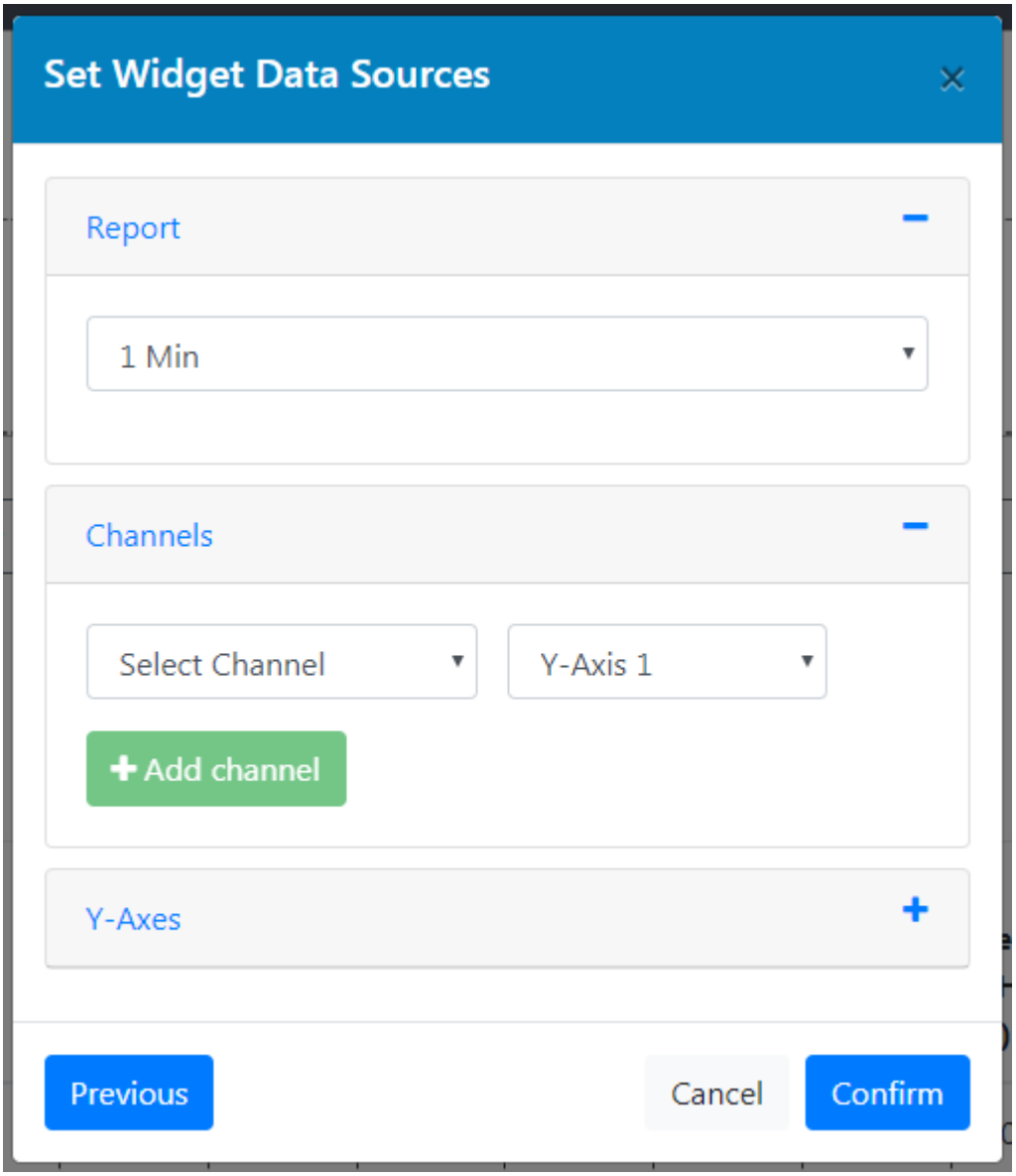
Historical Data Line Chart

Add the widget details.



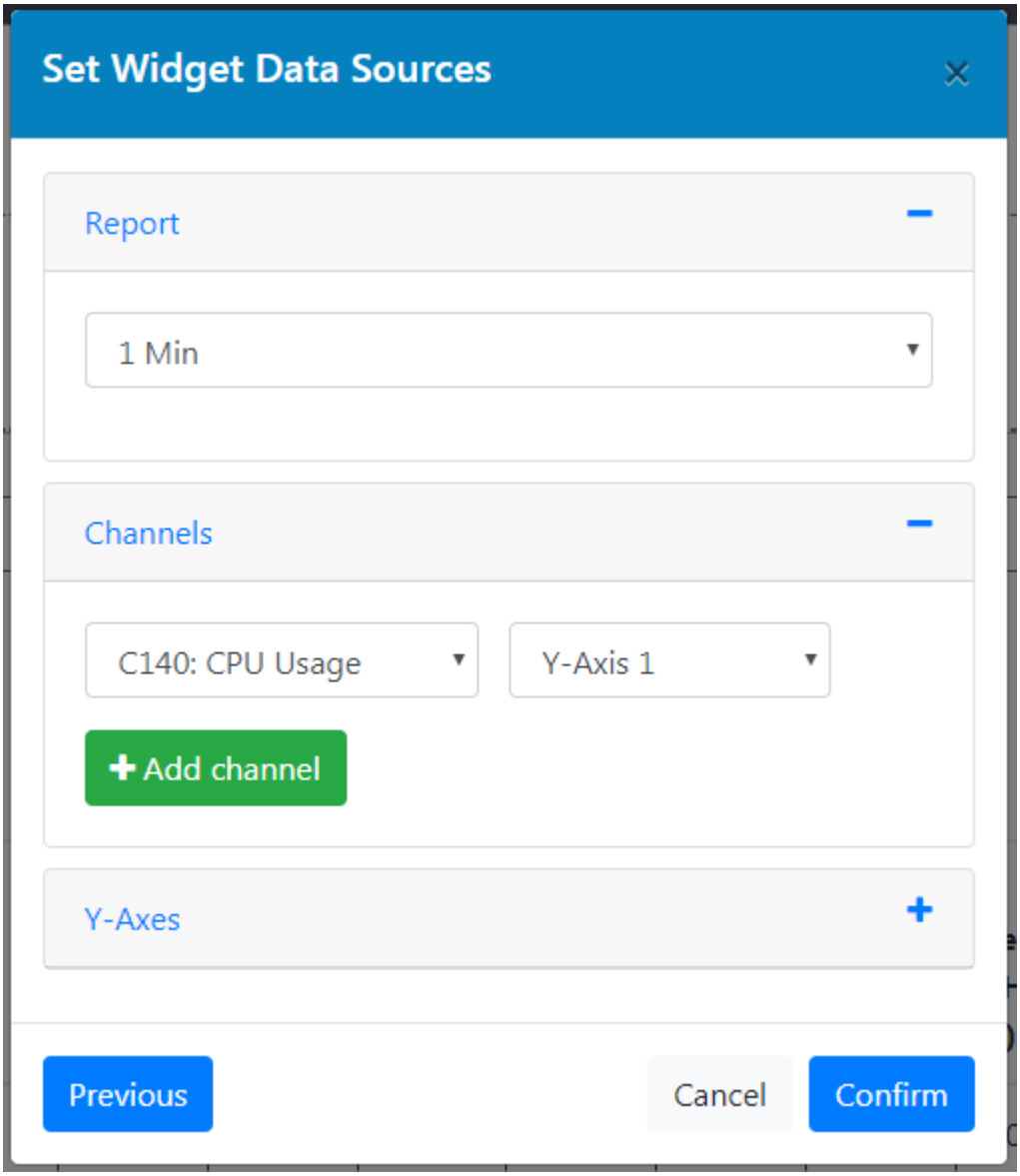
Widget Details

Select the source report for the data.



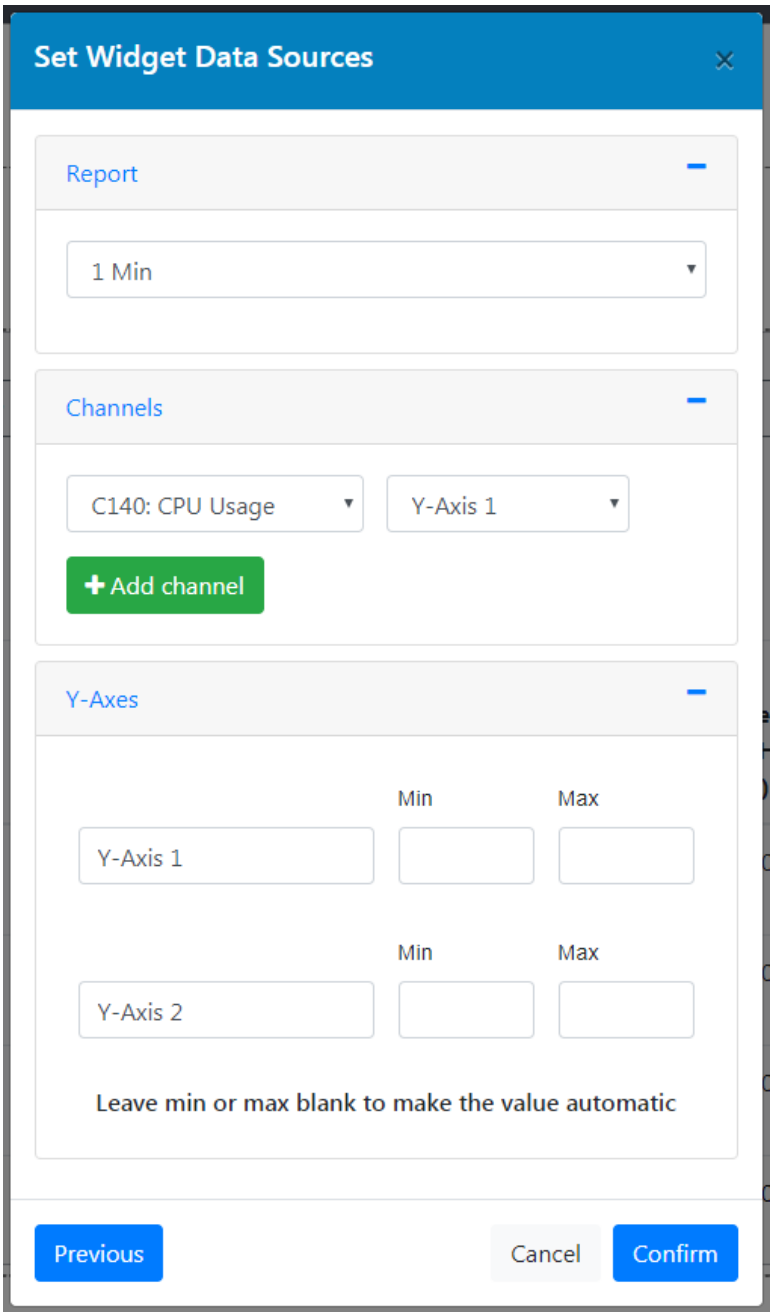
Historical Data Line Chart Source Selection

Select the parameter(s) to be plotted. A maximum of six can be selected.



Historical Data Line Chart Parameter Selection

Add ranges to the axis settings if needed, otherwise leave the fields empty for automatic settings.

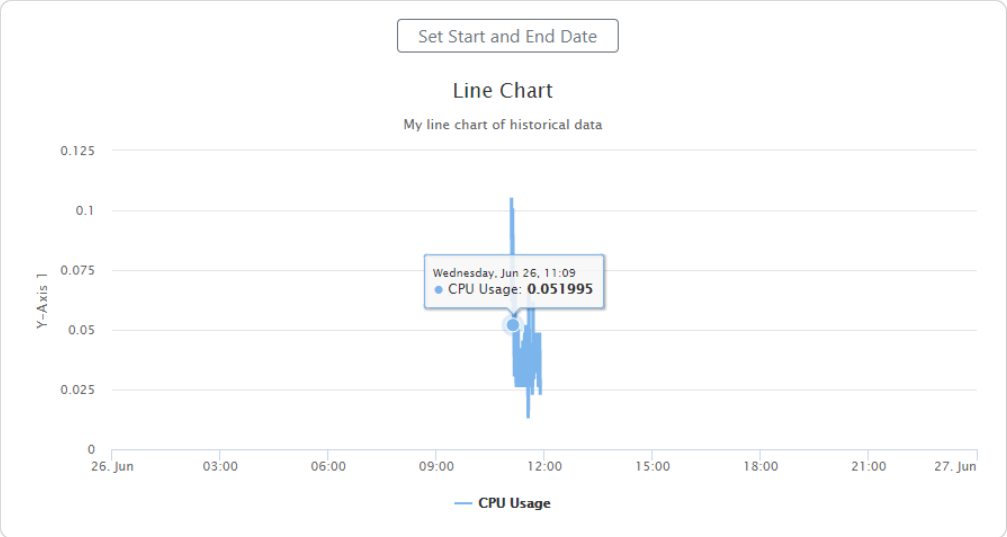


Historical Data Line Chart Axis Settings

Check the outlined box and make any size or data source adjustments.

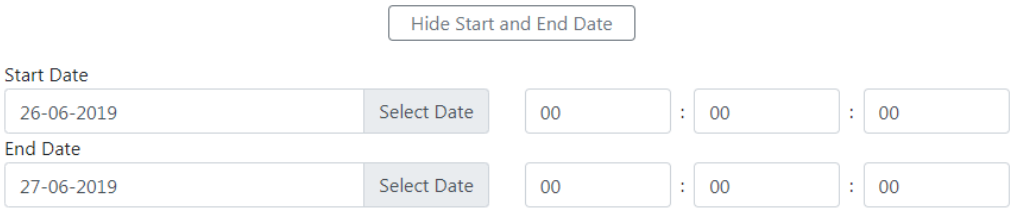
Save the widget and the *Historical Data Line Chart* will be shown on the dashboard with the selected channels displayed.
The time/date range is defaulted to the current day.

