## SIMATIC HMI

### WinCC V6.0 Options

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Order number: 6AV6392-1DA06-0AB0

Release 04/03

A5E00221821
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Order number 6AV6392-1DA06-0AB0
Foreword

Purpose

The WinCC V6 Options manual describes user archives, servers, redundancy and configuration. The information system integrated into WinCC contains further information: Instructions, examples and reference data are provided in electronic form.

In this manual you will find an overview of

- User Archives
- working with multi-user systems
- Redundancy

General information about WinCC and the configurations can be found in the manual WinCC V6 Basic Documentation.

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Available round the clock, worldwide:

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</tr>
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<td>Telephone: +1 423 461-2522</td>
</tr>
<tr>
<td>Fax: +49 (180) 5050-223</td>
<td>Fax: +49 (911) 895-7001</td>
<td>Fax: +1 423 461-2289</td>
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<tr>
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<td></td>
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<td></td>
</tr>
<tr>
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- In the Interactive Catalog CA01
  http://www.siemens.com/automation/ca01
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1 User Archives

In the introduction to the Editor User Archives you will receive the following information:

- User Archive Application Areas
- The components of the Editor User Archives
- Configuration and Runtime
- Function extent of User Archives

WinCC’s User Archives editor can be used to continually save data from technical processes on a Server PC. In Graphics Designer, a WinCC User Archives Table Element can be configured that will permit a tabular display of the online data from the User Archive in Runtime.

User Archives are also used in order to prepare data for automation systems such as e.g. S5, S7. When necessary, the data can be read from the controller in the form of recipes or setpoint values.

The Editor User Archives offers two type of database tables:

- User Archives: User Archives are database tables in which the user can create his own data fields. User Archives are used for the storage of data and offer a standardised access to these data according to the SQL database conventions.
- Views: Views receive the data from the user archives and are used for the summarisation of data, for example, in order to receive overviews about product groups.

For the creation and editing of the user archives there are two possibilities:

- The Editor User Archives for the comfortable interactive configuration of the user archives.
- The functions for the editing of user archives in the WinCC script language.

With the functions of the WinCC script language you can achieve also multiple actions for the runtime mode. In the runtime screen you can configure a table, which is connected directly with the process image of the automation system.
1.1 Components of the User Archives

1.1.1 The User Archives Editor

The Editor User Archives offers with its Windows user interface a comfortable way to create and maintain User Archives. The workspace of the Editors User Archives is divided into three areas:

- the Navigation Window for the selection of user archives and views.
- the Data Window for displaying and changing fields. In the data window the fields of the user archives and views are displayed, which have been selected in the navigation window.
- the Table Window to display and change Online data of the selected user archives and views. In the table window of the Editors User Archives an Online connection to the process images of the PLC's is possible.

The navigation and data window of the Editor User Archives offers a fast access to all the elements of the User Archives with a user interface similar to Explorer. The creation and changing of user archives is done user-friendly with dialog boxes and wizards.
1.1.2 The WinCC User Archives Table Control

With the Graphics Designer you can configure a User Archives Table Element. The User Archives Table Element is used for displaying and changing the user archive data in runtime. The control is operated with symbols.

In the control you can create, change or delete the contents of fields interactively. The browse functions facilitate the access also to large user archives. User Archives can be imported and exported and you can define filter and sorting conditions.

By a direct connection to the automation system you can read and write data online.

During configuration, a User Archives Table Element is connected to a selected user archive or view and can then only access that user archive or view. For access, the user archive / view must be enabled (access protection). Specific authorizations can be assigned to the control in the User Administrator.

If this access protection is canceled, the control must be reconnected in the Graphics Designer to the user archive so that control detects the canceled access protection.

Access protection for an archive or field is queried on opening a screen of a User Archive Table Element. Access protection for the control tags of a protected archive must be implemented separately via the object properties, e.g. of the picture, I/O field or button.
1.1.3 The User Archives Script Functions

The functions of the WinCC script language are divided to:

- **Configuration functions** for the configuring of User Archives
- **Runtime functions** for the configuring of actions in runtime mode

The runtime functions are activated by actions in the runtime screen, for example a mouse click on a specific button. The WinCC script language is based on the high language C, and the database functions are based on the SQL standard.

1.1.4 Applications of the User Archives

For the configuration of User Archives you can create your own database tables with the Editor User Archives or with the functions of the WinCC script language.

The Editor User Archives allows also the creation of new data records and the editing of data in existing data record even during the configuration.

In runtime user archives (synonym with database tables) in the picture windows of the User Archives Table Elements can be shown as tables. By raw data or WinCC tags a continuous data exchange can be done with the AS.

**Example with operational data recording of Turbine**

An energy production operator sets the user archive “HDTurbine1”. This user archive is used for the operation status monitoring of a high pressure turbine. The User Archive "HDTurbine1" has the following data fields:

<table>
<thead>
<tr>
<th>HDTurbine1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Index</td>
</tr>
<tr>
<td>Rotation speed</td>
</tr>
<tr>
<td>Entry pressure</td>
</tr>
<tr>
<td>Exit pressure</td>
</tr>
</tbody>
</table>
In runtime you can then save in set intervals the operation data of the turbine as data records of the user archives on the PC mass storage (hard disk):

![Diagram of data flow]

The process data is saved in the preconfigured data record every 15 minutes. The User Archives Script Functions save the data record HD Turbine1 to the hard drive every 15 minutes.

You can use the functions of the WinCC script language to analyse later data of the user archives, or visualised with the "WinCC User Archives Table Element".

### Example with recipes of a drink producer

An example for a data flow to the PLC are recipes. A drink producer who is producing in our example a Cola drink and an orange juice, uses the User Archives to prepare the recipes for the contents of his drinks for the AS.

<table>
<thead>
<tr>
<th>User Archive</th>
<th>Data fields</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cola</td>
<td>Water</td>
</tr>
<tr>
<td></td>
<td>Sugar</td>
</tr>
<tr>
<td></td>
<td>Dye stuff?</td>
</tr>
<tr>
<td></td>
<td>Phosphoric acid</td>
</tr>
<tr>
<td></td>
<td>Caffeine</td>
</tr>
</tbody>
</table>

The User Archives use the data interface that is provided by WinCC to the AS, either through the raw data of the WinCC data managers or via WinCC Tags. For the data transfer from / to the AS, WinCC provides a suitable set of C actions.
Application methods of views

WinCC offers as an additional performance sign “Views” to multiple user archives of a server. Views enable the summarising of data fields from different user archives. So, for example, you can create logical operations in the SQL language through data fields of different user archives, to display the desired relationships in runtime as views. The used user archives must have at least one common factor.

<table>
<thead>
<tr>
<th>Archive</th>
<th>Data Fields</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customers</td>
<td>Cust. No.</td>
</tr>
<tr>
<td></td>
<td>Company</td>
</tr>
<tr>
<td></td>
<td>Address</td>
</tr>
<tr>
<td></td>
<td>Phone No.</td>
</tr>
<tr>
<td></td>
<td>Fax No.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Archive</th>
<th>Data Fields</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jobs</td>
<td>Cust. No.</td>
</tr>
<tr>
<td></td>
<td>Article</td>
</tr>
<tr>
<td></td>
<td>Quantity</td>
</tr>
<tr>
<td></td>
<td>Price</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>View</th>
<th>Data Fields</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orders</td>
<td>Cust. No.</td>
</tr>
<tr>
<td></td>
<td>Company</td>
</tr>
<tr>
<td></td>
<td>Address</td>
</tr>
<tr>
<td></td>
<td>Article</td>
</tr>
<tr>
<td></td>
<td>Quantity</td>
</tr>
<tr>
<td></td>
<td>Price</td>
</tr>
</tbody>
</table>

In our example the user creates a view for orders. He gets the required information for the orders from the archives “Customers” and “Jobs”. The customer number is the common factor of the two user archives and is used as the connection marker for the view. The user wants only the required fields of the connected user archives to be displayed in runtime.

Note:

Available software, which has done direct ODBC database accesses to User Archives versions older than 4.02, will not be able to access the user archives of version 4.02 or later.
1.1.5 Functionality of the User Archives

The performance markers of the User Archives are introduced below in short headings:

Configuration

- User archives and views can be created in table form, this will provide a simple, direct assignment of the data to the fields of the user archives or views (division in columns and rows).
- Online display in runtime in form (process screen) or selectively in table form
- Input / output of data through I/O fields (assignment of the user archive fields through C actions/ control tags)

Reports

- of the configuration data and the runtime data in table form through WinCC reports
- Export of the data in CSV Format (processing through external programs e.g. Excel)

Transfer from / to the AS (S5, S7 etc.)

- whole data records of a user archive (through raw data tags)
- individual data fields of a data record (through WinCC tags)
- Communication through all the interfaces provided by WinCC.

Editing possibilities

- in the table views
- in forms
- through I/O fields (with C actions/ control tags)

Operation

- in tables through standardised buttons
- in forms through buttons
- with C actions
Delete or create new data records

- in tables create data records through buttons
- in forms through buttons
- with C actions create and delete data records

Control tags

- Wizard supported creation of WinCC tags as control tags
- fast access possibilities to User Archives for scripts and the AS
- Indirect addressing for C actions

Typical Application

In the Editor User Archives you can configure maximum 500 archives and 500 views on archives. Per archive maximum 500 fields can be created.

Archives

The maximum number of data records in an archive is limited and depends on the number of the configured columns and the data records contained in the archive. The product of columns and data record cannot be more than 320000. For the number of columns you must also include the column "ID" that was created by the system and if selected the columns "Last User" and "Last Access".

Example:

There are 15 individual columns configured in the archive and the column "Last Access" is selected. So, including the column "ID", a total of 17 columns is configured, which gives a maximum amount of 320000 / 17 = 18823 data records.
1.2 The User Archives Editor

1.2.1 Structure of the User Archives Editor

The Editor User Archives can be operated through its menus, its toolbar, by hotkeys or by direct mouse clicks. Below you will receive information about the following topics:

- The Menus of the Editor User Archives
- The toolbar of the Editors User Archives

1.2.1.1 The Menus

The menu operation is described in this section. Functions that correspond to the Windows standard will not be described here.

The Editor User Archives provides the following menus:

<table>
<thead>
<tr>
<th>Menu</th>
<th>Menu Command</th>
<th>Shortcut</th>
</tr>
</thead>
<tbody>
<tr>
<td>project</td>
<td>Restore</td>
<td>Ctrl + N</td>
</tr>
<tr>
<td></td>
<td>Save</td>
<td>Ctrl + S</td>
</tr>
<tr>
<td></td>
<td>Export...</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Import...</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Check...</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Exit</td>
<td></td>
</tr>
<tr>
<td>Edit</td>
<td>Cut</td>
<td>Ctrl + X</td>
</tr>
<tr>
<td></td>
<td>Copy</td>
<td>Ctrl + C</td>
</tr>
<tr>
<td></td>
<td>Paste</td>
<td>Ctrl + V</td>
</tr>
<tr>
<td></td>
<td>Runtime Data</td>
<td>Ctrl + R</td>
</tr>
<tr>
<td></td>
<td>Options</td>
<td>Ctrl + O</td>
</tr>
<tr>
<td>View</td>
<td>Toolbar</td>
<td></td>
</tr>
</tbody>
</table>
### Menu

<table>
<thead>
<tr>
<th>Menu</th>
<th>Menu Command</th>
<th>Shortcut</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status bar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Split</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Update</td>
<td></td>
<td>F 5</td>
</tr>
<tr>
<td>Runtime Data</td>
<td>Import</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Export</td>
<td></td>
</tr>
<tr>
<td>Help</td>
<td>Help Topics</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Log File...</td>
<td></td>
</tr>
<tr>
<td></td>
<td>About...</td>
<td></td>
</tr>
</tbody>
</table>

---

**Note:**

The functions “Cut, Paste and Copy” can be used only in the data window. Only one user archive, field or view can be cut, copied or pasted at a time. It can only be saved when at this time no user archive is referred to (User Archive is referred to e.g. during the display of the table window in the configuration system (CS) or in runtime).

---

**Restore**

By "Restore" the last changes are cancelled and the last saved state is restored without closing the editor. In addition, you can use this function to accept changes, which have been carried out and saved since the opening of the editor of scripts or external programs. Such external changes are not done to the editor automatically.
Export (Project Menu)

Use this menu command to export user archive and view structures (CS data) of the open WinCC project.

When you click on the Export command of the menu "Project", a dialog opens in which you can select between the user archives and views that were created in the open WinCC project. Simple and multiple selection are possible. In the area file selection, the project path of the open project and a file name of the project name and the file extension "uap" is set automatically. After you have clicked on the button for the file selection, a selection dialog is opened where you can set a free selectable memory location. After you have set the memory location, the export is carried out after clicking on the button "Export". Close the dialog after the export of the selected user archives and views.

Note:

In order to export runtime data, you must use the menu command "Export" in the menu "Runtime data".
Import (Project Menu)

Use this menu command to import user archive and view structures (CS data) of the open WinCC project.

In order to be able to import user archives and views, first the respective user archives and views in the project to be imported must be exported in order to create a uap file. In order to start the import, click in the menu "Project" on the command "Import". A dialog opens for the selection of the user archives and views you want to import. Simple and multiple selection are possible. In the area file selection, the project path of the open project and a file name, consisting of the name of the project and the file extension "uap" is set automatically. When you click on the button for the file selection, a selection dialog opens where you can select the file you want to import. After you have selected the file, the import will be carried out after you have clicked on the button "Import". Close the dialog after the import of the selected user archives and views.

In order to maintain the consistency of the structure data, a view is always exported together with the related archives and imported during the import together with this view. Existing archives with the same name must not be overwritten during an import. If you want to keep the archive name, you must delete the archives with the same names that exist in the project before the import. Existing runtime data must first be saved, since they are also deleted during the deleting of the archives.
04.03 User Archives

**Note:**
In order to export runtime data, you must use the menu command "Import" in the menu "Runtime data".

**Check**

This menu command allows you to check whether the tags referred to in the Editor User Archives exist in the WinCC Explorer. If no error is found, you will receive the message: "No error found during checking". If an error occurs, you will get the following error message.

![User Archive Editor](image)

The user archive, the related field and the missing tag in the tag management is displayed.

**Note:**
Structure tags are not checked with this function.

**Runtime Data**

This menu command allows you to edit the Online data in the table window. A check in the menu shows that the "Runtime Data" status is active.

**Options**

Use this menu command to set how the creation of user archives and views shall be done. The following dialog box appears after clicking on this menu:
Create user archives in a loop:
If this option is active, the dialog box for entering further User Archives appears after the input of a user archive and its fields automatically.

Create fields in a loop:
If this option is active, the dialog box for entering further data fields appears after the input of a user archive data field automatically.

Create views in a loop:
If this option is active, the dialog box for entering further views appears after the input of a view and its columns automatically.

Create columns of a view in a loop:
If this option is active, the dialog box for entering further columns appears after the input of columns automatically.

Split
This menu command is used for changing the size of the three dividing windows of the Editor User Archives.

Import (Runtime Data Menu)
This menu command is used to import the data records (Runtime Data) into the selected user archive.

In the import file there are no information about the data type and number of the columns. Therefore the structure of the import data and the target archive must be equal or the import is done into the user archive from which the data were exported before.
During the export, data record IDs are entered into the export data, in order to facilitate a unique assignment of the imported data during the import. If WinCC realises during the import, that one of the IDs that will be imported already exists in the user archive, an error message is given and an entry is made into the log file "UALogFile.txt", specifying the related ID. The data with a new data record ID are added as new data records into the user archive.

Note:
If data will be imported, which come from the current user archive, were edited outside of WinCC and will now overwrite the existing archive data, first all data records of the archive must be deleted. Otherwise there are error messages during the import because of equal data record IDs. In order to import structures from the user archive and view structures, you must use the menu command "Import" in the menu "Project".

The menu item is disabled if the function "Runtime Data" is enabled (Menu "Edit").

In the field "File Selection" enter the path and file information of the user archive to be imported. The button "..." supports you during the file selection. The file path is set automatically on the folder "ua" in the project path of the active user archive.

In the field "File format" you can select the file format of the user archive that will be read from. Use the button "Options" to specify the desired separator sign. The default separator is the semicolon ";".

In the field "Archive Selection" select one of the User Archives of the current project as the target archive. After the selection the button "Import" is enabled.

After the button "Import" is used the import will be carried out.
Note:

In the case of a client-server project, bear the following in mind: If there is a user archive on the server, e.g. at "c:\Projekte\Test\UA", it is enabled with this specified path. The client maps the enablement via a network drive e.g. "I:\Test\UA". Thereafter, the standard path of the User Archive is on the client "I:\Test\UA". However, this directory does not exist on the server with this description. If you want to import/export user archive to the client, you have to change the standard path on the client, in our example to "C:\Projekte\Test\UA".
Export (Runtime Data Menu)

Use this menu command to export the data records (Runtime Data) of the selected user archives. The exported data can be edited in another user program e.g. MS-Excel and then be imported back into the user archive.

Note:
The menu item is disabled if the function "Runtime Data" is enabled (Menu "Edit"). In order to export structures from the user archive and view structures, you must use the menu command "Export" in the menu "Project".

After WinCC V5.1 the column headings are exported as well and must not be changed.

In the field "File Selection" enter the path and file information of the user archive to be exported. The button "..." supports you during the file selection. The file path is set automatically on the folder "ua" in the project path of the active user archive.
In the field "File format" you can select in which file format the user archive will be exported. Use the button "Options" to specify the desired separator sign. The default separator is the semicolon ";".

In the field "Archive Selection" select one of the User Archives of the current project as the target archive. After the selection the button "Export" is enabled.

In the area "Filter" you can specify a filter for the export of the user archive, if necessary. In the field "Filter on field" specify the field to which the filter will refer. In the fields "from... to" give the value range which shall pass through the filter.

After enabling the option button "SQL Statement" you can enter in the input field under it a filter statement in the SQL language. For more about SQL statements refer to the appendix.

After the button "Export" is used the export will be carried out.

During the export, data record IDs are entered into the export file, in order to facilitate a unique assignment of the imported data during the import.

**Note:**

In the case of a client-server project, bear the following in mind: If there is a user archive on the server, e.g. at "c:\Projekte\Test\UA", it is enabled with this specified path. The client maps the enablement via a network drive e.g. "I:\Test\UA". Thereafter, the standard path of the User Archive is on the client "I:\Test\UA". However, this directory does not exist on the server with this description. If you want to export user archive data, you have to change the standard path on the client, in our example to "C:\Projekte\Test\UA".

### 1.2.1.2 The Toolbar

The Editor User Archives can be operated by direct mouse clicks on its toolbar. The individual symbols on the toolbar are described below in alphabetical order.

<table>
<thead>
<tr>
<th>Button</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Scrolling</td>
</tr>
<tr>
<td></td>
<td>Characteristics</td>
</tr>
<tr>
<td></td>
<td>Export</td>
</tr>
<tr>
<td>Button</td>
<td>Description</td>
</tr>
<tr>
<td>--------</td>
<td>-------------</td>
</tr>
<tr>
<td><img src="image" alt="Help" /></td>
<td>Help</td>
</tr>
<tr>
<td><img src="image" alt="Import" /></td>
<td>Import</td>
</tr>
<tr>
<td><img src="image" alt="Delete" /></td>
<td>Delete</td>
</tr>
<tr>
<td><img src="image" alt="New" /></td>
<td>New</td>
</tr>
<tr>
<td><img src="image" alt="Runtime Data" /></td>
<td>Runtime Data</td>
</tr>
<tr>
<td><img src="image" alt="Save" /></td>
<td>Save</td>
</tr>
<tr>
<td><img src="image" alt="Restore" /></td>
<td>Restore</td>
</tr>
</tbody>
</table>

**Browse**

The "Browse" symbols allow you a simple browsing in the user archive in runtime.

**Properties**

Use the "Property" symbol to edit the properties of the User Archives or data fields. A click with the right mouse button onto a user archive or data field enables also the editing of the properties of a user archive or data field.

In runtime you can move only at activated "properties" symbol during the editing of the data fields with the cursor control keys through the table, the fields can here be edited immediately. The button "Properties" can be enabled only after a data field has been selected.

**Delete**

Use the "Delete" symbol to delete user archives or data fields. A click with the right mouse button onto a user archive or data field enables also the deleting of an archive or the data field. In addition, it is also possible to click on a user archive or data field and then press the "Delete" key.

**New**

Use the "New" symbol to create new user archives or data fields. A click with the right mouse button in one of the top windows allows also the new creation of a User Archive.
1.2.1.3 The Table Window

You can use the menu item "Edit - Runtime Data" or with the corresponding button to switch on or off the table field. You can use a double click on one of the fields to enable the data input. This is marked by the text cursor. In runtime you can move only at activated "properties" symbol during the editing of the data fields with the cursor control keys through the table, the fields can here be edited immediately. The button "Properties" can be enabled only after a data field has been selected. The editing functions can also be used in the table field through a pop-up menu. In order to copy data records into an external program, select the desired table lines and copy them with the key combination "Ctrl" + "c" into the clipboard. The pasting into the external program is done with the hot key "Ctrl" + "v". The pasting of external data into the table window of the Editor User Archives cannot be done by this method.

Note:

If one or more values are changed in the table field of the Editor User Archive or in a User Archive control table, you must exit the data record (by clicking on another table cell or row) after making the entry in order for the value to be accepted into the database and be updated in all displays.
1.2.2 Configuration

The first step is the configuration of a new user archive. For the configuration you can use wizards, which offer a comfortable, user-controlled method. The following configuration steps are necessary:

Configuration of User Archives

- Creating a user archive
- Setting of the user archive fields

Configuration of views

- Create view
- Setting the data fields
- Setting the relations

Configuration of User Archives Table Elements

- Create User Archives Table Element
- Create view fields

1.2.2.1 User Archives Example

The drink producer "Sun Drink", produces in our example the Cola drink "Calif Cola" and the orange juice "Sunny Juice". In order to save the recipes for the contents of his drinks he uses the User Archives of WinCC. If a storage container of the filling system is empty, the recipe data are sent per communication channels from WinCC to the AS. The AS can then fill the storage container with the help of the recipe data again.
The User Archives are used as follows:

- **User Archives**: Here it is a user archive for the Cola drink and a user archive for the orange juice.

