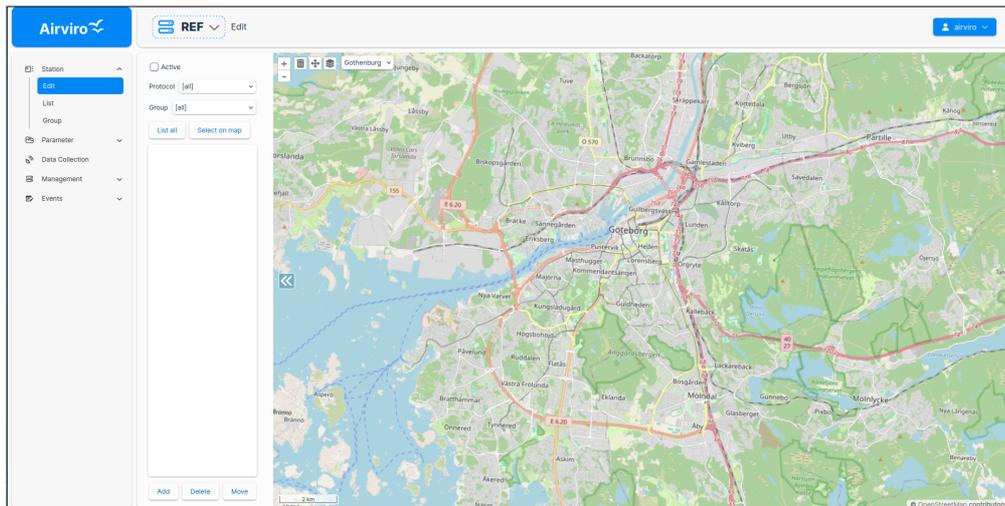


## Airviro User's Reference



## Working with Indico Administration

**How to fetch data automatically from remote stations**

## Working with Indico Administration

### How to fetch data automatically from remote stations

#### Amendments

Version	Date changed	Cause of change	Signature
3.11	May 2007	Upgrade to Airviro version 3.11	GS
3.12	January 2009	Upgrade	GS
3.13	January 2009	Upgrade	GS
3.20	August 2010	Upgrade	GS
3.21	Dec 2010	Upgrade	GS
3.21	June 2012	Review	GS
3.22	April 2012	Upgrade	GS
3.23	Nov 2014	Upgrade	GS
4.00	April 2015	New Version	GS
4.00	Aug 2018	Review	GS
4.01	May 2019	Upgrade	GS
5.01	Nov 2019	Review	GS
5.01	Dec 2020	Review	DC
5.01	April 2022	Review	GS
6.00	Oct 2023	New version	GS
6.00	April 2023	Review	GS
6.00	Sept 2024	Review	GS
6.00	Nov 2024	Review	DC
6.00	Jan 2025	Review	GS
6.00	Feb 2025	Review	DC
6.00	March 2025	Review	LEO

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## 6.1 Introduction

Automatic data collection is impressive once it is working, but setting up a system to handle it is not a trivial task. The Indico Administration module has been built to help with this task so that the whole process is user friendly, but nevertheless, a good understanding of how each part of the data collection works is important if you want to be able to sort out problems.

Automatic data collection is carried out via external protocol programs. Every external protocol is different, because each type of logger is different. This means that the documentation cannot really become specific enough to be able to lead step by step through the external protocol editor where all the external protocol information is given.

Data is usually gathered using modems. The Airviro server first runs an **external protocol**, which contacts a specified remote **station**. The station answers and waits for instructions. The external protocol then sends instructions to the remote station including a request for the latest data. The station responds to the instructions, the computer receives the new data and the conversation is complete. The new data is then loaded into the **time series database** so that other programs (such as the Indico Presentation Client) can access it.

The Indico Administration module is one of the three main tools in Airviro along with Indico Presentation, Indico Report and Indico Validation, intended for acquiring, storing, editing, presenting, analysing, reporting and exporting time series data. All Airviro modules version 5.00 or higher that require or use geositioned information or geotracking, and uses OpenStreetMap (OSM), which is an open-content free licensed map of the whole world. The standard OpenStreetMaplayer provide information such as street names, facilities, shops, etc

## 6.2 Getting Started

This Airviro module runs on any PC or device running later versions of Microsoft Edge,

Firefox, Chrome or Safari.

Once Airviro has been properly installed on the server, you can start using it by typing the correct URL in your web browser over the Intranet/Internet. (Figure 6.2.1. Input User and password).

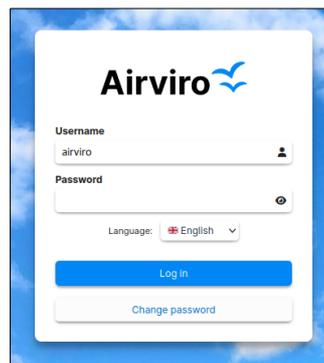


Figure 6.2.1. Input User and password.

The user can select the Language (Spanish and English) to work with, at the logging window. This functionality is not yet implemented in v6.00.

After logging into Airviro by entering a username and password, the user is presented with a list of all available Domains, if none has been previously selected and stored (Figure 5.2.1). By selecting a **Domain** the options list will be updated to show all Airviro Modules available for the selected domain. Click on the corresponding option to load Indico Administration

At the top of the window, in the Address Bar, the currently selected module name path, is shown. Additionally, placing your cursor over the Domain name (for example REF) will display a label showing the name of the module currently selected.

Clicking on the ^ **[down arrow]** button, besides the Domain name, the available modules are shown and can be selected.

By clicking on the button ^ **[down arrow]**, besides the user button text, the **Logout** button, is shown. By clicking on the Logout button, the current module is closed and the Airviro login page is displayed instead.