Once added, the *Historical Line Chart* is a permanent feature of the dashboard with settings that can be altered directly from the *Dashboard* view rather than the customised setup view.



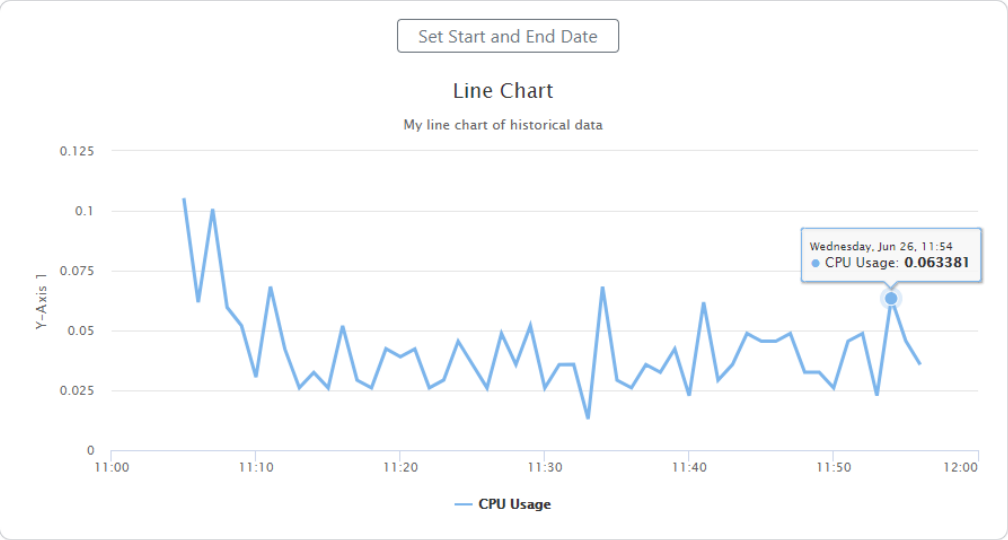
Historical Data Line Chart Widget

Adjustments can be made directly from the live dashboard by using the menu options.
Show Start and End Date allows users to choose the start date and end data for data to be displayed in the table, including the exact time in a 24 hour clock HH:MM:SS format.



Start and End Date Selection

When data is displayed in the graph, users can move the mouse pointer over the data to see specific values for specific channels.
The data is highlighted and the channel information, result, time and date are displayed.

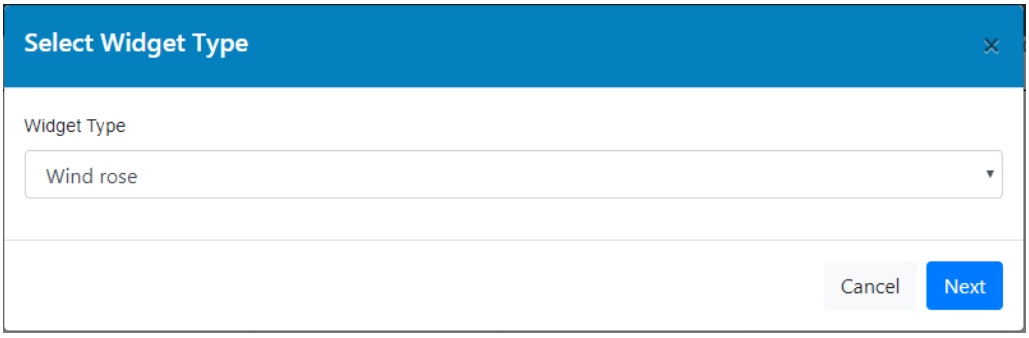


Historical Data Line Chart Showing One Hours Data

3.6.7 Wind Rose Widget

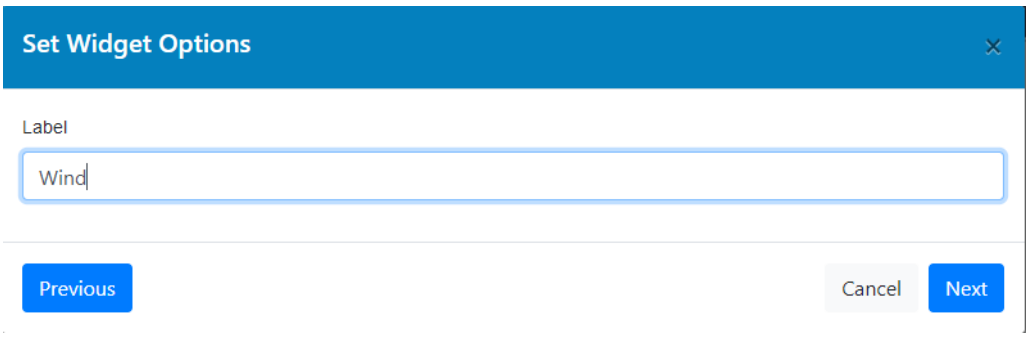
Adding the *Wind Rose* to the dashboard allows the user to display live wind data.
The *Wind Rose* is currently in its simplest form and will be improved with more options over time.

Select the widget type.
Click *Next*.



Wind Rose Widget Type

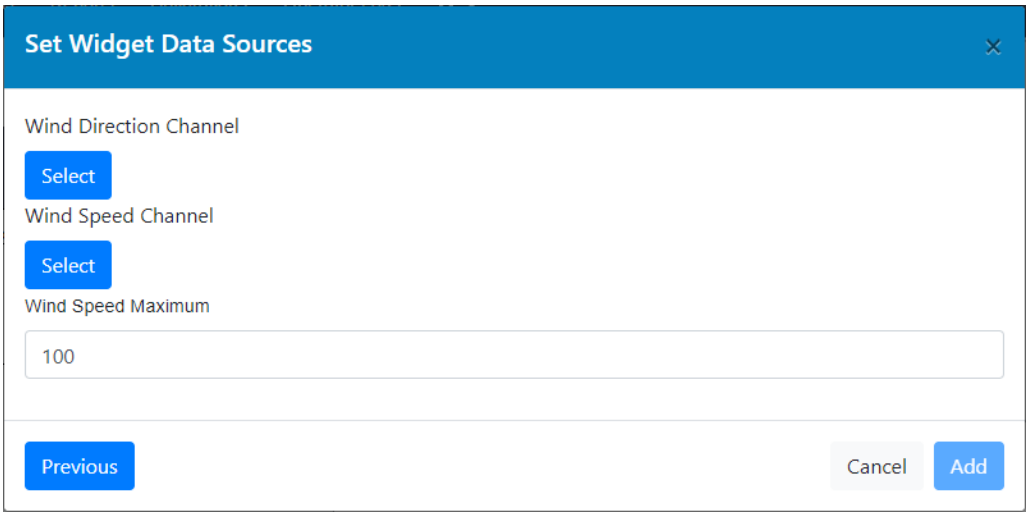
Enter a label for the widget.



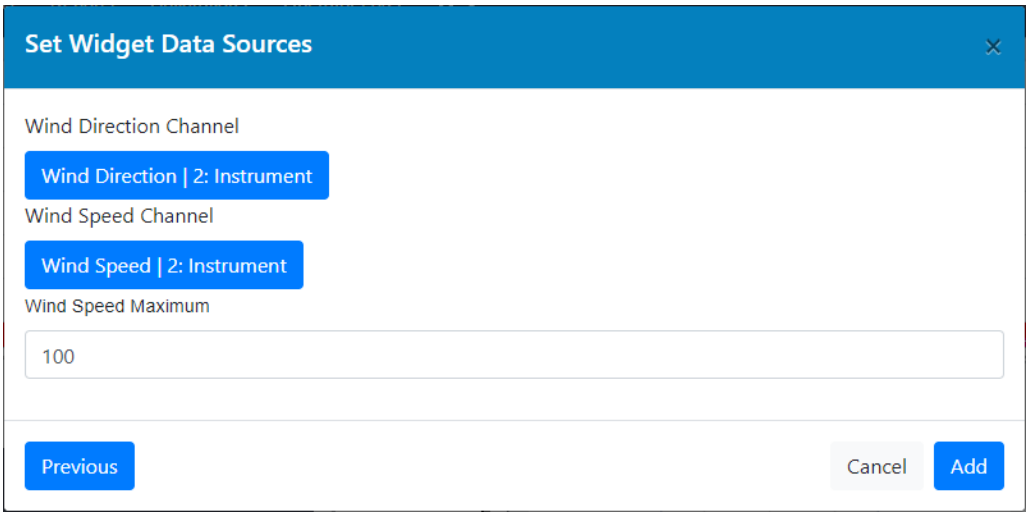
Wind Rose Widget Details

Enter the data sources, these are the wind speed and direction channels.

The *Wind Speed Maximum* field will limit the range of the widgets display, the units will be the same as those of the selected *Wind Speed Channel*.
Click *Confirm*.

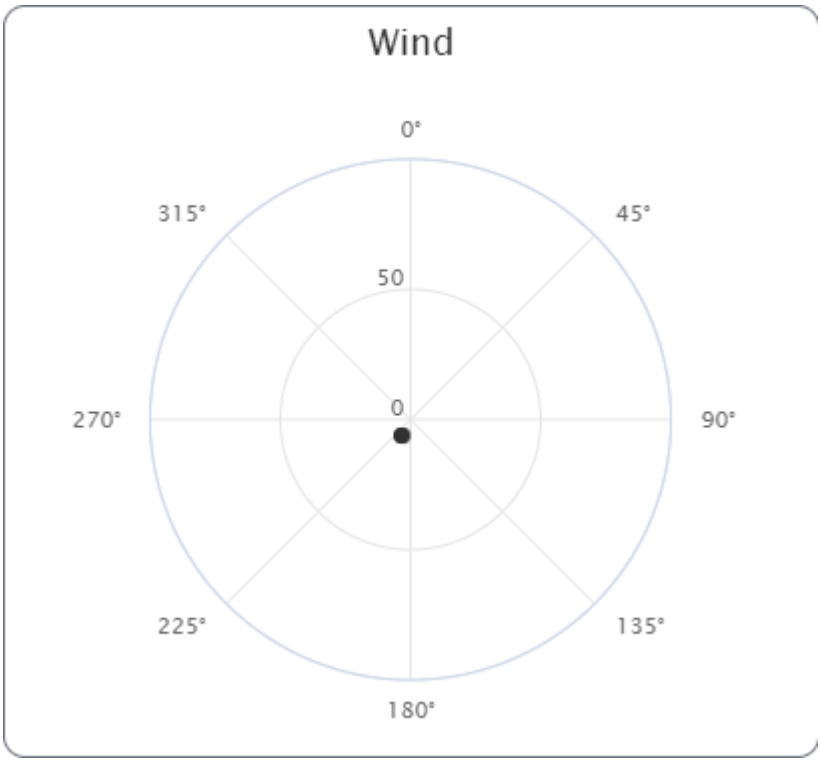


Wind Rose Widget Options (No channels selected)



Wind Rose Widget Options (Channels selected)

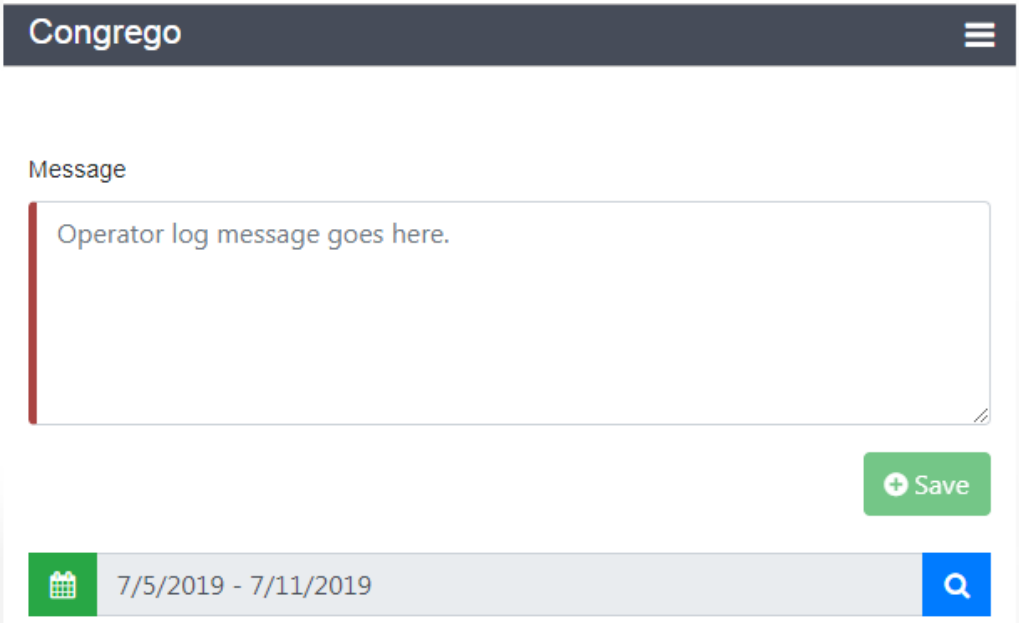
Save the dashboard and the wind rose will be now be displaying in real time.