- **Views**: Use the views to compile data fields of the two user archives, in this example the product group dye stuff.

Each user archive consists of data fields with editable properties. In the Cola drink in our example the contents are in the data fields. Each data field has properties such as name, alias name, type, lengths, value etc. The representation of the data fields and properties in the Editor User Archives is done in lines and columns. Therefore, we are talking of rows instead of data fields and of columns instead of properties. The structure of the user archive "Cola" looks for instance as follows:

<table>
<thead>
<tr>
<th>User Archive Cola</th>
<th>Properties (Columns)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data fields (Lines)</td>
<td>Name</td>
</tr>
<tr>
<td>Water</td>
<td>Water</td>
</tr>
<tr>
<td>Sugar</td>
<td>Sugar</td>
</tr>
<tr>
<td>Dye stuff 7</td>
<td>Dye stuff7</td>
</tr>
<tr>
<td>Coffeine</td>
<td>Coffeine</td>
</tr>
<tr>
<td>Phosphoric acid</td>
<td>Phosphoric acid</td>
</tr>
</tbody>
</table>
1.2.2.2 Configuration of User Archives

1.2.2.2.1 Creation of New User Archives

Create new user archive

Start the Editor User Archives from the WinCC Explorer.

- In order to do so, click on User Archives and select in the pop-up menu the menu item "Open". You will see the command surface of the Editor User Archives on the screen.

---

Note:

Per User Archive 500 fields can be created.

The default option "Put archive in loop" allows the creation of multiple user archives one after another. If you want to create only one User Archive, you can disable this option in the menu "Edit -Options".

To create a User Archive follow the steps.

1. Click on the navigation window with the left mouse button on "Archives".

2. Then click in the navigation or data window with the right mouse button. The pop-up menu that is displayed in the screen below appears.

3. Select the option "New Archive"

The wizard for the configuration of User Archive appears.
Definition of General Archive Properties

You can see the dialog "General", which you can use to create a new user archive.

Enter as the user archive name for example "Cola". In the field "Alias" you can give the user archive a second name, for instance "Calif Cola", in order to comment the user archive or to realise a language change through the text library in runtime. This input is optional.

If you specify the archive type "Limited", you can set the maximum number of data records in the field "Number". The type "Unlimited" creates user archives with an unlimited number of data record.

**Note:**

Keywords (or reserved words) of the database language SQL must not be used as archive or field names. For more details refer to the chapter "Alphabetical List of SQL Keywords".

When creating data records it will not be checked whether these are complete or correct.
Communication Settings

In the dialog box "Communication" you can set the connection type between the PLC and the user archive:

- **None**: No communication possible
- **through raw data tag**: Access to the AS through the raw data tag.
- **through WinCC tag**: Access to the AS through WinCC tags

In order to get a connection through raw data tags, click on the "through raw data tags". As an ID of the archive enter "PLCID". The "PLCID" consists of maximum 8 ASCII characters and is unique in the WinCC project. It identifies the respective user Archive and is the condition for the AS to return the process image data to the correct User Archive.

If you have selected "through raw data tag", you can click on "Select" and then select a raw data tag.

If you have selected communication through the WinCC Tag, the assignment of the tags is done in the properties dialog of the user archive fields.

**Note:**

For the communication through raw data tags a complete data record is connected to a raw data tag. If the WinCC Tag is used, a tag is connected to a user archive field.

For the communication of User Archive through raw data tags the PLCID is used as the unique name of the archive. The R_ID that was configured in the used raw data tag cannot be used, since it is relevant only for the communication with the AS. In addition, multiple user archives can be supplied by the same raw data tag.
Definition of Control Tags

On the tab "Control Tags" the Control Tags are set in the form of WinCC tags, which can be used to access the user archive field.

In the four input fields of the tab the WinCC tags will be set, which can be used to access the data record IDs, job codes, archive fields and archive field values.

Next to each input field you can see a button "Select" which can be used to open the tag selection dialog. Here you can display and select all existing WinCC tags.

Use the button "Create..." to create the tags automatically. You can use this to create a new tag group "@UA[Archive name]" and save the created tags there in the form @UA[Archive name]ID, @UA[Archive name]Job etc.

Note:

In order to check the function, always all four Control Tags of a User Archive must be given or created with the Wizard.

The data type of the Control Tags must not be changed.

When a User Archive is created, we recommend you to use the wizards for the creation and saving of the Control Tags.

With the help of these four Control Tags you can trigger a User Archive. For the triggering you must supply either the tags "ID" and "Job" or the tags "Job", "Field" and "Value" with the respective values.

More information about the PLC of the User Archive can be found by the Control Tags in the chapter "Properties of Control Tags".

For instance, if you do not want to use the Control Tags, you can quit the dialog without any input. You can find an example for the use of Control Tags in the chapter "Example for the use of the Control Tags".
Definition of the Authorizations and Flags

The dialog "Authorizations and Flags" is used for the setting of the access authorizations to the User Archives and the settings for the output of the last access / user in separate columns.

All the currently set authorizations are displayed for reading and writing accesses. In order to change these settings you can click on one of the "Select" buttons. Then you will get the dialog box "Authorizations" where you can select between the authorizations that were set in the User Administrator:
By activating the option "Field - Last modification" a column is set with date and
time of the last access. With the Option "Field - Last user" a column will be set,
where the user is listed who has accessed the user archive last.

1. Selecting one of the authorizations
2. Select for instance the field "Last User".
3. Exit the user archive creation with the key "Finish".

After the User Archive is created, the query "Add fields?" appears. If you confirm
with "Yes", the dialog "General" is opened for the creation of user archive fields.
For information on how to create user archive fields, refer to the chapter "Create
user archive fields".

If you have activated the option "Create archives in loop" in the menu "Edit -
Options", the query "Next Archive?" appears after the fields have been created. If
you click on "Yes" the initial dialog box "General" appears for the input of the next
User Archive.

Save the new User Archive at the end by a mouse click on the Save symbol or by
activating the menu "Project - Save".

**Note:**

Changes on the User Archives are adopted into the database only by "Save". If a
User Archive will be aligned through the option "Redundancy", the flag "Last
Access" must be activated.
The properties of the user archive “Cola” in our example are:

<table>
<thead>
<tr>
<th>User Archives</th>
<th>Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cola</td>
<td>Name: Cola</td>
</tr>
<tr>
<td></td>
<td>Alias: Calif Cola</td>
</tr>
<tr>
<td></td>
<td>Type: Unlimited</td>
</tr>
<tr>
<td></td>
<td>Max.Recs: 1</td>
</tr>
<tr>
<td></td>
<td>Com.Type: Raw</td>
</tr>
<tr>
<td></td>
<td>PLCID: S7112</td>
</tr>
<tr>
<td></td>
<td>Var.Name: CalifVarGroup</td>
</tr>
<tr>
<td></td>
<td>Right read: 0</td>
</tr>
<tr>
<td></td>
<td>Right write: 0</td>
</tr>
<tr>
<td></td>
<td>Flags: U</td>
</tr>
<tr>
<td></td>
<td>Pos.: 3</td>
</tr>
<tr>
<td></td>
<td>Last access: 03/05/98 12:54</td>
</tr>
</tbody>
</table>
1.2.2.2.2 Creation of Archive Fields

In this section you will learn how the data fields of a user archive are created.

The default option "Put archive in loop" allows the creation of multiple fields one after another. If you want to create only one field, you can disable this option in the menu "Edit -Options".

1. Expand "Archive" in the Navigation Window (click on the "+" character). The new User Archive "Cola" is then displayed in the navigation Window.

2. Click on the navigation window with the left mouse button on the user archive "Cola". The following pop-up menu is displayed:

<table>
<thead>
<tr>
<th>New Field</th>
<th>Ins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delete</td>
<td>Del</td>
</tr>
<tr>
<td>Restore RT Data</td>
<td>Ctrl + Y</td>
</tr>
<tr>
<td>Properties</td>
<td>F2</td>
</tr>
</tbody>
</table>

3. Click on the menu item "New Field".

The dialog "General" will appear.

Note:

In case of changes of the user archive fields data can get lost under the following circumstances:

If for existing data a new consistency condition cannot be fulfilled anymore, such as for instance for Unique, Not Null etc.

If a field name has been renamed.

When a new data type cannot convert the data from the source anymore.

More information about the changing of the user archives can be found under the chapter "Change configuration of User Archives".
Definition of General Properties of Archive Fields

In the dialog box "General" specify the user archive field, which you want to create as well as the field type. With the field type "String" the field length can also be defined.

- In the input field "Field name" now enter the name for the first user archive field, in our example the first recipe content "Water".
- In the field Alias you can give the field a second name in order to comment the field or to realise a language change for the display through the text library in runtime. This input is optional.

The entered names serve for the future assignment of the fields for the table view. In the input field "Type" you can specify one of the following tag types:

- integer Signed 32-bit value
- Float Floating-point number 32-bit IEEE 754
- Double Floating-point number 64-bit IEEE 754
- string Text tag, 8-bit character set
- Date/Time no special data type available

Note:

For the tag type "Date/Time" the input format for the date and the time depends on the settings in the operating system.
Setting of the Values

In the dialog box "Values" you can enter the minimum, maximum and start values.

Minimum, Maximum and Start Value

Here you can set the respective values depending on the selected data type.

WinCC Tag

Here you can set a WinCC tag, which will save the value of the user archive field. You can...

1. enter the tag directly into the input field
2. select or create a tag interactively with the "Select" button
3. create automatically a new tag with the "Create" button
4. change the properties of the tags with the "Edit" button
Settings for the Authorizations and Flags

In the dialog "Authorizations and Flags" you can set access authorization and attributes for the user archive fields.

Rights

With the help of the "Select" button you can set here the authorizations for reading and writing access. The possible authorizations are set in the User Administrator. The setting of the access authorization is done as in the section "Create a User Archive".

Flags

In the area "Flags" you can set the following attributes for the selected data field:

1. "Field must possess a value":
   The field has a value, which must be different from zero.

2. "Field must possess an unique value":
   The field must possess an unique value, that is, the values in this column must be different from each other.

3. "Field should be supported by an index":
   The field supports an index value, if this is possible. This index can increase the performance for search commands.

4. Exit the data field input by the button on "Finish".

This will create now a new data field in the User Archive "Cola".

If you have activated the option "Create fields in loop" in the menu "Edit - Options", the query "Next Archive ?" appears after the fields have been created. If you click on "Yes" the first dialog box "General" appears for the input of the next field.

5. Save the new User Archive
1.2.2.3 Properties of Archives

In order to be able to edit the properties of a user archive...

- Click in the navigation window with the right mouse button on one of the user archives, e.g. “Cola” (first expand the archive).
- Select “Properties” in the pop-up menu.

The dialog "Properties of Archive" will open, where you can change the properties. The tabs "General", "Communication", "Flags" and "Select Authorization" have been described in the chapter "Create User Archive". The additional tab "Sequence" is used for the setting of the order of the User Archives.

Note:
Changes on the User Archives are adopted into the database only by "Save".
The "Sequence" Tab

The tab "Sequence" is used for the setting of the order of the User Archives.

Select one or more of the user archives and move its position with the "Up" and "Down" keys. Confirm your entry by clicking "OK". Save the User Archive at the end by a mouse click on the Save symbol or by activating the menu "Project - Save". The order of the user archives is then displayed in the Editor User Archives in the column "Pos.".

Note:

Changes on the User Archives are adopted into the database only by "Save".
1.2.2.2.4 Properties of Archive Fields

In order to be able to edit the properties of the data field...

- Click in the navigation window on one of the user archives, e.g. "Cola" (first expand the archive).
- In the data window of the Editor User Archives you should now be able to see the data fields of the User Archive "Cola":

![Image of User Archive Editor]

In order to be able to edit the data fields of a user archive...

- Click on the field name "Water" in the data window of the Editor User Archives
- Click on "Properties" in the pop-up menu

![Image of User Archive Editor with properties dialog open]

The dialog "Properties of the field" will open, where you can change the properties of the data field.

The tabs "General", "Values", "Flags" and "Select Authorization" have been described in the chapter "Specifying the User Archive Fields". The additional tab "Sequence" is used for the setting of the order of the user archive field.
"Sequence" Tab

The tab "Sequence" is used for the setting of the order of the data fields. The order that is set here has an effect for the display of the data in the table window of the Editor User Archives, in the control of the runtime screen and for the assignment of the indexes for the access through the functions of the WinCC script language.

Select one or more of the fields and move its position with the "Up" and "Down" keys. Confirm your entry by clicking "OK". Save the User Archive at the end by a mouse click on the Save symbol or by activating the menu "Project - Save". The order of the user archive fields is then displayed in the Editor User Archives in the column "Pos.”.

In our example the User Archive "Cola" contains the following properties:

<table>
<thead>
<tr>
<th>User Archives</th>
<th>Data fields</th>
<th>Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cola</td>
<td>Water</td>
<td>Name: Water</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Alias: Wasser_aus_Brunnen_4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Type: integer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Length:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Precision:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Min Value: 1000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Max.Value: 1200</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Start Value: 1100</td>
</tr>
</tbody>
</table>
### Variable n...:

| Right (read): | 0 |
| Right (write): | 0 |
| Flags: | NN |
| P...: | 3 |
| Last access: | 03/05/98 12:54 |

<table>
<thead>
<tr>
<th>Sugar</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alias</td>
<td>....</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dye stuff7</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alias</td>
<td>....</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Coffeine</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alias</td>
<td>....</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Phosphorit acid</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alias</td>
<td>....</td>
</tr>
</tbody>
</table>

---

Save the User Archive at the end.

**Note:**

Changes on the User Archives are adopted into the database only by "Save".
### 1.2.2.2.5 Properties of Control Tags

You can use the properties dialog of the User Archives and user archive field to edit the properties of the Control Tags. Click on the "Edit" button on the respective tab in the toolbar. The dialog "Tag properties" appears, where you can control and change the properties of tags, if necessary.

<table>
<thead>
<tr>
<th>Data Types of the control tags</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data type for @UA_Cola_ID</td>
</tr>
<tr>
<td>Data type for @UA_Cola_Job</td>
</tr>
<tr>
<td>Data type for @UA_Cola_Field</td>
</tr>
<tr>
<td>Data type for @UA_Cola_Value</td>
</tr>
</tbody>
</table>

**Note:**
The data type of the Control Tags must not be changed.

With the help of these four Control Tags you can trigger a User Archive. For the triggering you must supply either the tags "ID" and "Job" or the tags "Job", "Field" and "Value" with the respective values.

<table>
<thead>
<tr>
<th>Function of the control tags</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
</tr>
<tr>
<td>The ID (corresponds to the record number of the user archive</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Job</td>
</tr>
<tr>
<td>Three jobs are possible: Read, Write and Delete:</td>
</tr>
<tr>
<td>read = 6</td>
</tr>
<tr>
<td>write = 7</td>
</tr>
<tr>
<td>Delete = 8</td>
</tr>
<tr>
<td>After the job has been carried out, an error ID can be seen in this</td>
</tr>
<tr>
<td>control tag:</td>
</tr>
<tr>
<td>No error 0=</td>
</tr>
<tr>
<td>Error -1</td>
</tr>
<tr>
<td>Field</td>
</tr>
<tr>
<td>The archive field</td>
</tr>
<tr>
<td>Value</td>
</tr>
<tr>
<td>The archive field value</td>
</tr>
</tbody>
</table>
More value combinations of the Control Tags "ID" and "Job"

<table>
<thead>
<tr>
<th>ID</th>
<th>Job = 6</th>
<th>Job = 7</th>
<th>Job = 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>Add data record</td>
<td></td>
<td>Delete data record with the lowest ID</td>
</tr>
<tr>
<td>-6</td>
<td>Read data record with the lowest ID</td>
<td>Write data record with the lowest ID</td>
<td>Delete data record with the lowest ID</td>
</tr>
<tr>
<td>-9</td>
<td>Read data record with the highest ID</td>
<td>Write data record with the highest ID</td>
<td>Delete data record with the highest ID</td>
</tr>
</tbody>
</table>

The Control Tags provide two methods to access the user archives:

1. By entering the control tags "ID" and "Job" you can write or read or delete aimed values in a data record.

2. Instead of the Control Tag "ID" you can use the Control Tags "Field" and "Value" to search for a data record. With the Control Tags "Job" you can write or read or delete the data record which you have selected by this method. This type of the data selection can be used if, for instance, data records must be deleted from the table and appended at the end of the table again. The field "Value" must be unique, otherwise the first data record that is used for which the condition value in the field applies.

**Note:**

In order to check the function, always all four Control Tags of a User Archive must be given or created with the Wizard.

When a User Archive is created, we recommend you to use the wizards for the creation and saving of the Control Tags.

For more information on how the Control Tags can be supplied please refer to the example about the use of the control tags.

**Control Tags Application Example:**

In order to be able to work in the example with the Control Tags you must carry out the following steps:

**In the Editor User Archives**

1. Create a User Archive (in our example the User Archive "Cola"). Please enter the settings that were executed below during the creation of the User Archive.
with the help of the wizard. If the project "Cola" was already created, you can check and, if necessary, change the settings through the properties of the User Archive.

### Properties of the User Archive "Cola"

<table>
<thead>
<tr>
<th>User archive type</th>
<th>&quot;Unlimited&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication</td>
<td>via WinCC tags</td>
</tr>
<tr>
<td>Control tags</td>
<td>create</td>
</tr>
<tr>
<td>Tag Group</td>
<td>&quot;@UA_Cola&quot;</td>
</tr>
<tr>
<td>Data type for @UA_Cola_ID</td>
<td>Signed 32-bit value</td>
</tr>
<tr>
<td>Data type for @UA_Cola_Job</td>
<td>Signed 32-bit value</td>
</tr>
<tr>
<td>Data type for @UA_Cola_Field</td>
<td>Text tag, 8-bit</td>
</tr>
<tr>
<td>Data type for @UA_Cola_Value</td>
<td>Text tag, 8-bit</td>
</tr>
</tbody>
</table>

2. Create in the User Archive the data fields "Water", "Sugar", "Dye stuff 7", "Coffeine" and "Phosphoric acid" (Type Integer).

3. Create a data field "Recipes" (Type String).

**In Graphics Designer**

1. Open a new screen and create a WinCC User Archives Table Element. With a double click of the left mouse button you can open the dialog "Properties of WinCC User ArchivesTable Element".
In the area "Source" of the tab "General" enable "Archives" and in the selection field select the User Archive "Cola".

In the field "Edit" disable the check box "Read only". Enable the access types "Insert", "Change" and "Delete".

The other settings can be adopted without any changes. If you have already created a User Archives Table Element, you can check and, if necessary, change the settings with the properties dialog.

2. Create one I/O Field for each of the four Control Tags and select the following settings:

<table>
<thead>
<tr>
<th>Control Tags</th>
<th>Data Format</th>
<th>Output Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>@UA_Cola_ID</td>
<td>Decimal</td>
<td>0999</td>
</tr>
<tr>
<td>@UA_Cola_Job</td>
<td>Decimal</td>
<td>s9</td>
</tr>
<tr>
<td>@UA_Cola_Field</td>
<td>string</td>
<td>*</td>
</tr>
<tr>
<td>@UA_Cola_Value</td>
<td>string</td>
<td>*</td>
</tr>
</tbody>
</table>

Select for each tag the object property "Update for changes".

3. Create an I/O Field for each configured data field (Water, sugar etc.) and connect them with the related tags (e.g. the I/O Field for "Water" with the
process tag "@UA_Cola_Water"). Select for each tag the object property "Update for changes".

Create a text field for each configured I/O Field for the labelling, so that you can assign the individual fields in runtime. Save the made entries and activate WinCC Runtime. Now enter five Data records in the table window. Enter in the data record with the ID 2 in the column recipe "Cola" and in the fourth data record "Cola Light".
Procedure for the execution of the possible individual actions.

1. Select a data record with the ID and write the values of the data record:

   Enter the ID "3" into the I/O Field "ID" and write into the I/O Field "Job" a 7 (write).

   Now the values of the data record "3" are displayed in the I/O Fields of the process tags.

   If the action was successful, the error number "0" is displayed in the I/O Field "Job". In the case of an error, the error number "-1" is displayed.

   The Control Tags "Field" and "Value" are not required.

Note:

By entering the ID "-1" and the job "6" the current contents of the process tags are read into the table. The new values are appended to the end of the table, the IDs of the data records are continued to be counted. More combinations of the values of the Control Tags "ID" and "Job" can be found under the chapter "Properties of Control Tags".

2. Select a data record with the ID and read the values of the data record:

   Change the values in the I/O Fields of the process tag and enter a "5" in the field "ID". In the I/O Field "Job" enter a "6" (read).

   The changed values of the process tag are written into the data record "5".

   The values that were contained in this data record before are overwritten.

   The Control Tags "Field" and "Value" are not required.
3. Select a data record with the Control Tags "Field" and "Value":

   Enter in the I/O Field "Field" the word "Recipe" and in the I/O Field "Value" write "Cola Light" (entry enclosed in apostrophs). In the I/O Field "Job" enter a "7" (write).

   Now the data record "Cola Light" is written, the values of the data record are displayed in the I/O Fields of the process tags.

   The Control Tag "ID" is not needed and must therefore be set to 0.

---

**Note:**

The field which is referred to with the Control Tags "Value" must be assigned to the flag "Field must possess an unique value" in the dialog "Authorizations and Flags". A unique assignment of the data record to the value in the field is not possible otherwise.

If text is entered into the I/O Field "Value" it has to be enclosed by apostrophs (e.g. 'Cola Light').
1.2.2.3 Modification configuration of user archives

If you want to change or expand an existing User Archive, existing data in the database table could be lost. Especially if the structure of a database table is changed or the properties of a field are changed, the consistency conditions of the database cannot be fulfilled anymore.

In order to avoid the loss of data, we recommend the following procedure:

1. Disable the runtime, open the User Archive in the User Archives Editor and carry out the desired changes. Save the archive only after all the changes have been done completely (no cache saving).

2. After saving press on the button "Edit Runtime Data". On the opened table you can see whether the existing data in the User Archive are still available.