**Main Menu** (Figure 6.2.2):

- STATION** Allows you to access the station interface, where it is possible to create, modify or delete existing stations. Automatic data collection is configured here as well.
- PARAMETER** Similar to STATION. It allows you to create, edit and delete parameters.
- DATA COLLECTION** Used to control the data collection. Here the state of the automatic data collection can be changed .
- MANAGEMENT** This enables you to modify the state of the Airviro database manager. Data cheks, postprocessor and distribution are configured using this menu.
- EVENTS** **Used** to define events for time series and stations.

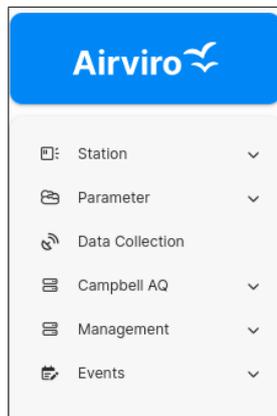


Figure 6.2.2. Main window.

## 6.3 Viewing and Editing the Parameter Database

The parameter database contains information about the different substances measured. This includes gaseous pollutants such as sulphur dioxide, carbon monoxide, etc. and also

meteorological parameters such as temperature and wind speed. A parameter can be anything that is measured as a variation against time.

In the **PARAMETER** menu, click on the option **List**, to view all parameters in the database in a new window. (see *Figure 6.3.1* ). Two options are available: Table view and Text view

Table view		Text view								
Key	Description	Unit	Alarm limit	Graph min	Graph max	Absolute min	Absolute max	Max number of equal values	Allowed variation	Max gradient
0001	SO2	µg/m3	55	0	200	0	1000	60	0	-1
0002	NO	µg/m3	1000	0	1000	0	10000	6	0	-1
0003	NO2	µg/m3	120	0	150	0	10000	6	0	-1
0004	CO	mg/m3	15	0	10	0	101	6	0	-1
0007	HCL	µg/m3	100	0	180	0	10000	6	0	-1
0008	O3	µg/m3	200	0	150	0	500	6	0	-1
0017	Ammonia	µg/m3	100	0	100	0	10000	6	0	-1
0018	Hg	µg/m3	100	0	180	0	1000	7	0	-1
0021	Benzene	µg/m3	100	0	150	0	10000	6	0	-1
0022	Toluene	µg/m3	500	0	200	0	10000	6	0	-1
0023	P-Xylene	µg/m3	100	0	100	0	10000	6	0	-1
0027	Formaldehy	µg/m3	100	0	50	0	1000	6	0	2
00HC	HC	µg/m3	1000	0	1000	0	10000	6	0	-1
0DIS	DIS	µg/m3	100	100	180	0	1	0	0	-1
0NOX	NOx	µg/m3	1500	0	1500	0	10000	6	0	-1
0PAN	PAN	µg/m3	100	0	10	0	1	0	0	-1
0SOT	Soot	µg/m3	200	0	100	0	1000	0	0	-1
10PR	Ambient Pressure	µg/m3	200	0	200	0	1000	60	0	-1

*Figure 6.3.1 List of parameters( Text view ).*

The parameter key is shown in the first column, this is a unique 4 alphanumeric characters identifier which identifies each parameter. The second column contains a parameter description (ie, such as a name), so that you know to which parameter the key is referring to. The fourth column shows the alarm limits,

The information in the third, fifth and sixth column is intended to be used by the Indico Presentation Module. They show the measuring units for each parameter, and the default minimum and maximum scale values for each parameter, so that correct scales are used to generate the graphs.

The information shown in the last five columns is used to check against any incoming data associated with a particular parameter, unless the data has already failed a check by an external protocol. **Imin** and **Imax** are the minimum and maximum acceptable values, and **MaxEq** is the maximum number of equal consecutive values that will be accepted, plus or minus the value **Eps**. **Grad** is the maximum difference allowed between two data values that differ by one hour. If incoming data fails one of these checks, it will be assigned a status indicating that the check has failed.

### 6.3.1 Creating and Editing Parameters

On the main menu, click on **Edit** under **PARAMETERS** in order to open the editing window.

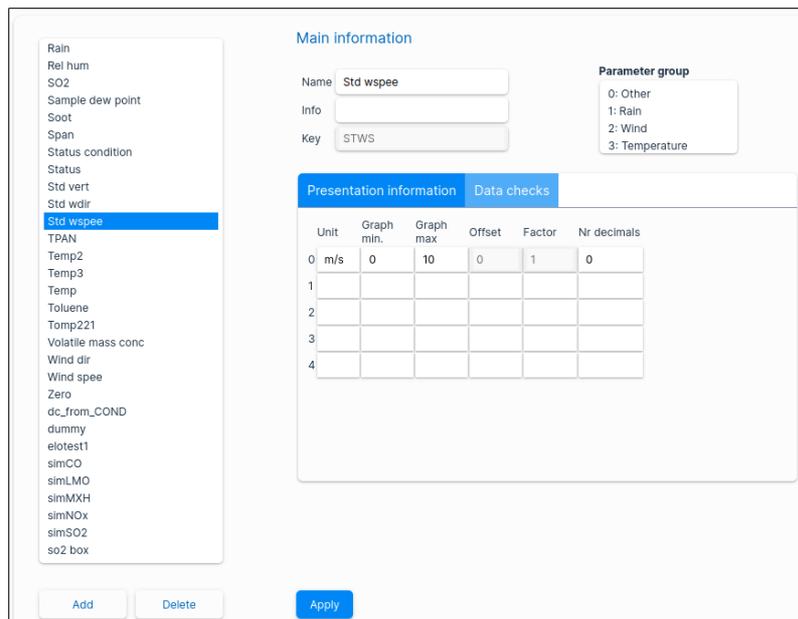


Figure 6.3.1.1 Edit parameters- Data checks

The screenshot displays the 'Edit parameters-Presentation information' interface. On the left, a list of parameters is shown, with 'Std wspee' highlighted. The main content area is divided into 'Main information' and 'Presentation information' sections. The 'Main information' section includes fields for 'Name' (Std wspee), 'Info', and 'Key' (STWS). The 'Presentation information' section has a 'Data checks' tab. Below this tab is a table with the following structure:

	Default	No check	No check	No check	No check
Max number of equal values	24	0	0	0	0
Allowed variation	0	0	0	0	0
Absolut min	0	0	0	0	0
Absolut max	20	0	0	0	0
Max gradient (per time unit)	-1	0	0	0	0

Below the table, there is a 'Log error status' checkbox and an 'Alarm limit' field set to 100 with an 'Upper limit' dropdown menu. At the bottom of the interface, there are 'Add', 'Delete', and 'Apply' buttons.

