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Remote Interface Control Center (RICC)

User Handbook

Synopsis	Describes how to install and run the RICC program.
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1 Introduction to the RICC

The *Remote Interface Control Center* (*RICC*) provides operators with a comfortable supervisory interface through which they can easily control the output of their plant portfolio in real time and apply output capping.

It connects to one or more skycontrol power plant regulation systems either using an on-site, secure LAN, or using a virtual-private-network (VPN) internet connection. The system requires the Remote Interface communication extension (skycontrolRI) to be fitted to the existing skycontrol system.

The *RICC* allows an operator to configure setpoint parameters for the plants being supervised. The setpoints can be based on any one of several control mechanisms, such as:

- Active power
- Reactive power
- Phase angle
- The use of pre-defined curves

In addition, an *Active Power Ramp* setting ensures smooth adjustment of the plant output to changes in the active power setpoint.

RICC is a Java™-based program and may be installed on Windows, OSX or Linux platforms. Up to 10 individual *RICC* programs may connect to a single skycontrol system, allowing the plants' current operational state to visible to all stakeholders; the functionality available may be password protected, so that users can only perform the actions permitted.

This document describes the operation of the RICC program in detail.

2 Installation

2.1 Before you start

Before installing RICC you need to:

- Check your computer's configuration
- Ensure you have the correct software environment installed.

These requirements are described in the following sections.

2.2 System Requirements

Operating system

RICC runs on Microsoft Windows™, Apple OS X™ and Linux.

Java™ must be installed on the PC. The most recent version of Java (1.7) is required; the least update should be installed, and the Java version should be kept up to date.

Processor

At least a dual-core processor

Memory

RAM: Minimum 2 GB

Disk: Minimum 200 MB of free disk space

Video

Recommended resolution: 1920x1080 pixels

2.3 Installing the program

Obtaining the Program

The program can be obtained by downloading it from the *RICC program download area*. Different versions are available for different language versions and operating systems.

Run the installation program

Double click on the downloaded installation file (you may need administrator rights to your computer for the installation to run).

A simple wizard will run (in English). Follow the instructions on the wizard. As part of the installation you will be required to accept the license terms (these may include terms for standard open-source components used as part of the program). Tick the **Acceptance** check box and click on **Next >**.

Note: The language of the program can be changed later from within the program itself.

Deinstallation

To remove the program, open the **Programs** folder in the Windows control panel. Select the Program Deinstallation option. A list of all installed programs will be displayed; right click on the *Remote Interface Control Center* entry, and select **Deinstall** from the context menu.

A wizard will start to guide you through the deinstallation. Note that as part of this process you will be asked whether you wish to remove the local *RICC Settings*. The default is for these to remain. If you tick the option to remove the settings, this will remove all connection information and their associated passwords from your PC; you will have to re-enter this information if you choose to re-install the RICC on your computer again.

2.4 Running the program

Running the program for the first time

When you start the program for the first time you will have to set up a first connection. You will need the *IP Address* and *Port Number* of the skycontrol system concerned. You should get this information from the technical service engineer who configured the internet link to the plant.

Details about setting up a connection are given in *Creating a new connection* on page 40.

Once the connection information has been entered and a connection established, the main program user interface will appear. See *The Main Program Window* on page 8

Note: If the RICC is not on the same Local Area Network as the control system, a pre-configured VPN connection will be required. You should consult the technical service engineers who configured the network or your local IT network administrator.

Program updates

Updates to the program will be published by skytron from time to time. If the program is connected to the Internet, these will be detected automatically by the program when it starts, and you will be prompted to upgrade it. See *Automatic Updates to the Program* on page 46.

If you leave the program running for a period of time, so that the automatic detection does not run, then you can use the menu function **Tools** > **Check for Updates** to explicitly run the update detection.

If you do not have a connection to the Internet, skytron will provide updates on CD. Instructions for installing updates are given in *Manually Updating the Program* on page 46.

3 Using the Program

3.1 The Main Program Window

After you start the program and have configured at least one connection, the main program window will open, as shown below.

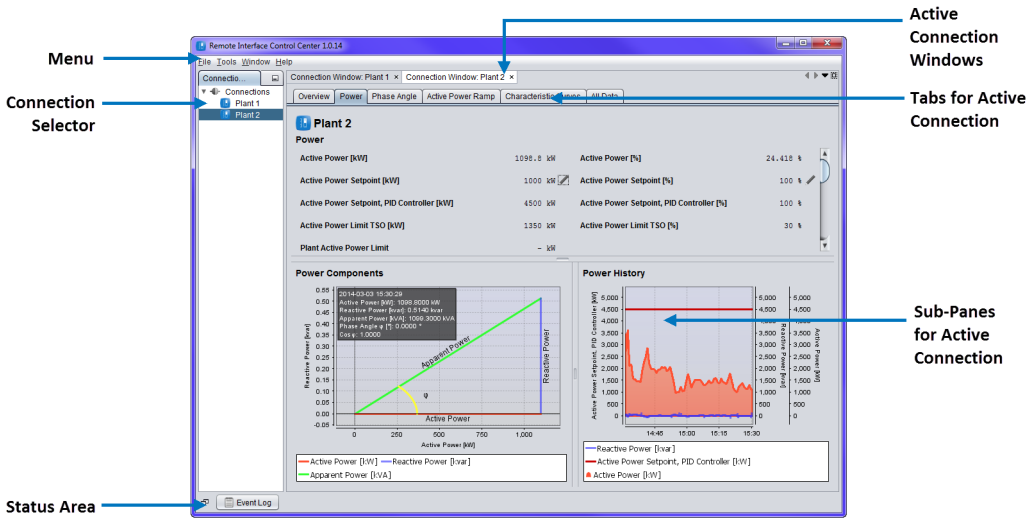

Fig 1: The RICC main window

The program display is divided into the following areas:

Area	Description
Menu	The menu functions are detailed in *The Program Menu* on page 10.
Active Connections Window	This is the main working area of the program. There is an open tab in this area for every connection you have opened. Each of these contains several sub-tabs. The tabs are described in *The Plant Control Tabs* on page 11.
Connections Window	This opens to the left of the *Active Connections Window*, which lists all the known connections and allows you to open a connection to any of them. Double clicking any of the entries will open it - see *Active Connections Window*.
Event Log	The *Event Log* is not opened on start-up, but can be opened by the menu option **Window** > **Event Log**.
Status Area	There is a status area at the bottom of the program display. This shows, for example, any minimised windows, and may display messages and icons in the event of a communications failure or an update.

Defining Setpoints

For a step-by step guide to defining setpoints in the RICC, see: *Defining a Setpoint* on page 37

3.2 Window Operations

The main program window has an extensive range of possibilities for adjusting the size and placement of the individual window components. The default window arrangement provides you with a working framework. However, if you wish to optimise the arrangement to better meet the needs of your situation, you may wish to experiment with some of the options described here.

Note: The default window arrangement may always be restored using the function: **Window** > **Reset Windows**

Resizing window sections

The borders between the individual sections of the windows may be resized by moving the cursor over the border, clicking an then dragging it. If this is available, the mouse cursor will change to the border-resizing mode, shown below.

Fig 2: Resizing borders

Maximising and minimising sub-windows

The sub-windows all have controls at the top right corner that allow you to maximise, minimise or restore that sub-window.

Using context menus

If you right-click over the tab headers at the top of the sub-windows, a context menu will appear. The options available will depend on the current arrangement of the sub-windows and tabs.

From the main menu

The **Window** > **Configure Window** function allows you to adjust the sub-window that is currently selected.

Menu functions

The menu functions, either in the main menu or in a sub-window context menu may include the following entries:

Close	Close that sub-window.
Maximize	The sub-window will expand to take all of the display.
Float	Open that sub-window as a completely separate operating-system window. For example, you could float the sub-windows for every plant being controlled by your computer in separate windows, possibly on separate monitors.
Dock	This returns a floating window back to the main program window.
Shift	Changes the order of the tabs within a sub-window.

New Tab Group	The *Active Connections Window* contains a separate sub-tab for each open connection. This function splits these into individual sub-windows.

Note: Closing any sub-window containing an active connection will cause that connection to be closed.

3.3 The Program Menu

The program menu has the following entries:

File

New Remote Interface Connection	Create a connection to a new plant
Exit	Exits the program. You will be prompted to close each active connection.