3. If the data are still present, you can use the archive or carry out further changes. In the case of changes, check after each save process whether the data are still available.

4. If after a change the data are not present anymore, first undo all the done changes in the archive without saving. Now select the archive in the User Archives Editor and select in the pop-up menu the command "Restore RT data". This will write the previous runtime data back into the table. Then save the archive and check whether the data has been written back into the archive.

<table>
<thead>
<tr>
<th>New Field</th>
<th>Ins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delete</td>
<td>Del</td>
</tr>
<tr>
<td>Restore RT Data</td>
<td>Ctrl + Y</td>
</tr>
<tr>
<td>Properties</td>
<td>F2</td>
</tr>
</tbody>
</table>

Note:

Check after each save process whether the runtime data are still available. If you have saved a first change step and already lost the data in this process and then save a second change on it, the data are lost.

If the runtime was started after a change and then the data loss detected, the data can be recovered nevertheless as described above by the command "Restore Rt data" into the table. The data can be restored even if the Editor User Archives is closed or WinCC quit. The important point in this relationship is only the single saving of a change.

In the case of comprehensive changes on a User Archive we recommend to export the existing data first to forego a data loss. The data can be written back into the changed archive by customizing the exported data table.
1.2.2.4 Configuration of Views

1.2.2.4.1 Creation of Views

The default option “Create Views in a Loop” allows the creation of multiple forms one after another. If you want to create only one view, you can disable this option in the menu “Edit -Options”.

In order to create a new view you can follow the following steps:
1. Click on the navigation window with the left mouse button on "Views".
2. Then click in the navigation or data window with the right mouse button. The pop-up menu that is displayed in the screen below appears.
3. Select the option "New View"

Now the wizard is started for the configuration of the views. You can see the dialog "General", which you can use to create a new view.

Enter as the view name for example "Dye stuff". In the field "Alias" you can give the view a second name, for instance "Dye stuffs in Cola and Orange Juice", in order to comment the user archive or to realise a language change through the text library in runtime. This input is optional.

Exit the creation of the view by the button "Finish".

After the View is created, the query "Add columns?" appears. If you confirm with "Yes", the dialog "General" is opened for the creation of a view. For information on how to create columns in a view, refer to the chapter "Create columns of a view".

If you have activated the option "Create views in loop" in the menu "Edit - Options", the "Next view?" query appears after the columns of a view have been created. If you click on "Yes" the initial dialog box "General" appears for the input of the next view.
Save the views after finishing.

**Note:**

Changes on the views are adopted into the database only by "Save".
1.2.2.4.2 Creation of Columns of a View

The default option "Put columns of a view in loop" allows the creation of multiple columns one after another. If you want to create only one column of a view, you can disable this option in the menu "Edit -Options".

1. Expand "Views" in the navigation window. The new view, for instance, "Dye stuff" is then displayed in the Navigation Window.

2. Click on the navigation window with the left mouse button on the view "Dye stuff". The following pop-up menu is displayed:

<table>
<thead>
<tr>
<th>New Column</th>
<th>Ins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delete</td>
<td>Del</td>
</tr>
<tr>
<td>Properties</td>
<td>F2</td>
</tr>
</tbody>
</table>

3. Click on the "New Column" button.

The dialog box "General" will appear.

General Properties of Columns of a View

In the dialog box "General" you can select fields from the User Archive, declare these as columns of your created view and give them their own names.
- In the selection dialog "Archive" you can select one of the set User Archives. For instance, leave the setting "Cola" without any changes.

- In the selection dialog "Field" select one of the fields from the User Archive Cola. For instance, leave the setting "Dye stuff 7" without any changes. Toggle into the next field with the TAB key or with a mouse click for further entries.

- If you click on the field "Column Name", the entry on the field "Field" is accepted. You can also select the Column Name freely, however, this name must be unique inside the view. For instance, accept the name "Dye stuff".

In the field Alias you can give the column a second name in order to comment the column or to realise a language change through the text library in runtime. This input is optional.

After you have clicked on "Finish", the configured data field is set:

![User Archive Editor](image)

The drink producer in our example for example creates a view "Dye stuff" by combining the data fields "Dye stuff 7" and "Dye stuff 16" from the User Archive "Cola" and "Juice":

If you have activated the option "Create columns of a view in loop" in the menu "Edit - Options", the "Next column?" query appears. If you click on "Yes" the initial dialog box "General" appears for the input of the next column.

Save the field of the view at the end.

**Note:**

Changes on the views are adopted into the database only by "Save".
1.2.2.4.3 Properties of Views

In order to be able to edit the properties of a view
1. Click with the right mouse button on one of the views in the Editor User Archives
2. Select "Properties" in the pop-up menu.

then the dialog "Properties of the view" will appear.

General Properties of Views

In the tab "General" the properties of the selected view will be displayed.

In the field "View name" you can change the name of the view and in the field "Alias" the alias name. In this dialog you can also see the date and time of the last change.
Definition of the Relations of Views

In the tab "Relation" you can create a relation between multiple User Archives for the output of a view. You can either formulate the logical operations directly in the SQL language or set them interactively with the given relation operators. Make sure that the user archive fields for which you want to set a relationship are of the same tag type.

Relation

In the field "Relation" you can enter the direct SQL Statements. In the appendix you can find more on the SQL language.

Conditions

In the selection fields you can enter the conditions interactively. In order to do so, click on the fields in the left and the right "Field" list and set the relation by clicking on the respective operation in the list "OP". After clicking on "Add" the condition will be accepted and this will then appear in the field "Relation".

Mode of Operation

All fields that show a relationship are connected to each other in the selected User Archive. By using the set relation, the field contents are filtered and the result is displayed as a view in runtime. The data of a view can also be edited in runtime, the modified data are inserted into the original archive.

Note:
The connected user archives must show at least one common factor or a relationship.
Definition of the Sequence of Views

In the "Sequence" tab, set the order of the views.

Select one or more of the views and move its position with the "Up" and "Down" keys. Confirm your entry by clicking "OK". Save the views at the end by a mouse click on the Save symbol or by activating the menu "Project - Save". The order of the views is then displayed in the Editor User Archives in the column "Pos.".

1.2.2.4 Properties of Columns of a View

In order to edit the properties of the columns of a view, follow the following steps:

1. Click with the right mouse button on one of the columns of a view in the Editor User Archives

2. Select "Properties" in the pop-up menu. Then the dialog box "Properties of column" appears:
The tab "General" contains the same fields as in the setup of a new view column. The date and time of the last change are shown in the field "Changed".

Definition of the Sequence of Columns of a View

In the Columns of a view set the "Sequence" tab of the views.

Select one or more of the columns and move its position with the "Up" and "Down" keys. Confirm your entry by clicking "OK". Save the views at the end by a mouse click on the Save symbol or by activating the menu "Project - Save". The order set here has an effect during the display of the columns in the table window of the Editor User Archives and in the control of the runtime screen.
1.2.2.5 Configuration Tips

- The communication between the AS and the User Archives is limited to one connection per User Archive.
- While the communication with the automation system is established, the PLCID cannot contain more than 8 characters.
- Terms that contain special characters or reserved words are not acceptable as field and table names. For more details refer also to the chapter "Alphabetical List of SQL Keywords".
- The saving of configuration changes in runtime is possible only if there is no redundancy alignment at any of the user archives at the time.
- If WinCC Redundancy is used, the same structure must be used at both the servers with the User Archives that will be aligned. Therefore the configuration of these user archives must be identical in terms of their properties and field/record structure. For the communication of the User Archives through raw data tags the name of the used raw data tags on both servers must be identical as well.
- If after the start of the Editor User Archives all fields of the toolbar are greyed out (except restore) the file "UAEditor.loc" in the project path must be deleted. This is also true for a User Archives Table Element that cannot be operated anymore.
- If you get the error message "Error while connecting the data!" at the start in runtime or at the change of the User Archives Table Element to the runtime view, a table element has no connection to a User Archive or a view. Please check whether the connection was entered correctly, whether the configuration was changed or whether the selected User Archive or the view still exist.

Note:

During configuration, a control "WinCC User Archives Table Element" is connected to a selected user archive or view and can then only access that user archive or view. For access, the user archive / view must be enabled (access protection). Specific authorizations can be assigned to the control in the User Administrator.

If this access protection is canceled, the control must be reconnected in the Graphics Designer to the user archive so that control detects the canceled access protection.

Access protection for an archive or field is queried on opening a screen of a User Archive Table Elements. Access protection for the control tags of a protected archive must be implemented separately via the object properties, e.g. of the picture, I/O field or button.
1.2.3 Language Switch

For User Archives, user archive fields, views or view fields you can realise a language change by the text library. Click the button "TextLib..." in the respective dialog box for this. The dialog to the text library is opened.

Procedure for texts from the text library
1. First set in the selection dialog "Language" the language in which you are configuring.
2. If the planned languages have already been created in the Text Library, you can load all existing texts by a mouse click into the selection field. These are displayed in the selection window and you can select the desired term.
3. After the selection the selected term will appear in the field "Text".
4. Acknowledge the dialog with "OK".
5. In the field "Alias" now the position number of this word is given from the Text Library.

If the language is changed in the runtime the term for the selected language that was selected in the Text Library will appear.

Procedure for new texts
1. First set in the selection dialog "Language" the language in which you are configuring.
2. Enter the text or term for which you want to change the language in the field "Text".
3. Acknowledge the dialog with "OK".
4. In the field "Alias" now the position number of this word is given to the Text Library.
5. Open the editor for "Text library". Here you can now enter the translation of the text that was entered into the Editor User Archives into the columns of the desired language.
6. Close the Text Library after the translation is finished.

If the language is changed in the runtime the term for the selected language that was selected in the Text Library will appear.
Note:

In the case of client projects, the same text IDs must be used in the text library of the server and client for the texts of the user archives, otherwise the text is displayed wrong in the runtime on the client.

In the field "Filter" you can specify filter properties for the texts from the text library, e.g. "a%" lists all terms from the text library that start with the letter a. If a new filter criterion is selected, you must click on the selection window again to update the text selection.
1.3 Standard Functions of the WinCC Script Language

The description of the user archive standard functions is divided into the following sections:

- General Information on Script Programming
- Functions for Editing and Displaying User Archives
- Handles of the Standard Functions
- Practical Example of a Script
- Reference of the Standard Functions for User Archives

A detailed description of the user archives functions can be found in the WinCC User Archives online help.

WinCC provides a number of standard functions enabling the user flexible implementation of user archives.

These standard functions are identified by a uniform naming convention. All standard functions for the user archives begin with "ua", for example "uaConnect", "uaArchiveOpen", uaArchiveGetFields" etc. User archive runtime functions always begin with "uaArchive"

The functions are divided into configuration and runtime functions. Handles are required for the configuration and runtime functions, which are returned by the previously called functions "uaQueryConfiguration", "uaConnect" and "uaOpen".

Note

Within a script, it must be ensured that the data is up-to-date. If a script has opened a user archive and a record is added or deleted via a Control or User Archive Editor, the script is not informed of the change. The script is only notified of the changes after a requery.
1.3.1 Configuration of Actions

Carry out the following steps in order to configure an action:

1. Start the graphic editor and create a picture of the system
2. Right-click on the object, for which an action (e.g. button) should be added.
3. Select Properties
4. Select the element from the "Properties" or "Events" tab and double click on the desired action (e.g. to configure an action for the "Press Left" mouse action, select "Events/Mouse/Press left"). In the following dialog box, the C-code can be entered directly and then be compiled.
5. Click "OK" to conclude configuration of the action.

1.3.2 Functions for Editing and Displaying User Archives

Configuration with the Standard Functions

The "uaQueryConfiguration" function provides a handle (UAHCONFIG) for the configuration functions. The "uaSetArchive", "uaAddArchive", "uaSetField", "uaAddField", etc. configuration functions can be called with this handle. The "uaReleaseConfiguration" function terminates the configuration.

Establishing a Connection to the User Archives

In order to access in runtime, the uaConnect standard function must be called to establish a connection to the user archive components. uaConnect generates the UAHCONNECT handle with which the user archives and views can be opened. The "uaDisconnect" function terminates the connection to the User Archives.

Opening the Runtime Functions

A configured user archive is required for the runtime operation. The "uaQueryArchive" and "uaQueryArchiveByName" functions provide a handle for the runtime functions. After opening a user archive with the "uaArchiveOpen" function, the user archive runtime functions can be used.
Functions for the Runtime Operation

The "uaArchiveNext", "uaArchivePrevious", "uaArchiveFirst" and "uaArchiveLast" functions move the pointer. A unique assignment to a data record of the user archive is generated via the "hArchive" handle. This assignment also allows indirect addressing, as required by the screen dialog boxes.

The "uaArchiveUpdate" function stores the temporary data record in the user archive and overwrites the data record to which the pointer is currently pointing. This data record must previously be read by the "uaArchiveNext", "uaArchivePrevious", "uaArchiveFirst" or "uaArchiveLast" functions.

Terminating the Connection to the User Archives

The "uaArchiveClose" function closes a user archive. The "uaReleaseArchive" function terminates the connection to the current user archive and the "uaDisconnect" function terminates the connection to the user archive component.

Note

The connections to the user archives established in a script must also be terminated again in that script.

<table>
<thead>
<tr>
<th>Function for Establishing a Connection</th>
<th>Function for Terminating a Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>UaQueryConfiguration</td>
<td>uaReleaseConfiguration</td>
</tr>
<tr>
<td>uaConnect</td>
<td>uaDisconnect</td>
</tr>
<tr>
<td>uaQueryArchive</td>
<td>uaReleaseArchive</td>
</tr>
<tr>
<td>uaQueryArchiveByName</td>
<td>uaReleaseArchive</td>
</tr>
<tr>
<td>uaArchiveOpen</td>
<td>uaArchiveClose</td>
</tr>
</tbody>
</table>

For the user archives, there are two views of API calls:
1. With prefix "ua" (lower case letters) for scripts (Global Script and action programming).
2. With prefix "UA" (upper case letters) for programs that run outside of WinCC.
If the calls for the User Archives are used in a Dynamic Wizard, they must be preceded by the prefix "UA" (upper case letters).
1.3.3 Handles of Standard Functions

1.3.3.1 Handles for the Configuration of User Archives

The "uaQueryConfiguration" function generates the "UAHCONFIG" handle which is a prerequisite for configuration of the user archives. This means that the "uaQueryConfiguration" function must be called first in order to receive the "UAHCONFIG" handle. This handle then allows you to call the configuration functions listed below. Finally, to complete the configuration, "uaReleaseConfiguration" must be called.

<table>
<thead>
<tr>
<th>Handles for the Configuration of User Archives</th>
</tr>
</thead>
<tbody>
<tr>
<td>UaQueryConfiguration</td>
</tr>
<tr>
<td>---&gt; Handle UAHCONFIG</td>
</tr>
<tr>
<td>required by:</td>
</tr>
<tr>
<td>uaAddArchive</td>
</tr>
<tr>
<td>uaAddField</td>
</tr>
<tr>
<td>uaGetArchive</td>
</tr>
<tr>
<td>uaGetField</td>
</tr>
<tr>
<td>uaGetNumArchives</td>
</tr>
<tr>
<td>uaGetNumFields</td>
</tr>
<tr>
<td>uaReleaseConfiguration</td>
</tr>
<tr>
<td>uaRemoveAllArchives</td>
</tr>
<tr>
<td>uaRemoveAllFields</td>
</tr>
<tr>
<td>uaRemoveArchive</td>
</tr>
<tr>
<td>uaRemoveField</td>
</tr>
<tr>
<td>uaSetArchive</td>
</tr>
<tr>
<td>uaSetField</td>
</tr>
</tbody>
</table>
1.3.3.2 Handles for the Runtime Functions

The "uaConnect" User Archives function generates the "UAHCONNECT" handle, which is required for opening and closing user archives and views. This means that the "uaConnect" function must be called first in order to receive the "UAHCONNECT" handle. This handle then allows you to call the functions listed below for opening and closing archives and views. Finally, to complete the configuration "uaDisconnect" must be called.

The "uaQueryArchive" and "uaQueryArchiveByName" functions generate the "UAHARCHIVE" handle. This handle is a prerequisite for the "uaArchiveOpen" function which opens the user archive for runtime operation. To terminate the connection, the "uaRelease" and "uaArchiveClose" functions must be called.

<table>
<thead>
<tr>
<th>Handles for the Runtime Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>uaConnect</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>--&gt; Handle</td>
</tr>
<tr>
<td>UAHCONNECT</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>required by:</td>
</tr>
<tr>
<td>uaDisconnect</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>uaQueryArchive</td>
</tr>
<tr>
<td>--&gt; Handle</td>
</tr>
<tr>
<td>UAHARCHIVE</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>required by:</td>
</tr>
<tr>
<td>uaArchiveOpen</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Required for:</td>
</tr>
<tr>
<td>uaArchiveClose</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>uaArchiveDelete</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>uaArchiveExport</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>uaArchiveGetCount</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>uaArchiveGetFieldLength</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>uaArchiveGetFields</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>uaArchiveGetFieldType</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>uaArchiveGetFieldValueDate</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>uaArchiveGetFieldValueDouble</td>
</tr>
</tbody>
</table>
## Handles for the Runtime Functions

<table>
<thead>
<tr>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>uaArchiveGetFieldValueFloat</td>
</tr>
<tr>
<td>uaArchiveGetFieldValueLong</td>
</tr>
<tr>
<td>uaArchiveGetFieldValueString</td>
</tr>
<tr>
<td>uaArchiveGetFieldName</td>
</tr>
<tr>
<td>uaArchiveGetFilter</td>
</tr>
<tr>
<td>uaArchiveGetID</td>
</tr>
<tr>
<td>uaArchiveGetName</td>
</tr>
<tr>
<td>uaArchiveGetSort</td>
</tr>
<tr>
<td>uaArchiveImport</td>
</tr>
<tr>
<td>uaArchiveInsert</td>
</tr>
<tr>
<td>uaArchiveMoveFirst</td>
</tr>
<tr>
<td>uaArchiveMoveLast</td>
</tr>
<tr>
<td>uaArchiveMoveNext</td>
</tr>
<tr>
<td>uaArchiveMovePrevious</td>
</tr>
<tr>
<td>uaArchiveReadTagValues</td>
</tr>
<tr>
<td>uaArchiveReadTagValuesByName</td>
</tr>
<tr>
<td>uaArchiveRequery</td>
</tr>
<tr>
<td>uaArchiveSetFieldValueDate</td>
</tr>
<tr>
<td>uaArchiveSetFieldValueDouble</td>
</tr>
<tr>
<td>uaArchiveSetFieldValueFloat</td>
</tr>
<tr>
<td>uaArchiveSetFieldValueLong</td>
</tr>
<tr>
<td>uaArchiveSetFieldValueString</td>
</tr>
<tr>
<td>uaArchiveSetFilter</td>
</tr>
<tr>
<td>uaArchiveSetSort</td>
</tr>
<tr>
<td>uaArchiveUpdate</td>
</tr>
<tr>
<td>uaArchiveWriteTagValues</td>
</tr>
<tr>
<td>uaArchiveWriteTagValuesByName</td>
</tr>
<tr>
<td>uaReleaseArchive</td>
</tr>
</tbody>
</table>
1.3.4 Example of as Script

The following section contains an example with two standard functions to read and write a user archive in runtime. The "UAReadFromArchive" function reads the "Cola" user archive and displays the data read in the Global Script Diagnostics Control window. The "UAWriteToArchive" function writes the user archive and displays the states and messages. The diagnostics window is created by placing an OLE Control (from the Object Palette -> Smart Objects) in the Graphics Designer and then selecting the "WinCC Global Script - Diagnostics Control" from the "Insert OLE Control (OCX)" dialog box.
In the Graphics Designer, create a new screen for your project. In the screen, create the "Read Archive" and "Write Archive" buttons and assign them the standard functions described below. The procedure is as follows:

1. Open the "Object Palette" selection window and select the "Button" field under "Windows Objects".
2. Place the button in the working area of Graphics Designer and drag it to size while keeping the mouse button pressed.
3. Right-click on this newly created button and select "Properties" from the pop-up menu. In the "Properties" tab, the button label (text) and color can be defined. The labels, for example, could read "Read Archive" and "Write Archive".
4. In the "Events" tab, assign an action to the mouse by selecting "Mouse" and then double-clicking on "Mouse Action". The script editor then appears. Enter the "UAReadFromArchive" standard script function listed below:

```c
#include "apdefap.h"

void UAReadFromArchive()
{
    UAHCONNECT hConnect = 0;
    UAHARCHIVE hArchive = 0;
    long IndexArchive;
    long FieldLength;
    long FieldType;
    long NumberOfFields;
    long Index;
    long IntValue;
    double DoubleValue;
    char ArchivName[255], StringField[255];
    SYSTEMTIME SysDate;

    //****** Connect to Component User Archives ***************
    if ( uaConnect( &hConnect ) == FALSE )
    {
        printf( "uaConnect error: %d\n", uaGetLastError() );
    }
```
return;
}
if ( hConnect == NULL )
{
printf("Handle UACONNECT equals 0\n");
return;
}

****** Connect to Archive via Archive Name ****************************
if (uaQueryArchiveByName( hConnect, "Cola", &hArchive ) == FALSE )
{
printf( "uaQueryArchive Error: %d\n", uaGetLastError() );
goto finish;
}

****** Opens Archive ****************************
if ( uaArchiveOpen( hArchive ) == FALSE )
{
printf( "uaArchive Open Error\n" );
goto finish;
}

****** Move to first record set ****************************
if (uaArchiveMoveFirst(hArchive) == FALSE )
{
printf("uaArchiveMoveFirst Error = %u\n" );
goto finish;
}

****** Get Number of Fields ****************************
NumberOfFields = uaArchiveGetFields( hArchive );
printf( "Number of Fields = %u\n", NumberOfFields );