Figure 6.3.1.2 Edit parameters-Presentation information.

The left side list shows all the parameters currently defined. To view the details for a given parameter, just click on the parameter name. The information displayed in the parameter database summary (see Figure 6.3.1), is now presented in editing mode, so you can modify it. Click on the **[Add]** button at the bottom of the list to add new parameters.

The most important piece of information for each parameter is its key, and once a parameter has been assigned a key to it, it cannot be changed. The parameter also requires a meaningful name or description so that you can recognize it in the parameter list. Fill in these information in the text-boxes beside to **Key** and **Name** respectively.

Then complete the **Presentation information** section. **Unit**, **Graph min.** and **Graph max.** are required by the Indico Presentation module for generating graphs involving parameters. It is always important for a person looking at a graph to know which measuring units are used. For most pollutants this will be  $\mu\text{g}/\text{m}^3$ . You can specify up to 4 new units. **Offset** and **Factor** are the conversion factors used for converting the default unit of the parameter into another measuring unit. Offset is needed for conversions between measuring units, like Celsius and Fahrenheit (Figure 6.3.1.2)

Minimum and maximum values, must be included for each parameter defined, as it is required for scaling the graph axis. These can then be modified in the Indico Presentation

module, but default values must be entered when a new parameter is defined, as these are required when a graph is first generated.

### 6.3.1.1 Checking the Incoming Data

The **Data checks** section (*Figure 6.3.1.1*). is used to define various limits to check the incoming data. All incoming data is checked against the limits defined here and a status code is assigned to them, indicating if data is OK or, otherwise, the reason why it has not passed the check. The data will be stored in the time series database whether they are checked OK or not (see Volume 5 - Indico Validation). Indico Presentation users can choose to only use data with certain status codes.

The data checks are made for a certain time resolution or for the default one if nothing is specially specified for a time resolution. A consecutive number of equal values often indicates an instrument failure. Set the **Max number of equal values** to what you consider would indicate such a failure. The **Allowed variation** is related to this - if the difference between two adjacent values is less than the allowed variation then they are considered to be equal. Instruments usually have a measurement range outside of which their readings cannot be relied upon. Enter these limits in the text-boxes labeled **Absolute min** and **Absolute max**. **Max gradient** is the maximum difference allowed between two hourly values of incoming data.

The error messages generated by the data collection are stored in the `/usr/airviro/log/` directory, these files are named `avlog.YYMMDD` (where YY is the year, MM the month and DD the day). These files are usually kept for a month before being deleted by the system.

In **Alarm limit** define a value, for lower limit or upper limit, that will trigger the alarm. These alarms are used in Indico Supervision.

Once you have completed all the required information to define a parameter press the **[Apply]** button to save your data.

## 6.4 Understanding the Station Database and Setting Up a Station

## 6.4.1 Viewing the Station Database

A site where data is measured is called a 'station'. In the **STATION** menu, click on the option **List**, to view all stations in the database in a new window. (see *Figure 6.4.1*)

Station	Op	Bad	Update	Next
265 Sweden1	NO	0s	700101 01:00	700101 01:00
GM1 Shell	NO	0	900122 12:00	700101 01:00
GM2 Lejonet	NO	0	910823 12:00	910823 13:35
GM3 Jarnbrott	NO	0	910116 15:00	910701 13:10
GM4 Risholmen	NO	0	910116 15:00	910701 13:10
GM5 Femman	NO	0	900101 01:00	700101 01:00
GM7 Sjuan	NO	0	900122 12:00	700101 01:00
GM8 Attan	NO	0	070911 02:57	070912 02:57
GM9 Nian	NO	0	070911 02:58	070912 02:58
GMA Tian	NO	0	070911 02:58	070912 02:58
GMB Elvan	NO	0	070911 02:59	070912 02:59
G01 Gamlestaden	NO	0	900122 12:00	700101 01:00
G02 Molndal	NO	0	900122 12:00	700101 01:00
G03 Rya	NO	0	900122 12:00	700101 01:00
G04 Volvo	NO	0	900122 12:00	700101 01:00
G05 Jarntorget	NO	0	900122 12:00	930407 00:00
GOX EMEST1	NO	0	900122 12:00	700101 01:00
GOY EMEST2	NO	0	900122 12:00	700101 01:00
TST AcceptTest	NO	0	700101 01:00	700101 01:00
XY1 CamDataColl	NO	12s	150304 07:05	150305 11:40

*Figure 6.4.1. Station List. (option:Text view )The first column shows the station key. A unique 3 alphanumeric characters identifier that refers to each station. The second column shows the station name.*

The third column shows if the station is in operation or not, i.e. if it is due to be called automatically at some specific time. The next column shows the number of bad (unsuccessful) calls and can also show if any alarm limits have been reached. The last two columns show the date and time of the last successfully fetched data, and the next call time (this is only relevant for operational stations).

The same data appears with the option: Table view (key, station, operational, bad calls, update and next).