Wind Rose

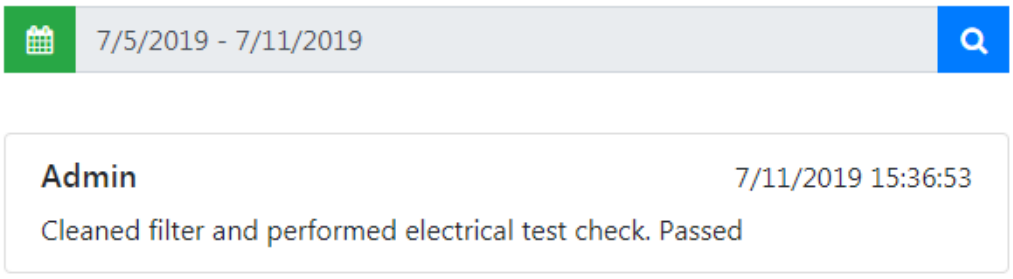
3.7 Operator Logs

The in-built *Operator Logs* are a quick and simple way for site operators to record and review site visits and other station activities.



Operator Logs

To create a log entry, simply start typing in the message window and save the entry when completed.



Operator log example

When the log entry is saved, Congrego® also records the user (if security settings are enabled – see User Management 84) the date and the time of the entry.
These files are then protected and can be viewed but not edited.
To search for a previous log entry, use the calendar button to input a date range and then press search. All of the log entries within the specified period will be displayed.

Search Feature

The *Operator Logs* are stored locally alongside the logged data in:
<Host Drive>:\ProgramData\Ecotech\Congrego\Data as part of the daily .ald data file.

Note that operator logs can not currently be exported.

3.8 Configuration

The *Configuration* menu allows access to various menu items that may be configurable or informative, these include

- **Configuration (system)**
- **Maintenance**
- **User Management**
- **Backups**
- **Data Pushers**
- **Support Request**
- **About**

3.8.1 Station Configuration

The station configuration is accessed through the *Configuration Menu* (denoted by the cog icon) and allows operators to record some generic information about the station.
This information falls into two sections.

General

The general data in this section covers the global settings that are used by the Congrego® software, these fields include:

Station Name
The name used to identify the station.

Once set, it will be shown on the navigation bar for all to see (**Note:** Anyone can see this, you aren't required to be logged in to view)

Molecular Formula Temperature
This is the reference temperature to be used by Congrego® when performing automatic conversions.
The value defaults to 0.0 degrees Celsius and is typically either 0.0, 20.0 or 25.0 °C.
The temperature units can be set to Celcius, Farenheit or Kelvin.

Latitude/Longitude/Altitude
The latitude, longitude and altitude of the station denote the physical location.

Enable Guest
The *Enable Guest* toggle switch allows guest users to access Congrego® without having to log in to the system.
This functionality will allow a *Guest* user to view dashboards but not the rest of the system.

SMTP

The **S**imple **M**ail **T**ransfer **P**rotocol is a protocol used for sending emails between servers.
When enabled, Congrego® can send reports and data via email on a set schedule.

Enabled/Disabled
Toggle the enabling and disabling of the SMTP functionality with this switch.


Consult your network administrator for the following settings

Host
The actual SMTP servers specification e.g. `smtp.gmail.com`

Port
The port to use on the server, usually port 25 but port 587 can also be used.

User Name/Password
These fields are used as part of the security to access the server

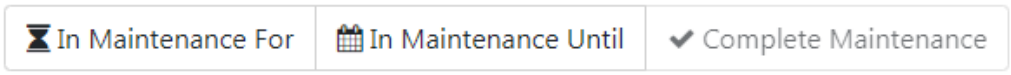
Enable SSL
SMTP email transfer doesn't provide any encryption. Enable the SSL functionality for a secure connection.

From Address/From Name
An email address and name that will be used to identify the sender of the email

3.8.2 Maintenance

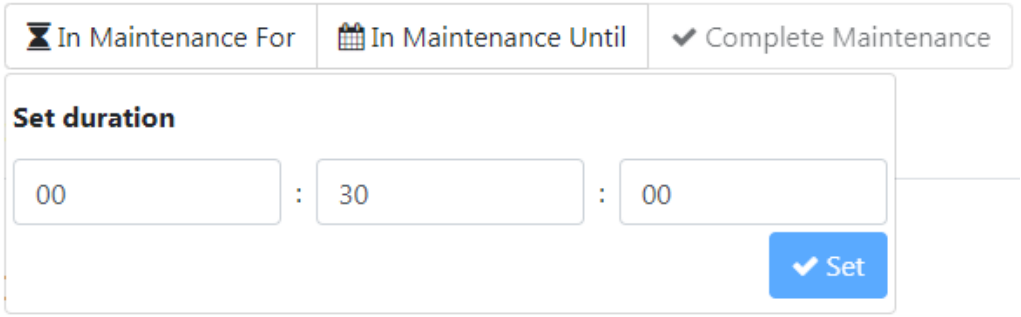
The Congrego® *Maintenance Menu* allows operators to manually flag instruments and channels as being "in maintenance" or out of service when performing maintenance tasks.

Any data marked as "in maintenance" will have a status flag attached and the data displayed on the dashboard will change to a light blue colour.
To access the *Maintenance Menu*, open the settings menu and select *Maintenance*.
There are three menu buttons available for use, as shown here:



Maintenace Options

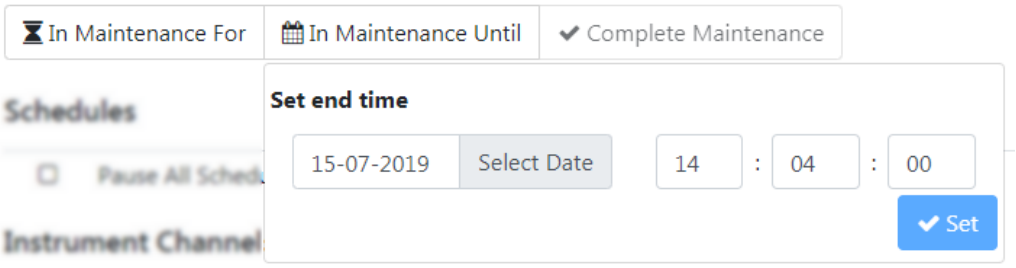
In Maintenance For



In Maintenance For options

In Maintenance For allows the user to set the selected channel(s) to be in maintenance for a specified duration.
The duration is specified in hours, minutes and seconds.
When the appropriate duration has been set it can be applied using the *Set* button.

In Maintenance Until



In Maintenance Until options

In Maintenance Until allows the user to set the selected channel(s) to be in maintenance for an extended period of time.
The duration for this setting is a future date and time, which means that it can be extended for months if need be.
Once the date and time have been set the settings can by applied using the Set button.

Complete Maintenance

The *Complete Maintenance* button is unavailable unless there are channels currently in maintenance
To use this feature select the channels currently in maintenance that are to be brought out of maintenance and select the button.

When performing system maintenance, simply select the channels that will be impacted using the tick-boxes.
If the "Instruments" box is ticked then all of the channels will be marked. This is a quick and easy way to select or deselect all of the channels.
Channels and instruments will still appear in the channels list when an instrument or channel is disabled.
It is good practice to mark all channels for an instrument that has been disabled as being in maintenance as well.

Instrument Channels

	Instrument	Channel	In Maintenance Until
☐	1 : Termination Panel	1 : Sample Air Temperature	
☑	1 : Termination Panel	2 : Sample Air Relative Humidity	7/15/2019 14:32:17
☑	1 : Termination Panel	3 : Termination Panel Temperature	7/15/2019 14:32:17
☐	1 : Termination Panel	11 : DO CO2 Span	
☐	1 : Termination Panel	13 : Compressed Air Relative Humidity In	

Example of two channels in Maintenace

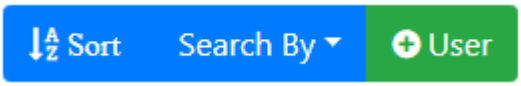
You can quickly select all instrument channels but clicking on the specific instrument cell you want to select.

3.8.3 User Management

The *User Management* screen allows the setting up and editing of users and their permissions in the system. This can help to manage user access and control changes made to the system.

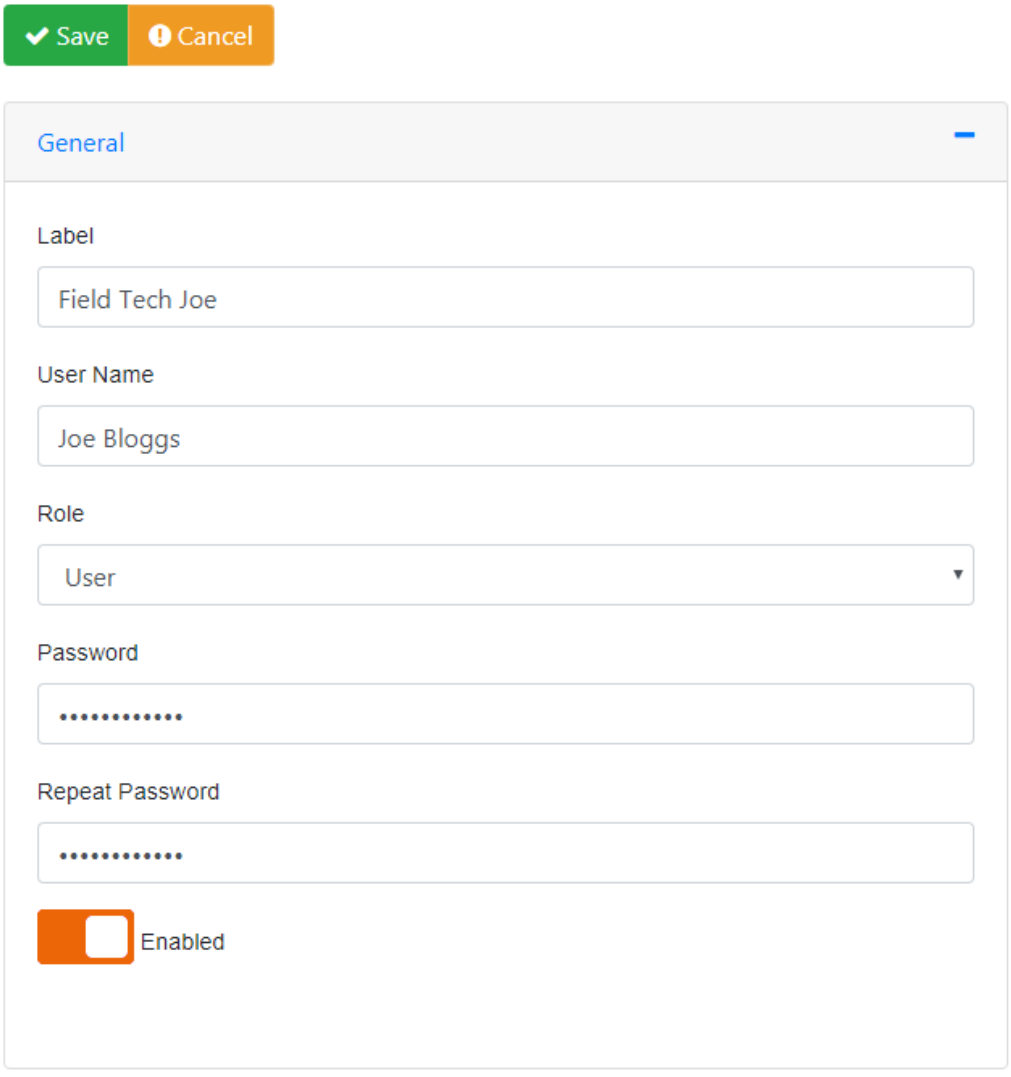
Congrego® automatically installs an administrator as part of the setup, as detailed here[17].

To add a new user select the *Add User* menu option.



User Menu Options

The following fields need completing to create a user.



User Fields

Label
The *Label* field is a user friendly descriptive name field.

User Name
The user name of the user, this will be used to log in to the system.

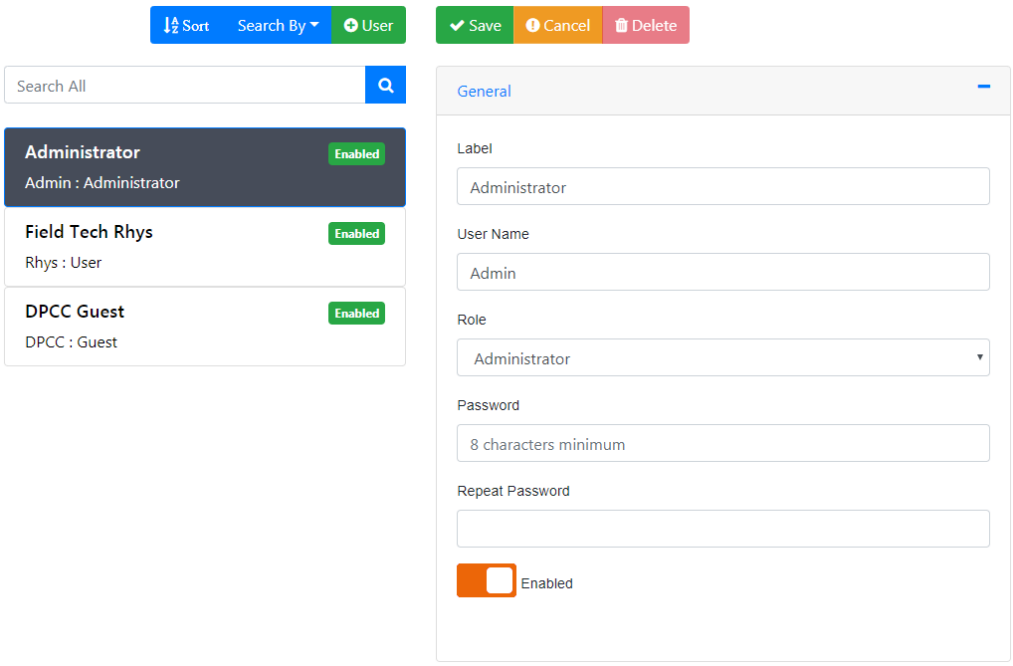
Role
The role assigned to the user, there are three different roles currently built-in to the system, a user can only have one role assigned and will be one of the following:

- *Administrator* - allows full access to and control of Congrego®
- *User* - allows the changing of instrument settings, channels and reports

- *Guest* - allows a view on the system with no ability to change settings

Password
The password that the user will use to log in to the system. There are two password fields that need completing and an error will be shown if they don't match.
The length of the password must be at least eight (8) characters.