//***** Read and show Data Fields ****************************************************
for ( Index = 1; Index < NumberOfFields; Index++ )
{
    printf( "Data of Field %u: \n", Index );
    FieldType = uaArchiveGetFieldType( hArchive, Index );
    switch ( FieldType )
    {
        case UA_FIELDTYPE_INTEGER :
            printf("Field Type = Integer\n");
            if ( uaArchiveGetFieldValueLong ( hArchive, Index, &IntValue ) == TRUE )
                printf( "Field Value = %d\n", IntValue );
            else
                printf("Error calling uaArchiveGetFieldValueLong: %d\n", "uaGetLastError()" );
            break;

        case UA_FIELDTYPE_DOUBLE :
            printf("Field Type = Double\n");
            if ( uaArchiveGetFieldValueDouble ( hArchive, Index, &DoubleValue ) == TRUE )
                printf( "Field Value = %g\n", DoubleValue );
            else
                printf("Error calling uaArchiveGetFieldValueDouble: %d\n", "uaGetLastError()" );
            break;

        case UA_FIELDTYPE_STRING :
            printf("Field Type = String\n");
    }
}

if (uaArchiveGetFieldValueString ( hArchive, Index, StringField, 20 ) == TRUE )
    printf( "Field Value = %s\n", StringField );
else
    printf("Error callinguaArchiveGetFieldValueString: %d\n", "uaGetLastError()" );

break;

    case UA_FIELDDTYPE_DATETIME :
        printf("Field Type = Date & Time\n");
if (uaArchiveGetFieldValueDate ( hArchive, Index, &SysDate ) == TRUE )
    printf("%d.%d.%d\n",SysDate.wDay, SysDate.wMonth, SysDate.wYear );
else
    printf("Error calling "uaArchiveGetFieldValueLong": %d\n", "uaGetLastError()" );

break;

    case -1 :
    default :
        printf( "Error executing uaArchiveGetFieldTypelong\n"); 
    }

****** Read and show Field Length *******************************************
    FieldLength = uaArchiveGetFieldLength( hArchive, Index );
    if ( FieldLength != -1 )
        printf( "Field Length = %d\n", FieldLength );
    else
        printf( "Error executing uaArchiveGetFieldLength\n" );
    }
//***** Close all handles and connections ****************************
finish;

//***** Close Archive ****************************
if( NULL != hArchive )
{
    if ( uaArchiveClose ( hArchive ) == FALSE )
    {
        printf( "error on closing archive\n" );
    }
}

//***** Release Connection to Archive ****************************
if( NULL != hArchive )
{
    if ( uaReleaseArchive ( hArchive ) == FALSE )
    {
        printf( "error on releasing archive\n" );
    }
    hArchive = 0;
}

//***** Disconnect to Component User Archives ****************************
if( NULL != hConnect )
{
    if ( uaDisconnect ( hConnect ) == FALSE )
    {
        printf( "error on disconnection\n" );
    }
    hConnect = 0;
}
Create a second button for writing to the archive. Follow the procedure of the first button. Select the standard function "UAWriteToArchive" and enter the following script:

```c
void UAWriteToArchive()
{
    UAHCONNECT hConnect = 0;
    UAHARCHIVE hArchive = 0;
    long    IndexArchive;
    long    FieldLength;
    long    FieldType;
    long    NumberOfFields;
    long    Index;
    long    IntValue;
    double  DoubleValue;
    char    StringField[255];
    SYSTEMTIME SysDate;

    //******* Connect to Component User Archives ***********************
    if   ( uaConnect( &hConnect ) == FALSE )
    {
        printf( "uaConnect error: \%d\n", uaGetLastError() );
        return;
    }
    if   ( hConnect == NULL )
    {
        printf( "Handle UAHCONNECT equals NULL\n" );
        return;
    }

    //******* Connect to Archive via Name ****************************
```


if (uaQueryArchiveByName(hConnect, "Cola", &hArchive) == FALSE)
{
    printf( "uaQueryArchive Error: \%d\n", uaGetLastError() );
goto finish;
}

//****** Opens Archives *****************************************************
if ( uaArchiveOpen( hArchive ) == FALSE )
{
    printf( "uaArchive Open Error\n" );
goto finish;
}

//****** Get Number of Fields ************************************************
NumberOfFields = uaArchiveGetFields( hArchive );
printf( "Number of Fields = %u\n", NumberOfFields );

//****** Read Last Data Set *************************************************
if ( uaArchiveMoveLast( hArchive ) == TRUE )
printf( "Number of Fields = %u\n", NumberOfFields );
else
{
    printf( "uaArchiveMoveLast Error: \%d\n", uaGetLastError() );
goto finish;
}

//****** Write into Data Fields *********************************************
IntValue = 32;
DoubleValue = 64;
strcpy( StringField, "Text12" );
GetSystemTime( &SysDate );

for ( Index = 1; Index < NumberOfFields; Index++ )
{
    printf( "Data of Field \%u: \n", Index );

    FieldType = uaArchiveGetFieldType( hArchive, Index );

    switch ( FieldType )
    {
        case UA_FIELDTYPE_INTEGER :
            printf("Field Type = Integer\n");
            if (uaArchiveSetFieldValueLong ( hArchive, Index, IntValue ) == TRUE )
                printf( "Field Value = %u\n", IntValue );
            else
                printf("Error calling uaArchiveSetFieldValueLong: %d\n",
                        "uaGetLastError() ");
            break;

        case UA_FIELDTYPE_DOUBLE :
            printf("Field Type = Double\n");
            if   ( uaArchiveSetFieldValueDouble (hArchive, Index, DoubleValue ) == TRUE )
                printf( "Field Value = %g\n", DoubleValue );
            else
                printf("Error calling uaArchiveSetFieldValueDouble: %d\n",
                        "uaGetLastError() ");
            break;

        case UA_FIELDTYPE_STRING :
            printf("Field Type = String\n");
            break;
    }
}
if (uaArchiveSetFieldValueString ( hArchive, Index, StringField ) == TRUE )
    printf( "Field Value = %s\n", StringField );
else
    printf("Error calling uaArchiveSetFieldValueString: %d\n",
            "uaGetLastError()" );

break;

case UA_FIELDTYPE_DATETIME :
    printf("Field Type = Date & Time\n");
    if (uaArchiveSetFieldValueDate ( hArchive, Index, &SysDate ) == TRUE )
        printf("%d.%d.%d\n ",SysDate.wDay, SysDate.wMonth, SysDate.wYear );
    else
        printf("Error calling "uaArchiveGetFieldValueLong": %d\n",
            "uaGetLastError()" );

break;

case -1 :
    default :
        printf( "Error executing uaArchiveGetFieldType\n");
    }

FieldLength = uaArchiveGetFieldLength( hArchive, Index );
if ( FieldLength != -1 )
    printf( "Field Length = %u\n", FieldLength );
else
    printf( "Error executing uaArchiveGetFieldLength\n");

// ******* Update Archive *****************************************************
if (uaArchiveUpdate(hArchive) == FALSE )
{
    }

printf("uaArchiveUpdate Error:\n");

//****** Close all handles and connections ********************
finish:;

//****** Close Archive ****************************************
if( NULL != hArchive )
{
    if   ( uaArchiveClose ( hArchive ) == FALSE )
    {
        printf( "error on closing archive\n" );
    }
}

//****** Release Connection to Archive **************************
if( NULL != hArchive )
{
    if   ( uaReleaseArchive ( hArchive ) == FALSE )
    {
        printf( "error on releasing archive\n" );
        hArchive = 0;
    }
}

//****** Disconnect Component User Archives ********************
if( NULL != hConnect )
{
    if   ( uaDisconnect ( hConnect ) == FALSE )
    {
        printf( "error on disconnecting\n" );
        hConnect = 0;
    }
}
The dialog can then be closed and runtime started. The effects of the scripts can then be monitored in the "Global Script Diagnostics Window".
1.4 Data Exchange with SIMATIC S5/S7

A data exchange between the User Archives and S5 and S7 PLCs can be carried out through raw data tags or through WinCC tags. You can use all SIMATIC interfaces, except the AS511 programming interface.

The data exchange with WinCC can be done with the following commands:

- S7-400
- S5-PLC-115U or later

The following topic will be explained:

- Data exchange with S5 and S7 via WinCC tags
- Data exchange with S5 and S7 via raw data tags
- Data format differences between WinCC and S5/S7

1.4.1 Data Exchange via WinCC Tags

The data exchange with S5 and S7 via WinCC Tags is very simple. However you must take care that for the User Archives Data Types only specific Data Types of the Tag Management can be used.

When using the data types Integer, Double and String in Editor User Archives, the following data types must be used in the tag management of the data manager. For the User Archives data type Date/Time there is no suitable data type in the tag management.

<table>
<thead>
<tr>
<th>Selection in the Editor User Archives</th>
<th>Tag Management / WinCC Tag</th>
</tr>
</thead>
<tbody>
<tr>
<td>number (integer)</td>
<td>Signed 32-Bit Value</td>
</tr>
<tr>
<td>number (float)</td>
<td>Floating-point number 32-bit IEEE 754</td>
</tr>
<tr>
<td>number (double)</td>
<td>Floating-point number 64-bit IEEE 754</td>
</tr>
<tr>
<td>Character String (String)</td>
<td>Text tag, 8-bit character set</td>
</tr>
<tr>
<td>Date/ Time</td>
<td>No suitable data type</td>
</tr>
</tbody>
</table>
1.4.2 Data Exchange via Raw Data Tags

Below we will describe the data exchange between the User Archive and the automation system via WinCC raw data tags. In order to do so, the function BSEND/BRCV is used in AS. The raw data tags are sent from the AS actively. The message frames contain one or several requests to the User Archive of WinCC. These requests can be write as well as read requests. As an answer to these request, WinCC sends the requested data and an processing acknowledgement back.

Note:
Since the AS is the active partner for a data exchange, a function of the user archive that is desired by the WinCC user must be started directly in the AS, e.g. write/read from archive values. This triggering can be done by e.g. the value of external WinCC tags in the AS being used for triggering a corresponding function of the User Archive. The parameter “Job type” that was used during the data exchange in the job or acknowledgement header cannot be used for the triggering of functions of the AS, since it has only functionality inrelationship with the User Archives.

You will find information about the following topics:
- Send jobs / data to WinCC
- Send processing acknowledgement / data to SIMATIC S5 and S7
- Structure of the message frame headers

1.4.2.1 Sending Requests/Data to WinCC

Structure of the raw data tag to send jobs and data from the SIMATIC S5 and S7 PLCs to WinCC:

<table>
<thead>
<tr>
<th>message frame to S5 / S7</th>
</tr>
</thead>
<tbody>
<tr>
<td>message frame header</td>
</tr>
<tr>
<td>Job header 1</td>
</tr>
<tr>
<td>Data of the job 1</td>
</tr>
<tr>
<td>Possible job header 2</td>
</tr>
<tr>
<td>Possible data of the job 2</td>
</tr>
<tr>
<td>Job n</td>
</tr>
</tbody>
</table>
1.4.2.2 Sending Processing Acknowledgment/Data to SIMATIC S5 and S7

Structure of the raw data tag to send processing acknowledgements and data from WinCC to the SIMATIC S5 and S7 PLCs:

<table>
<thead>
<tr>
<th>Raw data tag to send to S5 and S7</th>
<th>Processing acknowledgement</th>
<th>Acknowledgement header</th>
<th>Acknowledgement data</th>
</tr>
</thead>
</table>

1.4.2.3 Structure of the Message Headers

Structure of the separate message frame blocks (distribution in bytes):

<table>
<thead>
<tr>
<th>Function of the field</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>message frame length in byte LSB *)</td>
<td>Length of the field 4 bytes</td>
</tr>
<tr>
<td>max. length 4091 byte</td>
<td>(bec. S5/ S7 transport)</td>
</tr>
<tr>
<td>Transfer type</td>
<td>1 from WinCC, 2 from the PLC</td>
</tr>
<tr>
<td>Reserved</td>
<td></td>
</tr>
<tr>
<td>Number of the jobs in the message frame LSB *)</td>
<td>Length of the field 2 Byte</td>
</tr>
<tr>
<td>Number of the jobs in the message frame MSB**)</td>
<td>.</td>
</tr>
<tr>
<td>Name of the archive 1. character</td>
<td>Specifying the name is don in ASCII</td>
</tr>
<tr>
<td>Length of the field 8 Byte</td>
<td></td>
</tr>
<tr>
<td>Name of the archive 8. character</td>
<td>.</td>
</tr>
</tbody>
</table>
*) LSB = Least Significant Byte (lowest value byte)
**) MSB = Most Significant Byte (highest value byte)

1.4.2.4 The Request Header

Structure of the separate job header (distribution in bytes):

<table>
<thead>
<tr>
<th>Function of the field</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Job length in bytes LSB</td>
<td>Length of the field 2 Byte</td>
</tr>
<tr>
<td>Job length in bytes MSB</td>
<td>.</td>
</tr>
<tr>
<td>Job Type</td>
<td>refer to the description</td>
</tr>
<tr>
<td>Reserved</td>
<td></td>
</tr>
<tr>
<td>Field number LSB</td>
<td>Length of the field 2 Byte</td>
</tr>
<tr>
<td>Field number MSB</td>
<td>.</td>
</tr>
<tr>
<td>Record number LSB</td>
<td>Length of the field 4 Byte</td>
</tr>
<tr>
<td>Data record number MSB</td>
<td>.</td>
</tr>
<tr>
<td>Selection Criterion LSB</td>
<td>Field number, according to which the selection will be made</td>
</tr>
<tr>
<td>Selection criterion MSB</td>
<td>(not for 0) Length of the field 2 bytes</td>
</tr>
</tbody>
</table>
Data of the Request

The data of the job correspond to the contents of a data record (or the addressed field).

Important note

- Text boxes are not \0 terminated !!!
- Numbers must be transferred in Intel Format (LSB first, MSB last).
- An Integer field has a length of 4 Byte, a float field 4 Byte, a double field 8 Byte.
- The data move at the length of the field, which has been selected as the selection criterion, when the selection criterion has a value not equal to 0.

If the selection criterion will be used, the start of the data area is used as a selection value in the field size of the selection criterion.

Acknowledgment Header

Structure of the separate acknowledgement header (distribution in bytes):

<table>
<thead>
<tr>
<th>Function of the field</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message frame length in byte LSB</td>
<td>Length of the field 4 Byte</td>
</tr>
<tr>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>message frame length in bytes</td>
<td>.</td>
</tr>
<tr>
<td>Transfer type</td>
<td>1 from WinCC, 2 from the PLC</td>
</tr>
<tr>
<td>Reserved</td>
<td></td>
</tr>
<tr>
<td>Job Type</td>
<td>refer to the description</td>
</tr>
<tr>
<td>Reserved</td>
<td></td>
</tr>
<tr>
<td>Field number LSB</td>
<td>Length of the field 2 Byte</td>
</tr>
<tr>
<td>Field number MSB</td>
<td>.</td>
</tr>
</tbody>
</table>
Data of the Acknowledgement

The acknowledgement contains either the data record or the addressed field (during a read request) or it is empty (write job, archive job).

Description of the job types

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Check if user archive exists</td>
</tr>
<tr>
<td>5</td>
<td>Delete all of the records in the User Archive</td>
</tr>
<tr>
<td>6</td>
<td>Read data record</td>
</tr>
<tr>
<td>7</td>
<td>Write data record</td>
</tr>
<tr>
<td>8</td>
<td>Delete a data record</td>
</tr>
<tr>
<td>9</td>
<td>Read data record field</td>
</tr>
<tr>
<td>10</td>
<td>Write data record field</td>
</tr>
</tbody>
</table>
# Description of the error codes

<table>
<thead>
<tr>
<th>Group</th>
<th>No.</th>
<th>Description</th>
<th>Possible Causes of Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>0</td>
<td>The function has been executed</td>
<td>--</td>
</tr>
<tr>
<td>Archive</td>
<td>2</td>
<td>Not available data</td>
<td>- no archive configured with this PLCID</td>
</tr>
</tbody>
</table>
| Data record | 101 | Not allowed data | - record layout does not agree, e.g. number or type of fields  
- adding or updating records fails because e.g. archive of the type "limited" is configured or a minimum or maximum value is configured for a field  
- filter criterion incorrect |
| Data record | 102 | Not available data | (only for job type 6)  
- no data available  
- filter criterion incorrect |
| Field     | 201 | Not allowed data   | (only for job type 10)  
- filter criterion incorrect because e.g. field not available or a minimum or maximum value is configured for a field |
| Field     | 202 | Not available data | (only for job type 9)  
- filter criterion incorrect or no field found because which meets the filter criterion |
| General   | 254 | Function not available | --                                                                                      |
| General   | 255 | Undefined error    | --                                                                                      |
1.4.3 Data Format Differences between WinCC and S5/S7

The data formats in WinCC are different principally from the data formats in the SIMATIC-S5/S7 PLCs. This must be considered in order to avoid unwanted errors.

In WinCC the data formats of Intel and Microsoft are kept, where principally least significant bytes are stored first and most significant bytes last. This data format is very common and is known in general as the "Intel Format". An example should clarify the "Intel Format":

**Intel-Format**

In the Intel format the decimal number 300 is stored as follows:

<table>
<thead>
<tr>
<th>Bit</th>
<th>15</th>
<th>14</th>
<th>13</th>
<th>12</th>
<th>11</th>
<th>10</th>
<th>9</th>
<th>8</th>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binary</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Hex</td>
<td>0</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The decimal number 300 corresponds according to the Intel Format to the hex-number 12C ( 1*256 + 2*16 + 12 ).

**SIMATIC-Format**

In the SIMATIC Format the least significant bytes are stored on most significant places. In the SIMATIC format the decimal number 300 is stored as follows:

<table>
<thead>
<tr>
<th>Bit</th>
<th>15</th>
<th>14</th>
<th>13</th>
<th>12</th>
<th>11</th>
<th>10</th>
<th>9</th>
<th>8</th>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binary</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hex</td>
<td>2</td>
<td>C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The decimal number 300 corresponds according to the SIMATIC-Format to the hex-number 2C01. If 2C01 would be erroneously interpreted according to the Intel-Format, you would get 11265 decimal, that is, a significant deviation.

For the SIMATIC-PLCs there are function block available, which can carry out corresponding data conversions. These should be started always before and after the data transfer between S5/ S7 and WinCC. The function blocks can be downloaded on the Internet from the Siemens Customer Support (http://www.ad.siemens.de/support/html_00/download/s5-ag135.htm#.._download_s5-ag135_angps5_3.htm ). Es wird dann die
komprimierte Datei ANSI_S5.EXE geladen. In ANSI_S5.EXE befindet sich der Funktionsbaustein "IEEE:GP".

Active sending is described in the reference manuals of the PLCs or the CP's (Communication Processors).
1.5 Appendix

You will find the following topics on this appendix:

- SQL instructions for the specification of sorting and filter condition of user archives
- Alphabetical list of SQL keywords, these must not be used as archive or field names in the user archives
- Typical application, especially the performance when writing and reading of tags and the performance of the screen opening times
- What you must pay attention to

1.5.1 The SQL Language

SQL (Structured Query Language) is a strong and common database language. In the functions of the WinCC script language the SQL language is used for database jobs. For further information please apply to the professional references.

For some standard functions as well as for some functions in the Editor User Archives you must specify the conditions in the database language SQL for the specification of the data records to be edited. Below you will see some examples of how an SQL instruction must be provided:

- FieldA > '1992-12-31 23:45:12.12'
  The statement selects all data records where the value in the column "FieldA" is greater than the one entered. FieldA is of the data type DB_TYP_TIME.

- FieldB like 'Cauldron%'
  This is used for example to select the data records which have in the column "FieldB" the value "Cauldron1", "Cauldron4", "Cauldron12". FieldB is of the data type DB_TYP_CHAR.

- FieldC > 100
  By a condition of this form all data records are selected, which have in the column "FieldC" a value greater than 100. FieldC is of the data type DB_TYP_INTEGER

- BETWEEN FieldC = 20 AND FieldC = 200
  The statement selects all data records the value of which in the column "FieldC" is between 20 and 200. FieldC is of the data type DB_TYP_INTEGER
- FieldD
  This sorts according to the column "FieldD".

- FieldE desc
  This sorts according to the column "FieldE" in reverse alphabetical order (descending order).
1.5.2 Alphabetical List of SQL Keywords

Archive, view and field names can be made only of letters, numbers and underscores "_" and can be made of maximum 25 characters. The first character must always be a letter.

The following terms must not be used as archive, view and field names:

- "Archives"
- "View"
- "Field"
- "ViewCol"
- All SQL keywords

Keywords (or reserved words) of the database language SQL must not be used as archive, view or field name in User Archives. Below you can see the SQL keywords:

<table>
<thead>
<tr>
<th>Used keywords in SQL language</th>
</tr>
</thead>
<tbody>
<tr>
<td>add</td>
</tr>
<tr>
<td>any</td>
</tr>
<tr>
<td>between</td>
</tr>
<tr>
<td>call</td>
</tr>
<tr>
<td>char_convert</td>
</tr>
<tr>
<td>close</td>
</tr>
<tr>
<td>constraint</td>
</tr>
<tr>
<td>cross</td>
</tr>
<tr>
<td>dba</td>
</tr>
<tr>
<td>decimal</td>
</tr>
<tr>
<td>desc</td>
</tr>
<tr>
<td>drop</td>
</tr>
<tr>
<td>END</td>
</tr>
<tr>
<td>exec</td>
</tr>
<tr>
<td>First</td>
</tr>
<tr>
<td>Used keywords in SQL language</td>
</tr>
<tr>
<td>-------------------------------</td>
</tr>
<tr>
<td><strong>from</strong></td>
</tr>
<tr>
<td><strong>Group</strong></td>
</tr>
<tr>
<td><strong>if</strong></td>
</tr>
<tr>
<td><strong>inout</strong></td>
</tr>
<tr>
<td><strong>integer</strong></td>
</tr>
<tr>
<td><strong>join</strong></td>
</tr>
<tr>
<td><strong>lock</strong></td>
</tr>
<tr>
<td><strong>message frame</strong></td>
</tr>
<tr>
<td><strong>natural</strong></td>
</tr>
<tr>
<td><strong>numeric</strong></td>
</tr>
<tr>
<td><strong>Open</strong></td>
</tr>
<tr>
<td><strong>order</strong></td>
</tr>
<tr>
<td><strong>passthrough</strong></td>
</tr>
<tr>
<td><strong>Print</strong></td>
</tr>
<tr>
<td>** raiserror**</td>
</tr>
<tr>
<td><strong>references</strong></td>
</tr>
<tr>
<td><strong>resource</strong></td>
</tr>
<tr>
<td><strong>Right</strong></td>
</tr>
<tr>
<td><strong>Schedule</strong></td>
</tr>
<tr>
<td><strong>smallint</strong></td>
</tr>
<tr>
<td><strong>Start</strong></td>
</tr>
<tr>
<td><strong>synchronize</strong></td>
</tr>
<tr>
<td><strong>then</strong></td>
</tr>
<tr>
<td><strong>tran</strong></td>
</tr>
<tr>
<td><strong>union</strong></td>
</tr>
<tr>
<td><strong>User</strong></td>
</tr>
<tr>
<td><strong>varbinary</strong></td>
</tr>
<tr>
<td><strong>View</strong></td>
</tr>
<tr>
<td><strong>with</strong></td>
</tr>
</tbody>
</table>
1.5.3 Specifications

Test environment

The measurements that are described below were made in the following test environment:

- **Hardware**: Pentium III 600 / 256MB
- **Connection**: S7 Protocol Suite, Channel Unit MPI
- **Project environment**:

  Typical application: Three User Archives, Archive 1 with 100 fields 3000 data records, Archive 2 with 200 fields 1500 data records and Archive 3 with 500 fields 500 data records.