## 6.4.2 Creating / Editing Stations

There are two ways for creating or editing stations. On the main menu, click on **Edit** under **STATIONS** and then:

- By clicking on any station on the map, a menu will pop up where you can choose to add a new station, or edit or delete the selected station.
- Or clicking the  button, to display the old Airviro style interface, with a listing on the left side of the map, where you can select stations for editing, deleting or adding. If you are using the old airviro style, press the **[List all]** button to populate the list with the names of all stations in the database. Alternatively, you can select an area on the map by pressing the **[Select on map] button.** and then using the mouse pointer and the keyboard [Ctrl] key to select the area of interest by dragging the mouse pointer and then releasing the key. Also you can zoom in on a particular area in the same fashion using Shift+left mouse button instead.

By checking the **Active** check box above the stations list, only active stations will be shown. You can also filter the stations shown in the list according to the protocol used by the stations or by the station group, the station belongs to.

To view the map location of any station, just click on the station name, or double click on it to edit it.

#### 6.4.2.1. Name Information

Enter a meaningful and recognizable name to identify the station in the text box labelled **"Name"** and a unique 3 alphanumeric characters identifier in the **Key** textbox. The Key by convention follow a naming pattern. For instance, the first letter representing the location of the station, that is, all stations in Göteborg have G as the first letter of the key. The second letter usually describes the type of data measured at the station. The most important types are O for Opsis analysers and M for Campbell loggers. The last letter distinguishes between different stations of the same type. You do not need to follow this convention - as long as the key is unique.

The screenshot shows the 'Edit Station' configuration interface. It includes the following elements:

- Name information:** Name: Volvo, Key: GO4
- Main information:**
  - Operate:  Log error status:
  - Latest update: 240122 12:00
  - Time to call: 240101 01:00
  - Argument: [empty]
  - Consecutives: 0 Today: 0
  - Bad calls: 6 Yesterday: 0
  - Stop limit: 12 Alarm limit: 0
  - Protocol settings: [none]
  - Location: sinca label
- Station groups:**
  - Station groups list: 6, 7: DEMO, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18
  - Selected list: 0: Opsis, 1: Weather, 2: Conventional, 3: Industrial, 4: Rural, 5: Roadside
- Error message:** [empty text box]

Figure 6.4.2. Edit Station.

### 6.4.2.2. Main information

Next comes **Main information**, though this is actually the last step in the configuration. Once the station is fully configured for automatic data collection, fill in the date and time for the next data collection in the text box **Time to call** and tick on the check box **Operate** to make it active. Once data collection is running the **Latest update** field automatically updates itself.

**Argument:** Each protocol requires a specific argument that indicates the starting date and time of the data to be collected. This has to be written using the correct format required by the station that is being called. This argument is automatically updated after data has successfully been collected from the station.

Write a suitable argument in the text box **Argument**. This takes different formats for different protocols - for example, Opsis loggers take a normal date and time format but Campbell loggers require a pointer which does not seem to have anything to do with time at all.

If you are using the "cam" protocol then you must write the pointer position e.g. 1046. If you enter a pointer position 0 then all data in the logger will be fetched.

You can define your own **Alarm limit** and **Stop limit**, which typically take values of 5 and

10 respectively. When the number of consecutive bad calls reaches the alarm limit, a warning message can be sent, and when the stop limit is reached another message can be sent and the station ceases to be operational. When this happens, you must first find out the problem and solve it, then reset the number beside **Bad calls** to 0 and make the station operational again.

**Acum bad calls:** in this section the accumulated bad calls are shown for **Today**, **Yesterday**. The **Alarm limit** can be set for these accumulated counters. The accumulated bad calls are shown in Indico Supervision and they will be red if the counter is equal to or greater than the **Alarm limit**.

Today: Number of bad calls registered today

Yesterday: Number of bad calls registered the day before

Alarm limit: Show the alarm limit for the counters.

---

**Note:** When creating a new station, it is usually much easier to copy an existing station and then modify it as required for the new station. First select the station that you want to copy and then click on the **[Add]** button. All the information will be copied to the new station

---

Airviro systems have been successfully used with loggers from the following manufacturers:

- Monitor Labs/Monitor Europe
- Thermo (42i, 43i, 48i, 49i)
- Met1
- BAM1020Campbell (always used for Airviro principal masts)
- Opsis Analyzers using ComVision
- Opsis loggers
- Horiba

- Envidas
- Philips / DMS / A30
- Odessa
- Nilu
- Aanderaa
- Dasibi
- Marksman
- API
- ESC
- Ecotech
- TEOM
- All loggers / instrument with support for the Extended Bavarian protocol

### 6.4.2.3. Configuration

#### Restricting the Call Times

Click on the **[Time restrictions]** button to open this sub-window . Here you can restrict the times and days of the week when the system will try contact the station. Under **Hour**, click on the hours that the station may be contacted (press the **[All]/[None]** buttons to select / deselected them all). The hours that will be used are those that are highlighted, the same for Weekdays.

Hour	Week day	Misc. information
00 - 01	Sunday	Call int 240 (min)
01 - 02	Monday	Retry int 0 (min)
02 - 03	Tuesday	Start min 0
03 - 04	Wednesday	Stop min 59
04 - 05	Thursday	Max factor 0 min/h
05 - 06	Friday	
06 - 07	Saturday	
07 - 08		
08 - 09		
09 - 10		
10 - 11		
11 - 12		
12 - 13		
13 - 14		
14 - 15		
15 - 16		
16 - 17		
17 - 18		
18 - 19		
19 - 20		
20 - 21		
21 - 22		
22 - 23		
23 - 24		

Figure 6.4.3. Time Restriction-

Under the Misc. Information section we have:

**Call int.** (call interval, in minutes). This indicates for how long the system waits between each call to the station. Of course this depends on the restrictions that you have made under **Hours** and **Week days** - if you have restricted calls to be only between the hours of 6 and 7 then the station will only be contacted between the hours of 6 and 7, even if the call interval is 180 minutes. Try to call fairly frequently to avoid loss of data - it is best to call at least once a day to collect hourly data, and if you want to have fairly recent data during the day you will need to call 3 or 4 times a day, or even every hour.