Enabled/Disabled
The user can be enabled or disabled by an Administrator using this toggle button.
Users can be disabled but they can not be deleted from the system as their records may be used in an audit trail e.g. in Operator Logs



Three User Example

Note that *Guest* access can be enabled in the Configuration 82 screen, this will enable anybody access to the system in the *Guest* role.
However for more control over guest access, by specifically setting up some users as guests in the *Guest* role, they will get the same permissions but will have to log into the system using a password. Thus ensuring that only invited guests have access to the system.

3.8.4 Backups

Congrego® users have the ability to make complete backups of the system, including the data, server configuration, drivers and log files.
These backups can be run either manually or scheduled to be performed automatically, on a regular basis.

The *Backups* menu item is found under the *Settings Menu* and will display a list of all of the backups currently configured, as well as their status and any error messages.

Congrego® comes pre-configured with an automatic backup called “Monthly Configuration Backup”.
This backup is set to save the server configuration and the drivers, on the first day of every month from the date of installation.
The backed up files are saved to: <Host Drive>: \ProgramData\Ecotech\Congrego\Backups

These backups are stored as Zip files with a file name format including the backup name, year, month, day and time.
Example: `Weekly Config Backup_20190411_000000`

Creating a New Backup

To create a new backup, use the *New Backup* button at the top of the menu and open the setup menu.

Backup Button Options

The following fields must be completed.

Label

Enter a meaningful name for the backup, for example: `Monthly Configuration Backup`

Backup Items

Select which aspects of the logger to backup, including the server configuration, the installed drivers, the event log files and the raw data.
Note that if choosing to backup raw data files, Congrego® lets users choose a maximum number of days to backup by using the *Backup Size (days)* field.

Target Folder

Choose the destination for the backup file. This could be an external drive or a specific location on the computer.

> Note that users should always save to a specific folder, if Congrego® cannot access the desired destination a warning message will be displayed.
> If setting this up from a remote *Client* it should be noted that the folder path is relative to the host machine that the *Congrego® Server* is running on and not the remote *Client* machine.

Comments

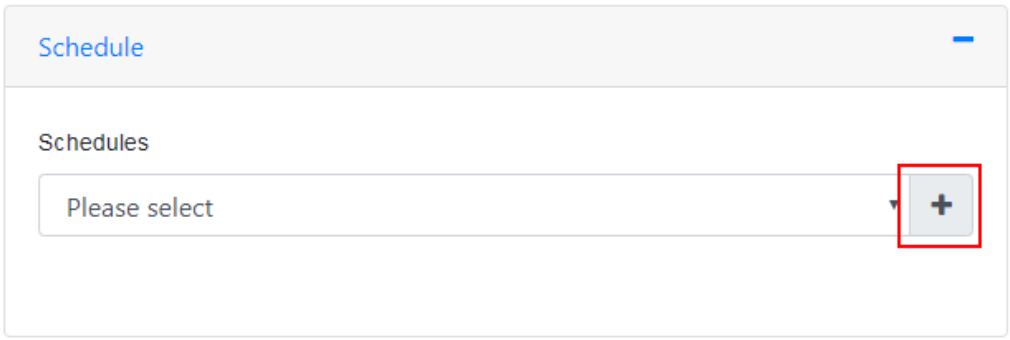
The comments field allows users to input a comment regarding the backup.
This comment is associated with the backup file and can help identify the backup and contain any other relevant information.

Once the backup has been configured, users can save the new backup and it will appear in the menu on the left.

This backup is then available to be run manually using the *Run Now* button, or set to run on an automatic schedule.

Scheduling an automatic backup

A new schedule can be added by expanding the Schedule section.
Click on the "+" icon to add a new schedule.

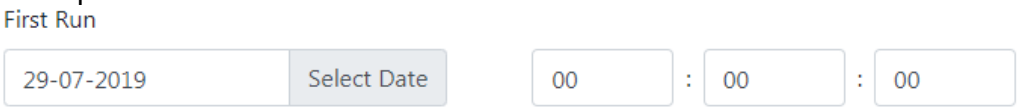


Add Backup Schedule

The following fields need entering.

First Run

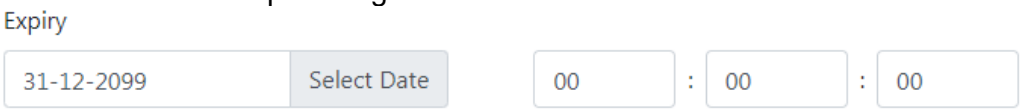
Choose the start date and the start time for the schedule. This date can be set in the past.



Schedule First Run

Expiry

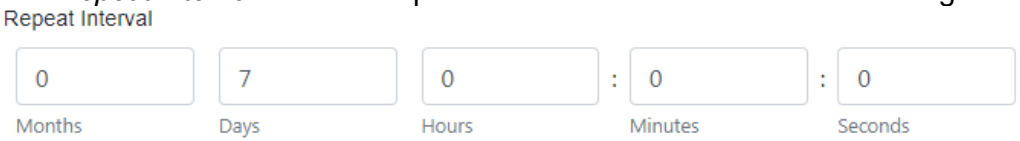
Choose the date and time for the schedule to end. It is not possible to set the end date as blank, but users may choose a date far in the future to ensure the schedule doesn't stop running.



Schedule Expiry

Repeat Interval

The *Repeat Interval* defines the period after which the schedule will run again.



Schedule Repeat Interval - 7 Day Example

Run Filters

The filters determine when the schedule will and won't run, there are four available:

- *Day Of Week* - Any day or a specific day of the week
- *Day Of Month* - Any day, the final day of the month or a specific day
- *Week Of Month* - Any week, the final week or a specific week
- *Month Of Year* - Any month or a specific month

Schedule Missed
If an event occurs that prevents a schedule from running, such as a power failure, choose what to do when the system is operating again:

- *Don't Run* - Don't try and catch up on the missed schedule(s)
- *Run Once* - Run the schedule once
- *Run Every Interval* - Run the schedule for every repeat interval missed up to the current time

Enable/Disable
Use this switch to disable a schedule temporarily.

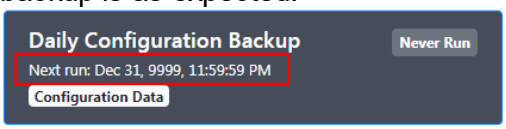
Removing a Schedule

Users can choose to remove or delete a schedule.
To remove a schedule, choose *Remove Schedule* at the bottom of the menu.

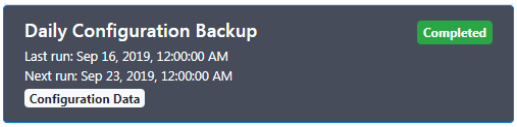
Remove Schedule

The schedule will be removed but this change will not be persisted until the *Save* button is selected.

Once the schedule has been saved check that the *Next Run* date for the backup is as expected.



Backup Schedule with Error



Backup Schedule OK

In this example, with the error condition, we can see that the *Next Run* date is the year 9999, so there is an issue with our schedule configuration.
In the other schedule, that has completed at least once, we can see valid *Last Run* and *Next Run* dates.

3.8.5 Data Pushers

The Congrego® *Data Pusher* functionality allows users to configure an automated data output from the logger to either a file location, an FTP address or an e-mail address.
The data files are generated as CSV files using the format: `RPT{ID}_{yyyyMMdd_HHmm}.csv`

Example: `RPT3_20190605_13:00.csv`

To create a new output in the data pusher, use the *New Data Pusher* button and complete the setup details.

New Data Pusher

Label
Create a unique identifier for the data output

Report
Choose the source report to be used from the available list in the drop-down menu

Data Period
This is how much data is contained in each data "push" or file. When set to 1 hour, each file will contain 1 hour of data.

Note: Date Period must be greater or equal to the truncation interval.

Truncation Interval
The truncation interval truncates the start and end data-time for each data file. It will shorten the duration or extent of the start/end to match up to the specified interval.

This is also used to give the file for each period a unique name.

It is a good idea to set the truncation interval. If it's 00:00:00, it will truncate the last hour of data 'to the second'.
So if the schedule kicks off at 14:22:18 with a 1 hour Data Period, you will get data from 13:22:18 to 14:22:18.
Setting the truncation interval to 10 minutes would give you from 13:20:00 to 14:20:00
Setting it to 1 hour would give you from 13:00:00 to 14:00:00.

Time Stamps
Users can choose to use either local time or UTC for time/date stamps.

Timestamp Format
The timestamp format can be selected to be either:
- Combined (DateTime) e.g. with a label of *Timestamp* the date and time is output as *1970/01/01 13:02:03*
- Separate (Date | Time) e.g. with a label of *Date* the date is output as *1970/01/01* and a label of *Time* the time is output as *13:02:03*

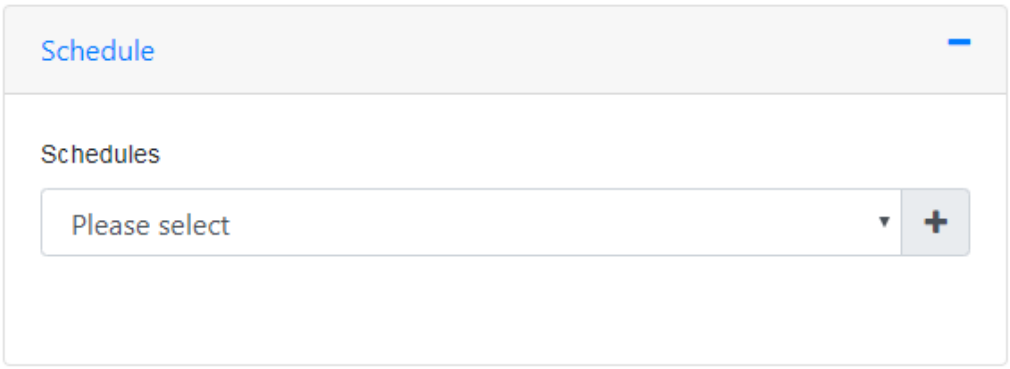
Destination
Choose the desired output type, the available settings will change dependent on the output.

- **File Output** – type in the location for the file to be stored
- **FTP** – complete the details for the Host, port, security access and data file path.
- **E-mail** – input the destination e-mail address including options for CC and BCC fields. Note that multiple e-mail addresses can be sent using semi-colon separators.
- **Eagle.io** - pushes data to the eagle.io platform via a 'connector' application. This is still currently experimental, contact your local sales person for additional details.

Overwrite/Append
This handles the behaviour when the data push is scheduled to run more often than the truncation interval. When there is an existing file, it will either append new data to the file or overwrite the file.
Note that using "append" on a File or FTP job will move the start date (not end date) forward according to the truncation interval. This ensures that data is not repeated when appending a file. It has no effect on an email “push”.

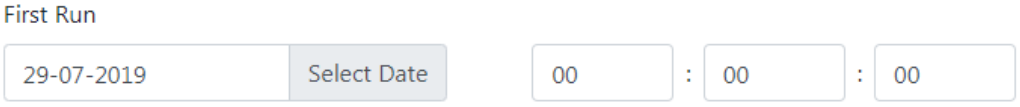
Scheduling the Data Pusher

This will determine how often the schedule will run. It will perform the equivalent of clicking *Run Now* button at the scheduled times.
It has no effect on the amount of data in the file, or how often it will close an old file and create a new one.
Use the *Add* button to create a new schedule. Note that multiple schedules can be created for a data push.



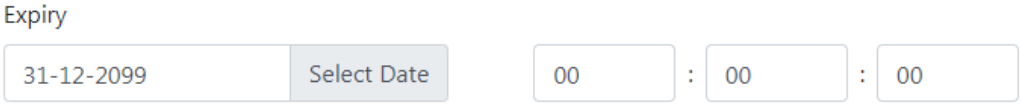
Add Schedule

First Run
Choose the start date and the start time for the schedule. This date can be set in the past.



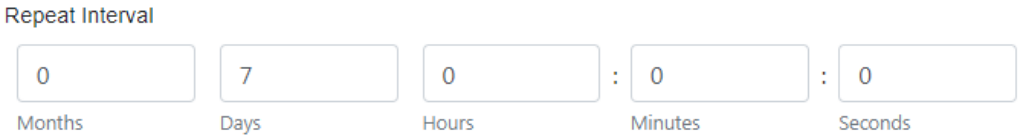
Schedule First Run

Expiry
Choose the date and time for the schedule to end. It is not possible to set the end date as blank, but users may choose a date far in the future to ensure the schedule doesn’t stop running.



Schedule Expiry

Repeat Interval
The *Repeat Interval* defines the period after which the schedule will run again.