  Measurements in runtime, first and last line are read or written, triggering of the write/ read commands in table control above toolbar buttons.

  Editor closed, no C functions executed, no picture exchange executed.

WinCC Tags and raw data tags

During these measurements the WinCC tags were used. As the measurements show, the access times grow with greater user archives.

For greater user archives we recommend the use of raw data tags. Raw data tags transfer data in packs and offer a faster access even for greater archives.

---

**Note:**

Per User Archive maximum 500 fields can be created.
### 1.5.3.1 Performance while Writing and Reading Tags

In the performance measurements that were described here the behavior of the User Archives was measured during writing and reading of tags.

Please remember that the performance depends on the applied typical application.

<table>
<thead>
<tr>
<th>Number of Boxes</th>
<th>Number of data records</th>
<th>Time for writing into the tags in sec</th>
<th>Time for reading from the tags in sec</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>100</td>
<td>10</td>
<td>1</td>
<td>2-3</td>
</tr>
<tr>
<td>100</td>
<td>50</td>
<td>1</td>
<td>3-4</td>
</tr>
<tr>
<td>100</td>
<td>100</td>
<td>1</td>
<td>3-9</td>
</tr>
<tr>
<td>100</td>
<td>1000</td>
<td>1-2</td>
<td>&gt;3 (depending on connection)</td>
</tr>
<tr>
<td>200</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>200</td>
<td>10</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>200</td>
<td>50</td>
<td>1-2</td>
<td>&gt;4</td>
</tr>
<tr>
<td>200</td>
<td>100</td>
<td>1-2</td>
<td>&gt;4</td>
</tr>
<tr>
<td>200</td>
<td>1000</td>
<td>2-3</td>
<td>&gt;4</td>
</tr>
<tr>
<td>500</td>
<td>1</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>500</td>
<td>10</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>500</td>
<td>50</td>
<td>3-4</td>
<td>approx. 15</td>
</tr>
<tr>
<td>500</td>
<td>100</td>
<td>4</td>
<td>&gt;15</td>
</tr>
<tr>
<td>500</td>
<td>500</td>
<td>4</td>
<td>&gt;15</td>
</tr>
</tbody>
</table>

The calculated times depend on the size of the respective table.
1.5.3.2 Performance of the Screen Opening Times

In the following table you will see the data from one of the performance measurements of the screen opening times. We assume that in the Editor User Archives the table window is inactive.

Please remember that the screen opening times depend on the applied typical application.

<table>
<thead>
<tr>
<th>Number of Boxes</th>
<th>Number of data records</th>
<th>Screen opening time in sec</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>100</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>100</td>
<td>100</td>
<td>3</td>
</tr>
<tr>
<td>100</td>
<td>500</td>
<td>3</td>
</tr>
<tr>
<td>100</td>
<td>1000</td>
<td>3</td>
</tr>
<tr>
<td>100</td>
<td>2000</td>
<td>3</td>
</tr>
<tr>
<td>100</td>
<td>3000</td>
<td>3</td>
</tr>
<tr>
<td>200</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>200</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>200</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>200</td>
<td>500</td>
<td>4</td>
</tr>
<tr>
<td>200</td>
<td>1000</td>
<td>4</td>
</tr>
<tr>
<td>200</td>
<td>1500</td>
<td>&gt;4</td>
</tr>
<tr>
<td>500</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>500</td>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>500</td>
<td>100</td>
<td>&gt;4</td>
</tr>
<tr>
<td>500</td>
<td>500</td>
<td>&gt;4</td>
</tr>
</tbody>
</table>
1.6 WinCC User Archives Table Element

The User Archives Table Element offers access options to user archives and views of the user archives. In runtime, the User Archives Table Element allows you to:

- Create or delete data records
- Browse in the user archive
- Read and write tags via a direct tag connection
- Import and export user archives and
- Define filter and sort conditions

The User Archives Table Element offers two views: the table view and the form view.

The Table View

The table view provides a tabular representation of the user archives. Each data record occupies one row, with the data fields of a data record appearing as columns.
The Form View

The form view provides a user interface that users can structure themselves. The form view of user archives offers three field types: static texts, input fields and buttons.

Note

During configuration, a User Archives Table Element is connected to a selected user archive or view and can then only access that user archive or view. For access, the user archive / view must be enabled (access protection). Specific authorizations can be assigned to the control in the User Administrator.

If this access protection is canceled, the control must be reconnected in the Graphics Designer to the user archive so that control detects the canceled access protection.

Access protection for an archive or field is queried on opening a screen of a User Archive Table Element. Access protection for the control tags of a protected archive must be implemented separately via the object properties, e.g. of the picture, I/O field or button.
1.6.1 Configuration of the User Archives Table Element

To configure a WinCC User Archives Table Element, you have to proceed as follows:

1. Use the User Archives Editor or the functions of the WinCC script language to configure a user archive. In the description of the User Archives Editor, you can learn how the user archive "Cola" was configured.
2. Place a new User Archives Table Element in a screen of the Graphics Designer.
3. Configure the properties of the User Archives Table Element.
4. Configure a User Archives form view.

1.6.1.1 Placing User Archives Table Element in a Process Picture

To set up a User Archives Table Element in a process screen, it must be configured in the Graphics Designer. To do so, follow these steps:

1. Select the object group "Smart Objects" from the object palette.
2. Click on the object "Control" and drag open a window of sufficient size.
3. In the following "Insert Control" selection dialog box, select the "WinCC User Archive Table Element" option and confirm the selection by clicking on "OK".
or:

1. Select the "Controls" tab in the object palette; you are then offered a number of standard controls for selection in the "Object Palettes" window.

2. Select the WinCC User Archive Table element.

1.6.1.2 Define the properties of the User Archives Table Element.

The following guideline describes the configuration of a User Archives Table Element for the "Cola" user archive using the "WinCC User Archives Table Element Properties" dialog box (in the Graphics Designer).

1. Double-click within the area of the "WinCC User Archive Table Element". This will display the "WinCC User Archives Table Element Properties" dialog box containing the "General" tab.
2. In the "Source" area, the archive or view to be displayed in the control is defined. Click on "Select" and select the user archive "Cola" in the Package Browser dialog.

3. In the "Edit" field, the runtime access type can be defined. The access types "Insert", "Change" and "Delete" are activated by default. Instead of them, you can also activate "Read only".

4. The "Border" check-box defines whether the Control window is displayed with or without a frame. Activate this option.

The presettings of the remaining tabs can be accepted unchanged.
1.6.1.3 Deleting the User Archives Table Element

The User Archives Table Element is deleted in the Graphics Designer in two steps:

1. Selection (mouse-click) of the User Archives Table Element to be deleted
2. Press delete key or select "Edit - Delete" in the menu.

- The deletion will be performed without prior warning! You can only undo the deletion using the "Edit - Undo" menu or "Ctrl-Z".

1.6.2 Configuration of a Form View

The User Archives Table Element form can be configured by users themselves in the Graphics Designer and it is used for editing and for display of the user archive data.

A configured User Archives Table Element is required for the creation of a form view.

The following guideline illustrates the configuration of a new form view using the Graphics Designer.

1. While pressing the "CTRL" key, double-click on the "User Archives Table Element". The table view of the Control will be displayed. In the table view, the width of the individual columns for the runtime operation can be defined.
2. You can use this icon to toggle between the form and table view. Click on this icon to display the form view. Now you can start with the configuration of the form.

We will create the following form:

![Form with data fields]

**Note**

If you right-click on the blank form and select the "Create all" function from the pop-up menu, the form fields of all the user archive data fields will be generated automatically. A text field containing the alias name will also be created for each data field. The "Create selected" function will only generate the form fields for the columns selected in the "Columns" tab.
1.6.2.1 Creating a "Text" Form Field

Open the form view if it is not yet open.

To create a new "Text" form field, right-click on the User Archives Table Element workspace at the location where you want to place the text. The following pop-up menu will be displayed:

After selecting "Insert Text Field", the "Text Field Properties" dialog box will be displayed:

In the "Text" field, the desired text can be entered. In here, enter "Cola Input Form" as the title of the form.

Note
If you expand the list-box of the "Text" field, all field names of an archive will be displayed as static texts. If text references for a language switch have already been created in the Text library, they will also be listed.
1.6.2.2 Defining the "Edit" Form Field

Open the form view if it is not yet open.

To create a new "Edit" form field, right-click on the User Archives Table Element workspace at the location where you want to place the edit field. The following pop-up menu will be displayed:

After selecting "Insert Edit Field", you enter the "Edit Field Properties" dialog:

In the selection field of the dialog, all configured fields of the user archive are offered for selection.

Select the "Water" field. You can also define additional edit fields, e.g. Sugar, Coloring7, Caffeine, Phosphoric Acid, etc.
1.6.2.3 Defining the "Button" Form Field

Open the form view if it is not yet open.

To create a new button, right-click on the User Archives Table Element workspace in the Graphics Designer at the location where you want to place the button. The following pop-up menu will be displayed:

![Insert Button Menu]

After selecting "Insert Button", you enter the "Button Properties" dialog:

![Button Properties Dialog]

In the "Text" field, the label for the new button can be entered. Enter the text "Table View".

In the "Action" field, one of the icons for the form view can be selected. Your newly configured button will then perform the same action as the corresponding icon from the toolbar. Select "Form" to enable the switch to the table view.
Note
All functions of the form view toolbar can be connected to a button. This allows you to define the size and appearance of the buttons to, for example, operate the toolbar from a touch screen.

1.6.2.4 Editing Form Fields at a Later Time

To edit a form field, right-click on the configured form field and select "Properties" from the pop-up menu,

- double-click on the configured form field.

This will display the corresponding dialog box for editing the form field (as described in the text, edit and button form field chapters).

1.6.2.5 Deleting Form Fields

To delete a form field, right-click on the configured form field to be deleted. Click "Delete". This will delete the form field. Do not press the "Delete" key since it will delete the entire control.
1.6.3 Properties of the WinCC User Archives Table Element.

1.6.3.1 Object Properties of the WinCC User Archives Table Element

The properties of the User Archives Table Element can be changed by right-clicking on the object and selecting "Properties" from the displayed pop-up menu. The static (column) of the Filter, Form, Press TB Button and Sort properties (attributes) can be edited here. To avoid inconsistencies in the database, changes to the remaining object properties should always be made in the "WinCC User Archives - Table Element" dialog box (accessed via a double-click on the Control).

In the displayed "Object Properties" dialog, select the "Control Properties" entry from the "Properties" tab.

![Object Properties dialog](image)

**Note**
A complete description of all properties of the WinCC User Archives Table Element can be found in the Online Help.
In the Graphics Designer, the configuration of the User Archives Table Element is usually performed by double-clicking on the Control. The desired changes can then be made in the displayed dialog box. Since existing user archives, views, tags, etc. are listed in the various tabs, changes can be made safely and easily.
1.6.3.2 Properties Dialog Box of the WinCC User Archives Table Element.

"General" tab

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source</td>
<td>The &quot;Select&quot; button opens the Package Browser from which you can select a previously configured user archive or view.</td>
</tr>
<tr>
<td>Editing</td>
<td>In the &quot;Edit&quot; field, the runtime access type can be defined. If you deactivate the &quot;Read only&quot; check-box, the &quot;Insert&quot;, &quot;Change&quot; and &quot;Delete&quot; access types for the user archives will be enabled. For views, only the &quot;Change&quot; check-box will be enabled.</td>
</tr>
<tr>
<td>Border</td>
<td>The check-box defines whether the Control window is displayed with or without a frame.</td>
</tr>
<tr>
<td>Form</td>
<td>The check-box defines whether the form view in the Control window should be the initial view.</td>
</tr>
<tr>
<td>Time base of the Last Access field</td>
<td>In this selection field, you define the time base for the time display in the &quot;Last Acess&quot; field.</td>
</tr>
</tbody>
</table>
Symbol | Description
--- | ---
Print job for quick print | In this field, you define the print job which is used when printing the displayed data.

**Note**

If the configuration of the user archive was changed in the editor User Archives, e.g. by removing the access protection, the control in the Graphics Designer must be relinked to this user archive. This way the control recognizes the changed archive configuration.

**The Package Browser**

The "Select" button in the properties dialog box of the "User Archives - Table Element" activates the Package Browser. This displays the already configured user archives and views for selection.

In the case of a WinCC client project, you can select the server from which packages have been loaded and on which a user archive with tags has been configured in the navigation field of the "Package Browser" dialog. In a project of a WinCC client, the user archives of all servers in the project can be accessed. User archives on the WinCC client itself have not been planned. The "Hierarchy" field displays the path to the selected server. This field can be edited, giving you the option to manually enter the desired server.
If a required server is not included in the server list, a package of this server must be loaded first using the "Load" server data function. More information on WinCC client functionality can be found in the Help for the WinCC Explorer.

**Note**

If the Control is not connected to an existing user archive or view, the error message "Error while connecting the data!" will be displayed if runtime is activated.

"Column" tab

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Columns</td>
<td>In the &quot;Columns&quot; input field, the fields created in the User Archives Editor to be displayed in the process screen are selected.</td>
</tr>
<tr>
<td>Properties</td>
<td>The &quot;Properties&quot; field allows you to define the properties of the currently selected &quot;Columns&quot; field.</td>
</tr>
<tr>
<td>Locked</td>
<td>The &quot;Locked&quot; check-box allows you to write-protect the selected field.</td>
</tr>
</tbody>
</table>
Symbol | Description
--- | ---
Format | In the "Format" field, the value display is defined: 
Fixed (Fixed point number "%f")  
Scientific (Exponential display "%e")  
Date (Only date output "%x")  
Time (Only time output "%X")  
TimeStamp (Output of date and time "%c")  
The date field is displayed in the date format set in the operating system.
Orientation | For "Orientation", you can choose between "Left", "Centered" and "Right".
Reset | The "Reset" button restores the previous settings.

**Note**

In the "Format" field, the number of decimal places (e.g. "%3f" for three decimal places) or the hexadecimal format "%x" for integer values can be set.

"Toolbar" tab
### Symbol Description

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symbols</td>
<td>The &quot;Symbols&quot; check-boxes allow you to select the icons of the toolbar.</td>
</tr>
<tr>
<td>Access</td>
<td>The &quot;Access&quot; field displays the access rights of the selected icon.</td>
</tr>
<tr>
<td>Select</td>
<td>Clicking on the &quot;Select&quot; button will display the &quot;Authorization Levels&quot; dialog box, in which you can set the desired access.</td>
</tr>
<tr>
<td>Turn Off</td>
<td>The &quot;Turn Off&quot; field enables or disables the toolbar.</td>
</tr>
<tr>
<td>Hotkeys</td>
<td>In the &quot;Hotkey&quot; field, hotkeys can be assigned to the individual functions.</td>
</tr>
</tbody>
</table>

In the “Authorization Levels” dialog box, the desired access can be defined. The authorizations displayed in the dialog box were previously configured in the User Administrator.
"StatusBar" tab

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Areas</td>
<td>The &quot;Areas&quot; check-boxes allow you to select the elements of the Control status bar.</td>
</tr>
<tr>
<td>Turn Off</td>
<td>The &quot;Turn off&quot; field enables or disables the status bar.</td>
</tr>
</tbody>
</table>

If all areas of the status bar have been activated, the status bar will look as follows:

<table>
<thead>
<tr>
<th>Finished</th>
<th>Rec 1/1</th>
<th>Row 1</th>
<th>Col 1</th>
</tr>
</thead>
</table>
"Filter/Sort" tab

Filter Condition
In the "Filter Condition" dialog box, you define the filter conditions. Enter the rules for the filter conditions directly. These conditions are formulated using the database programming language SQL (Structured Query Language). The Appendix contains a description of SQL with a number of practical examples.

Example: FieldC >100
All data records in the "FieldC" column containing values greater than 100 are selected.

Clicking on the "Create..." button will display an automated filter dialog window in which you can define the filter conditions.
In the “Filter By” line, the filter criteria can be defined (the left list-box contains all data fields of the user archive). In the lines “Followed By” and “At Last By”, you can set the following filter conditions. The filters will be processed in this order.
Sort

In the "Sort" dialog box, you define the sort conditions. Enter the sorting rules directly using the database programming language SQL.

Clicking on the "Create..." button will display a "Sort" dialog window in which you can define the sort conditions.

In the "Sort By" field, the sort criteria can be defined (the list-box contains all data fields of the user archive). In the "Followed By" and "At Last By" selection fields, you can set the following sort conditions. The filters will be processed in this order. The "Ascending" option sorts in ascending order and the "Descending" option sorts in descending order.
"Fonts" tab

In the "Fonts" tab, the font used by the Control is defined.
"Colors" tab

In the "Colors" tab, the colors used by the Control are defined.
1.6.4 User Archives Table Element im Runtime

1.6.4.1 The table of the User Archives Table Element

The table of the User Archives Table Element is used to display the user archive data in runtime in tabular form.

```
<table>
<thead>
<tr>
<th></th>
<th>D</th>
<th>Recipes</th>
<th>Water</th>
<th>sugar</th>
<th>Caffeine</th>
<th>Coloring</th>
<th>Phosphoric acid</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>Calif Coke</td>
<td>90</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>Coke</td>
<td>80</td>
<td>80</td>
<td>15</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>Standard</td>
<td>100</td>
<td>50</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>CokeLight</td>
<td>100</td>
<td>20</td>
<td>80</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>CherryCoke</td>
<td>100</td>
<td>80</td>
<td>50</td>
<td>5</td>
<td>10</td>
</tr>
</tbody>
</table>
```