**Retry int.** is the time to wait (retry interval, in minutes) after a bad call before retrying. The optimum time to wait varies between systems, but 3 minutes is quite common.

**Start min** (minute) and **Stop min** (minute) restrict the fraction of an hour to use when calling a station. For example, if **Start min.** is 10 and **Stop min.** is 30, then calls to the station may only be made between 10 past and half past the hour. This can be very useful in helping to avoid more than one process trying to use the modem at the same time.

**Max factor** is the maximum number of seconds or minutes per hour that the station is allowed to gather data. For each call the maximum allowable call time is calculated, which depends on the number of hours of data to be collected, plus a default connection time that is added because it sometimes takes a while to establish contact with a station. If a call exceeds its maximum call time, then the process is terminated by the collection daemon. A value of 0 here means no restrictions.

Press **[Ok]** to save your choices and to return to the **Stations** sub-window.

- **Station groups**

You can associate stations to **Station groups**. These groups can be created clicking on the option **Groups** under the **Station** menu on the main menu. A station can then be assigned to one or several station groups. Then when you look at the time series data in Indico Presentation you can choose to only look at stations in a particular station group. This is useful if you have a large number of stations.

Station groups can also be used to deal with mobile stations. Every time a mobile station moves it becomes a new station with a new station key. However, the mobile station can have its own station group so that it is easy to use the Indico Presentation module to select all stations that are actually the same, mobile station.

- **Defining and selecting Protocols**

From the drop down list, select which data collection protocol to use, Then press the **[Protocol settings] button** in order to complete all the information required to set up the data collection protocol selected. (for setting up protocols see section 6.4.3)

## Miscellaneous information

Click on **[Miscellaneous]** and to open this window.

Figure 6.4.4. Miscellaneous information.

In **Geographic info** you can set the station location and its height above the ground.

**Time Information:** The **Birth time** of a station is automatically stored here when a new station is created. If a station ceases permanently to be operational then you may want to call it "dead" and you enter the **Death time**. In the future this might be more relevant and most will be used with mobile stations. You can use the **Retire station** button to retire station at the last hour of the current day, this mean that the station will no longer be operational. Historical data will be kept in the Time Series Database.

Under **Protocol**, in Resources you can specify the name of the resource (device file) such as `/dev/ttyS0` or otherwise from a set of modems it can be specified by:

**type (T)** Indicates the type of resource (ex TModem, TDirect).

**speed (S)** Specifies which speed the resource supports (ex S2400 or S1200).

**property (P)** Specifies a certain type of modem (ex PHST, PDiscovery)

Most external protocols require a resource to be used (such as a modem). For systems that have several modems with different capabilities, it is possible to just specify a resource type to use, so that any available resource matching that type can be used.

Alternatively, you may instead just specify a specific resource, but it is better to designate the resource type, as this is unaffected if the actual resource changes its name or if more resources become available when the system is expanded.

**Statistics** shows a summary of Data Collection good or bad calls due to external protocol or data collection daemon failures

Now fill in the **Attributes**. Here you can specify three additional features related to the data that is collected. Choose **Logging** if you want to keep a log of all transactions with the station (you usually will use this option with live stations). Choose **Dummy station** if the station is not actually operational but data appears at regular intervals anyway (for example if it is distributed from another computer system). Setting the **Dummy station** flag means that you can set the **Operate** flag under **Main information** but it will be ignored by the data collection daemon.

Choose **Save raw data** if you want to keep a copy of the incoming data in the original format as well as in standard format in the time series database. Sometimes this is needed to sort out problems with data collection but in normal cases is not necessary.

Now fill in the **Contact information**. Here you can specify additional information about the contact, including her/his email.

Click on **[OK]** to confirm your settings and go back to the main page.

## Location

If a station has been moved to different locations (using button [Move]), you can update the information stored for this historical locations. Type date and time, coordinates and description as shown in the *Figure 6.4.5*.



Date	X Coord	Y Coord	Comment
240902 22:04	123456	654321	Old place

*Figure 6.4.5. Location.*

## Error Message

This text box, is intended to visualize error messages generated by the data collection daemon. Click on **[OK]** to save your changes.

### 6.4.3 Setting Up an External Protocol

This is the most complicated part of setting up an operational station and it is intended to be used only by experienced users who have had system administration training. It requires detailed information about how the logger has been configured and which

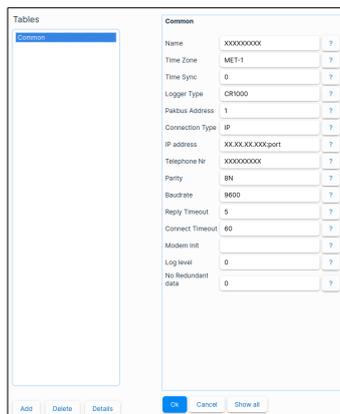
parameter is measured on each channel.

Choose a protocol from the protocol drop down list that appears above the stations list, in order to filter the stations displayed according to your selection.

Once you have loaded a station like the one shown in *Figure 6.4.2*. Press the **[Protocol Settings]** button. Depending on the protocol selected different user interfaces may be available for some uncommon protocols. This editor is not explained here. Each property specifies some specific information about the data logger such as the way different channels are configured or the way in which they can be contacted.

Depending on the selected protocol, the configuration window might be different. See *Figure 6.4.6* and *Figure 6.4.7*.

Each property (Level) must therefore be given the correct value or values (Number). A property will enable you to edit it. Activating the **filter level** allows you to display only the current level.