Tools

Install Updates from File	Allows you to update the program from a file or CD.
Check for Updates	Runs the process to update the program if updates are available.
Plugins	Opens a dialog that allows you to update the program.
Options	Opens a dialog for changing the program settings and look and feel.

Window

Connections	Opens the *Connections Window* if it has been closed.
Event Log	Opens the *Event Log* in a sub-window
Configure Window	Allows you to change the size and placement of the sub-windows.
Reset Windows	Returns the windows their default arrangement.
Close Window	Closes the selected window and the associated connection.

Help

About	Provides information about the program version.

4 The Plant Control Tabs

For each connection you open in the RICC, a separate window will open in the *Active Connections Window*. Each of these windows will contain a number of tabs, depending on the control application you are connected to. These may include:

Overview	Provides an overall summary of system output, together with status and any error messages.
Power	Displays and allows control of the active and reactive power components.
Phase Angle	Displays and allows control of the reactive power components by means of the phase angle.
Active Power Ramp	Controls how quickly the output power may change following an adjustment to the output setpoint.
Characteristic Curves	Allows you to choose one of a number of characteristic curves that define how the reactive power should be controlled.
All Data	Gives a detailed list of all controls and settings.

The individual tabs are detailed in the next sections.

Note: The actual tabs that appear, and the exact fields that appear on these tabs, depend on the configuration of the plant being controlled. For example, some inverters do not allow control of the reactive power component using Cos ϕ. A compatibility list is provided at: *skytron Inverter Compatibility List*.

4.1 Overview Tab

The **Overview** tab lists key messages from the system. It is divided into three separate panes: a *Plant Summary* pane at the top, and separate *Status Message* and *Error Message* panes at the bottom.

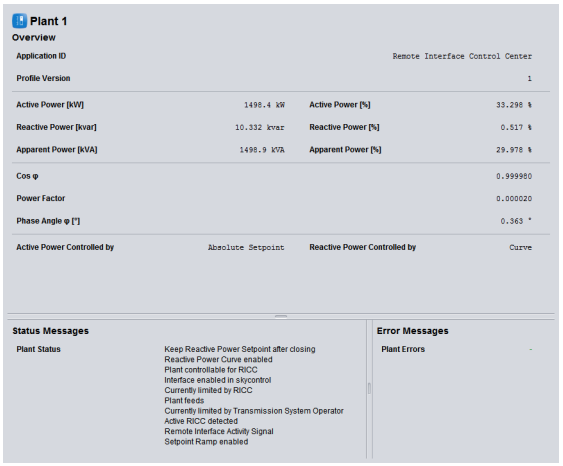

Fig 3: The Overview tab

Plant Summary

At the top of the *Plant Summary* come two entries: *Application Id*, the name of the running program running. (*Remote Interface Control Center*; and the *Profile Version*, which defines the data and features provided by the skycontrol Remote Interface.

In the next section, the *Active Power*, *Reactive Power* and *Apparent Power* components of the corresponding plant's actual output are displayed, with percentile figures to show how close the plant is running to its rated output.

Next, key details are given concerning the reactive power components of the output: *Cos φ*, the *Power Factor* and the *Phase Angle φ*.

Finally, the mechanisms currently in use for active and reactive power control are shown.

Status Messages

The *Status Messages* pane shows a list of messages concerning the current status of the program and plant controller. A full list of the possible items and their current status are listed in the *Plant Status* section of the **All Data** tab. See *Plant Status* on page 26.

Error Messages

The *Error Messages* pane lists any relevant errors that have been logged by the plant or the RICC program. A full list of the possible errors and their current status are listed in the *Plant Errors* section of the **All Data** tab. See *Plant Errors* on page 28

4.2 Power Tab

The **Power** tab provides you with an at-a-glance picture of the power output at the plants being monitored.

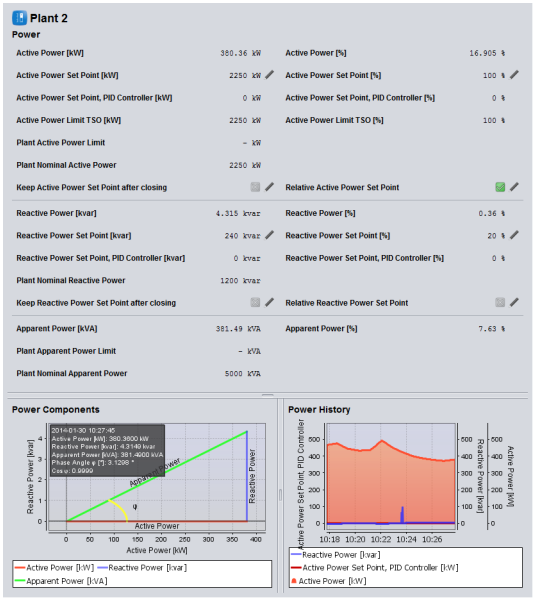

Fig 4: The Power tab

Power Data

The table at the top of the tab displays output values and set points for the active and reactive power components and for the resulting apparent power. The individual fields are listed in the following sections:

1. *Active Power Fields* on page 15
2. *Reactive Power Fields* on page 16
3. *Apparent Power Fields* on page 17

The controls marked by a *pencil* allow you to adjust the corresponding setpoints:

- The *active power*
- The *reactive power*

Either can be set as an absolute value or as a percentage relative to the plant's nominal output.

Note: For the relative, percentage setting to take effect, the corresponding *Enable* control must be explicitly set on.

In addition, you can set whether these values are only in operation whilst the RICC program is running, or whether you wish the values to be retained one the program has been closed.

Chart: Power Components

The *Power Components* chart gives a pictorial representation of the active and reactive components of the output at the current time. An overlay panel shows the actual data. The axes of the chart will adjust to suit the direction and magnitude of the output.

Note: Note that the reactive power axis may 'flip' from time to time.

If you move the mouse across the chart, an overlay panel will show the actual output figures at that time.

Chart: Power History

The *Power History* allows you to see the trend of the plant's output (both active and reactive) over approximately the last hour.

Actions in Charts

A context menu is available if you right-click the mouse over the chart. This is described in *Chart Context Menus* on page 44 In addition, you can easily zoom in or out of the chart using the mouse as described in *Easy Zooming within Charts* on page 44.

Defining Setpoints

For a step-by step guide to defining the output power setpoints, see:

- *Defining an active power setpoint* on page 37
- *Defining a reactive power setpoint* on page 38

Defining Setpoints

For a step-by step guide to defining the output power setpoints, see:

- *Defining an active power setpoint* on page 37
- *Defining a reactive power setpoint* on page 38

4.2.1 Active Power Fields

Field	Description	Note
Active Power [kW]	The instantaneous active component of the output power.	
Active Power [%]	The instantaneous active power component as a percentage of the plant's nominal active power.	
Active Power Setpoint [kW]	The absolute active power limit that has been set in the RICC.	*1*
Active Power Setpoint [%]	A percentage-based active power limit that has been set in the RICC.	*1*, *2*
Active Power Setpoint, PID Controller [kW]	The active power setpoint value that the controller is currently using.	
Active Power Setpoint, PID Controller [%]	The active power setpoint percentage that the controller is currently using.	
Active Power Limit TSO [kW]	The active power limit being enforced by the transmission system operator.	
Active Power Limit TSO [%]	The active power limit being enforced by the transmission system operator as a percentage of the plant's nominal active power.	
Plant Active Power Limit	The actual limit being enforced at the current time, if any. This depends on the actual output of the plant and the different setpoint settings that have been configured, either through the RICC or by the transmission system operator.	
Plant Nominal Active Power	The plant's nominal (or *rated*) active power output capability.	
Keep Active Power Setpoint after closing	Controls whether the RICC's active power setpoint should still be applied after the RICC program has been closed.	*1*
Relative Active Power Setpoint	This control switches the setpoint being used from the actual value in kW to the relative value in %. Otherwise the relative value setpoint is ignored.	*1*, *2*, *2*

Notes:

1. Click the heading or pencil to change the setting
2. The *Active Power Setpoint [%]* setting will be ignored unless the *Relative Active Power Setpoint* control has been enabled. In this case it overrides any entry in the *Active Power Setpoint [kW]* field.
3. Note that, for example, updating the RICC program will cause the connection to be closed, and the corresponding plant setting will therefore revert to that active in the controller.