The table and form window is operated using this toolbar:

```
<p>| | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

Editing within the table is the same as editing in the table of the User Archives Editor.

**Note**

If one or more values are changed in a control table, you must exit the data record (by clicking on another table cell or row) after making the entry in order for the value to be accepted into the database and be updated in all displays. Actions in the WinCC script language must themselves ensure the selection of data records. Records cannot be selected using the Control.
1.6.4.2 The Form of the User Archives Table Element

The form of the User Archives Table Element can be configured by users themselves in the Graphics Designer; it serves for input and representation of the user archive data in runtime in a form that is particularly appealing to the user.

Note
If one or more values are changed in the User Archive Table Element form, you must click on another data record after making the entry in order for the value to be accepted into the database and be updated in all displays.
1.6.4.3 The Toolbar of the User Archives Table Element

The toolbar offers the following operating options:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Switch" /></td>
<td>Switch</td>
</tr>
<tr>
<td><img src="image" alt="Delete" /></td>
<td>Delete a data record</td>
</tr>
<tr>
<td><img src="image" alt="Create" /></td>
<td>Create a new data record</td>
</tr>
<tr>
<td><img src="image" alt="Edit" /></td>
<td>Edit an existing field</td>
</tr>
<tr>
<td><img src="image" alt="Page" /></td>
<td>Page through the table window</td>
</tr>
<tr>
<td><img src="image" alt="ReadWrite" /></td>
<td>Read or write from tags</td>
</tr>
<tr>
<td><img src="image" alt="ImportExport" /></td>
<td>Import and export user archives</td>
</tr>
<tr>
<td><img src="image" alt="Filter" /></td>
<td>Define filter conditions</td>
</tr>
<tr>
<td><img src="image" alt="Sort" /></td>
<td>Define sort conditions</td>
</tr>
<tr>
<td><img src="image" alt="TimeBase" /></td>
<td>Time base of the &quot;LastAccess&quot; field</td>
</tr>
<tr>
<td><img src="image" alt="Print" /></td>
<td>Print</td>
</tr>
<tr>
<td><img src="image" alt="Help" /></td>
<td>Request help</td>
</tr>
</tbody>
</table>

**Switch**

This icon allows you to switch between the form and table views.

**Delete data record**

Deletes the highlighted data record.

**Create a new data record**

Sequentially enter values into the data fields and confirm each entry by clicking on this icon. After entering all data fields, the data record with the entered values will be created.
Edit an existing field

After clicking on this icon, click on the field you want to edit. This will display the cursor, indicating that this field can be edited. As long as the "Edit an existing field" icon is active, the User Archives Table Element is in the "Edit" mode. This means that you can move the cursor in the table and make changes immediately. If the "Edit" mode is turned off, changes can only be made after pressing the F2 key or double-clicking on the field to be changed.

Page through the table window

These buttons allow you to page forward/backward in the table window and to jump to the beginning/end of the user archive.

Read or write tags

These buttons allow you to read and write WinCC tags.

When setting up the user archive in the "Properties of Archive" dialog box in the "Communication" tab, you can choose the type of communication "Communication via WinCC Tags".

Import/export archives

Clicking on these icons imports/exports user archives in the CSV (Comma Separated Value) format.

Warning! Before exporting to Excel, the CSV file type must be specified in order for the exported WinCC CSV file to be read correctly.

Note

In the case of a multi-user project, bear the following in mind: If there is a user archive on the server, e.g. at "c:\Projekte\Test\UA", it is enabled with this specified path. The client maps the enablement via a network drive e.g. "I:\Test\UA". Thereafter, the standard path of the user archive is on the client "I:\Test\UA". However, this directory does not exist on the server with this description. If you want to import/export user archive data, you have to change the standard path on the client, in our example to "C:\Projekte\Test\UA".
Define filter conditions

This option allows you to define filter conditions. All displayed data will be exported - if you only want to export a partial set, you must formulate filter conditions that will only allow the display of the desired data. You can then export the filtered data.

The filter conditions are formulated using the database programming language SQL (Structured Query Language). The Appendix contains a description of SQL with a number of practical examples. Additional information can be obtained from appropriate literature.

Example: ID < 100
Only data fields with IDs ranging from 1 to 99 will be selected, all other data fields will not be displayed.

Clicking on the "Create..." button will display an automated filter dialog window in which you can define the filter conditions.
In the "Filter By" line, the filter criteria can be defined (the left list-box contains all data fields of the user archive). In the lines "Followed By" and "At Last By", you can set the following filter conditions. The filters will be processed in this order.

**Note**

The filter conditions defined in here are only temporary, i.e., after a new screen is generated, the filter criteria defined in the properties dialog box will apply again.
Define sort conditions

This option allows you to define sort conditions.

Enter the sorting rules directly using the database programming language SQL. Also refer to the description of SQL in the Appendix. Additional information can be obtained from appropriate literature.
Clicking on the "Create..." button will display a "Sort" dialog window in which you can define the sort conditions.

In the "Sort By" field, the sort criteria can be defined (the list-box contains all data fields of the user archive). In the "Followed By" and "At Last By" selection fields, you can set the following sort conditions. The filters will be processed in this order. The "Ascending" option sorts in ascending order and the "Descending" option sorts in descending order.

**Note**

The sort conditions defined in here are only temporary, i.e. after a new screen is generated, the sort criteria defined in the properties dialog box will apply again.

**Time base of the "Last Access" field**

Using this option, you can change the time base of the "Last Access" field.

**Print**

This option begins printing the displayed values.

**Request help**

Click on this icon to request help for the User Archives Table Element.
1.6.4.4 Operation of the Control via Dynamic Objects

The User Archives Table Element offers you the possibility convert all the buttons on the toolbar to self-defined buttons or I/O fields. This allows you to define the size and appearance of each button to, for example, operate the Table Element from a touch screen.

Example of using the "Press TB Button" attribute

To establish a connection of the User Archives Table Element to a button, perform these steps:

1. In the Graphics Designer, create a button and display its object properties by right-clicking on the button.

2. In the "Event" tab, select the option "Mouse". In the right side of the tab, select execute in the case of a "Mouse Action". Right-click on the arrow in the "Action" column and select "Direct Connection" from the pop-up menu.
3. In the "Source" area, activate the "Constant" radio-button and enter a constant, e.g. "Form" (an overview of the constants available for the User Archives Table Element is provided below). In the "Target" area, activate the "Object in Screen" radio-button and select the Table Element to be connected from the "Object" list. Select "Press TB Button" from the "Property" list and confirm all settings made by clicking on "OK".

4. Save the screen in the Graphics Designer and go to runtime. If you now click on the configured "Form" button, the display of the Control will switch from the table view to the form view and vice versa.

The constants for a direct connection to the User Archives Table Element

For the above direct connection of the User Archives Table Element, a constant is available for each button of the Control. The assignment of the individual buttons is listed in the following table:

<table>
<thead>
<tr>
<th>Constant</th>
<th>Associated button</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form</td>
<td><img src="image" alt="Form" /></td>
</tr>
<tr>
<td>Delete</td>
<td><img src="image" alt="Delete" /></td>
</tr>
<tr>
<td>New</td>
<td><img src="image" alt="New" /></td>
</tr>
<tr>
<td>Edit</td>
<td><img src="image" alt="Edit" /></td>
</tr>
<tr>
<td>First</td>
<td><img src="image" alt="First" /></td>
</tr>
</tbody>
</table>
**Note**

If the table window is operated with a keyboard, the cell cursor in the selected data record cell will become invisible after hitting the "TAB" or "Position 1" key. To jump back to the last edited data record, create a button, following the steps outlined above, using the constant "VTB_Focus". By clicking on this button, the cell cursor will jump back to its last position.
2 Multi-User Systems

2.1 Client-server Systems in WinCC

Introduction

WinCC can be used to configure client-server systems having several clients and servers enabling large systems to be operated and monitored more efficiently. By distributing the tasks for operating and monitoring processes amongst several servers, the utilization rate of each individual server is reduced, thus increasing the performance. In addition, it is also possible to map systems which have a technologically or topologically complex structure using WinCC.

Examples of client-server system implementation:

• In the case of large systems in which several monitoring and operating workstations (clients) are required to complete the same tasks.
• When different operating and monitoring tasks should be distributed over several operating workstations, e.g. a central client for displaying all messages from one system.

Clients can be used for:

• Multi-user systems with one server to configure: Several clients access the project on a server with process driver connection. In the case of a multi-user system, it is not necessary to configure the clients because all data is provided by the server.
• Distributed systems with several servers to configure: Clients can display the data from different servers with process driver connection. Within a distributed system, each client has an individual configuration, the necessary server data is imported on the clients and, if modified, can be automatically updated. The process data is provided by the servers.
• Remote configuration: One server project is configured from a client.

Conditions for Configuring Client-server Systems

In order to configure client-server systems with WinCC, the "WinCC Server" option must be available on every WinCC server.

All computers in a client-server system must be connected to each other via a network (LAN). It is also possible to log on computers in neighboring subnets, which are connected via a router, as clients or servers in the system.

In order to connect computers via ISDN, the WinCC SmartTool “Communication Configurator” is required.
Redundant Systems

To maintain system operation even in the case of faults, e.g. following failure of a server, it is recommended to configure a redundant server. The exact procedure for configuring redundant systems is described in the WinCC documentation "Redundant Systems".

The documentation contains information on the configuration of clients in redundant systems.

Note:
If a project must be configured remotely on a redundant server, the redundancy must be deactivated before starting the remote configuration. Otherwise, there is a risk that the active server switches to the redundant server during configuration and the consistency between the redundant server pair can no longer be guaranteed.
2.2 Configurations and Quantity Structure

Configuration of Client-Server Systems for Different Requirements

Different client-server solutions can be configured according to the requirements. It is possible to implement Clients, WebClients and ThinClients.

Clients
Depending on the configuration, clients in a client-server system can:

- Represent a view from a server on several clients (multi-user system)
- Display views of several servers on clients (distributed system)
- Configure a server project (remote) from a client
- Activate and deactivate a server project (remote) from a client

To configure several clients the "WinCC Server" option is required on each server.

WebClients
WebClients are installed in a client-server system, for example, when:

- Access to the system is required via narrowband connections
- Only temporary access to data is required
- Data access is necessary over large distances, e.g. via Internet

WebClients have the following advantages:

- Client computers with different operating systems can be implemented
- Simultaneous access to a server by several WebClients is possible
- Large quantity structures can be realized

In order to configure WebClients, a minimal installation of WinCC is required and the "WinCC WebNavigator" option.

ThinClients
ThinClients basically have the same main features as WebClients and the additional features:

- Use is also possible on robust client platforms on a Windows CE basis (e.g. MP370)
- Mobile clients can also be used (e.g. Mobic)

In order to configure ThinClients, a minimal installation of WinCC is required and the "WinCC WebNavigator" option.
Possible numbers of clients and servers

Different quantity structures can be realized according to the type and number of client types used. Mixed systems are possible, meaning the parallel use of clients and WebClients within one client-server system.

If only clients are used, up to 32 clients have parallel access to one server in a WinCC network. One client can access up to 12 servers in runtime. A maximum of 24 servers can be implemented in the form of 12 redundant server pairs.

When using WebClients, the maximum quantity structure is achieved with up to 51 clients (1 client and 50 WebClients). In such a system, a maximum of 24 servers can be implemented in the form of 12 redundant server pairs.

Configuration of mixed systems

When configuring a mixed system, the following rule of thumb should be observed to achieve the maximum quantity structures:

Each client type has one value:
- WebClient/Thin Client = 1
- Client = 2
- Client with “Configure remote” function = 4

The total of all the values of all the clients should not exceed 60 per server in the case of WinCC servers without operating function. In the case of servers with operating function, the total value should not exceed 16.

Example:

<table>
<thead>
<tr>
<th>Components</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 clients with the &quot;Configure remote&quot; function</td>
<td>2 x 4 = 8</td>
</tr>
<tr>
<td>4 Clients</td>
<td>4 x 2 = 8</td>
</tr>
<tr>
<td>44 WebClients</td>
<td>44 x 1 = 44</td>
</tr>
<tr>
<td>Sum</td>
<td>60</td>
</tr>
</tbody>
</table>
2.3 Client-Server Scenarios

Introduction

WinCC can be used to realize different client-server scenarios according to the application:

**Multi-user systems**

A multi-user system is typically configured for smaller systems in which a distribution of data to several servers is required.

A server with process driver connection is configured which is then responsible for all central functions and several operating stations (clients). The individual operating stations can perform the same or different tasks in this case.

The clients can be used for the following, depending on their operator authorization:

- Monitor the system.
- Monitor and operate the system.
- Remote configuration of the server project, e.g. as service computer.

The clients can be used for the following, depending on their configuration:

- To display the same view of the project when the process, for example, should be capable of being operated from various points in the system.
- To display different views of the project, e.g. only messages.

User authorization is issued to define the functions that are available to an operator on a certain operating console.

**Distributed systems**

Distributed systems implementing several servers are generally used in the case of large systems when particularly large quantities of data must be processed. As a result of distributing the tasks amongst several servers, the load applied to individual servers is reduced. A better system performance is obtained and larger quantity structures can be realized.

If distributed systems are configured in a WinCC system, the process tasks are distributed amongst the servers by means of the corresponding configuration according either to the process steps or functionally:

- In the case of a technological distribution, each server takes over a technically restrictable area of a system, e.g. a certain press or dry unit.
- In the case of a functional distribution, each server takes over a certain task, e.g. visualization, archiving, issuing alarms.

In runtime, the clients in a distributed system can each display the data from up to twelve different servers or from redundant pairs of servers. Each client in a distributed system is configured individually with basic pictures and a little local
data. The server data required for displaying the process data is transferred from the servers to the clients and can be updated automatically, if necessary.

**Fileserver**

You can use a fileserver for client-server systems in order to save all projects and administer them in a centralized system. Therefore it is e.g. easier to create regular backup copies of all projects. The servers with process driver connection have access to the fileserver and can configure the projects on the fileserver. The fileserver can be used for configuration only.

The fileserver can be adapted to specific demands, as necessary, by adding further hardware components. This enables, for example, the production of mirrored disks for backup security.

**Long-term archive server**

A long-term archive server is used to save archive backup copies. A server without process driver connection is used as a long-term archive server onto which the servers with process driver connection transfer their archive backup data copies. Access can be made to the archived data on the long-term archive server with external applications using OLE-DB, for example.

**Central archive server**

You can save process values and messages of all connected WinCC servers on a centralized archive server (WinCC Historian). You can display the saved process values and messages, as usual, on the process screen in Runtime in WinCC Online Trend Control or WinCC Alarm Control. Moreover, you have direct access to the process values and messages saved in the archive by means of defined interfaces, such as ODBC or OLE-DB. In this way, you can make available important production data, for instance, throughout the company for analyzing purposes.

**Server-server communication**

During communication between two servers, one server accesses data on another server. One server is capable to access the data from up to twelve other servers or redundant pairs of servers. The server accessing the data behaves as a client in respect of the configuration and operation, except that a standard server cannot be configured.

Each server making access requires a WinCC server license. When the system is being configured, the accessing server must be included in the quantity structure.

**Standard server**

In distributed systems, your data is allocated server prefixes from specific servers so that WinCC controls can display messages and process data.

In a distributed system, a standard server is configured for clients so that data, to which no unique prefix has been specified, can be requested from the standard server. If no standard server is defined, an attempt is made to access the corresponding data locally. If there s no local data management (e.g. messages and archives), access is rejected and an error message issued.

**Preferred server**
If redundant servers are used in the distributed system, a preferred server can be configured for the clients.

A preferred server is the server in a redundant server pair which has priority for a client in a distributed system. The preferred server can be selected separately for each client in order to ensure the operability of the system.
2.4 Server Configuration

Introduction

A server within a WinCC network can fulfill the following tasks:

- Connection to the process
- Acquisition of the process values
- Archiving messages and process values
- Providing clients with data from the process
- Providing clients with the configuration data

The tasks assumed by the individual servers can be distributed according to technological or functional aspects:

- Technological aspect: Each server manages a specific section of the process/system.
- Functional aspect: Each server fulfills a specific task in runtime in respect of the entire process, e.g. alarm logging or archiving.

Configuration steps

Configuring a multi-user system

In the case of a multi-user system, several clients are configured which display the view from one server in runtime. The clients receive data exclusively from one server and have no individual configuration.

Proceed as follows to configure a server in a multi-user system:

1. Create a new project, of the "Multi-User Project" type, on the server.
2. Configure the necessary project data (pictures, archives, tags...) on the server.
3. Clients which should be capable of remote configuration must be registered in the computer list on the server.
4. Assign operating rights for the clients which should be capable of remote configuration.
5. Activate the automatic package import at the server.
6. Configure the clients in the server project.
Configuring a distributed system

In a distributed system, clients are configured with views on several servers. The clients have their own projects with local data. Data updated by the server is transferred to the clients via the package export feature.

Proceed as follows to configure a server in a distributed system:

1. Create a new project, of the "Multi-User Project" type, on each server.
2. Configure the necessary project data (pictures, archives, tags...) on each server. Depending on the distribution (technological/functional), it can also be related to specific project data, e.g. only archives.
3. Clients which should be capable of remote configuration must be registered in the computer list on the server.
4. Assign operating rights for the clients which should be capable of remote configuration.
5. Configuring the package export (manually or automatically).
6. Configure the client projects on the clients.
7. Make the server data (packages) available to the clients.

**Note:**
Always configure the server of a client-server system before the associated clients.
2.5 Client Configuration

Introduction

A client configuration is only necessary when a distributed system is configured in which the clients can display the views on several servers. If a multi-user system is configured in which the clients only display data from one server, no client configuration is necessary. The clients receive all the data and their runtime environment from the server project.

If a client-server system is configured which includes several servers, and clients display different views on several servers (distributed system), configure an individual client project for each client. In runtime, each client can display views on up to twelve different servers redundant servers, e.g. display messages from Server 1 and Server 2, display and write process values from Server 3, display pictures from Server 4, etc.

Clients in a distributed system can perform the following according to the respective operating authorizations on the server:

- Monitor the process.
- Monitor and operate the process.
- Remote configuration of projects on a server.
- Remote activation and deactivation of projects on a server.

**Note:**

In order to display data from different servers, the server prefixes (i.e. the server names) must be unique within the distributed system.

Each client has its own configuration and stores a little administrative client-specific data locally in the client database, e.g.:

- Local tags
- User administrator data
- Data from the Text Library
- Project properties
- User cycles

**Note:**

All external data of the server configuration must also be available on the clients so that it can be displayed correctly in the client project. External data relates to ActiveX Controls which do not come from WinCC and external graphics which are integrated as OLE objects, for example.
Configuration steps

1. Configuring server projects.
2. Creating and exporting server packages.
3. Configuring the package import on the client.
4. Configuring the client projects on the clients.
2.6 System Behavior in Runtime

Introduction
A client-server system in WinCC can be used to distribute the system configuration to several servers in order to reduce the load applied to the individual servers. The data configured on the server can be displayed by clients, whereby a client can display data from up to twelve different servers or redundant server pairs in runtime.

Behavior of Editors in Runtime

Archive
If the archive system is activated on an operating station, the Tag Logging Runtime operates on the servers as archive server, on the clients as archive client. Only the archive server accesses the database and compiles and archives the process data. The clients receive archive data from the archive server.

The archive data can be displayed as a table or graphic on every client on which the Tag Logging Runtime runs. The data to be displayed always comes from the archive server. All operations on the client are transmitted to the server and the result of the processing is transferred back to the client.

Graphics
When a picture is called in by a client in runtime, Graphics Runtime initially searches for locally stored pictures. If no picture with the corresponding name is found locally, a search is made in the project folder on the server. If no picture is available, the corresponding message appears.

If a picture request requires an exchange with another editor (Alarm Logging, Global Script), the exchange is local. A picture can be opened and processed by several operating stations in runtime.

Note:
The picture build up on the client is quicker when the respective picture is copied locally onto the client. Enter the relevant directory in the client's "Computer Properties" dialog in the Runtime tab control. It is also possible to specify whether the directory should always be used or preferably.

If a picture is modified in the server project, the data must be updated manually by copying the modified picture to the local client again.

Messages
If messages are displayed on a client, the client receives the data displayed from the server. The message server receives the configured data from the database.
Archive data and message lists can be displayed on every client. The data to be displayed always comes from the message server. When new messages are received, the messages are archived in the message server.

When an operating acknowledges an alarm, the acknowledgement is transferred to the message server. The server enters the change of status in the archive and distributes the notification to all participating clients. The same process applies to the locking of messages.

If a message server is not available in runtime, the corresponding message appears in the message window instead of the messages. When the server becomes available again, messages are displayed in the message window again.

Reports

The protocol system in WinCC does not detect runtime in the real sense of the meaning. Protocols and print jobs can be configured and executed at any time. Only print jobs which should display the archive or process data are dependent on runtime.

The protocol system is automatically started on every client during the startup routine. The server operates as a protocol server, the clients as protocol clients. During the startup routine, the client log in on the server and receive the current information on the print jobs available and their status. If a print job is started on a client, it obtains the related data from the server database. The print job is started locally. The protocol server receives the current data concerning the print job status from the client and transfers the information to the other clients.

Scripts

If an operating station activates a project locally, the server’s project functions and standard functions are loaded locally.

User administrator

The operating rights are checked by the runtime component of the User Administrator. The user administrator runtime component is automatically started on every computer when WinCC is activated. If the login is changed, the current operating rights list is loaded from the local database.

Text library

If the server project is activated, Text Library Runtime runs on the server as text server and on the clients as text client. The data is always read from the server database.

Behavior in the case of system faults

If a server is not available, the clients poll the server cyclically until is has been started up again. Data on the server cannot be displayed in the case of system faults, all the operable graphic objects, for example, are switched inactive.
2.6.1 Starting Up the Server

Principle

Servers in a client-server system can be started up independently of the clients. As soon as a server has been started up, it makes its services available to the clients and retrieves information on all the participants in the network.

The current status of all the servers can be viewed in the "WinCC Projects" data window. Open "WinCC-Projects" using the Windows Explorer:

![WinCC Projects window](image)

If a server fails during normal operation, the data on the clients can no longer be updated and information is provided on the failed server.

**Note:**

If a file server is used in the client-server system, the system is only ready for operation again when both the file server and the WinCC server have been started up.

Remote Activation

A server can also be started from another remote computer (client or server). The procedure for this is described in "Activate project".
2.6.2 Starting Up the Client

Principle

The clients in a client-server system boot independently of the servers. When a client in a client-server system starts up, it receives all the current information on the following via the WinCC servers known to it in the network, e.g.:

- Project names
- Server names and IP addresses
- Project status of the servers (configuration or runtime)

The user can view the corresponding information in the list in the "WinCC Projects" dialog. If the status of a server changes, the "WinCC Project" dialog of all the participating computers is updated.

Server not available

If servers are not available, a corresponding error message is issued. In addition, graphic objects, for example, who receive their data from the server, are switched inactive.

Scripts can be used to configure the display of connection faults to the client.
2.6.3 Special Communication Features Using Servers with Several Network Cards

Introduction