Schedule Repeat Interval - 7 Day Example

Run Filters
The filters determine when the schedule will and won't run, there are four available:

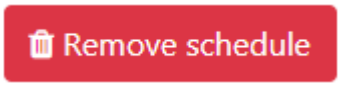
- *Day Of Week* - Any day or a specific day of the week
- *Day Of Month* - Any day, the final day of the month or a specific day
- *Week Of Month* - Any week, the final week or a specific week
- *Month Of Year* - Any month or a specific month

Schedule Missed
If an event occurs that prevents a schedule from running, such as a power failure, choose what to do when the system is operating again:

- *Don't Run* - Don't try and catch up on the missed schedule(s)
- *Run Once* - Run the schedule once
- *Run Every Interval* - Run the schedule for every repeat interval missed up to the current time

Enable/Disable
Use this switch to disable a schedule temporarily.

Removing a Schedule
Users can choose to remove or delete a schedule.
To remove a schedule, choose *Remove Schedule* at the bottom of the menu.



Remove Schedule

The schedule will be removed but this change will not be persisted until the *Save* button is selected.

Example
With the following settings:

```
Data Period = 8 hours
Truncation Interval = 5 minutes
Schedule = every hour (overwrite)
```

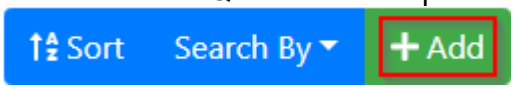
Every hour a new file will be created containing the last 8 hours data, ending at the last 5 minute block.
So, if the schedule runs at 10:27, the data will be from 02:25 to 10:25.
The data interval (data period) is actually not how often the data is sent, it is the period of the data being sent in the file, the scheduler controls how often the data is sent.

3.8.6 MQTT Broker

The MQTT Broker page shows the list of MQTT broker endpoints that are configured in the system.
By default on a new system this list will be empty. For additional information about MQTT see the overview 93 section.

Adding a new MQTT Broker endpoint

MQTT broker endpoints are configured in the software using the *Brokers* tab. To add a new MQTT Broker Endpoint select the *Add* button.



Add MQTT Broker Endpoint

The settings 94 can now be configured for the new broker

Editing an existing MQTT Broker endpoint

For an existing MQTT broker endpoint, clicking on the broker will allow its settings 94 to be edited.
Save changes once they are complete, or *Cancel* to discard them.

Deleting an MQTT Broker endpoint

To delete an existing MQTT broker endpoint, select the broker and then select the *Delete* button.

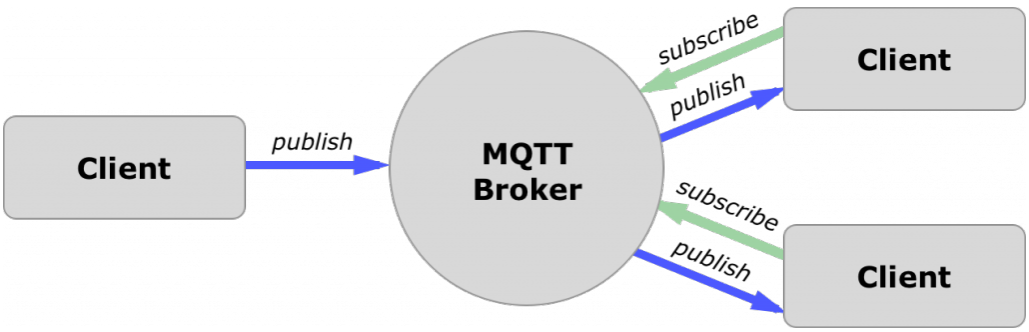
Delete MQTT Broker Endpoint

Confirmation of the deletion will be required.

3.8.6.1 MQTT overview

MQTT(**M**essage **Q**ueuing **T**elemetry **T**ransport) is a standard network protocol for the Internet of Things (IoT). It is a lightweight publish/subscribe messaging transport that is used for machine to machine communication.

The general MQTT architecture consist of MQTT clients and a broker. The MQTT broker is a server that receives and routes messages from the connected clients. An MQTT client can be any device from a small temperature sensor to a complex system such as Congrego.



Client broker relation

The information passed between clients and broker is structured in a hierarchy of topics.
A message in MQTT is composed of two components. A topic and a payload. A client can publish a new messages on specific topics.
The broker then distributes the message to any clients that have subscribed to that topic. Congrego for instance publishes its status information on a 1 minute interval to a topic named "congrego/status".

An MQTT topic is a string of one ore more topic levels that are separated by a slash. The topic usually describes where the message is coming from and what payload it contains. A client can subscribe to one or more topics.
MQTT has the notion of wild-cards when subscribing to topics which are:

- # (hash character) = Multi level
- + (plus character) = Single level

For example if a client subscribes to topic "congrego/#" it would receive any topic published by Congrego including the status.

The lifetime of a topic is defined by the quality of service (QoS) parameter. MQTT support 3 different levels.

- QoS 0 = delivered at most once
- QoS 1 = delivered at least once
- QoS 2 = delivered exactly once

Congrego only supports QoS 1, this will ensure that the message is always delivered at least once.

Congrego is not an MQTT broker and needs one to connect as a regular client. To setup an MQTT broker there are various options from free and self hosted brokers to commercially hosted brokers.
The configuration of an MQTT broker is not part of this document.

More detailed information about the latest MQTT standard can be found at *http://docs.oasis-open.org/mqtt/mqtt/v5.0/mqtt-v5.0.pdf*

3.8.6.2 Status Topic

Once a MQTT broker endpoint has been configured and a connection has been established Congrego will publish status information periodically at a 1 minute interval.
The status information can be observed at Topic: "congrego/status".
The status payload includes information about the available reports and report channels that can be published.

3.8.6.3 MQTT Broker Settings

The *MQTT Broker* dialog allows the user to set and edit the properties for a new or existing broker.

General Settings

Label
A unique label supplied by the user to allow easy identification of the broker, this is a required field.

Connection Settings

Host
Enter the IP address or the host name of the MQTT broker end point in this field.

Port
Enter the port number on the MQTT broker. The standard MQTT broker port number is 1883.

Select the Use SSL check-box if the broker supports this function

The *Test Connection* button can be used to validate connection settings. If the connection test is successful a message "Connected successfully to broker" is displayed.

Authentication Settings

Authentication based on Username and Password is supported.

Authentication Type

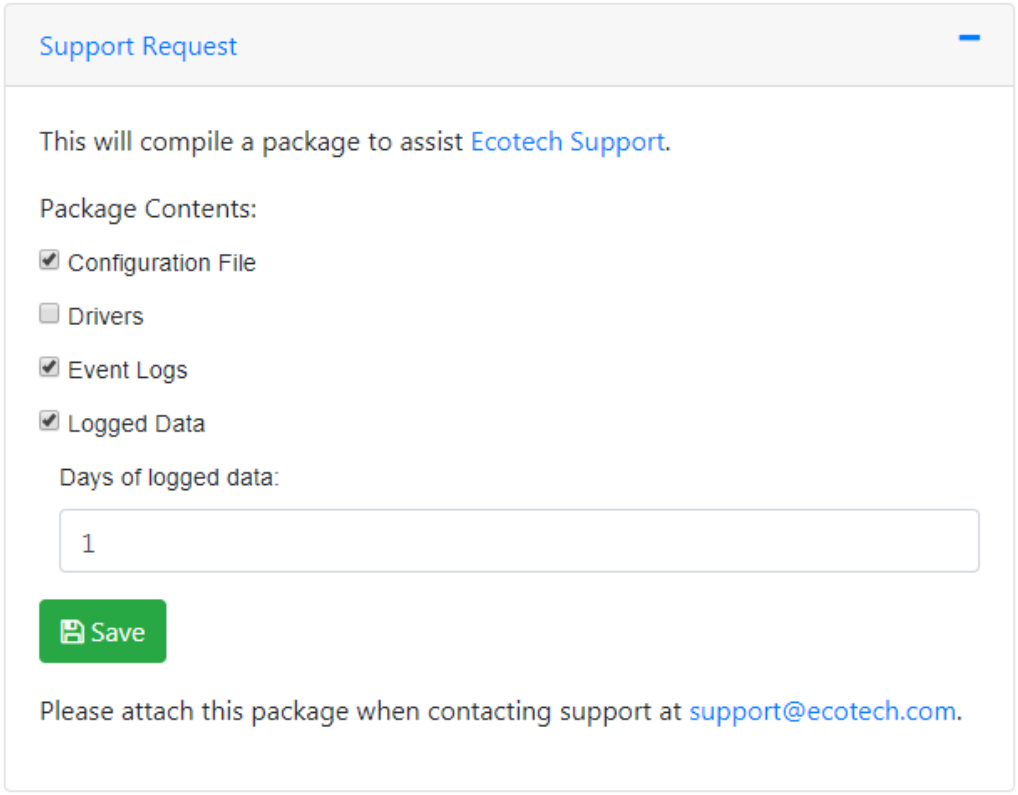
If the MQTT broker requires authentication select "Default" as the authentication type.

User Name/Password

Populated user *Username* and *Password* field with the credential required by the broker.

3.8.7 Support Request

The *Support Request* functionality enables a user to send a configuration and data file package to the Acoem support group.



Support Request Page

The following options are available to add to the package:

Configuration File
This contains all of the configuration data for the users Congrego® installation.

Drivers
Include any customer generated or edited drivers if needed. Any standard drivers that are installed with Congrego® do not need to be sent.
This option however will package all driver or none.

Event Logs
Event logs are generated when the system is running and will include multiple levels of severity, these files should be included as standard.

Logged Data
It may be beneficial to send a sample of the logged data for analysis too, depending on the problem encountered.
The size of the logged data will depend on the users system and what is being logged so when selecting the number of days data to send this needs taking into account.
A lot of email servers will limit the size of the attachment that can be sent in an email so there may be a 10 MB or 30 MB limit in place.

On selecting the *Save* option the package will be available for downloading and saving in the browser.
This means that to send an email support request the user doesn't have to be on the same host machine as the Congrego® server but instead can be on a remote client.

Once the package is downloaded it should be sent as an attachment to the support email address with as much information about the issue as possible.

3.8.8 About

The *About* screen has a number of details on it that include the host system details, the version number of the Congrego® software running on the system and the licence details.

About Screen

The host information may be particularly important if the user encounters issues with the system.
The licence details indicate the support that the user is entitled to as well as well as features of the software that are included in the licence.
All of this information can be useful when raising a support request or when detailing issues.

Appendix A - Moving from WinAQMS

4 Appendix A - Moving from WinAQMS

If the Congrego® software application has been purchased as part of a *crossgrade* option, i.e. an existing customer has qualifying Acoem WinAQMS hardware and wants to update to use the Congrego® software then there is an upgrade path available.

A customer may also have an existing Acoem WinAQMS logger but may want to purchase and run Congrego® on the new hardware but keep their existing logger configuration.
In both of these instances Acoem should be contacted for help in the migration of the logger configuration which is actually a quick and easy process with a few points to consider.

1. Contact your Acoem sales representative to express an interest in purchasing a crossgrade package or a new logger package with a view to replace an existing Acoem WinAQMS logger.
2. Send your Acoem WinAQMS configuration (.waq) file to Acoem
3. Acoem's support services will convert the .waq file to a Congrego® configuration file and return it to the customer
4. The customer simply replaces their existing or default configuration file from the Congrego® installation with the one that they have been sent
5. The customer checks that the instrument connection details are correct and the Congrego® software should start logging

Important

If the customer is using the Airodis™ software package to pull data from the Congrego® logger then there is an additional step that needs performing. In order to keep the existing channel order and report settings in Airodis™ all of the channels in the Airodis™ configuration **MUST** be prefixed with a 'C'.

Appendix B - Channel Functions and Aggregations

5 Appendix B - Channel Functions and Aggregations

Aggregations listed here are performed on a channel at its 'processing interval'. A channels default aggregation is 'Average' by default, with 'VectorAvg' being applied to vector channels.
Functions can be applied as part of a Calculated Channel calculation. See Calculated Channel Examples 105.