*Figure 6.4.6. Example Dasibi Protocol Settings.*

Figure 6.4.7. Example Cam Protocol Settings.

**Note:** you can request to the System Administrator to configure the “Import” protocol used to extract existent data from a station.

Once you have completed all the required info for the external protocol, confirm it by clicking on **[Ok]** button of the protocol editor and return to the main station edit page. You must save the station to save the protocol associated to it.

## 6.4.4 Starting the Data Collection

It is now time to test the automatic data collection. Return to the Stations Edit window, and select your station from the stations list. Activate your station by ticking on the check box **Operate**. Fill in **Time to call** with a time 5 minutes from now. Fill in **Latest update time** as some time a few hours ago. It is not a good idea to try and collect too much data at once, especially with a new station, which might not work properly at first, as it is easy to forget to define something important. Save the station and wait for the call time. Check that the station appears in the data collection idle queue (click on **Data Collection** on the main menu). Watch the modem and make sure it makes the calls at the correct time.

When it has finished the call, look at the data collection queue again to see if the call was successful (i.e. 0 bad calls). If this is the case then you have successfully set up automatic data collection, otherwise you will have to go through all your settings very carefully and to work out what is wrong.

## 6.5 Examining the Data Collection Processes

Click on **Data Collection** in the left menu. This list displays the the active stations for the selected domain. In the **Domain** combo box the domains that are configured for data collection are shown. **Table Mode** Advanced shows more information about each station. The stations can be in one of three modes , called Idle, Wait and Running. When a station is Idle, it is coloured white and it means that the station are waiting until next call time is reached. When a station is in Wait state it has a yellow colour and it is waiting for a device that it needs to be free. It will start to collect as soon as the device is freed. A Running station is collecting data and it has a green colour.

Press [**Show Filter**] button to visualise the filters that can be applied to the table.

## 6.6 Examining the Database Management Processes

### 6.6.1 Management

#### 6.6.1.1 Data Checks

Data checks are usually performed for individual parameters but here it is possible to add checks based on time series. The rules defined here will apply to all incoming time series data.

In order to decide which time series should be checked a system-based rule is used. These rules are based on the 12 letters of the time series key: **SSSRTPPPPIII**, where the three **S**:s are the station key, **R** the time resolution, **T** the type of data, the four **P**:s the parameter key and the three **I**:s the instance. It is possible to define rules using pattern matching. A **?** means any character, a **\*** means one or more of any characters.

The rule **GM5+MTEMP???** would apply for all time series with station GM5, time resolution + (hourly), type normal, parameter TEMP and for any instance.

Performed checks for each rule are: **Minimum**, **Maximum** and **Suspect**. These checks change the status code. **Alarm and Comment** are not used in this version.

The information displayed in the lists Stations, Time res, Types and Parameters are only to help you with the time series key letters. By clicking on the names in the lists, the corresponding codes are displayed below. Using the lists it is possible to define a time series pattern.

The screenshot shows the 'Data Check' configuration interface. On the left, a list of rules is displayed, with '265s00017 11 10 1 2 test' selected. Below the list are 'Up' and 'Down' buttons. On the right, the 'Info Lists' section shows four columns: Stations, Times Res, Types, and Parameters. The 'Times Res' column is selected, showing 'Hourly'. Below this, the 'Data Checks' section contains input fields for 'Key' (265s00017), 'Minimum' (11), 'Maximum' (10), 'Suspect' (1), and 'Alarm' (2). A 'Comment' field contains 'test'. There is an 'Apply to list' button. At the bottom, there are 'Add', 'Delete', and 'Apply to server' buttons.

Figure 6.7.1. Data Check.

Select a rule from the list and press the **[Up]**/**[Down]** buttons to move it up/down in the list. This will modify the order in which the rules are applied for top to bottom. When a rule is applicable for a time series, the rest of the rules are not executed.

Use **[Add]** to add a **Data Check**. Select an item on the list and use **[Delete]** to delete.

### 6.6.1.2 Back. Processes.

Select **Back.Proc** menu under **Management**. Here you can configure a Time Serie database as active, inactive or off as well as Data Collection processes.

The screenshot shows the 'Timeseries database' configuration page. It features two dropdown menus: 'Timeseries database' set to 'Active' and 'Data collection processes' set to 'Active'. Below these, there is a section for 'Spool files' with a checked checkbox and a 'File listener' button.

Figure 6.7.2. Background processes.

Off: means that the database manager is not running. No data will be written to the time series database.

- Active: the database is active.
- Inactive: the database is inactive.
- With **Spool files** you can identify the number of spool files and invalid files (0), in the spool directory for the current Domain.

### 6.6.1.3 Post Processor

**Select Post Proc** menu under **Management**. This windows display the post processor.

Incoming data stored in the time series database can be used to calculate other values. A typical post processing is to calculate averages and sums but also to scale raw values to scaled values (See Indico validation user's reference).

To decide which time series should be post processed a pattern matching rule is used. The rules are based on the 12 letters of the time series key: **SSRTPPPPIII**, where the three **S**:s are the station key, **R** the time resolution, **T** the type of data, the four **P**:s the parameter key and the three **I**:s the instance. It is possible to define rules using pattern matching. A **?** means any character, a **\*** means one or more of any characters.

For each rule an action must be selected and that action then is executed on the data that fulfilled the rule. Available actions are: Calculation of 30 min averages, Calc hourly avg, Calc daily avg, Scale, Hourly sum, Daily sum, Calc NO2, Adjust. TEOM.

A rule that is only a **\*** would perform the action specified on all incoming data. A rule that is **GM5+\*** would apply for all time series with station GM5, time resolution + (hourly) and with any type, parameter and instance. A rule that is **???+MTEMP???** would apply to all time series with hourly resolution, normal values and with TEMP as parameter.