If several network cards or SIMATIC NET SOFTNET drivers are installed on a WinCC server for the process connection and are operated with an active TCP/IP protocol, communication of the server with WinCC clients could be affected. A possible cause could be that each network card or the SOFTNET driver in the server has its own IP address. Therefore, under certain circumstances, it is possible that when the server is logged on in the network, Windows attempts to establish a connection via the wrong IP address, e.g. via that of the SOFTNET driver. If the attempt to establish a connection fails, Windows marks the communication via this IP address as defective but does not attempt to establish a connection via another IP address available on the computer.

In this case, appropriate modifications must be made by the network administration.

Diagnostics

This conflict can be detected in WinCC with the aid of the "NetCC" component, for example.

If display of the IP address is activated in the NetCC Viewer properties, the overview field enables a quick check to be made as to whether a computer is displayed with an address assigned an incorrect, i.e. unavailable, network area. In this case, the configuration of the computer's network card should be checked in CCAgent on the computer.

To do this, call in the Configuration dialog from CCAgent. The following options are available:

- When the toolbar icon for CCAgent is displayed, select the "Configuration" menu option in the pop-up menu of this icon and open the "CCAgent - Configuration" dialog.
- If no toolbar icon for CCAgent is displayed, open the navigation window in Windows Explorer and select the "WinCC Projects" directory. Then select the "WinCC Projects" directory in the data window. Select the "Configuration" entry in the pop-up menu of the directory and use it to open the "CCAgent - Configuration" dialog.

Then use the "Extended" button to open the "CCAgent - Configuration - Extended" dialog. This dialog displays several IP addresses for selection in the "IP-Addr." field. The fault can be cleared by selecting the correct address and starting a new attempt to establish a connection using the "New Initialization" button.
A check should also be made in the configuration of the SOFTNET driver on the server whether the Windows utilities not required for the process connection can be deactivated.

If a connection can still not be established after checking these points, please contact Customer Support.

**Note:**
An authorization license is required for WinCC NetCC on the client. None is required on the server.
2.6.4 Shutting down the Server

Principle
If a server in the client-server system is shut down, it can no longer provide the connected clients with process data. It is simultaneously logged off from the system and is marked in the "WinCC Projects" dialog project list as deactivated.

Remote Deactivation
A server can also be shut down from another remote computer (client or server). The procedure for this is described in "Deactivate project".

2.6.5 Shutting Down the Client

Principle
When a client in a client-server system is shut down, it is logged off from the system.
2.7 Remote Configuration

Principle

Clients provided with the corresponding operating rights can operate a server project from a remote station, e.g.:

- Remote configuration of a server project
- Activate a server project
- Deactivate a server project

Remote configuration is possible using the "WinCC Projects" dialog which can be opened from Windows Explorer:

Function of WinCC Projects

The "WinCC Projects" dialog displays the enabled servers and the projects in the client-server system which can be accessed via the network. These include all the projects which run under a demo license.

The window can be used to access an enabled server project from a client:

- to remotely open any project
- to remotely activate a project
- to remotely deactivate a project
2.7.1 Access to Projects from Several Clients

Configuration Options

One or more clients can access the server project in remote operation depending on the type of data. A differentiation is made between data stored in a server database (alarm logging, tag logging, tags, user admin, text library) and data based on files (pictures and graphics, reports, scripts).

Note:
Data from the server database can be processed by several clients at the same time. Observe, in this case, that modifications from the last client that stored the data are stored when several clients access the same data. In the case of data from the server database, all the data from the respective editor is always stored, not individual values.
In the case of data stored in the files, the data is blocked for further access when the file is open.

Archives (tag logging)
Archives are stored in the server database. The data in Tag Logging can be modified in runtime. The modifications are distributed by the server to all the participating clients.

Pictures
Pictures are stored as files on the server or file server. When a client accesses a picture on the server, the picture blocked for other clients. Different project pictures can be opened by different clients.
Pictures can be changed in runtime and, after being stored, are available the next time the picture is selected. Pictures can also be stored locally for editing but matching them with the respective ones on the server must be carried out manually.

Messages
Messages are stored in the server database. The data in the alarm logging system can be modified in runtime. The modifications are distributed by the server to all the participating clients.

Reports
Protocols are stored centrally in the server's project folder. The protocol data is divided into layouts (files) and print jobs (entries in the project database). Only one client can configure the protocol system on the respective server.
Protocols can be stored locally to be edited, but matching them with the respective ones on the server must be carried out manually. It is not intended to enable modifications to the protocol system in runtime because protocols can be executed independent of runtime.
Scripts

Scripts are stored centrally in the server’s project folder. Project-specific scripts can be defined individually on local computers. Scripts are stored in files. Graphics Designer actions are stored in the picture. During editing, the files (scripts or pictures) are blocked for other clients. If there is no connection to the server, scripts can be modified locally, but matching them with those on the server must be performed manually. Scripts can be modified in runtime. The server distributes the modifications to all the participating computers.

Note:
If a client without access to the server configures a script, that script is stored locally. If the script should be available on the server, the script must be copied in the appropriate server folder manually.

Texts in the text library

Texts in the text library are stored in the server database. The text objects are stored individually. Texts can be modified in runtime. The server distributes the modifications to all the participating computers. Updating occurs in the configuration language defined on the local computer.

Note:
Certain WinCC editors, such as Alarm Logging and User Administrator, access the same database table in the text library during configuration. Therefore, these editors can only be operated simultaneously on one operating station.

Tags

Tags are stored in the server database.

Note:
If a client project is deactivated in order to modify a tag, the modifications only take effect after restarting all the computers on which the project was active at the moment it was changed.

User administrator

The user administrator operating rights are stored in the server database. User administrator data can be modified in runtime. The participating computers are not notified. The new data takes effect when the client is logged in again.
2.8 Use of the OPC Interface in Client-server Systems

Principle

OPC (OLE for Process Control) is a worldwide communication standard for components in the automation industrial sector. Developed from Windows-based technology, the OPC provides an open interface which enables problem-free, standardized data exchange between PLCs, operating and monitoring systems and office applications from different manufacturers.

Note:
Leading companies involved in the automation industry cooperate within the "OPC Foundation".
Further information on the OPC Foundation is available in Internet under the following address: "http://www.opcfoundation.org"

Using OPC in WinCC

Used within a distributed system, each WinCC server can monitor the entire system. A WinCC server, however, only assumes a specific range of tasks, for example, such as message editing or archiving.

The WinCC OPC servers enable OPC access to the WinCC runtime data via the software interface. The WinCC OPC servers support the full functional scope complying to the corresponding OPC specifications.

As OPC client, any software can be implemented which is based on the respective OPC specification. In this way, the OPC client can be used, for example, to analyze various sources. Demands can be fulfilled to the highest possible level by implementing self-developed OPC clients.

In order to operate the WinCC OPC server mode, the Connectivity Pack license must be installed on the computer which is to be used as the WinCC OPC server.

The OPC interface is installed on the client and server with the WinCC installation. The OPC servers from WinCC support the following specifications:

- OPC Data Access 2.0 (OPC DA)
- OPC Historical Data Access 1.1 (OPC HDA)
- OPC Alarm & Events 1.0 (OPC A&E)

Detailed information on the use of the OPC interface in WinCC is available in the WinCC Information System under the topic "Communication" > "OPC".
3 Setting up the Central Archive Server

Introduction

You can save process values and messages of all connected WinCC servers on a centralized archive server (WinCC Historian). You can display the saved process values and messages, as usual, on the process screen in Runtime in WinCC Online Trend Control or WinCC Alarm Control. Moreover, you have direct access to the process values and messages saved in the archive by means of defined interfaces, such as ODBC or OLE-DB. In this way, you can make available important production data, for instance, throughout the company for analyzing purposes.

Requirements

The computer to be used as central archive server must have the following prerequisites:

- Operating system Windows 2000 SP2 or Windows XP SP1
- Computer is available in the network (LAN).

For the installation of WinCC V6.0, the following prerequisites must be met:
The central archive server proper does not have any process connectivity, but is linked to the WinCC servers via server-server connection.

Installation

To set up the computer as central archive server, run the WinCC setup on the computer.

For more detailed information on the installation see "Installation of WinCC".

Performance Features

The central archive server has or supports the following performance features:

- Unlimited database size (only depending on the memory space available)
- Maximum four CPUs
- Improved archiving capacity at even reduced storage space requirements
- Integrated long-term archiving (Backup)
- Archiving of process data and messages of up to eleven different WinCC servers.

Configuration

Configure the central archive server:

7. Set up the server-server communication
8. Import the packages of the connected servers
9. Nest the variables to the packages
10. Configure process value archives and message archives

For more detailed information to this subject see "Client-Server Systems in WinCC".

Creation of Archive Tags with the WinCC Configuration Tool

Create yourself archive tags with the WinCC Configuration Tool on the central archive server from a tag list (e.g. MS Excel):

8. Import the packages from the concerned servers
9. Read the project with the configuration tool. In doing so, the packages are also read.
10. Configure the process value archive on the central archive server.
11. Insert the necessary tags via tag dialog.

The archives are written towards WinCC. For more detailed information to this subject see "Creation of Archive Tags from Tag Table".
4 Setting up the Long-Term Archive Server

Introduction
You can save the archive swap-out files on the long-term archive server. These can be process value or message archives. The swapped out archive data of process archives is saved in compressed form as binary data. To be able to access this archive data, use the "External Browsing" WinCC functionality.

Prerequisite
One the computer to be used as long-term archive server:
• Windows 2000 or XP must be installed and
• the computer must be available in the network (LAN).

Installation
To set up the computer as file server, run the file server setup on the computer. You access the file server setup by selecting "Additional Software" on the installation menu.
The following components are installed on the computer:
• WinCC (minimum installation)
• Microsoft Secret Server

Configuration
Configuring the long-term archive server involves two steps:

Step 1: Releasing drives or folders
To be able to save the swap-out files in the long-term archive server, you must release the required drives or files on the long-term archive server.

Note:
To release folders or drives, you require Windows administrator rights.
Step 2: Entering paths for the archive files to be swapped out
You enter the paths for the swap-out files on the configuration computer.
The instructions for process value archives can be found under "Storing archive on the harddrive". The instructions for message archives can be found under "Configuring archive backup".

Note:
If you want to swap out archive files for backup purposes, you can save these on any drive. You must then specify a drive on the long-term archive server if you want to access the archive data with OLE DB.

Access to the swap files
There are three ways in which to access the swap files:
- Copy the swap files onto the configuration computer on which runtime is also running. Link the swap files to the project in AlarmLogging or Tag Logging. The archived values are displayed in runtime.
- Access using OLE DB
- Access using Dat@Monitor Web Edition
5 Setting up the File Server

Introduction

The WinCC fileserver is a server with minimum configuration of WinCC components.

You can save projects on the file server and manage them centrally. Therefore it is e.g. easier to create regular backup copies of all projects.

Note:
Only use the fileserver for configuration.

Prerequisite

For the installation of a WinCC fileserver V6.0, the following prerequisites must be met:

• Operating system Windows 2000 SP2 or Windows XP SP1
• Administrator Rights
• Microsoft SQL Server 2000 SP3 is installed.
• Microsoft Message Queuing services must be installed.
• WinCC V6.0 may not be installed.
• The computer must be available in the network (LAN).

Note:
On one computer, WinCC V6.0 and the WinCC fileserver V6.0 cannot be installed at the same time.

Installation

To set up the computer as file server, run the file server setup on the computer. Select on the WinCC installation CD from the menu "Other Software" the entry "WinCC Fileserver V6.0".

The minimum installation for WinCC is installed on the computer.
Configuration

The projects are saved on the file server. So that all those involved can access the projects, you must release the corresponding drives or folders on the file server.

Note:
To release folders or drives, you require Windows administrator rights.
Assign the released folders or drives a unique drive letter on the configuration computers. Those involved can then open the projects on the file server like a local project.
6 WinCC Redundancy

Introduction

WinCC Redundancy provides a considerable increase in the availability of WinCC and the system as a whole by operating two server PCs at the same time linked together.

The servers monitor each other in runtime to allow for an early recognition of a failing partner server.

If one server fails, the clients will automatically be switched from the failed server to the still active server. This ensures that all clients will always be available for monitoring and operating the process.

During the failure, the active server will continue to archive all messages and process data of the WinCC project. After the failed server comes back online, the contents of all message, process value and user archives will automatically be copied to the returned server. This will fill the archive data gaps of the failed server. This action is also called synchronization after return.
The WinCC Redundancy Option offers:

- The automatic synchronization of message, process value and user archives after a failed server comes back online.
- The automatic synchronization of message, process value and user archives after a process connection error.
- The online synchronization of internal messages
- The online synchronization of user archives.
- The automatic switching of clients between the redundant servers if one of the servers fails.
- A "Project Duplicator" for copying a project to a redundant server.
- The automatic switching of clients if the process connection fails.
- The "Application Health Check" function to monitor the WinCC applications.

The "Application Health Check" function

In the WinCC / PCS7 environment the expression "Application Health Check" refers to the cyclic lifebeat monitoring of important applications. The function increases the sensitivity of the redundancy, since the lifebeat monitoring is extended via the servers themselves to the individual applications. All important WinCC applications are automatically monitored.

The lifebeat monitoring detects a software error, sets the server status in the "@RedundantServerState" system tag to "Fault" and switches the linked clients to the redundant server.

A process control message warns the user about the software error.

---

**Note:**
If a software error was detected by the "Application Health Check" function and client switching was initiated, the relevant server must then be restarted. Only after that can the client be relinked to the server.
The redundant servers must be equipped with Windows 2000 Server and the client PC's with Windows 2000 or Windows XP.
6.1 Configuring the WinCC system

6.1.1 Structure of a WinCC system without Redundancy

Introduction

The above sketch shows the typical structure of the WinCC Control level with the Corporate level above and the Process level below. As you can see, the tasks of the control level are distributed among multiple PCs. The tasks are distributed to a client server structure. Tasks performed by the servers:

- Servers acquire process images and messages from the automation systems.
- To acquire data, the servers are connected to the automation systems via industrial networks.
• The servers provide the process data to the clients and control the processing states.

Tasks performed by the clients:
• The client stations operate and monitor the entire plant.
• Clients retrieve the currently needed states from the corresponding server via PC networks.
• In general, all clients are equal and have the same rights.
6.1.2 Structure of a WinCC System with Redundancy

Introduction

A WinCC project consists of a group of automation systems, a server computer and one or more client computers. The project also includes all data such as programs, configuration data and miscellaneous settings.

Redundant WinCC Project

A project is structured for redundancy when a second functionally identical server is made to run in parallel. The two servers are connected to each other, the PLCs and the clients. For further information see "Configuring an identical function".
6.2 How Redundancy Works

Introduction

WinCC Archiving in normal operation

Normally the servers run at the same time in Runtime. Each server computer has its own process driver connection and has its own data archives. The process data and messages are sent by the ACs to both redundant servers, which process them accordingly.

The servers monitor each other during runtime, to allow for the early recognition of a failing partner server. This is indicated by a process control message.

User archives and internal messages can be continuously synchronized online (Online Synchronization).
Both servers have equal rights and work independently of each other. Both are available to the user. Should one server fail, an equal redundant server will always be available.
The redundant servers communicate via the terminal bus to monitor the status and synchronize the archives. The network is a PC-LAN network with TCP/IP protocol. If there is a serial connection between the servers, this is used to monitor the status but not to synchronize the archives.

Failure of a Server

Server failure refers to the physical failure of a server, e.g. by a power cut or by turning off the server without turning it off properly. If one of the servers fails, the other operational server receives and archives process values and messages from the AS. This ensures uninterrupted data integrity.

The clients will automatically be switched from the failed server to the redundant partner server. After a brief switching period, all operator stations will be available again. If there is a serial connection between the redundant servers, this is used to monitor the status.

Factors triggering the Client Switch

The switch of the clients from the default (master) server to the partner server during a server failure is performed automatically by the system. The following factors cause a switch of servers:

- Network connection to server failed
- Server failure
- Process connection error
- The "Application Health Check" function has detected a defective WinCC application and triggers a switchover.
- The project is deactivated.

Factors triggering Archive Synchronization after the Server returns

The synchronization of the archives between the servers will be initiated after the following errors have been corrected:

- Process connection error. Process connection monitoring may be turned off. For further information see "Configuration".
- Network connection failure to the partner server
- Server failure
- Project is not activated
Synchronization after the Server returns

After the failed server comes back online, the Redundancy will perform an archive synchronization for the down time. The gap in the archives caused by the failure is closed by transferring the missing data to the filed server. This action equalizes and makes both servers available again.

The message archives, process value archives and user archives will be synchronized. The failed server receives its data after a slight time delay (caused by the failure).

The archive synchronization is implemented as a background function and runs parallel to the process management and archiving of WinCC. Therefore the operation and observation of the system is guaranteed at all times.

Synchronization after process connection error

If there is a network error during running operation between a server and one or multiple AS, synchronization is automatically started, if this was configured, after the error was handled.

Online Synchronization

A direct server-to-server synchronization (Online Synchronization) takes place during Alarm Logging for internal messages and in user archives.
6.3 Configuring the Redundancy Servers

6.3.1 Functionally Identical Configuration

Archives for process data and messages

Tag Logging and Alarm Logging must be configured in a functionally identical way for the redundant servers. Functionally identical means:

- Identical archives, where additions can be made in the form of additional measurement points or archives. These additions will not be synchronized and must therefore be updated manually on the partner server.

The following archives are synchronized by WinCC:

- Archives held on hard disk, i.e. process value archives, compressed archives and message archives.
- On the other hand, no synchronization of main memory archives is performed.

User Archives

The User Archives require the same structure on both servers:

- The configuration of user archives that are going to be synchronized must be identical in terms of their properties and field/record structure.
6.3.2 Requirements for redundant systems

Introduction

The following requirements are expected for WinCC Redundancy:

- Only computers with Windows 2000 Server may be used for redundant WinCC servers with multi-user operation.
- Redundancy requires servers to be time-synchronized. However, it is strongly recommended that the total plant (WinCC computer, automation systems, etc.) should be time-synchronized. This can be carried out by using the "Time synchronization" option in WinCC.
- Messages and acknowledgments from the PLCs and clients must always contain a time stamp (in the message) to avoid double entries (sequential reporting). A way to achieve this is by using alarm blocks from the PLCs.
- Process values, messages and active message locks from the subordinate automation systems are sent to both servers in parallel.
- The Redundancy option must be installed on both servers.
- The Redundancy servers must be configured functionally identical.
- Each user archive must contain a field for the unique assignment and a field for the date of the last change. For further information see "Redundant User Archives".

Note:
Only data for the "new" user archives is synchronized (from version 4.02 and higher). User archives that are configured in the latest versions but retain the old structure are not synchronized. However, these "old" user archives can be converted into the new structure. Further information is available in the User Archives manual.
To safely exit WinCC in the event of a power failure, the use of an uninterrupted power supply - UPS - is recommended. Following the return of a failed server, messages actively locked in Alarm Logging are determined by means of a general query to the PLCs, and any such messages are then synchronized.
In the case of passive message locking, i.e. on one server only, the lock information is synchronized.
If a message class is locked on one of the servers, the marker for the lock on the redundant server is not synchronized.
To guarantee the secure status of the redundancy system tags, you are recommended to use a serial connection between the redundant servers.
6.3.3 Redundant User Archives

Introduction
User Archives can be edited by operations, standalone programs, PLCs or other functions.

Editing User Archives in Parallel
Note the following when adding records to redundant user archives in parallel:
- For runtime reasons, the sequence in which the records are inserted can be different.
- Even before the synchronization of a returned server is complete, records can be added to the server being synchronized.
- Even during the online synchronization, some time will pass before the record has been synchronized in the redundant archive.

6.3.3.1 Requirements for redundant User Archives

Introduction
The configuration of the archives must be identical on both computers. For this reason the Project Duplicator should be used.

If the archives are not identical, the system message "Synchronization not ready for all User Archives" will be displayed.

Configuration of the Archives
To be able to activate synchronization for a User Archive, these two fields must be configured:
Unique Key

The requirement for the unique assignment of the records in one archive to the records in the redundant archive is a Unique Key. Records with the same content in this field are synchronized. This field must contain a "unique value" property - this will ensure that there are never 2 records with the same content in an archive.

This can be implemented via:

- The record number - this number is always part of a record and must not be configured separately. The record number is always unique. If the record number is used, no other field is allowed to possess the "unique value" property.

- An archive field that has been assigned the "unique value" property. If a field other than the record number is used, this field must be the only one containing the "unique value" property.

For example:
Recipe Number ("Text" Type)
Recipe Number ("Integer" Type)
Insertion Date/Creation Date ("Date" Type)

"Last Access" Field

This field must be selected while configuring the archive properties, since the time stamp is used as the synchronization criterion.

During synchronization, a data record with a newer time stamp overwrites the older record - this ensures that the most current data record remains. This must be noted for working or editing in parallel during a synchronization.

The latest modification date is automatically entered by the system. During the import of records, the modification date of the "csv" file will be accepted unchanged.

During synchronization, a data record with a newer time stamp overwrites the older record - this ensures that the most current data record remains. This must be noted for working or editing in parallel during a synchronization.
### 6.3.3.2 How user archive synchronization works

#### Introduction

<table>
<thead>
<tr>
<th></th>
<th>Synchronization via Record Number</th>
<th>Synchronization via Unique Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deleting a record during a server failure</td>
<td>Does not take place</td>
<td>Does not take place</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Editing/adding a record during a server failure</td>
<td>During the offline synchronization all data records edited or added during the down time will be synchronized.</td>
<td>During the offline synchronization all data records edited or added during the down time will be synchronized.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Changing a record during online synchronization</td>
<td>OK</td>
<td>OK</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The &quot;unique key&quot; field content must not be changed (if it is changed, the new record content will still be added to the redundant archive; the old record, however, will also remain because it cannot be identified).</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adding a record during online synchronization</td>
<td>OK</td>
<td>OK</td>
</tr>
<tr>
<td></td>
<td>If a record is added separately to both redundant archives before the synchronization of a returned server is complete, the automatically assigned record number might already be present in the redundant archive. In this case, the older of the two records will be overwritten.</td>
<td></td>
</tr>
</tbody>
</table>
04.03 WinCC Redundancy

### Synchronization via Record Number

<table>
<thead>
<tr>
<th>Deleting a record during online synchronization</th>
<th>OK</th>
</tr>
</thead>
<tbody>
<tr>
<td>An online synchronization of deleted records will only be performed if the synchronization is carried out via the record number and the changes are made within an &quot;OLE Control Element (OCX)&quot; or via the User Archives API functions. Only records are deleted that contain no earlier time in the &quot;Last Access&quot; field than the time of deletion.</td>
<td>Not available</td>
</tr>
</tbody>
</table>

#### Note:

No record with a value higher than the current system time in the "Last Access" field must be inserted into the archive (e.g. by importing). Synchronization operates only up to current system time.