Aggregation	Description
Avg	Average value for period
CapturePercent	Capture % during period
Count	Number of measurements in period
Delta	Difference between the first and last reading during period.
DbAvg	dB Average for period
Earliest	Earliest measurement in the period
Exceedences	Count of values exceeding threshold, parameter defines threshold value
GeometricMean	Geometric mean value in period
GeometricStdDev	Geometric standard deviation in period
Latest	Latest value measured
Log10Avg	Base 10 logarithmic average for period
LogAvg	Base e Logarithmic average for period
Max	Maximum value measured in period
MaxAbs	Maximum of absolute values
Median	Median value for period
Min	Minimum value measured in period
MinAbs	Minimum of absolute values
Mode	Mode value for the period
NthEarliest	Nth earliest value in the period, parameter indicates position
NthLatest	Nth latest value in the period, parameter indicates position
NthMax	Nth maximum value in the period, parameter indicates position
NthMin	Nth minimum value in the period, parameter indicates position

NthPercentile	Nth percentile value in the period, parameter indicates percentile
Range	Difference between minimum and maximum readings during period.
Rms	Root Mean Square for period
SigmaTheta	Sigma Theta value calculated from vector values
StdDev	Standard deviation calculation for the period
Sum	Sum of values during period
VectorAvg	Vector average by taking direction / magnitude into account
VectorSum	Vector sum by taking direction / magnitude into account
Function	**Description**
Abs(value)	Return the absolute value of a number
ACos(value)	Returns the angle whose cosine is the specified number
ASin(value)	Returns the angle whose sine is the specified number
ATan(value)	Returns the angle whose tangent is the specified number
ATan2(x, y)	Returns the angle whose tangent is the quotient of two specified numbers
Cos(value)	Returns the cosine of the specified angle
Cosh(value)	Returns the hyperbolic cosine of the specified angle
Convert(value, sourceUnit, destUnit)	Convert a value from one unit to another
ConvertMolecular(value, sourceUnit, destUnit, molecularFormula)	Convert a value between gravimetric and volumetric units using a molecular weight or formula at the temperature specified in the configuration settings.
ConvertMolecularTemp(value, sourceUnit, destUnit, molecularFormula, temperatureCelsius)	Convert a value between gravimetric and volumetric units using a molecular weight or formula at a specified temperature
Exp(value)	Returns e raised to the specified power

If(condition, ifTrue, ifFalse)	Evaluate a condition and return one of two values based on the result
Log(value)	Returns the natural (base e) logarithm of a specified number
Log10(value)	Returns the base 10 logarithm of a specified number
Max(...values)	Return the larger of multiple values
Min(...values)	Return the smaller of multiple values
Avg(...values)	Return the average of multiple values
Round(value, precision)	Round a number to a specific number of decimal places
Sin(value)	Returns the sine of the specified angle
Sinh(value)	Returns the hyperbolic sine of the specified angle
SolarAzimuth (timestamp, latitude, longitude)	Returns the solar azimuth at given time (Unix time) and position (decimal degrees)
SolarElevation(timestamp, latitude, longitude)	Returns the solar elevation at given time (Unix time) and position (decimal degrees)
SolarRad(timestamp, latitude, longitude)	Returns the direct solar radiation at given time (Unix time) and position (decimal degrees)
Sqr(value)	Returns the square root of a specified number
Tan(value)	Returns the tangent of the specified angle
Tanh(value)	Returns the hyperbolic tangent of the specified angle
Global	**Description**
e	Natural Log Constant (*e*)
h	Planck Constant (*h*)
now	Unix Time (seconds since 1970-01-01 UTC)
null	Null Constant
pi	Pi Constant (π)

Appendix C - Calculated Channels Formula Examples

6 Appendix C - Calculated Channels Formula Examples

The *Calculated Channels formula* functionality allows the user to create channels based on existing channels using a number of functions are made available for use in the calculation.
Some examples are provided here.

Basic arithmetic

```
C1 + 273.15
```

Boolean logic

returns 0.0 if false, 1.0 if true

```
C1 > 10
```

Booleans can also be used like a value

```
(C1 > 10) * 100.0
```

Trigonometric functions

```
Sqr(C1 * C1)
Sin(C1)
Cos(C1)
Tan(C1)
ATan2(C1, C2)
```

Rounding function

Round([value], [decimal places)

```
Round(C1, 2)
```

If/Else function

If ([Condition], [IfTrue], [IfFalse])

```
If(C1 == null, C2, C1)
If(C1 < 0, 0, C1)
If(C1 > C2, C1 - C2, C2 - C1)
```

Min/Max/Avg functions

Takes an arbitrary number of parameters and returns the highest/lowest of them

```
Min(C1, C2, C3, 4.0)
Max(C1, C2, C3, 4.0)
Avg(C1, C2, C3, 4.0)
```

Aggregations

```
C1.Max - C1.Min

If(C1.Count > 0, C1.Latest, -9999.0)
```

Get the 75th percentile value

```
C1.NthPercentile[75]
```

Get the number of exceedences over 400

```
C1.Exceedences[400]
```

Standard Deviation

```
C1.StdDev
```

Unit Conversion

```
Convert(C1, "ppb", "ppm")

ConvertMolecular(C1, "ppb", "µg/m³", "CO2")

ConvertMolecularTemp(C1, "ppb", "µg/m³", "CO2", 25.0)
```

Solar functions

```
SolarElevation(now, -37.8982076, 145.2455205)

SolarAzimuth(now, -37.8982076, 145.2455205)

SolarRad(now, -37.8982076, 145.2455205) / 1.1
```

Timer functions

Alternate between 0 and 1 on 5 second interval

```
(Now % 10) < 5
```

Get current hour of the day

```
Floor(LocalTime(Now) / 3600)
```

Get current minute of the hour

```
Floor((LocalTime(Now) % 3600) / 60)
```

Get current second of the minute

```
Now % 60
```

Appendix D - Telnet Commands

7 Appendix D - Telnet Commands

The following are a list of the telnet commands available for use.

Command	Description
AUTH	Authenticates a user
GETCALCONFIG	Returns the settings for calibration sequences
GETCHANNELVALUE	Gets the instantaneous value for a channel
GETCLOCK	Get the date and time from the system clock
GETCONFIG	Returns a list of currently logged reports and channels
GETOPERATORLOGS	Outputs operator logs for a specified period
LISTDRIVERS	Lists all available instrument drivers
LISTINSTRUMENTS	Lists all configured instruments
LISTMODBUS	Lists modbus channels on a report
LISTPARAMETERS	Lists all available parameters for an instrument
LOGOUT	Logs out and disconnects the telnet session. Alises for this command include LOGOFF, SIGNOFF, SIGNOUT, DISCONNECT, EXIT, QUIT and BYE
PASSTHROUGH	Initiates a direct connection to the instrument
RELOAD	Reloads the running instrument/parameter/channel/report configuration
RESTART	Reboots the computer
SETCHANNELVALUE	Sets the value for a channel
SETCLOCK	Set the system clock to a new date and time
SETINSTRUMENTSTATE	Sets the state of an instrument
STATUS	Displays a status page
SYNCINSTRUMENTCLOCK	Synchronise an instrument's clock with the system clock
UNLOADBINARY	Unloads logged data in binary format
UNLOADTEXT	Unloads logged data in text format

AUTH
Authenticates a user

Usage: `AUTH Username [Password]`

`Username` User name

`Password` Password - will be prompted if not specified

Examples:

```
AUTH admin
AUTH admin pa$$word
```

Response on success:

```
Authentication successful
```

Response on error:

```
Error: Authentication failed
```

GETCALCONFIG

Returns a list of the calibration sequence settings

Usage: `GETCALCONFIG`

Response Format:

```
Calibration [Id]: [Calibration Name],[Report Name]

CalPoint [Id]: [Calibration Point Name],[Point Type],

[Duration Time],[Average Time]
```

Where: `Point Type` will be `Zero`, `Span` or `Stabilise`
The `Duration` and `Average` times are timespans in the standard ISO8601 duration format

Example Response:

```
Calibration 4: [Nightly Calibration], S4

CalPoint 1: [SpanPoint01],Span,PT10M,PT2M

CalPoint 2: [ZeroPoint01],Zero,PT10M,PT2M

CalPoint 3: [Stabilisation],Stabilise,PT10M,
```

GETCHANNELVALUE

Gets the instantaneous value for a channel

Usage: `GETCHANNELVALUE [ChannelID] [RollingFunction] [n]`

`ChannelID`	Channel ID, or '*' for all channels.
`RollingFunction`	Rolling Function (default function if not specified)
`n`	Function Parameter (if required)

Examples:

```
GETCHANNELVALUE 10 NthPercentile 10

GETCHANNELVALUE * Count

GETCHANNELVALUE *
```

Available Rolling Functions:

Latest	LogAvg	Sum	NthMin [n]	VectorSum	Delta
Earliest	StdDev	MaxAbs	NthMax [n]	SigmaTheta	Range
Min	Median	MinAbs	NthPercentile [n]	Mode	RMS
Max	Geometric Mean	Count	Exceedences [n]	NthEarliest [n]	Log10Avg
Avg	Geometric StdDev	CapturePercent	VectorAvg	NthLatest [n]	DbAvg

Response Format:

```
[Channel ID] [Value] [Status]
```

Example Response:

```
1       14.174179 128

2       26.523788 128

3     -0.51223243 128

4      -763.77866 128

5      -172.02027 128
```

GETCLOCK

Get the date and time from the system clock

Usage: `GETCLOCK [UtcOffset]`

`UtcOffset` UTC offset to represent return value in (default is system time zone). 'Z' denotes UTC.

Examples:

```
GETCLOCK

GETCLOCK +10:00

GETCLOCK Z
```

Response Format:

```
yyyy-MM-ddTHH:mm:ss.fff+hh:mm
```

This response is the standard ISO8601 format

Example Response:

```
2020-05-13T10:56:01.974+10:00
```

If no UTC offset is specified in the request, the system local timezone will be assumed.

GETCONFIG
Returns a list of currently logged reports and channels

Usage: `GETCONFIG`

Response Format:

```
Report [Name]: [Label],[Interval],[BinaryUID]
```

The report name is used as an identifier when unloading data with the `UNLOADTEXT` command.
The binary UID is used as an identifier when unloading data with the `UNLOADBINARY` command.
The interval is the standard ISO8601 duration format.

Example Response:

```
Report 1: [5 Min],PT5M,0001

Channel C1: [Ambient Temp],[°C],,Avg,2,0000

Channel C2: [Relative Humidity],[%],,Avg,1,0001

Channel C3: [Dew Point],[°C],,Avg,1,0002

Channel C4: [CO],[ppb],[CO],Avg,1,0003

Channel C5: [SO2],[ppm],[SO□],Avg,5,0004
```

```
Report 2: [1 min],PT1M,0002
Channel C1: [Ambient Temp],[°C],,Avg,2,0000
Channel C2: [Relative Humidity],[%],,Avg,1,0001
Channel C3: [Dew Point],[°C],,Avg,1,0002
Channel C4: [CO],[ppb],[CO],Avg,1,0003
Channel C5: [SO2],[ppm],[SO□],Avg,5,0004

Report S1: [Cal 1],PT0S,8001
Channel C1: [Ambient Temp],[°C],,Avg,2,0000
Channel P1: [Ambient Temp (Precision)],[°C],,,2,0001

Report S1P1: [Cal 1 / Zero],PT0S,C001
Channel C1: [Ambient Temp],[°C],,Avg,2,0000
Channel P1: [Ambient Temp (Precision)],[°C],,,2,0001
```

Optional Arguments:
Extension fields are available for both the Channel and Report responses, these extensions can be used to retrieve additional field data.
To request addition data the CEXT and/or REXT commands can be used followed by their respective keywords.

Sample: `GETCONFIG CEXT n1 n2 n REXT n1 n2 n`
The keywords after the additional commands can be included/excluded in any order and are separated by spaces.

The order in which the returned fields are appended is the order in which they are specified in the command, left-to-right (first-to-last).

The supported extension keywords are the following:
REXT - Report Extension

Extension Keyword	Description

Note: There are currently no report extension keywords.

CEXT- Channel Extension

Extension Keyword	Description
AQS	The EPA AQS code associated with the

	channel if defined (Integer). https://www.epa.gov/aqs/

Usage: `GETCONFIG CEXT AQS`

Response Format:
`Report 9: [1 Min],PT5M,0001`

`Channel C1: [Ambient Temp],[°C],,Avg,2,0000,`**`12139`**

GETOPERATORLOGS
Outputs operator logs for a specified period

Usage: `GETOPERATORLOGS Start [End]`

`Start`	Start time in ISO-8601 notation, or '*' for first operator log entry
`End`	End time in ISO-8601 notation. Outputs all operator log entries after start date if not specified.

Response Format:
`Timestamp,[Username],[Message]`

Example Response:

```
Timestamp,Username,Message;0;26;0A11
2020-07-22T11:28:23+10:00,[Admin],[This is a single-line operator log.];0;71;1561
2020-07-22T11:28:42+10:00,[Admin],[This log has\na new line in it.];0;67;138F
2020-07-22T11:29:50+10:00,[Admin],[This log entry has a backslash (\\), a newline\nand [text wrapped in boxes]].];0;113;2407
```

LISTDRIVERS
Lists all available instrument drivers

Usage: `LISTDRIVERS`

Response Format:
```
[Make] [Model] ([Protocol])
```

Example Response:

```
Ecotech 9400TP

Ecotech ACS1000 (Advanced)

Ecotech Aurora 1000 (Multi-Drop)

Ecotech Aurora 1000 (Remote Menu)

Ecotech Aurora 3000 (Multi-Drop)

Ecotech Aurora 3000 (Remote Menu)

Ecotech Aurora 4000 (Multi-Drop)

Ecotech Aurora 4000 (Remote Menu)
```

(... truncated)

LISTINSTRUMENTS
Lists all configured instruments

Usage: `LISTINSTRUMENTS`

Example Response:

```
ID   State        Description

1    Measure      Ecotech Serinus 10 USB

2    Online       Ecotech 9400TP

3    Online       System Monitor
```

LISTMODBUS
Lists modbus channels on a report

Usage: `LISTMODBUS [SlaveAddress]`

SlaveAddress	Slave Address. All slaves are returned if not specified.

Example:

```
LISTMODBUS

LISTMODBUS 2
```

Response Format:

```
Slave [Slave Address]: [Label],[Interval]

[Type] [Data Address]: [Register],[Count],[Data Type],
[Channel],[Label],[Unit]
```

Example Response:

```
Slave 1: [Modbus Slave],PT0S

Coil 20: 00021,1,Bit,C11,[Fan Switch],

Coil 22: 00023,1,Bit,C13,[Heater Switch],

Coil 48: 00049,1,Bit,C26,[Fan Switch],

Holding Register 0: 40001,2,Float,C1,[Ambient Temp],[°C]

Holding Register 2: 40003,2,Float,C2,[Relative
Humidity],[%]

Holding Register 4: 40005,2,Float,C3,[Dew Point],[°C]

Input Register 0: 30001,1,UInt16,C1.Status,[Ambient
Temp],

Input Register 2: 30003,1,UInt16,C2.Status,[Relative
Humidity],

Input Register 4: 30005,1,UInt16,C3.Status,[Dew Point],
```

LISTPARAMETERS

Lists all available parameters for an instrument

Usage: `LISTPARAMETERS [InstrumentID]`

InstrumentID	Instrument ID. Available instruments are listed if not specified.