The information displayed in the lists Stations, Time res, Types and Parameters are only to help you with the time series key letters. By clicking on the names in the lists, the

corresponding codes are displayed below. Using these lists it is possible to define a time series pattern.

The rules are applied to incoming data in sequential order starting from the topmost rule in the list down until the rule that applies to that data is found and then executed ending the process. This process is then repeated with the next data received, and so on.

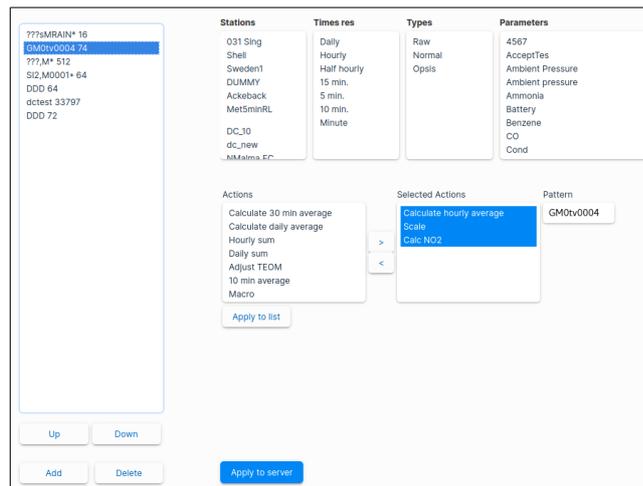


Figure 6.7.3. Postprocessor.

#### 6.6.1.4 Distribution

Click on **Management** in the main menu, and select the option **Distribution** In order to save time series data for distribution. Airviro stores this data in a file that is located in `/usr/airviro/data/<domain>/dist/` directory. Using the Dist, Fdist and Hdist protocols the data can be sent to other Airviro systems.

If tick on **D** , it is only distributed if the data in the time serie database is different from the stored data. If they are the same, it is not distributed. Tick on **A** when receiver is an Airviro system.

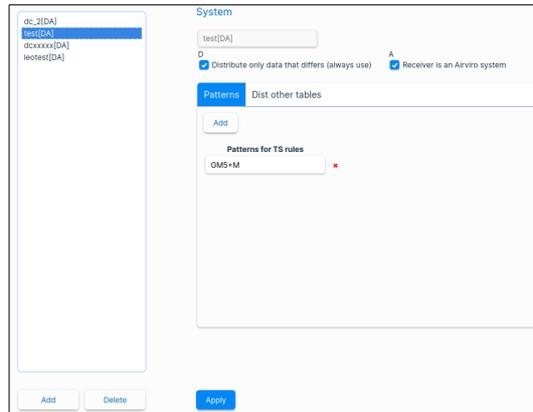


Figure 6.6.4. Distribution Systems. Patterns

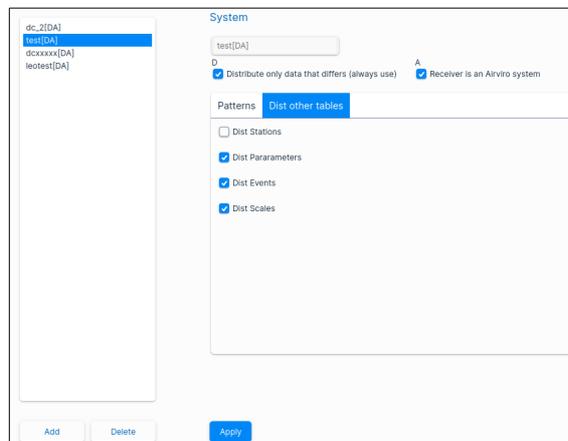


Figure 6.6.5. Distribution Systems. Dist other tables.

Airviro can distribute data to one or more systems. These are shown in the leftmost list. Each system can have one or more distribution rules defined. These rules are listed in the **Patterns** list.

To decide which time series should be saved in distribution files a system based rule is used. Press **[Add]** to define the rule. Select the station, time resolution and types. The rule will be defined. For example: a rule that is GM5+? would save all data from the station GM5 with time resolution + (hourly) with any type. A rule that is ???+M would save all normal hourly data in the distribution file. A ? means any character.

Airviro can distribute data to other tables. There are: stations, parameters events and scales. Tick on them in **Dist other tables**.

### 6.6.1.5 PPQC (Post Processor Quality Control)

This interface allows the user to set up rules for selecting time series in order to change the status according to user defined functions. Time series that enters the time series database and matches any of the PPQC rules, will be marked for post processing.

The post processing uses the user defined functions for the matching rule in order to change the status of the time series data. Depending on the function, the status is changed to either 8 (PPQC bad), 13 (PPQC suspect) or 14 (Checked OK).

Select the menu **PPQC under Management** to define rules (*Figure 6.6.5*).

#### Input

Select the times series for which the rule will apply. Press the **[Add]** button to add time series for the rule. Select Station, time resolution, types, parameters and instance as shown in *Figure 6.6.5*.

Tick the “**Any stn key**”, if the time series should be a general one and apply to all stations with the selected time resolution, parameter type, parameter and instance.

If more than one time series is specified, it is enough that one of the time series is applicable for the rule to be executed.

The rules in the list are tested in top / down order. When one rule is applicable the rest of the rules are skipped. The order can be changed using the **Order** button.

The screenshot shows the 'Rule' configuration window for a rule named 'Rain'. On the left, a list of input time series is shown, with 'PM10 vs PM2.5' selected. On the right, the configuration details are shown. The 'Name' is 'Rain' and the 'Id' is 'rain'. The 'Input' tab is active, showing a table of input time series. The table has three columns: 'Var', 'TS selected', and 'Any stn key'. Two rows are shown: 'x1' with '+MRINTB1' and 'x2' with '+MRINTB2'. Both rows have 'TS selected' checked and 'Any stn key' marked with a red 'x'. The 'Times res' is set to '1 hour'. At the bottom, there are buttons for 'Add', 'Delete', 'Order', and 'Apply'.