4.2.2 Reactive Power Fields

Field	Description	Note
Reactive Power [kvar]	The instantaneous reactive component of the output power.	
Reactive Power [%]	The instantaneous reactive power component as a percentage of the plant's nominal reactive power	
Reactive Power Setpoint [kvar]	The absolute reactive power limit that has been set in the RICC.	*1*
Reactive Power Setpoint [%]	A percentage-based reactive power limit that has been set in the RICC.	*1*, *2*
Reactive Power Setpoint, PID Controller [kvar]	The reactive power setpoint value that the controller is currently using.	
Reactive Power Setpoint, PID Controller [%]	The active power setpoint percentage that the controller is currently using.	
Plant Nominal Reactive Power	The plant's nominal (or *rated*) reactive power output capability.	
Keep Reactive Power Setpoint after closing	Controls whether the RICC's reactive power setpoint should still be applied after the RICC program has been closed.	*1*
Relative Reactive Power Setpoint	This control switches the set point for reactive power being used from the actual value in kW to the relative value in %. Otherwise the relative value setpoint is ignored.	*1*, *2*, *3*

Notes:

1. Click the heading or pencil to change the setting
2. The *Reactive Power Setpoint [%]* setting will be ignored unless the *Relative Reactive Power Setpoint* control has been enabled. In this case it overrides any entry in the *Reactive Power Setpoint [kvar]* field.
3. Note that, for example, updating the RICC program will cause the connection to be closed, and the corresponding plant setting will therefore revert to that active in the controller.

4.2.3 Apparent Power Fields

The fields are listed below:

Field	Description	Note
Apparent Power [kVA]	The plant's apparent output power.	
Apparent Power [%]	The plant's apparent output as a percentage of its nominal value.	
Plant Apparent Power Limit	The actual limit of the apparent power being enforced at the current time, if any. This depends on the different setpoint settings that have been configured, either through the RICC or in the control system or by the transmission system operator.	
Plant Nominal Apparent Power	The plant's nominal (or *rated*) apparent power output capability.	

4.3 Phase Angle Tab

The **Phase Angle** tab provides you with an at-a-glance picture of the reactive power phase angle at the plants being controlled.

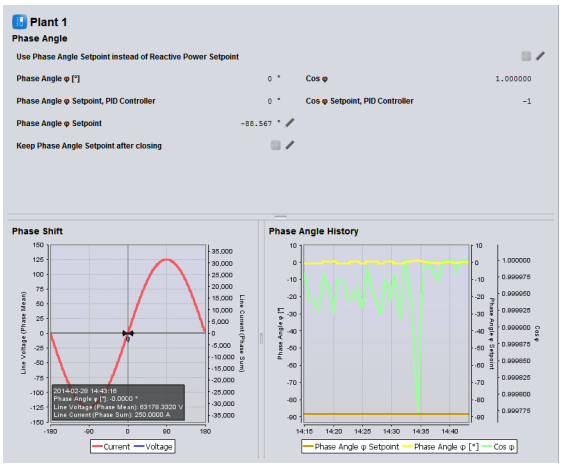

Fig 5: The Phase Angle tab

The table at the top of the tab displays phase angle values and set points for the plant. The individual fields are listed in *Phase Angle Fields* on page 19.

Clicking the control marked with a *pencil* by a *setpoint* entry will cause a dialog to pop up in which you can change the target parameter.

Note: The *Phase Angle Setpoint* is ignored unless the lower control Use Phase Angle Setpoint instead of Reactive Power Setpoint has been enabled.

Phase Shift Chart

The *Phase Shift* chart gives a pictorial representation of the phase angle of both voltage and current at the present time. An overlay panel shows the actual values.

Phase Angle History Chart

The *Power History* allows you to see the trend of the plant's output (both active and reactive) over approximately the past hour.

Actions in Charts

A context menu is available if you right-click the mouse over the chart. This is described in *Chart Context Menus* on page 44 In addition, you can easily zoom in or out of the chart using the mouse as described in *Easy Zooming within Charts* on page 44.

Defining Setpoints

For a step-by step guide to defining the phase angle setpoints, see: *Defining a reactive power setpoint based on phase angle* on page 38.

4.3.1 Phase Angle Fields

The fields are:

Field	Description	Note
Use Phase Angle Setpoint instead of Reactive Power Setpoint	By default, the reactive power setpoint is taken from the absolute value of the reactive power. If you enable this setting, the phase angle will be used as the setpoint instead.	*1*
Phase Angle ϕ [°]	The actual value of the phase angle in degrees.	
Cos ϕ	The actual value of Cos ϕ.	
Phase Angle ϕ Setpoint, PID Controller	The phase angle setpoint that the controller is currently using.	
Cos ϕ Setpoint, PID Controller	The Cos ϕ setpoint that the controller is currently using.	
Phase Angle ϕ Setpoint	Allows you to adjust the setpoint for the reactive power output by means of the phase angle. Clicking on the *pencil* will open a dialog where you can enter the desired setpoint, either in degrees, or as a value of Cos ϕ.	*1*
Keep Phase Angle Setpoint after closing	Controls whether the RICC's phase angle setpoint should still be applied after the program has been closed.	*1*, *2*

Notes:

1. Click the heading or pencil to change the setting
2. Note that, for example, updating the RICC program will cause the connection to be closed, and the corresponding plant setting will therefore revert to that active in the controller.

4.4 Active Power Ramp Tab

The **Active Power Ramp** tab allows you to define the maximum rate of change of the output power following a change in the setpoint.

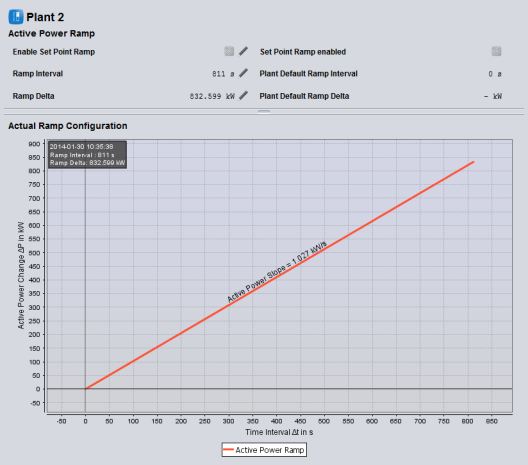

Fig 6: The Active Power Ramp tab

Power Ramp Data

The table at the top of the tab displays details for defining the power ramp setpoint. The controls marked by a *pencil* may be set: the *interval* and *delta* defining the maximum rate of change, and whether the ramp setpoint is enabled.

The individual fields are listed in *Power Ramp Fields* on page 21.

Actual Ramp Configuration

The chart at the bottom of the display gives a pictorial representation of the slope defined by the configured settings.

Actions in Charts

A context menu is available if you right-click the mouse over the chart. This is described in *Chart Context Menus* on page 44 In addition, you can easily zoom in or out of the chart using the mouse as described in *Easy Zooming within Charts* on page 44.

Defining Setpoints

For a step-by step guide to defining the power ramp setpoints, see: *Defining a ramp setpoint for the active power* on page 38.

4.4.1 Power Ramp Fields

The fields are:

Field	Description	Note
Enable Setpoint Ramp	This control allows you to make the Ramp setpoint active.	*1*
Setpoint Ramp enabled	Shows whether the Ramp setpoint is enabled in the controller. In this case, either the Plant Default values will be used or, if the **Enable Setpoint Ramp** control has been enabled, the value will be set from the RICC.	
Ramp Interval	The **Ramp Interval** and the **Ramp Delta** are used as a convenient mechanism for defining the maximum *rate of change* in the plant output following a change in the setpoint. This is to avoid sudden transients in the grid; the maximum allowable rate will normally be defined by the grid organisation. The **Ramp Delta** sets the maximum allowed change in output over the period defined by the **Ramp Interval** value.	*1*
Plant Default Ramp Interval	Similar to **Ramp Interval**, this is the default maximum rate of change of output set in the plant controller; i.e. the value that will be used if not overridden by the RICC.	
Ramp Delta	The **Ramp Interval** and the **Ramp Delta** are used as a convenient mechanism for defining the maximum *rate of change* in the plant output following a change in the setpoint. This is to avoid sudden transients in the grid; the maximum allowable rate will normally be defined by the grid organisation. The **Ramp Delta** sets the maximum allowed change in output over the period defined by the **Ramp Interval** value.	*1*
Plant Default Ramp Delta	Similar to **Ramp Delta**, this is used to define the plant controller's default maximum rate of change of output; i.e. the value that will be used if not overridden by the RICC.	