If the server providing the data is shut down or has a failure before completing the synchronization of all records, only the last 50 records of each archive will be synchronized if runtime is activated again.

If WinCC runtime is stopped and started again within 10 seconds (which is generally only possible for smaller projects), this will not be recognized as a failure and no synchronization will take place.

The online synchronization stores up to 10 records. If there is a connection error to the redundant server, these records will be synchronized immediately after the connection has been reestablished.

#### 6.3.4 Messages Synchronized Online

**Introduction**

All internal messages are synchronized online. This includes for instance the system operator messages of Alarm Logging and the messages of Batch-Flexible.
6.4 Working with Redundancy

6.4.1 Guide to Setting Up a Redundant System

Introduction

The following section is a brief guide to setting up a redundant WinCC system consisting of Server 1 and Partner Server 2.

Setting up the Servers and Clients on the Network

Install the network on each computer and give each computer a unique name by which it can easily be identified on the network.

Setting up the Users

After installing the network, user accounts must be set up on each computer.

For further information, refer to "Entering the Servers in Windows"

Installation of the Authorization

The Redundancy authorization must be installed. Carry out the installation by opening the Start menu in Windows and activating the "AuthorsW" application located under "SIMATIC / AuthorsW" and then install the authorization on every server.

Configuring the project on the server

When configuring WinCC Redundancy the default master, the partner server, the behavior of the clients on switchover and the type of archive synchronization are defined.

Before duplicating the project, the server package is created (Editor "Serverdata"). It is recommended to create this on the default master.

For further information on configuring the server for Redundancy see "Configuration".

---

Note:

Only configure the User Archives for the synchronization that you really need. The greater the number of User Archives to be synchronized, the longer the synchronization process will take and the greater the system loads will be.
Duplicating the Project

To avoid having to configure the partner server for a second time, the "Project Duplicator" gives you the ability to duplicate the project from one server to the other.

For further information see "WinCC Project Duplicator".

---

**Note:**
Before duplicating, make sure there is sufficient memory on the computer on which the project should be duplicated. If you are duplicating to an existing project, it must not be open.

Configuration of the Clients

In order to use Redundancy, configure the clients in accordance with the following steps:

- Load the package for the server (Default Master) in the "Server data" editor.
- In the editor "Serverdata", if required, you can set the preferred server and activate the automatic package update.

Activating the Redundancy Servers

You can activate WinCC Redundancy as follows:

Activate the first server. Next, start its existing clients. Once they are active, activate the second server and its existing clients.

The first synchronization will then be performed. The downtime synchronized is the interval between starting the first and second server.

---

**Note:**
On activating the redundant server, it is recommended to maintain an interval of approx. 2 minutes before the previous master server is deactivated. If this time is less than the recommended interval, data loss can occur when an archive synchronization is still running. Pay particular attention to this interval in the case of frequent, alternate activation/deactivation of the server, e.g. in the startup phase.
6.4.2 Entering the servers in Windows

Introduction

Both redundant servers must recognize each other on the network. For this, enter the same user names in the Windows User Manager of both servers.

To enter the user, proceed as follows:

- Under Windows 2000: This is accessed via the Windows start menu via "Start / Settings / Control Panel " and the "Users and Passwords" icon. In the "Users and Passwords" dialog box you must set up the users at least as Power Users.
- Under Windows XP: This is accessed via the Windows start menu via "Start / Settings / Control Panel" and the "User Accounts" icon. In the "User Accounts" dialog box you must set up the users at least as Power Users.

The example shows the dialog in Windows 2000.
**Note:**
The user must possess the authorizations of an Administrator or Power User. The redundant servers must be equipped with Windows 2000 Server and the client PC's with Windows 2000 or Windows XP.
6.4.3 Configuring Redundancy

Introduction

When configuring WinCC Redundancy the default master, the partner server, the behavior of the clients on switchover and the type of archive synchronization are defined.

**Note:**
Only configure the User Archives for the synchronization that you really need. The greater the number of User Archives to be synchronized, the longer the synchronization process will take and the greater the system loads will be.

Procedure

To call the Redundancy system, display all editors and then right click on the "Redundancy" editor. In the context menu which appears, click "Open".
### 6.4.3.1 "General" Tab

#### Introduction

On this tag you configure general settings for the redundancy system.

![Redundancy Configuration](image)

**The "General" Tab**

| Servers | In the "Server" field the name of the computer in entered on which Redundancy is configured. |
### The "General" Tab

| Default Master | Use the "Default Master" option to define which of the Redundancy servers will routinely be activated as the master and as the standby when both servers are being booted at the same time.  
  
  In runtime, the redundancy master can be recognized by means of the redundancy tags "@RM_MASTER" or "@RM_MASTER_NAME", which are located in Tag Management under "Internal Tags" in the "Redundancy" tag group.  
  
  The redundancy computer on which the tag "@RM_MASTER" is set to "1" is the master.  
  
  The computer name of the corresponding redundancy master is written to the tag "@RM_MASTER_NAME".  
  
  If the status of the "@RM_Master" tag changes, e.g. due to a computer failure, the clients will switch to the former "standby" computer that now becomes the master.  
  
  Clients for which no preferred server has been entered will connect to the redundancy server which is master.  
  
  Clients with a preferred server (permanent operability) ignore the master/standby identifier in the "@RM_Master" and "@RM_MASTER_NAME" redundancy tags.  
  
  Note: Make sure that only one of the two redundancy servers is designated the "Default Master" (the check-box must not be activated on both computers)! Otherwise problems may arise during the redundancy switchover of clients. |
|---|---|
| Redundant Partner Server | In the "Redundant Partner Server" field, enter the computer name of the partner server; in our example this is "RedServ2".  
  
  The "Search" button helps you with selecting the partner server. |
| Synchronize all data of the down time | The "Synchronize all data of the down time" radio-button defines that all data of the entire down time is to be synchronized. |
| Only synchronize the last ... days | Using the "Only synchronize the last ... days" selection button, you define for example that only the last 10 days should be synchronized. |
| Synchronization of Tag Logging after the partner server comes back online | The "Synchronization of Tag Logging after the partner server comes back online" check-box defines whether a synchronization of Tag Logging is to be performed after the partner server returns. |
### The "General" Tab

<table>
<thead>
<tr>
<th>Process connection monitoring (PLC)</th>
<th>WinCC client change in the case of a process connection error</th>
</tr>
</thead>
</table>
| The "Synchronization after process connection error" option, you define whether a network connection from a master server is synchronized with the WinCC client change in the case of a process connection error. If a network error occurs, the respective server can no longer reach the defined interface. If this option is activated, WinCC monitors the network connection between the master server and the redundant server.

The WinCC client change in the case of a process connection error is performed if the WinCC client error is detected. The WinCC client change is performed if the network connection between the master server and the redundant server fails.

If the network connection between the master server and the redundant server fails, the respective server does not communicate with the WinCC client. The WinCC client change in the case of a process connection error is performed if the WinCC client error is detected.

A network error occurs if the network connection between the master server and the redundant server fails. The WinCC client change in the case of a process connection error is performed if the WinCC client error is detected.

### Synchronization

<table>
<thead>
<tr>
<th>Range is to be performed in runtime.</th>
</tr>
</thead>
</table>
| The "Online synchronization for alarm logging" check-box is to be performed after the alarm server starts. The synchronization of alarm logging is to be performed after the alarm server starts.

The Online synchronization for alarm logging is to be performed after the alarm server starts. The synchronization of alarm logging is to be performed after the alarm server starts.

### Synchronization of Alarm Logging after the partner server comes back online

- The "Synchronization of Alarm Logging after the partner server comes back online" check-box defines whether a synchronization of Alarm Logging is to be performed after the partner server returns.

### Online synchronization of Alarm Logging

- The "Online synchronization of Alarm Logging" check-box defines whether a synchronization of the Alarm Logging operator messages and the messages of the reserved number range is to be performed in runtime.

### Synchronization after process connection error

- With the "Synchronization after process connection error" option, you define whether network connections from a master server and its redundant servers are synchronized.

If the network connection between the master server and the redundant server fails, the respective server does not communicate with the WinCC client. The WinCC client change in the case of a process connection error is performed if the WinCC client error is detected.

The Online synchronization for alarm logging is to be performed after the alarm server starts. The synchronization of alarm logging is to be performed after the alarm server starts.

If the network connection between the master server and the redundant server fails, the respective server does not communicate with the WinCC client. The WinCC client change in the case of a process connection error is performed if the WinCC client error is detected.

If a network error occurs, the respective server cannot reach the defined interface. If this option is activated, WinCC monitors the network connection between the master server and the redundant server.

If the network connection between the master server and the redundant server fails, the respective server does not communicate with the WinCC client. The WinCC client change in the case of a process connection error is performed if the WinCC client error is detected.

A network error occurs if the network connection between the master server and the redundant server fails. The WinCC client change in the case of a process connection error is performed if the WinCC client error is detected.

### No active synchronization will take place

- If an error occurs, WinCC monitors the network connection between the master server and its redundant server.

If the connection is still active, WinCC monitors the network connection between the master server and its redundant server.

If the network connection between the master server and the redundant server fails, the respective server does not communicate with the WinCC client. The WinCC client change in the case of a process connection error is performed if the WinCC client error is detected.

If a network error occurs, the respective server cannot reach the defined interface. If this option is activated, WinCC monitors the network connection between the master server and the redundant server.

If the network connection between the master server and the redundant server fails, the respective server does not communicate with the WinCC client. The WinCC client change in the case of a process connection error is performed if the WinCC client error is detected.

A network error occurs if the network connection between the master server and the redundant server fails. The WinCC client change in the case of a process connection error is performed if the WinCC client error is detected.

If a network error occurs, the respective server cannot reach the defined interface. If this option is activated, WinCC monitors the network connection between the master server and the redundant server.

If the network connection between the master server and the redundant server fails, the respective server does not communicate with the WinCC client. The WinCC client change in the case of a process connection error is performed if the WinCC client error is detected.

A network error occurs if the network connection between the master server and the redundant server fails. The WinCC client change in the case of a process connection error is performed if the WinCC client error is detected.
The "General" Tab

<table>
<thead>
<tr>
<th>Serial connection to the redundant partner</th>
<th>In this field you determine whether there is a serial connection to the partner and via which interface. If there is a serial connection between the redundancy servers, the status of the redundancy is controlled via this connection.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activate Redundancy</td>
<td>The &quot;Activate Redundancy&quot; check-box indicates if the Redundancy system is active. The Redundancy can be activated/deactivated by clicking on this field. This field is used primarily to deactivate the redundancy system from time to time during configuration. If you click on the &quot;Activate Redundancy&quot; check-box while Redundancy is active (indicated by the check-mark), a dialog box asking you &quot;Do you really want to deactivate the Redundancy?&quot; will be displayed as a safety precaution. This gives you the option to stop the deactivation of the Redundancy.</td>
</tr>
</tbody>
</table>

Note:

During commissioning, WinCC Runtime is often activated and deactivated on the server PCs. When redundancy is active, this leads each time to archives being synchronized which can possibly lead to noticeable disimprovement in the WinCC runtime behavior. To avoid this, you are recommended to deactivate redundancy during commissioning.

In Runtime only changes to the synchronization of the archives take immediate effect, so without restarting Runtime. Part of this on the General tab are the options "Synchronization ... after the service partner comes back online", "Online synchronization Alarm Logging" and "Synchronization after error of the process link der Prozesskopplung...".

The User Archive tab of the online synchronization of the archives also take immediate effect.

Changes to the other options take effect after restarting Runtime.

In the event of a software error on the server it is possible for connected clients not to be switched over to the redundant partner but for the system to be blocked.
6.4.3.2 "User Archives" Tab

Introduction

In this tab, the automatic User Archives synchronization for the Redundancy system is configured.
### The "User Archives" Tab

<table>
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<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
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<tr>
<td>User Archive</td>
<td>In the &quot;User Archive&quot; column, all configured User Archives are displayed by row.</td>
</tr>
<tr>
<td>Unique Key</td>
<td>In the &quot;Unique Key&quot; column, the unique key for the assignment of the data records to both redundant archives is displayed. Double-clicking on this field will display a selection of all suitable archive fields. These are all fields with the configured &quot;Unique Key&quot; property and the record number itself. If the selected field is not the record number, the archive to be synchronized must not contain any other field with the &quot;Unique Key&quot; property (other than the selected field). If this is not the case, any such field must be removed via the User Archives Editor.</td>
</tr>
<tr>
<td>Synchronization</td>
<td>In the &quot;Synchronization&quot; column, the synchronization of the individual User Archives can be activated or deactivated. Double-clicking on this field switches its current status. If the &quot;Last Access&quot; field has not yet been configured for the archive, it can be added here. This can take some time, especially if the archive contains a lot of data records.</td>
</tr>
<tr>
<td>Synchronization of all User Archives</td>
<td>The two buttons at &quot;Synchronization of all User Archives&quot; field allow you to activate or deactivate the synchronization of all displayed User Archives.</td>
</tr>
<tr>
<td>Update</td>
<td>The &quot;Update&quot; button applies the current configuration, if the configuration has been changed in the User Archives Editor after calling the Redundancy Editor.</td>
</tr>
</tbody>
</table>

**Note:**
In Runtime only changes to the synchronization of the archives take immediate effect (without restarting Runtime). Part of this, in the "General" tab, are the options "Synchronization ... after the service partner comes back online", "Online synchronization Alarm Logging" and "Synchronization after error of the process link...".

The User Archive tab of the online synchronization of the archives also take immediate effect.

Changes to the other options take effect after restarting Runtime.
6.4.3.3 Example of changing client in the case of a process connection error

Introduction

A redundant system consists of two functionally identical servers. One server is the master server and the other is the redundant partner server. In the normal, undisturbed operating state the master server has the status of "Master" and the redundant partner server has the status of "Standby". Clients are connected to the master server unless a preferred server has been configured, in which case they are connected to the preferred server.

Once both servers are in runtime, process connection monitoring starts. The number of defective logical connections to the master server and the redundant partner server is cyclically determined. If the master server has more defective logical connections than the redundant partner server, the status of the server becomes invalid ("Fault"). The clients are switched over to the redundant partner server, which now has the "Master" status.

Note:
The "Fault" status is not displayed in the "@RM_MASTER" system tag but in the "@RedundantServerState" tag.
Normal operating state

The plant consists of the redundant servers A and B. There are also three clients. Client 1 has entered server A as its preferred server, Client 2 has entered no preference and Client 3 has entered server B as its preferred server.
Process connection error on server A

There is a process link error on server A. The error is not present on server B. The number of defective logical connections on server A is greater than on server B. Server A therefore receives the "Fault" status. As a result, Clients 1 and 2 switch over to redundant server B.
Enf of the process link error

When the process link error on server A has been cleared, server A then has the status "Standby". As a result Client 1 switches over to server A, since it has indicated this as its preferred server. Client 2 stays connected to server B because this has now become the master server since the Redundancy switchover and Client 2 has indicated no preferred server.
6.4.4 WinCC Project Duplicator

Introduction

Projects with the same functions must be set up on both redundant servers. After configuration, the WinCC Project Duplicator allows you to copy all data belonging to the project to the redundant partner.

The WinCC Project Duplicator generates the redundant partner project. The Project Duplicator not only copies all the project data (screens, scripts, archives, etc.), but also makes all the necessary settings on the target computer, which is then ready for the use of Redundancy.

Further configuring only needs to be carried out on one of the servers. The changes can be transferred to the redundant server by running the "WinCC Project Duplicator" again.

Note:
The WinCC Redundancy system always consists of 2 servers. No additional Redundancy PCs should be configured as Redundancy servers. Computer-specific settings must be changed manually afterward.

Procedure

Open the WinCC Project Duplicator from the Windows Start menu by pointing to "SIMATIC / WinCC / Tools / Project Duplicator".

The "WinCC Project Duplicator" dialog is displayed:
### The "WinCC Project Duplicator" dialog

<table>
<thead>
<tr>
<th>Action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select the Source Project</td>
<td>In the &quot;Select the source project that is to be duplicated&quot; field, specify the source project. The &quot;...&quot; button makes it easy for you to browse for the path name of the source project.</td>
</tr>
<tr>
<td>Duplicated Project</td>
<td>In the &quot;Store duplicated project for Redundancy partner at&quot; field, specify the target computer together with the folder for the target project. The &quot;...&quot; button makes it easy for you to browse for the folder that will hold the target project.</td>
</tr>
<tr>
<td>Save As</td>
<td>The &quot;Save As&quot; button allows you to create a back-up copy of the source project or you can save the project under a new name. &quot;Save As&quot; only saves the configuration data. The current runtime database is not saved. However, a new empty runtime database is generated so that a project is not mistakenly started without a runtime database.</td>
</tr>
<tr>
<td>Duplicate</td>
<td>After specifying the source project and the target computer of the project to be duplicated, click on the &quot;Duplicate&quot; button to start the duplication process. A completely configured partner project will then be created on the target computer.</td>
</tr>
</tbody>
</table>
6.4.5 Failure Scenarios

Introduction

Some commonly occurring failures will be used to illustrate how WinCC Redundancy works. The following failures will be discussed:

1. The project on the redundant server is not in runtime
2. Connection error to the redundant server
3. Connection error to the client
4. Disturbed process connection
5. Software error on a server

WinCC Redundancy will recognize the current error itself or react to error messages by:

- Saving times and events
- Synchronizing archives
- Changing Master/Standby identifiers
- Switching clients
- Issuing messages

Startup of the Server PCs

When the server PCs are starting up, the Redundancy component establishes whether the partner server is already active. If this is the case, a standby identifier is then set in the server computer. If the partner server (2) has not been activated, the server computer (1) will be set as the master during startup. The master identifier is reset if there is a problem with the network connection between the servers or if the partner server is turned off. To identify the server computer (1) as the "Master", the system tag @RM_MASTER will be set. To identify the server computer (1) as the "Standby", the @RM_MASTER tag will be reset. The @RM_MASTER_NAME tag contains the name of the server PC that possesses the "Master" status, for example "Server 1". The @RedundantServerState tags shows on each server its status in the Redundancy, e.g. "Standby". These tags can be evaluated by other applications or scripts. However, only the @RM_MASTER tag can be modified.

Redundancy only sets the above tags. Both servers are always completely equal.

If a client or the redundant partner server cannot be reached by the master server (e.g. project not activated on the computers or the network connection between the computers is interrupted), this becomes the standby server. This is necessary so that both Redundancy servers do not receive the "Master" status.

If there is a connection via the serial interface between the two redundant servers, the status of the Redundancy is controlled via this connection.
6.4.5.1 Scenario 1: Server Not in Runtime

Introduction

This scenario discusses the behavior of Redundancy, if the project has been deactivated on server 2.

The following actions will be triggered:

- Server 1 stores the failure time (date and time) of server 2.
- Server 1 will report the failure of server 2 through a system message.
- If server 1 is the "Standby" server, this takes over the role of the "Master" by setting the @RM_MASTER tag. The corresponding @RM_MASTER_NAME and @RedundantServerState tags are changed.
- The clients connected to server 2 switch over to server 1.

Server 2 comes back online

The downtime means that there is a gap in the archives of server 2. This gap will be filled by the following measures:

- Server 1 stores the return time (date and time) of server 2.
- Server 1 will report the return of server 2 through a system message.
- A redundancy synchronization of the message archive, process data archive and user archives occurs on the server 2 based on the server 1.
- The @RM_MASTER tags remain unchanged in both servers, i.e. the @RM_MASTER tag in server 1 remains set and the @RM_MASTER tag in server 2 remains reset. The @RM_MASTER_NAME and @RedundantServerState tags also remain unchanged.
- Clients which are configured with server 2 as their preferred server switch over to that server once more.

Compared to online synchronization, archive synchronization following a server failure can take noticeably longer depending on the number of data records to be synchronized and the computer/network loads.

If failures alternate between the two servers (see diagram), they will be synchronized one after the other. After the synchronization, all data will be available in both archives.
In the case above, server 1 first passes all values to server 2 for failure A, then server 1 synchronizes itself from server 2 for downtime B. Synchronization always occurs on the standby server based on the master server.

All these processes run automatically and in the background, independently of the process value archiving and message archiving from the subordinate ASs running in parallel.

### 6.4.5.2 Scenario 2: Connection Fault to Partner Server

**Introduction**

This scenario discusses the behavior of Redundancy, if there is a connection error to server 2. In this case, both servers are running without errors in runtime.

The following actions will be triggered:

- Both servers store the failure time (date and time).
- Both servers report the failure through a system message.

**The connection is restored**

During the connection error, no online synchronization could take place for alarm logging and the user archives. This situation will be remedied by the following measures:

- Both servers store the return time (date and time).
- Both servers report the return through a system message.
- A redundancy synchronization occurs on the standby server based on the master server.

In both servers, the @RM_MASTER, @RM_MASTER_NAME and @RedundantServerState tags remain unchanged.
6.4.5.3 Scenario 3: Faulty Network Connection to Client

Introduction

In this third scenario there is a disturbance in the network connection between server 2 and the server 2 client "CL5".

The following action will be triggered:

• Client "CL5" automatically switches over from disturbed server 2 to running server 1.

End of the network disturbance to the client

The following reactions are triggered at the end of the network disturbance:

• In both servers, the @RM_MASTER, @RM_MASTER_NAME and @RedundantServerState tags remain unchanged.
• If server 2 is configured as the preferred server for client "CL5", then client "CL5" switches back to that server once more.

6.4.5.4 Scenario 4: Disturbed Process Connection

Introduction

In scenario 4, on server 2 there is a disturbance of the process link due to an interrupted network connection to the automation systems.

An AS connection error is only recognized by Redundancy as a failure, if the connection is interrupted to only one server. If there is a connection error from one AS to both servers (e.g. caused by an AS failure), this will not be recognized as a failure by Redundancy.

If WinCC recognizes a failure, the following actions will be triggered:

• The disturbance of the process link is reported on server 2.
• Server 1 receives a message that partner server 2 has failed.
• Server 1 stores the failure time (date and time) of server 2.
• If in the server project "Client change with disturbance in the process link" is configured, the clients linked to this server are changed to the partner server.
• The @RM_Master tag is set to "Master" Status in server 1 and to "Standby" in server 2. The corresponding @RM_MASTER_NAME and RedundantServerState tags are adapted.
Correction of the process link error on server 2

Provided process connection monitoring has been activated, the gap in the archive of server 2 will be filled by the following measures:

- Server 1 stores the return time (date and time) of server 2.
- A redundancy synchronization occurs on the server 2 based on the server 1, because server 1 had no disturbance of the process connection. The data of all ASs will be synchronized. This means that the data of ASs that have not failed will also be synchronized.
- On server 2 the @RedundantServerState tag is changed from "Fault" to "Standby".
- The correction of the process link error on server 2 is announced by a system message.

6.4.5.5 Scenario 5: Software Error

Introduction

In scenario 5, an error occurs on server 2 in software that is being monitored. When the error occurs, server 2 is "Master" and server 1 is on "Standby" status. There are several clients connected to each server.

If the "Application Health Check" function detects an error in the WinCC software, the following reactions are triggered:

- Application Health Check reports the error to Redundancy. The status of server 2 is set in the @RedundantServerState tag to "Fault". The @RM_Master tag is set to the "Standby" status.
- The @RM_Master tag in server 1 is set to the "Master" status. The corresponding @RM_MASTER_NAME and RedundantServerState tags are adapted.
- The clients connected to server 2 switch over to server 1.
- A process control message warns the user about the software error.
Correction of the software error on server 2

The software error can be cleared by deactivating the server project and restarting server. When the project is activated on server 2 the archives are automatically synchronized.

- On server 2 the @RedundantServerState tag is set to "Standby". Server 1 remains at "Master" status.
- Server 1 stores the return time (date and time) of server 2.
- A redundancy synchronization of the archives occurs on the server 2 based on the server 1.
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