Figure 6.6.5 PPQC input.

## Output

The main functionality is to change the status of the input time series, if **Enable** is ticked.

For each time series two functions can be defined for changing the status to either 8 (PPQC Bad), 13 (PPQC Suspect) or 14 (Checked OK).

The input time series are referenced as x1, x2, ... xn.

If the first formula exists and it evaluates to **true** the status will be set to 8. Otherwise, if the second formula exists and it evaluates to **true** the status will be set to 13. If both formulas evaluates to **false**, the status is set to 14. If enabled, at least one formula must be specified. If one of the input time series doesn't have any value, the formulas can't be evaluated and the status will be set to the status selected in the **Missing** list, for the time series that has a value.

In the case that one or more input time series is general (any station), the status can only be changed for the general time series. If none of the input time series is general, the status can be changed for all time series as well.

The functions are created using the same formulas as those available in Indico

Presentation (arithmetic functions, relational functions and logical functions). The formula should evaluate to either **true** or **false**. Press the [...] button to expand the input box in order to write long formulas.

Click on **[Apply]** to save the rule.

Figure 6.6.6 Example PPQC output.

### 6.6.1.6 PPTS ( Post Processor Time Series)

In PPTS new time series can be created using one or more time series combined with formulas. Time series that enters the time series database and matches any of the PPTS rules, will be marked for post processing.

The post processing uses the user defined functions for the matching rule in order to calculate a new time series.

Select the menu **PPTS** under **Management** (Figure 6.6.7). These windows are similar to those explained for PPQC.

Figure 6.6.7. PPTS

## Input

Select the times series for which the rule will apply. Press the **[Add]** button to add time series for the rule. Select Station, time resolution, types, parameters and instance as shown in *Figure 6.6.5*.

Tick the “**Any stn key**”, if the time series should be a general one and apply to all stations with the selected time resolution, parameter type, parameter and instance.

If more than one time series is specified, it is enough that one of the time series is applicable for the rule to be executed.

The rules in the list are tested in top / down order. When one rule is applicable the rest of the rules are skipped. The order can be changed using the **Order** button.

## Output

The main functionality is to calculate derived time series using the input time series.

For each derived time series a function is defined in order to calculate the value of the new time series.

The input time series are referenced as x1, x2, ... xn.

To define a time series key for a derived time series, press the **[Add]** button. Select the station, parameter type and parameter. Enter the three letters for the instance. If one of the input time series is general, i.e. has the **Any stn key** selected, it is not possible to specify the output station. The output station will be set to the same as the input station.

In the case that one or more input time series is general (any station), the status can only be changed for the general time series. If none of the input time series is general, the status can be changed for all time series as well.

The functions are created using the same formulas as those available in Indico Presentation (arithmetic functions, relational functions and logical functions). The formula should evaluate to the new value. Press the [...] button to expand the input box in order to write long formulas.

Click on **[Apply]** to save the rule.

The screenshot shows the 'Rule' configuration interface. On the left, a list of time series includes 'Temp Average', 'NO2 diff calculation', and 'RelHum limitation' (which is selected). The main area is titled 'Rule' and contains the following fields:

- Name: RelHum limitation
- Id: rhum
- Type: Expression
- All required:

Below these fields, there are tabs for 'Input' and 'Output'. The 'Output' tab is active. An 'Add' button is located above a table. The table has three columns: 'TS selected', 'Unit', and 'Expression'. The first row contains the following data:

TS selected	Unit	Expression
SSS+MRHUM000	%	(x1 > 100) ? 100 : x1

At the bottom of the interface, there are buttons for 'Add', 'Delete', 'Order', and 'Apply'.

Figure 6.6.8 Example Output PPTS.

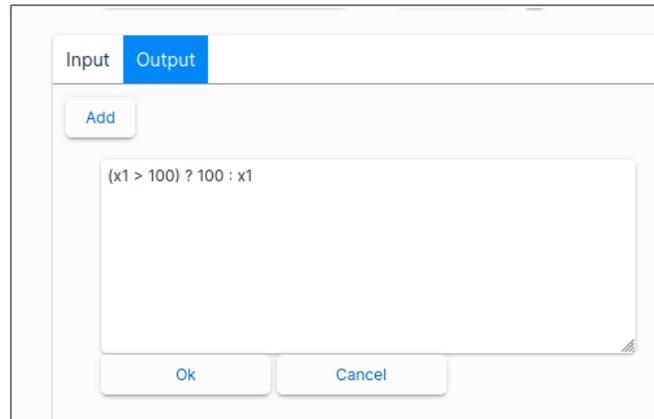


Figure 6.6.9. Example Output\_Mathematical expressions.

## 6.7 Events

These events can be used in Indico Validation. They are used to record events that occurred in a station or a time series as well as to add comments to the validated time series.

### 6.7.1 Type

You can define different Event Types. For example:

- Events for a station such as when someone visited the station or a power outage occurred.
- Comments for a time series, for example, when data is deleted or modified.
- Event messages coming from the data collection process.

For each type, you must define a name, a unique key of 4 alphanumeric characters. an icon type and a source (time series or station). Event Types can then be selected in Indico Validation.

Also, different colours can be assigned to different event types.

Figure 6.7.1. Event Type. CommentsStn.

## 6.7.2 Icon

You can enter an icon (upload an image file) and associate it to an event type.

## 6.7.3 Edit

Here you define Events for each event type. You can filter and select events from the list to edit, delete, or copy when adding new ones. Filter options are: period ( from/to), event type , station and parameter. Use **[Add]** to add events and **[Delete]** Delete bottom to delete a event from the list. *Figure 6.7.2 .*

Figure 6.7.2 Edit.