Notes:

1. Click the heading or pencil to change the setting

4.5 Characteristic Curves Tab

The **Characteristic Curves** tab allows you to define the maximum rate of change of the output power following a change in the setpoint.

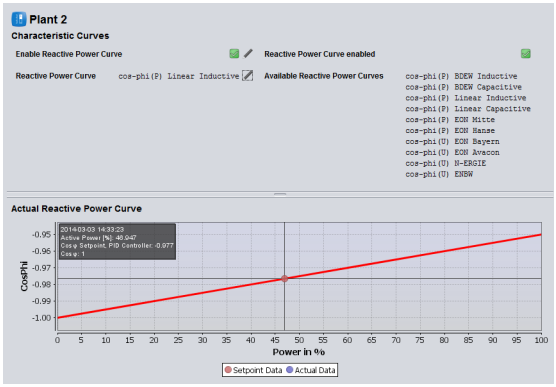

Fig 7: Characteristic Curves tab

Characteristic Curves Data

The table at the top of the tab displays details about the curves settings. It allows you to enable or disable this control mechanism, and to select the curve to be used. It also shows a list of the curves available in the controller for the plant. The controls marked by a *pencil* may be set: the *Reactive Power Curve* defines the one in use, and whether use of a curve-based setpoint is enabled.

The individual fields are listed in *Characteristic Curve Fields* on page 23.

Actual Reactive Power Curve

The chart at the bottom of the display gives a pictorial representation of curve that has been selected for control of the reactive power. The lines show the shape of the curve. The red and blue dots show the setpoint for the plant under it's actual operating conditions; note that ideally they will overlay one another. The actual operating point is also shown by the intersection point of the x and Y axis cross-hairs.

Clicking on the pencil by the **Reactive Power Curve** will open a dialog box where you can change the curve being used. The shape of the curves are previewed in the dialog. The available curves will depend on the country and region in which the plant is operating. A selection of some of the curves available in Germany are illustrated below.

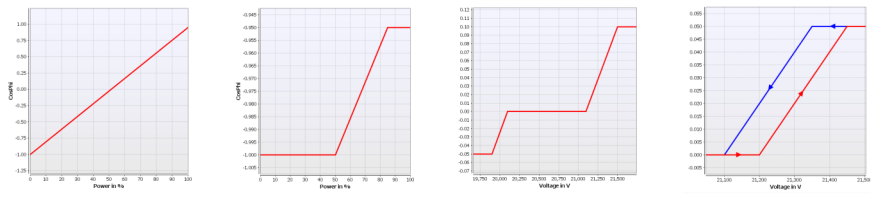

Fig 8: Selection of the available curves (Germany)

Defining Setpoints

For a step-by step guide to defining the curve-based setpoints, see: *Defining a reactive power setpoint based on a curve* on page 39.

4.5.1 Characteristic Curve Fields

The fields are:

Field	Description	Note
Enable Reactive Power Curve	This control allows you to turn on the reactive power setpoint control based on the selected curve.	*1*
Reactive Power Curve enabled	Shows whether the controller is using the curve-based control for the reactive power.	
Reactive Power Curve	This control shows which of the possible curves is currently selected. Clicking on the pencil will open a dialog showing the shape of the curve, and allow you to change it to another curve.	*2*
Available Reactive Power Curves	Shows you a list of all possible curves that have been configured in your controller (the list will vary depending on region and country).	

Notes:

1. Click the heading or pencil to change the setting
2. Clicking on the pencil will bring up a dialog which shows the form of the selected curve, together with a pop-down list allowing the curve to be changed. Selecting any of the other curves will allow the form of that curve to be seen before it is selected.

4.6 All Data Tab

The **All Data** tab summarises the current values of all data and settings from the other tabs.

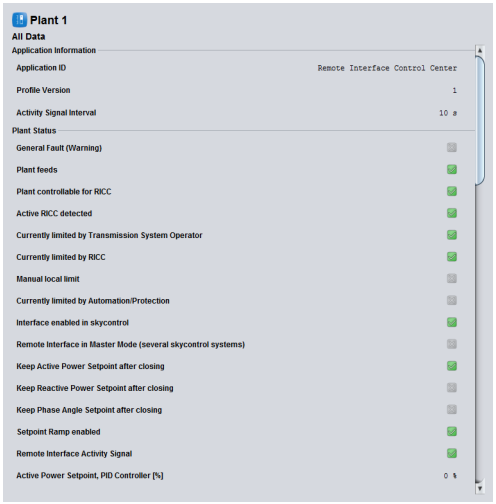

Fig 9: The All Data tab

The display is broken into the following sections:

1. *Application Information* on page 25
2. *Plant Status* on page 26
3. *Plant Errors* on page 28
4. *Transmission System Operator (TSO) Settings* on page 29
5. *Control Settings* on page 30
6. *Control Parameters* on page 31
7. *Plant Parameter Fields* on page 32
8. *Actual Output Fields* on page 33
9. *Available Characteristics* on page 34

4.6.1 Application Information

The fields are listed below:

Field	Description	Note
Application Id	The name of the corresponding application that the RICC program is communicating with on the skycontrol system.	
Profile Version	Shows which variant of the program is running.	

4.6.2 Plant Status

The fields are listed below:

Field	Description	Note
General Fault (Warning)	Will be set if any of the errors in the *Plant Error* section occurs.	
Plant Feeds	Indicates that the plants are currently feeding the grid. Is the opposite of the *Plant Shutdown* error field.	
Plant controllable for RICC	Indicates that the plant controller can accept RICC commands.	
Active RICC detected	Indicates that the plant controller has identified a version of the RICC program. (Note however that more than one RICC program may communicate with any controller, though this is not recommended.)	
Currently limited by Transmission System Operator	The output is currently being capped at the level set by the transmission system operator.	
Currently limited by RICC	The output is currently being capped at the level set in the RICC program.	
Manual local limit	The output is currently being capped at a level set manually in the plant controller.	
Currently limited by Automation/Protection	The plant's output is being limited because of an automatic plant protection mechanism running in the controller	
Interface enabled in skycontrol	This status field should always be set.	
Interface in Master Mode	Where a plant is controlled by a number of interconnected skycontrol systems, one of them will act as a *Master*. This setting shows such an arrangement is active. Otherwise the RICC program is only communicating with a single skycontrol system.	
Keep Active Power Setpoint after closing	Controls whether the RICC's active power setpoint should still be applied after the RICC program has been closed.	
Keep Reactive Power Setpoint after closing	Controls whether the RICC's reactive power setpoint should still be applied after the RICC program has been closed.	
Keep Phase Angle Setpoint after closing	Controls whether the RICC's phase angle setpoint should still be applied after the program has been closed.	
Setpoint Ramp enabled	Shows whether the Ramp setpoint is enabled in the controller. In this case, either the Plant Default values will be used or, if the **Enable Setpoint Ramp** control has been enabled, the value will be set from the RICC.	
Reactive Power Curve enabled	Shows whether the controller is using the curve-based control for the reactive power.	
Remote Interface Activity Signal	This setting will toggle between *Enabled* and *Disabled* every few seconds to indicate to the RICC that the plant control system is functioning.	

Field	Description	Note
Active Power Setpoint, PID Controller [%]	The active power setpoint percentage that the controller is currently using.	
Active Power Setpoint, PID Controller [kW]	The active power setpoint value that the controller is currently using.	
Reactive Power Setpoint, PID Controller [%]	The active power setpoint percentage that the controller is currently using.	
Reactive Power Setpoint, PID Controller [kvar]	The reactive power setpoint value that the controller is currently using.	
Phase Angle ϕ Setpoint, PID Controller	The phase angle setpoint that the controller is currently using.	
Cos ϕ Setpoint, PID Controller	The Cos ϕ setpoint that the controller is currently using.	
Active Power Controlled by	Shows which type of setpoint is being used to control the active power. Options include: *No Selection*, *Absolute Setpoint*, *Relative Setpoint*.	
Reactive Power Controlled by	Shows which type of setpoint is being used to control the reactive power. Options include: *No Selection*, *Absolute Setpoint*, *Relative Setpoint*, *Phase Angle*, *Curve*, *External Source*.	