Example: `LISTPARAMETERS 5`

Response Format:

```
[Parameter ID]: [Label] ([unit])
```

Example Response:
```
UPTIME: Uptime (sec)

CPUUSAGE: CPU Usage (%)

DISKTIME: Disk Time (%)

MEMUSAGE: Memory Usage (MB)

FREESPACE_C: Free space on OS (C:\) (MB)
```

LOGOUT
Logs out and disconnects the telnet session.

```
Usage: LOGOUT
```

Aliases for this command include `LOGOFF`, `SIGNOFF`, `SIGNOUT`, `DISCONNECT`, `EXIT`, `QUIT` and `BYE`. This command does not return a response.

PASSTHROUGH
Initiates a direct connection to the instrument.

Usage: `PASSTHROUGH [InstrumentID]`

InstrumentID	Instrument ID. Available instruments are listed if not specified.

Example: `PASSTHROUGH 5`

Note: The instrument will suspend polling while a passthrough connection is active. Logging will resume when the telnet session is terminated. It is not advised to use this command when telnet is hosted on a serial port.

RELOAD
Reloads the running instrument/parameter/channel/report configuration

Usage: `RELOAD`

Response:
```
Reloading configuration...
Configuration reloaded successfully
```

A reload will momentarily suspend logging, halt web dashboards, and disconnect all instruments. Normal operation will resume upon completion.

RESTART

Reboots the computer

Usage: `RESTART`

This function requires authentication via the `AUTH` command. It also requires that Congrego is running under a user account with sufficient permissions to restart the computer.

SETCHANNELVALUE
Sets the value for a channel

Usage: `SETCHANNELVALUE ChannelID Value`

`ChannelID`	Channel ID
`Value`	New Value

Example:
```
SETCHANNELVALUE 10 3.14159
```

Example Response:
```
Channel 12 is now set to 3
```

This function will only succeed on instrument parameters with a direction of "output" or "bidirectional".

SETCLOCK
Set the system clock to a new date and time

Usage: `SETCLOCK DateTime`

`DateTime`	New value to set the system clock to in ISO-8601 notation

Examples:
```
SETCLOCK 2012-11-10T09:08:07
SETCLOCK 2012-11-10T09:08:07+10:00

SETCLOCK 2012-11-10T09:08:07.123Z
```

Example Response:
```
2020-05-13T12:21:18.734+10:00
```

The response will always have the same UTC offset as the request, regardless of system locale configuration.

SETINSTRUMENTSTATE
Sets the state of an instrument

Usage: `SETINSTRUMENTSTATE InstrumentID [State]`

`InstrumentID`	Instrument ID
`State`	ID or label of the instrument state. Available instrument states are listed if not specified.

Examples:

```
SETINSTRUMENTSTATE 3

SETINSTRUMENTSTATE 3 1

SETINSTRUMENTSTATE 3 Span
```

Example Response:

```
Instrument state is now 'Zero'
```

STATUS

Displays a status page

Usage: `STATUS`

Example Response:

```
Version: Congrego v4.0.8 build 7436 - Professional

Site Name: Congrego Logger #1

Host Name: CONGREGO1

Platform: Microsoft Windows 10.0.18362

Architecture: x64

Build Date: 2020-05-11

Time Zone: (UTC+10:00) Canberra, Melbourne, Sydney

Uptime: 1.02:04:36

Network Interface: Ethernet 2

        Address: fe80::a906:9e97:56a2:1c3b%7

        Address: 172.18.244.98

Identifier: YVC1Wx7PNcNtz9PqlykoLYXSwZ23oymcVYbRi5Tqxg
```

SYNCINSTRUMENTCLOCK

Synchronise an instrument's clock with the system clock

Before executing this command, clock synchronisation must first be configured in the instrument settings.

Usage: `SYNCINSTRUMENTCLOCK InstrumentID`

`InstrumentID`	Instrument ID

Example:

```
SYNCINSTRUMENTCLOCK 1
```

Example Response:

```
Instrument clock will be synchronised
```

UNLOADTEXT

Unloads logged data in text format

Usage: `UNLOADTEXT Report Start [End]`

`Report`	Report ID, or '*' for all reports.
`Start`	Start time in ISO-8601 notation, or '*' for first logged record
`End`	End time in ISO-8601 notation. Unloads all data after start date if not specified.

Examples:

```
UNLOADTEXT 4 2012-11-10 2012-11-11

UNLOADTEXT * *
```

Response Format:

```
CHANNELS,[Channel IDs ...];[Tamper Flag];[Length];
[Checksum]

LABELS,[Channel Labels ...];[Tamper Flag];[Length];
[Checksum]

UNITS,[Channel Units ...];[Tamper Flag];[Length];
[Checksum]

yyyy-MM-ddTHH:mm:ss+hh:mm,[Value ...,Status ...];[Tamper
Flag];[Length];[Checksum]

...
```

```
END UNLOAD;[Tamper Flag];[Length];[Checksum]
```

A **line footer** is appended to each line of the response:
The **tamper flag** is set if the data appears to have been modified since it was logged. This includes altering values, altering statuses or adding/removing channels from the report.
The **length** is the total number of characters before the footer.
The **checksum** is the sum of all characters before the footer (16-bit hexadecimal)

Example Response:

```
CHANNELS,C1,C2,C35,C36;0;22;053C

LABELS,[Ambient Temp],[Relative Humidity],[WS Vector],
[WD Vector];0;65;16CD

UNITS,[°C],[%],[m/s],[°];0;24;07FA

2020-05-13T15:00:00+10:00,5,-9.3014147,129,-
67.231537,129,7.1324481,128,187.61438,128;0;85;10BF

2020-05-13T15:01:00+10:00,5,-9.2854226,128,-
67.137539,128,7.784608,128,208.03952,128;0;84;109F

2020-05-13T15:02:00+10:00,5,-9.2549349,128,-
67.037242,128,8.2639631,128,226.25633,128;0;85;10CB

2020-05-13T15:03:00+10:00,5,-9.2363378,128,-
66.950487,128,8.7240724,128,244.11821,128;0;85;10CC

2020-05-13T15:04:00+10:00,5,-9.2121537,128,-
66.854751,128,9.2980454,128,261.10292,128;0;85;10C6

2020-05-13T15:05:00+10:00,5,-9.1878342,128,-
66.748845,128,9.6783048,128,277.32169,128;0;85;10EB

2020-05-13T15:06:00+10:00,5,-9.1637267,128,-
66.651919,128,10.081772,128,292.49634,128;0;85;10D5

2020-05-13T15:07:00+10:00,5,-9.1378875,128,-
66.553602,128,10.416696,128,306.43658,128;0;85;10D6

2020-05-13T15:08:00+10:00,5,-9.1145159,128,-
66.457494,128,10.939692,128,318.89309,128;0;85;10E2

END UNLOAD;0;10;02BA
```

For each command additional help is available within your telnet session by typing:
`HELP [Command]` e.g. `HELP AUTH`

Appendix E - Supported Modbus Functions

8 Appendix E - Supported Modbus Functions

Congrego® supports a number of Modbus function codes.
The following table summarises the available Modbus commands, some of these are available as a Master device, a Slave device or both.

Data Addresses	Read	Write Single	Write Multiple
Output Coils 0xxxx	FC01	FC05	FC15
Input Contacts 1xxxx	FC02	n/a	n/a
Analog Input Registers 3xxxx	FC04	n/a	n/a
Analog Output Holding Registers 4xxxx	FC03	FC06	FC16

Function Codes

FC01 – Read Coil

This function returns each channel's value as a single bit. A zero value is '0', all non-zero values are '1'.
This function is intended for use with digital channels, but will work for scalar channels as well.
Two coils are assigned to each channel so they align with registers in other functions. Querying either coil will return the same value.

FC02 – Read Input Status

Each channel is assigned two 1-bit registers. The first register will return '1' if the channel has a bad status. This can be used for filtering out nulls, faults and calibration data.
The second register will return '1' if the channel is in calibration and not registering a fault.

FC03 – Read Holding Registers

Each channel is assigned two 16-bit registers. This will contain the channel's current value as a 32-bit IEEE754 floating point number.
Null values are substituted with 'NaN'. The endianness can be configured in the modbus slave configuration.

FC04 – Read Input Registers

Each channel is assigned two 16-bit registers. Each register contains the 8-bit status code for the channel. Querying either register will return the same result.

FC05 – Force Single Coil

This function allows setting the coils, and can set the value of a channel.
For a digital instrument channel, this will set the instrument's channel value to on or off. For a scalar channel, this will set the instrument's channel value to 0.0 or 1.0.
Setting either coil allocated to a channel will set the channel value on the instrument.
This functionality requires the channel's direction to be set to 'output' or 'bi-directional'.

FC06 – Preset Single Register

This function is not supported because each channel's value is stored across multiple registers. Please use FC16 to preset registers.
This function will always return an 'Illegal Function' error code.

FC15 – Force Multiple Coils

This function allows for the setting of multiple coils in a single message.
It will attempt to set all coils, even in the event of an error. If both coils for a single channel are assigned different values, '`ON`' will be assumed.
This functionality requires the channel's direction to be set to 'output' or 'bi-directional'.

FC16 – Preset Multiple Registers

This function allows multiple holding registers to be written to. Data is to be encoded as 32-bit IEEE754 floating point values in the configured endianness.
It will attempt to set all channel values, even in the event of an error.
This functionality requires the channel's direction to be set to 'output' or 'bi-directional'.

FC17 – Report Slave ID

This function will return the ID of the requested slave, followed by a run indicator flag.
It will return '`0x00`' if the Congrego® back-end is stopped or reloading, and '`0xFF`' if the back-end is running.

Appendix F - Hardware Watchdog

9 Appendix F - Hardware Watchdog

The Congrego® hardware watchdog is supplied as an (optional) part of the logger hardware and is an integral part of the system that ensures that the system is always available and logging.

Refer to the *TEC 0290 - E042010 Hardware Set Up Guide* document that can be found on the resources USB device for full instructions on setting up the hardware prior to using the Congrego® software.

In brief the hardware watchdog is attached to the logger hardware and communication between them occurs. In the event that the Congrego® logger stops communication with the watchdog hardware, mains power to the logger is cut and the logger will reboot. On reboot the Congrego® logger software will resume logging.

After the watchdog hardware has been connected correctly it is important to ensure that it is is the correct mode, there are two modes of operation.

Watchdog On

Watchdog On

In the *On* position the watchdog functionality is activated, the *Status* indicator will pulse green and the *Bypass* indicator will remain off.
This is the 'normal' operating position for the watchdog hardware.

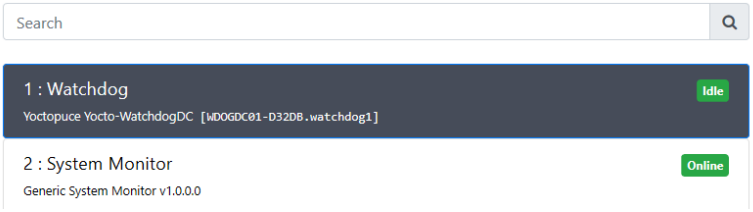
Watchdog Bypass

Watchdog Bypass

Setting the switch to the *Bypass* position will deactivate the watchdog functionality, the *Status* indicator will pulse green while the *Bypass* indicator will be permanently red.

Watchdog Instrument

As a default configuration the watchdog hardware will be present as an instrument in the *Instruments* page of the Congrego® software.

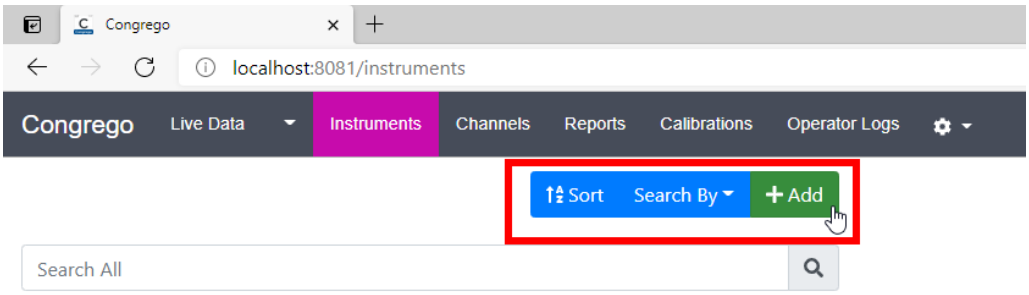


Watchdog Default Instrument

Watchdog Setup on Congrego®

If the Congrego® default configuration has been deleted or an existing configuration needs updating to support a hardware watchdog, then this section describes the process.
Before starting ensure that the physical watchdog device is powered and connected to the logger.