4.6.3 Plant Errors

The fields are listed below:

Field	Description	Note
Remote Site Inactive	Indicates that the controller has not detected a toggling RICC *Activity Signal*.	
Invalid Active Power Setpoint	Somehow an invalid setpoint value has been set in the controller. This should not occur and indicates a serious problem in the controller, RICC or other control program attached to the controller.	
Invalid Reactive Power Setpoint	Somehow an invalid setpoint value has been set in the controller. This should not occur and indicates a serious problem in the controller, RICC or other control program attached to the controller.	
Invalid Phase Angle Setpoint	Somehow an invalid setpoint value has been set in the controller. This should not occur and indicates a serious problem in the controller, RICC or other control program attached to the controller.	
Plant shut down	The plant feed to the grid has been shut down.	
Slave unreachable	Indicates that the RICC program was not able to establish a connection to the slave communication interface running in the controller.	
Invalid Ramp Interval	Somehow an invalid setpoint value has been set in the controller. This should not occur and indicates a serious problem in the controller, RICC or other control program attached to the controller.	
Invalid Ramp Delta	Somehow an invalid setpoint value has been set in the controller. This should not occur and indicates a serious problem in the controller, RICC or other control program attached to the controller.	
Reactive Power Curve Configuration invalid	Somehow an invalid curve has been configured in the controller. This should not occur and indicates a serious problem in the controller, RICC or other control program attached to the controller.	

4.6.4 Transmission System Operator (TSO) Settings

The fields are listed below:

Field	Description	Note
Active Power Limit TSO [%]	The active power limit being enforced by the transmission system operator as a percentage of the plant's nominal active power.	
Active Power Limit TSO [kW]	The active power limit being enforced by the transmission system operator.	

4.6.5 Control Settings

The fields are listed below:

Field	Description	Note
Remote Control enabled	Shows whether the controller may be operated by the RICC. Should always be shown as enabled.	
Keep Active Power Setpoint after closing	Controls whether the RICC's active power setpoint should still be applied after the RICC program has been closed.	*4*
Keep Reactive Power Setpoint after closing	Controls whether the RICC's reactive power setpoint should still be applied after the RICC program has been closed.	*4*
Keep Phase Angle Setpoint after closing	Controls whether the RICC's phase angle setpoint should still be applied after the program has been closed.	*4*
Enable Setpoint Ramp	This control allows you to make the Ramp setpoint active.	
Activity Signal	This setting will toggle between *Enabled* and *Disabled* every few seconds to indicate to the plant control system that the RICC is functioning.**Correct?**	
Relative Active Power Setpoint	This control switches the setpoint being used from the actual value in kW to the relative value in %. Otherwise the relative value setpoint is ignored.	*1*, *2*
Relative Reactive Power Setpoint	This control switches the set point for reactive power being used from the actual value in kW to the relative value in %. Otherwise the relative value setpoint is ignored.	*1*, *3*
Use Phase Angle Setpoint instead of Reactive Power Setpoint	By default, the reactive power setpoint is taken from the absolute value of the reactive power. If you enable this setting, the phase angle will be used as the setpoint instead.	

Notes:

1. Click the heading or pencil to change the setting
2. The *Active Power Setpoint [%]* setting will be ignored unless the *Relative Active Power Setpoint* control has been enabled. In this case it overrides any entry in the *Active Power Setpoint [kW]* field.
3. The *Reactive Power Setpoint [%]* setting will be ignored unless the *Relative Reactive Power Setpoint* control has been enabled. In this case it overrides any entry in the *Reactive Power Setpoint [kvar]* field.
4. Note that, for example, updating the RICC program will cause the connection to be closed, and the corresponding plant setting will therefore revert to that active in the controller.

4.6.6 Control Parameters

The fields are listed below:

Field	Description	Note
Active Power Setpoint [%]	A percentage-based active power limit that has been set in the RICC.	*1*, *2*
Active Power Setpoint [kW]	The absolute active power limit that has been set in the RICC.	*1*
Reactive Power Setpoint [%]	A percentage-based reactive power limit that has been set in the RICC.	*1*, *3*
Reactive Power Setpoint [kvar]	The absolute reactive power limit that has been set in the RICC.	*1*
Phase Angle ϕ Setpoint	Allows you to adjust the setpoint for the reactive power output by means of the phase angle. Clicking on the *pencil* will open a dialog where you can enter the desired setpoint, either in degrees, or as a value of Cos ϕ.	
Ramp Interval	The **Ramp Interval** and the **Ramp Delta** are used as a convenient mechanism for defining the maximum *rate of change* in the plant output following a change in the setpoint. This is to avoid sudden transients in the grid; the maximum allowable rate will normally be defined by the grid organisation. The **Ramp Delta** sets the maximum allowed change in output over the period defined by the **Ramp Interval** value.	
Ramp Delta	The **Ramp Interval** and the **Ramp Delta** are used as a convenient mechanism for defining the maximum *rate of change* in the plant output following a change in the setpoint. This is to avoid sudden transients in the grid; the maximum allowable rate will normally be defined by the grid organisation. The **Ramp Delta** sets the maximum allowed change in output over the period defined by the **Ramp Interval** value.	
Reactive Power Curve	This control shows which of the possible curves is currently selected. Clicking on the pencil will open a dialog showing the shape of the curve, and allow you to change it to another curve.	*4*

Notes:

1. Click the heading or pencil to change the setting
2. The *Active Power Setpoint [%]* setting will be ignored unless the *Relative Active Power Setpoint* control has been enabled. In this case it overrides any entry in the *Active Power Setpoint [kW]* field.
3. The *Reactive Power Setpoint [%]* setting will be ignored unless the *Relative Reactive Power Setpoint* control has been enabled. In this case it overrides any entry in the *Reactive Power Setpoint [kvar]* field.
4. Clicking on the pencil will bring up a dialog which shows the form of the selected curve, together with a pop-down list allowing the curve to be changed. Selecting any of the other curves will allow the form of that curve to be seen before it is selected.

4.6.7 Plant Parameter Fields

The fields are listed below:

Field	Description	Note
Plant Nominal Apparent Power	The plant's nominal (or *rated*) apparent power output capability.	
Plant Nominal Active Power	The plant's nominal (or *rated*) active power output capability.	
Plant Nominal Reactive Power	The plant's nominal (or *rated*) reactive power output capability.	
Plant Apparent Power Limit	The actual limit of the apparent power being enforced at the current time, if any. This depends on the different setpoint settings that have been configured, either through the RICC or in the control system or by the transmission system operator.	
Plant Active Power Limit	The actual limit being enforced at the current time, if any. This depends on the actual output of the plant and the different setpoint settings that have been configured, either through the RICC or by the transmission system operator.	
Plant Default Ramp Interval	Similar to **Ramp Interval**, this is the default maximum rate of change of output set in the plant controller; i.e. the value that will be used if not overridden by the RICC.	
Plant Default Ramp Delta	Similar to **Ramp Delta**, this is used to define the plant controller's default maximum rate of change of output; i.e. the value that will be used if not overridden by the RICC.	

4.6.8 Actual Output Fields

The fields are listed below:

Field	Description	Note
Apparent Power [%]	The plant's apparent output as a percentage of its nominal value.	
Apparent Power [kVA]	The plant's apparent output power.	
Active Power [%]	The instantaneous active power component as a percentage of the plant's nominal active power.	
Active Power [kW]	The instantaneous active component of the output power.	
Reactive Power [%]	The instantaneous reactive power component as a percentage of the plant's nominal reactive power	
Reactive Power [kvar]	The instantaneous reactive component of the output power.	
Cos ϕ	The actual value of Cos ϕ.	
Phase Angle ϕ [°]	The actual value of the phase angle in degrees.	
Power Factor	The actual value of the power factor.	
Line Voltage (Phase Mean)	The mean line voltage across all phases, as measured by the skycontrol unit.	
Line Current (Phase Sum)	The sum of all phase currents, as measured by the skycontrol unit.	

4.6.9 Available Characteristics

The fields are listed below:

Field	Description	Note
Available Reactive Power Curves	Shows you a list of all possible curves that have been configured in your controller (the list will vary depending on region and country).	

5 The Event Log

You can open the RICC event log by using the menu function **Window** > **Event Log**. The event log will open in a separate at the bottom of the RICC program window. It appears as shown in *Fig 10: The RICC Event Log showing the controls*.