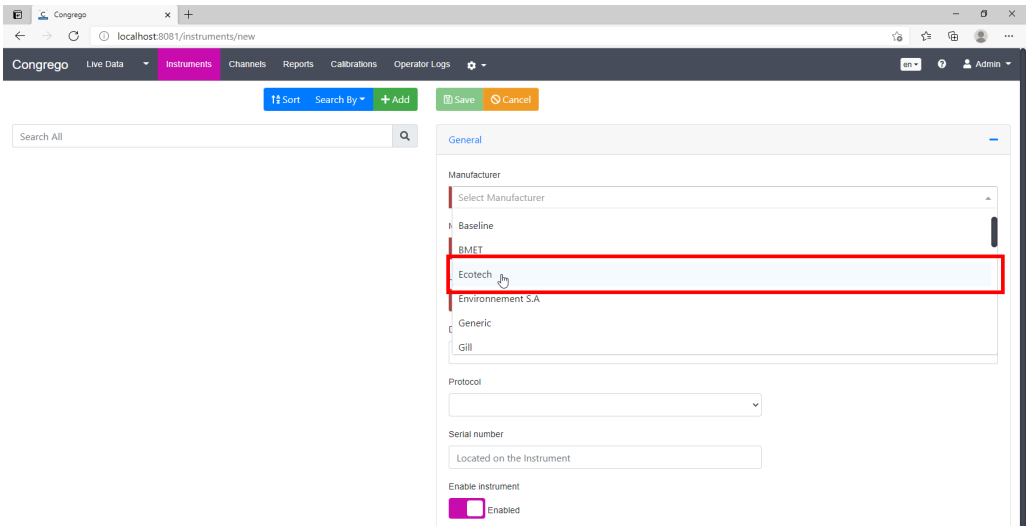
1. Navigate to the Congrego® user interface on the web browser.
2. Select the *Instruments* tab on the top bar.
3. Press *Add*.



Add Watchdog Instrument

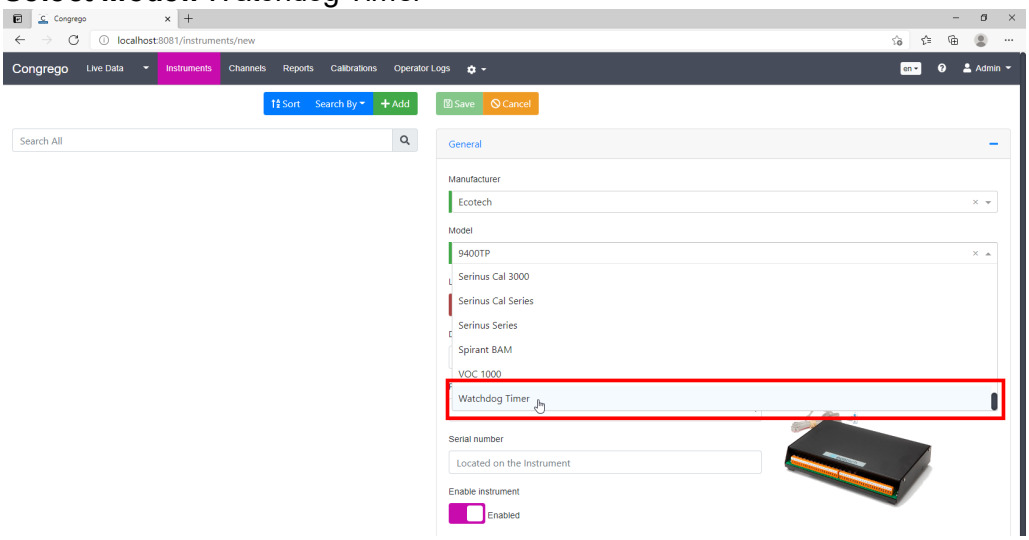
4. On the right hand side options for the instrument to be created are shown. The required settings are:

Select Manufacturer: Ecotech



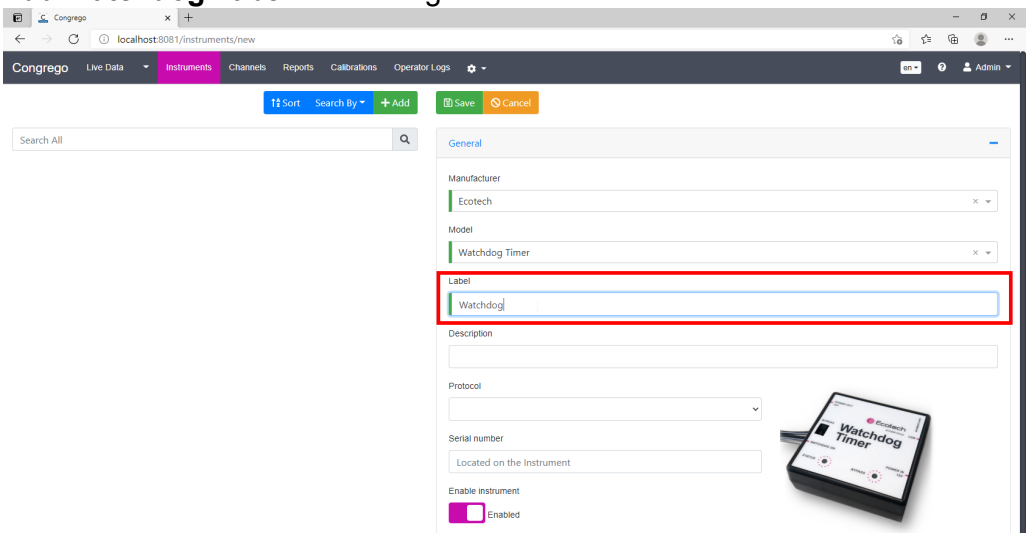
Select Manufacturer

Select Model: Watchdog Timer



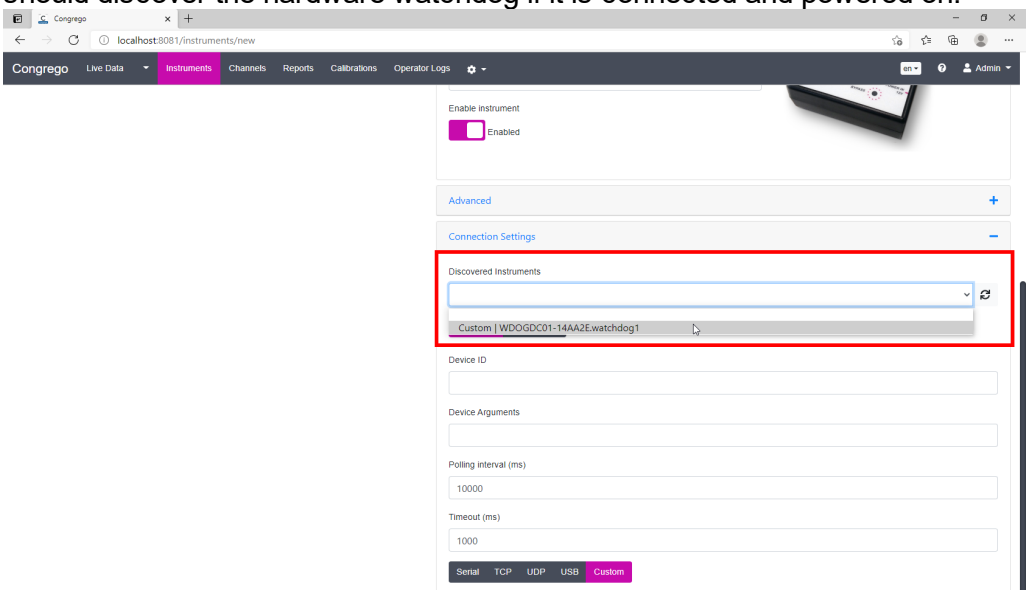
Select Instrument Type

Add Watchdog Label: Watchdog



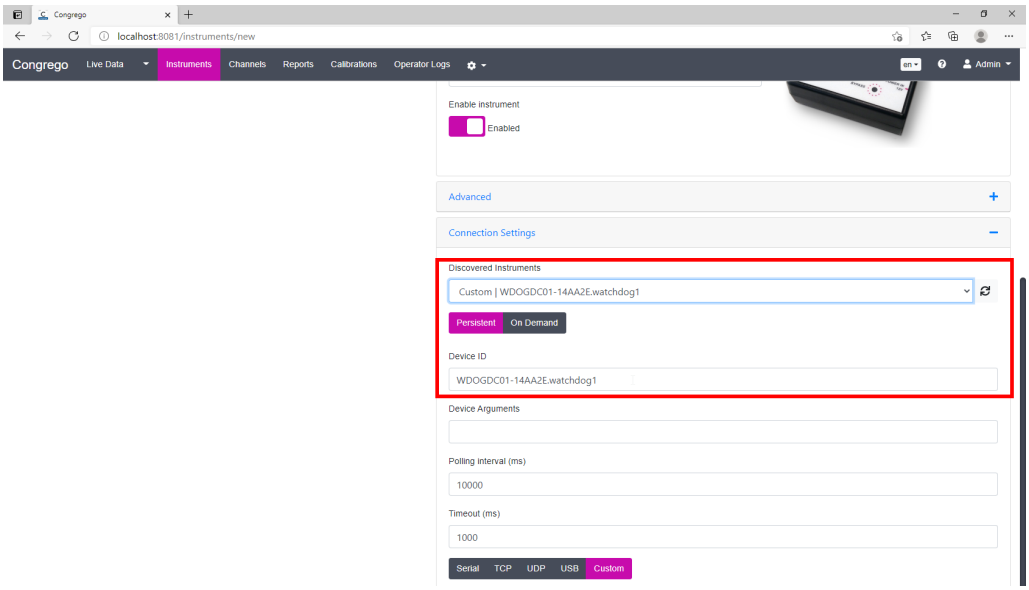
Label Watchdog Instrument

5. Under *Connection Settings*, select the *Refresh* button to the right of the *Discovered Instruments* field. Congrego® will poll for attached instruments and should discover the hardware watchdog if it is connected and powered on.



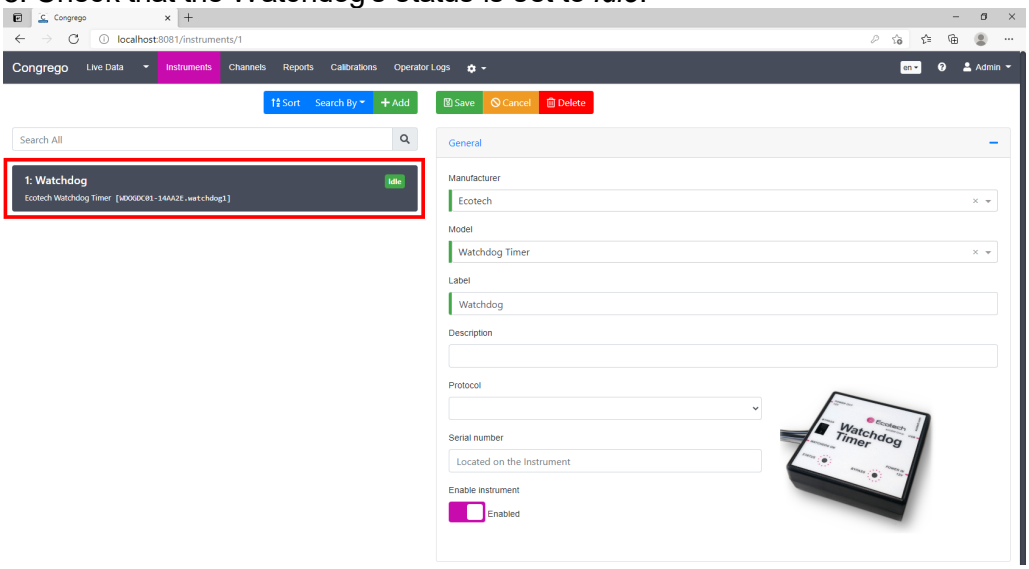
Discover attached Watchdog

6. Use the drop-down to select the discovered hardware watchdog (If the hardware is not displayed then ensure that the connections between Congrego® and the hardware are sound).
The *Device ID* field should now be populated.



Select Discovered Watchdog

7. Press *Save*.
8. Check that the Watchdog's status is set to *Idle*.



Setup Completed

To confirm that the Watchdog instrument and hardware is setup correctly perform the following steps:

- Disconnect the hardware watchdog's USB from Congrego® and ensure that the Watchdog is not in Bypass mode.
- Wait approximately 15 minutes and check to see if the Congrego® host has been restarted, if the host was restarted then the setup is correct.
- Reconnect the USB and resume normal use. If the unit did not restart the Congrego® host, contact your nearest Acoem Australasia representative.

Removal of the watchdog instrument in the Congrego® software when the watchdog hardware is still on and attached to the host machine will result in the watchdog functionality no longer working.

Appendix G - Status Flags

10 Appendix G - Status Flags

Congrego® uses an 8-bit unsigned integer for its status flags. The upper 3 bits represent the general status, while the remaining bits provide further detail of the status.

Bit	7	6	5	4	3	2	1	0
Status Flag	Good	In Calibration	Fault	Unused		See Below		

Good Status Codes (Bit 7 set)

All OK	128	Data has been captured with 100% capture rate.
Sufficient	129	Data has been captured with less than 100% capture rate, but still above the capture threshold.
High Alarm	130	Captured value is above or equal to the high alarm threshold.
Low Alarm	131	Captured value is below or equal to the low alarm threshold.
Limit Exceeded	132	Captured value is above/below/equal the maximum/minimum value threshold respectively.
Limit Exceeded High	134	Captured value is above or equal to the maximum value threshold and above or equal to the high alarm threshold **(Unused)**.
Limit Exceeded Low	135	Captured value is below or equal to the minimum value threshold and below or equal to the low alarm threshold **(Unused)**.

Calibration Status Codes (Bit 6 set)

In Calibration	64	Data has been flagged as in calibration with 100% capture rate.
In Calibration (Sufficient)	65	Data has been flagged as in calibration with less than 100% capture rate, but still above the capture threshold.

Fault Status Codes (Bit 5 set)

Instrument Fault	32	The instrument has reported a fault code.
Communications Fault	34	There was a problem communicating with the instrument. Either the instrument produced an invalid response, or did not respond within the timeout period.
Out of Service	36	The channel has been flagged for maintenance and is currently out of service.

Low Capture Status Codes (Bits 5-7 unset)

No Data	0	No data has been captured (0% capture rate).
Not Enough Samples	1	Some data has been captured, but the capture rate is below the threshold.

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