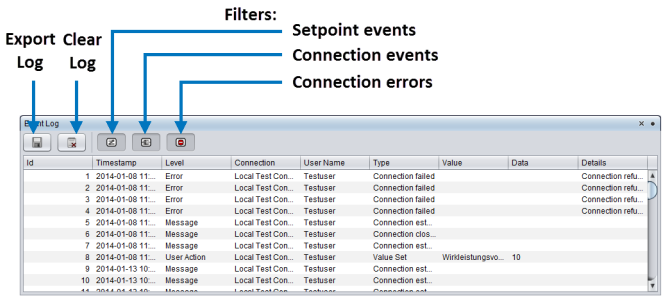

Fig 10: The RICC Event Log showing the controls

5.1 The Controls on the Event Log

At the top of the log are a number of controls for using the log. These have the following functions:

Allows you to export the event log. Clicking on this button causes a **Save** dialog to appear, where you can select the file into which the data is to be stored. Data is stored in a *Comma Separated Variable (.csv)* format, and takes account of the filters you have currently applied to the log.

Clears all entries from the log.

Includes setpoint events in the display.

Includes connection events in the display.

Includes connection errors in the display.

5.2 Fields of the Event Log

The event log includes the following fields.

Note: Double clicking in the header row at the top of any column will sort the log according to that column.

Id	Each entry has a unique identification number in the log.
Timestamp	Provides the data and time of the event of error.
Level	Entries are classified into *Levels*. Can take the values: *Message*, *Warning*, *User Action*, *Error*.
Connection	Controls how quickly the output power may change following an adjustment to the output setpoint.
User Name	Shows the user of the program when the event occurred.

Type	A categorisation of the event or error type. Can take the values: *Connection Established*, *Connection Failed*, *Connection Closed*, *Value Set*, *Transfer Error*.
Value	Where an event or error involves a particular parameter, this field gives the name of the parameter.
Data	Where an event or error involves a particular parameter, this field gives the actual data for the parameter.
Details	Provides more information about the event or error.

6 Defining a Setpoint

This section describes the steps to configure one of the various setpoints available for capping a plant's active or reactive power output.

Active Power

To define a setpoint on the active power output, goto *Defining an active power setpoint*.

You may also like to set up a power ramp setpoint for the active power output. To do this, see *Defining a ramp setpoint for the active power*.

Reactive Power

There are a number of ways to define a setpoint on the reactive power output. You can:

- Configure a setpoint based on the actual output figure in kvar or as a percentage of the plant's output. Go to *Defining a reactive power setpoint*.
- By defineing a setpoint based on the reactive power phase angle. Go to *Defining a reactive power setpoint based on phase angle*.
- By defining the operation to be based on a prefined curve. Go to *Defining a reactive power setpoint based on a curve*.

6.1 Defining an active power setpoint

You need to define a setpoint on the plant's active power output.

1. Open the **Power** tab.
2. Decide whether you want to enter the setpoint as an absolute figure in kW, or as a percentage of the plant's rated power.
3. To enter the setpoint as an absolute value:
   - Click the pencil by the **Active Power Set Point [kW]** entry.
   - A dialog will appear where you can enter the setpoint value.
   - If you have previously defined the setpoint as a percentage, click the pencil by the **Relative Active Power Set Point** entry, and confirm that you do **not** want to use the relative, percentage figure.
4. To enter the setpoint as a percentage of the plant's rated power:
   - Click the pencil by the **Active Power Set Point [%]** entry.
   - A dialog will appear where you can enter the setpoint value.
   - Click the pencil by the **Relative Active Power Set Point** entry. A dialog will appear where you can confirm you wish to use the relative, percentage figure.
5. If you wish the setpoint to remain active after you have closed the RICC program or during a restart e.g. when you update the program:
   - Click the pencil by the **Keep Active Power setpoint after closing** entry.
   - A dialog will appear to allow you to confirm the retention of the setpoint value.
6. Decide whether you wish to establish a setpoint for the *Active Power Ramp*. To do this, see *Defining a ramp setpoint for the active power*.

6.2 Defining a ramp setpoint for the active power

You need to define a ramp setpoint to control the speed of change of the plant's active power output.

1. Open the **Power Ramp** tab.
2. Click the pencil by the **Ramp Interval** entry, and set the interval that defines the ramp gradient.
3. Click the pencil by the **Ramp Delta** entry, and set the maximum change in power (delta) that is allowed in the power interval.
4. The power change gradient will be shown in the lower graph. Check that this is correct.
5. Click the pencil by the entry **Enable Set Point Ramp**. A dialog will appear for you to confirm this.

6.3 Defining a reactive power setpoint

You need to define a setpoint on the plant's reactive power output.

1. Open the **Power** tab.
2. Decide whether you want to enter the setpoint as an absolute figure in kvar, or as a percentage of the plant's rated reactive power.
3. To enter the setpoint as an absolute value:
   - Click the pencil by the **Reactive Power Set Point [kvar]** entry.
   - A dialog will appear where you can enter the setpoint value.
   - If you have previously defined the setpoint as a percentage, click the pencil by the **Relative Active Power Set Point** entry, and confirm that you do **not** want to use the relative, percentage figure.
4. To enter the setpoint as a percentage of the plant's rated reactive power:
   - Click the pencil by the **Reactive Power Set Point [%]** entry.
   - A dialog will appear where you can enter the setpoint value.
   - Click the pencil by the **Relative Reactive Power Set Point** entry. A dialog will appear where you can confirm you wish to use the relative, percentage figure.
5. If you wish the setpoint to remain active after you have closed the RICC program, click the pencil by the **Keep Reactive Power setpoint after closing** entry. A dialog will appear to allow you to confirm the retention of the setpoint value.
6. If you have previously been using a setpoint based on the phase angle, open the **Phase Angle** tab, and click the pencil by the entry **Use Phase Angle Setpoint instead of Reactive Power Setpoint**. Disable the phase angle setpoint.
7. If you have previously been using a setpoint based on a curve, open the **Characteristic Curves** tab, and click the pencil by the entry **Enable Reactive Power Curve**. Disable the reactive power curve operation.

6.4 Defining a reactive power setpoint based on phase angle

You need to define a setpoint on the plant's reactive power output based on the phase angle.

1. Open the **Phase Angle** tab.
2. Click the pencil by the **Phase Angle ϕ Setpoint** entry. A dialog will appear where you can enter the setpoint value.

3. Click the pencil by the entry **Use Phase Angle Setpoint instead of Reactive Power Setpoint**. Confirm that you wish to use the phase angle setpoint.
4. If you wish the setpoint to remain active after you have closed the RICC program, click the pencil by the **Keep Phase Angle Setpoint after closing** entry. A dialog will appear to allow you to confirm the retention of the setpoint value.
5. If you have previously been using a setpoint based on an absolute or percentage value, disable this by opening the **Power** tab, and clicking the pencil by the entry **Relative Active Power Set Point**. Disable the option in the dialog.
6. If you have previously been using a setpoint based on a curve, open the **Characteristic Curves** tab, and click the pencil by the entry **Enable Reactive Power Curve**. Disable the reactive power curve operation.

6.5 Defining a reactive power setpoint based on a curve

You need to configure the plant to operate according to a grid operator's defined characteristic curve.

1. Open the **Characteristic Curves** tab.
2. Click the pencil by the **Reactive Power Curve** entry. A dialog will appear where you can select the curve you wish to use. Select the appropriate curve.
3. Click the pencil by the entry **Enable Reactive Power Curve**. Confirm use of the curve-based operation.
4. If you have previously been using a setpoint based on an absolute or percentage value, disable this by opening the **Power** tab, and clicking the pencil by the entry **Relative Active Power Set Point**. Disable the option in the dialog.
5. If you have previously been using a setpoint based on a phase angle, **Phase Angle** tab, and click the pencil by the entry **Use Phase Angle Setpoint instead of Reactive Power Setpoint**. Disable the phase angle based operation.

7 Changing the Program Settings

7.1 Creating a new connection

In order to connect a new plant you will need to enter a new connection - the link between the RICC program and the plant controller being monitored and controlled.

Open the command **File** > **New Remote Interface Connection**. The dialog **Create Connection** will appear as shown below.

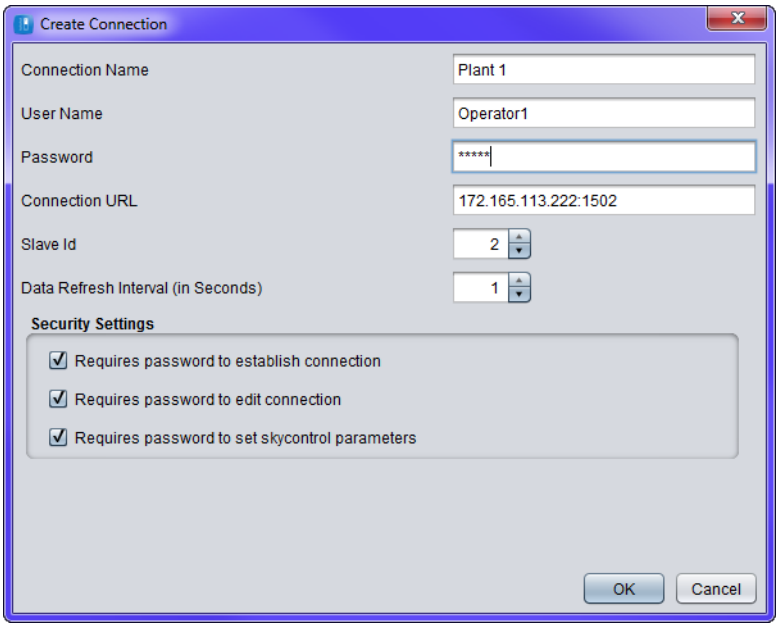

Fig 11: The Edit Connection dialog

In the upper half of the dialog fill in the connection details as follows:

Field	Description
Connection Name	Any name you choose. Is the name that is shown in the **Connection Window** of the main window.
User Name	The user name associated with this connection (2-20 characters). You may choose any name you like, this is used to prevent non-authorised staff from accessing the program. (The user name is not associated with any user-id needed at a technical level to establish communications connections.)
Password	The password for this connection (4-20 characters).
Connection URL	An IP Address or URL and Port Number for the skycontrol unit being controlled. In the usual case of an IP address, this will be in the form <IP-address>:<port-number>. For example `172.16.103.237:1502`. The correct values will be notified by the skytron technicians.

Field	Description
Slave Id	This entry, a digit, defines a program interface within the controller, for example `0` or`1`. The correct value will be notified to you by skytron.
Data Refresh Interval	Here you can specify how often in seconds you wish the display to be refreshed for this connection.

Note: The user name and password entered here are used to control access to the various controls and settings displayed by the program, to ensure only permitted users may observe or control a plant's output, and to ensure that those users only allowed to view the output may be prevented from interfering with the actual plant supervision. The user name and password are, however, independent of any user-name and password needed for the VPN or other connection to the plant.

In the lower half of the dialog you can control how the user name and password are to be used. You can configure the RICC to prompt the user for the user name and password whenever:

- They try to open a connection to a plant
- They wish to edit the connection details described above
- They attempt to change any of the control settings or parameters for the skycontrol unit

7.2 Program Language

The language of the program's user interface may be easily changed as described here.

Open the command **Tools** > **Options**. The dialog **Options** will appear as shown below.

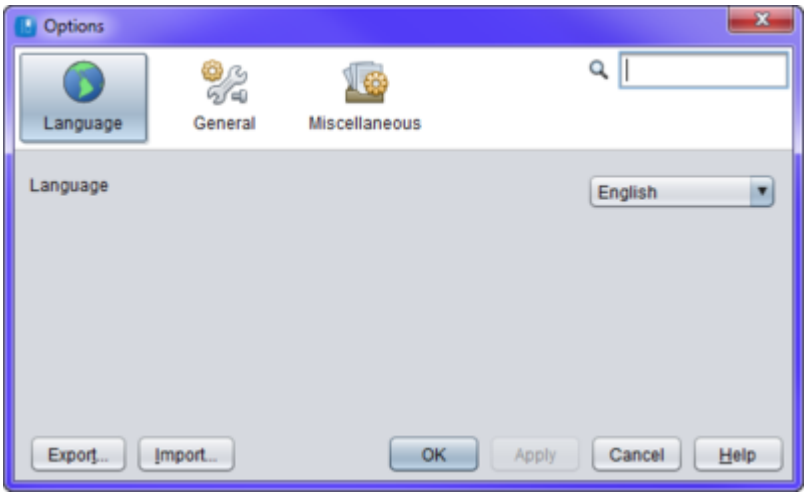

Fig 12: The Options dialog on opening

The program language can be changed in the drop-down box in this form. You will need to restart the program for the change to take effect.

7.3 Proxy Settings

The RICC program includes features such as automatic update. For this to work, the program must be able to establish an Internet connection. If the program reports that it cannot connect to the

Internet, then the most likely reason is that your organisation uses a *Proxy Server* to connect to the Internet. In this case, the settings for this must be entered correctly.

Open the command **Tools** > **Options** The dialog **Options** will appear.

Click on the **General** button. Th form will appear as shown below.

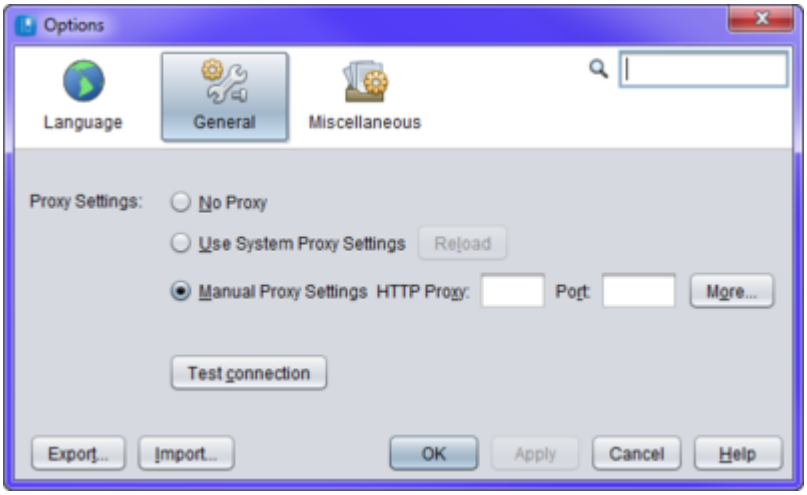

Fig 13: The General tab in the Options dialog

There are three options:

No Proxy	Click this box if your organisation uses a direct connection to the Internet, without any *Proxy Server*.
Use System Proxy Settings	If you tick this box, then any default proxy settings that have been configured for your computer will be used. Check for example the *Windows Control Panel* or your system administrator.
Manual Proxy Settings	In this case you must enter the settings yourself in the two fields **HTTP Proxy** and **Port**. The first will typically be an *IP Address* such as `192.168.200.100` and the second a number such as `8080`.

In the rare case that the Manual Settings are insufficient for the requirements of your organisation's infrastructure, further options (e.g. settings for an HTTPS proxy) are available by clicking the **More...** button.

7.4 Miscellaneous Settings

The Miscellaneous button of the **Options** dialog allows you to change various parameters concerning the program's look and feel. Of these, the most useful is the **Preferred look and feel** option, which enables you to change the program appearance from, for example, a light background to a darker display.

Dragging and Snapping (top section)

The settings in this section affect the program's behaviour if you try to drag (for example) one of the connection windows to another point in the program. The **Drag window image** setting, for example, sets whether a thumbnail image will follow the mouse as you move the connection window.

Connection Tabs

These settings affect the program's behaviour when you open a second or third connection window - how the multiple tabs will be placed in relation to each other, and where they will be placed in the program window.

Look and Feel

These settings allows a choice of around six different appearances for the program, and how closely they match the appearance of the native operating system (e.g. Windows) on your PC. The images in the current manual are based on the *Nimbus* look and feel.

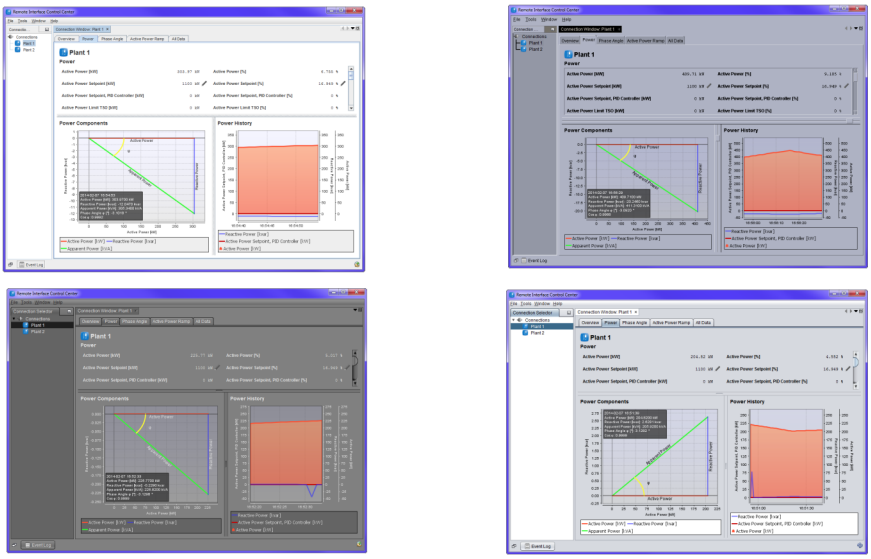

Fig 14: A variety of different options for look and feel

8 Actions

8.1 Chart Context Menus

Right clicking over one of the charts shows a context menu. This may include the following entries:

Copy	Copies the chart to the clipboard as a picture.
Save as...	Allows you to save the picture in the *Portable Network Graphics (.png)*format.
Print...	Allows you to print the chart directly to a printer.
Zoom In	See *Zooming in Chart Context Menus*
Zoom Out	See *Zooming in Chart Context Menus*.
Auto Range	See *Zooming in Chart Context Menus*.

8.1.1 Zooming in Chart Context Menus

The last three menu entries (*Zoom In*, *Zoom Out*, *Auto Range*) include the same sub-menu, as follows:

Both Axes	Here both axes are zoomed together.
Domain Axis	The *Domain Axis* is the horizontal (time) axis. This function will enlarge or contract the view of this axis.
Range Axis	The *Range Axis* is the vertical axis. This function will enlarge or contract the view of this axis.

Note: Zooming is also possible using a mouse. See *Easy Zooming within Charts* on page 44.

8.2 Easy Zooming within Charts

You may wish to zoom in to look at a particular feature in a displayed chart. Normally a context menu will allow this through a zoom-in or out command, however there are a shortcuts available with the mouse.

To zoom in to the chart, left click with the mouse at the top right position of the area you wish to enlarge. Then, holding the mouse button down, drag the mouse to the bottom right corner of the area. The zoom area will be mark as a selection while you drag. Finally, release the mouse button and the chart will zoom in to show just the selected area.

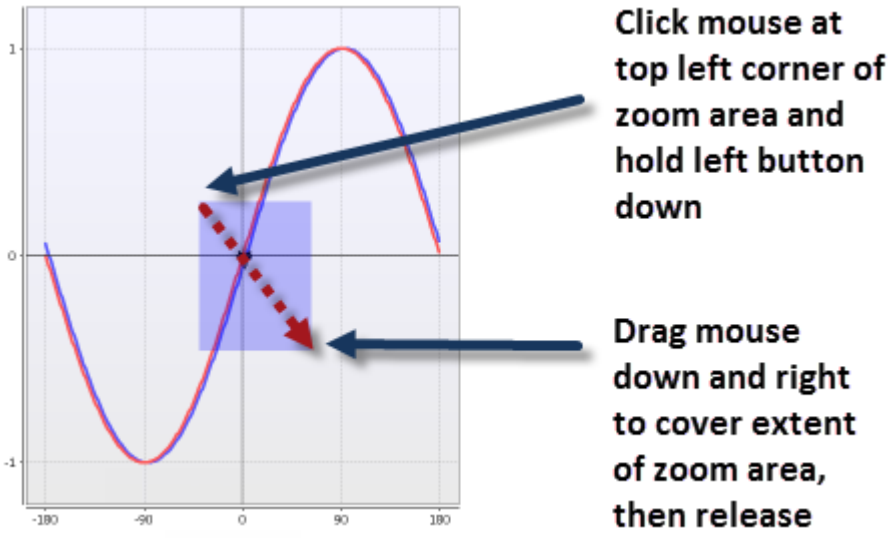

Fig 15: Zooming in

To zoom back out, left-click with the mouse at any point of the chart display and, holding the mouse button down, drag the mouse towards the top left of the chart. Release the mouse key, and the chart will zoom out to its fullest extent.

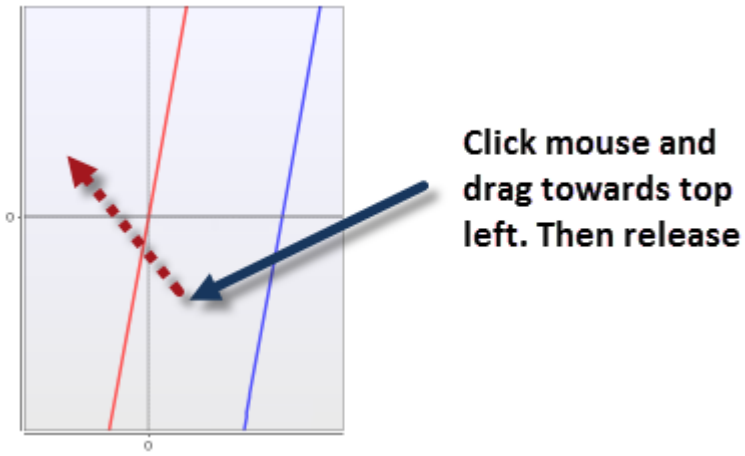

Fig 16: Zooming out

9 Program Updates

9.1 Automatic Updates to the Program

If the program has a working Internet connection, it will detect automatically when any updates are available. You will be alerted by:

- A balloon box appearing for a short time above the status bar at the bottom-right of the program window.
- The *update-required* symbol being shown in the status bar. If you click this symbol, the balloon box will reappear.

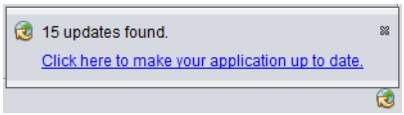

Fig 17: The Automatic Update prompt and Update Required icon

Warning: Depending on the nature of the update, the process may run fully automatically or a wizard may run to walk you through any necessary changes (see, for example, *Manually Updating the Program* on page 46). At the end of the process you will be required to restart the program and re-open any connections.

9.2 Manually Updating the Program

If the program does not have a working Internet connection, you will have to install any program updates manually. The updates will be provided by skytron, usually as a file that you can download.

Warning: During the update process you will be required to restart the program and re-open any connections.

1. If the updates have been provided as a single download zip file, move or copy the file into a temporary directory and extract it there.
2. In the program, select **Tools** > **Install Updates from File** from the menu.
3. The **Select Update Files** dialog will appear as shown in the figure below.

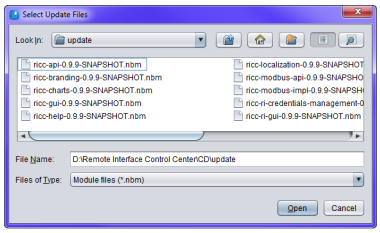

Fig 18: The **Select Update Files** dialog

The update files will be located in the extracted zip file (or file on a CD) in a subdirectory called `update` or similar. The have the file extension ".nbm". In the dialog, select the directory containing these files, and click **Open**.

4. A wizard called **Plugin Installer** will may appear. This will walk you through the steps of the update.

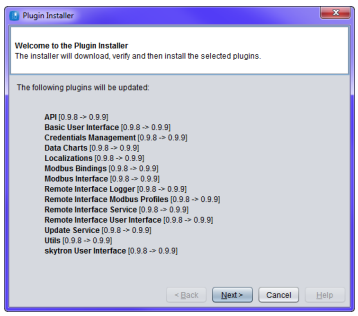

Fig 19: Page 1 of the **Plugin Installer** dialog

Click on **Next >.**

5. At the end of the process you can choose whether you wish to restart the RICC application now or at a later time, as shown below.

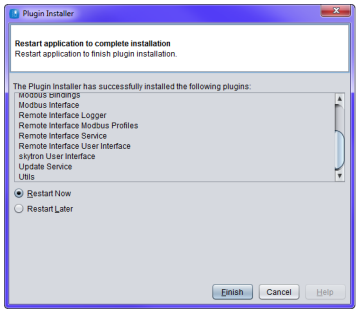

Fig 20: Page 2 of the **Plugin Installer** wizard

Warning: If you choose the option **Restart Now** and there are any connections open to plants, these connections will be closed. If you have not chosen the option to keep the setpoints after closing, then the output setpoints of the corresponding plants will revert to the plant defaults (or none).

6. If you choose to delay restarting the program, the *restart-required* icon will persist in the status bar at the bottom-right of the program window. Clicking on this symbol will allow you to restart the program.

Fig 21: The Restart Required icon