Buffering a SIMATIC IPC in the event of power failure with SITOP DC UPS

SIMATIC IPC427C, WinCC flexible, WinAC RTX, SITOP UPS500S

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SIMATIC IPC and SITOP DC UPS

SIMATIC IPC427C, WinCC flexible, WinAC RTX,
SITOP UPS500S

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Preface

Objective of this application

SITOP UPS500 is a maintenance-free DC UPS with double-layer capacitors as energy savers. The buffer time depends on the load current and the UPS configuration and can be up to several minutes. In many cases this time is sufficient to bring a PC-based automation solution to a defined condition in the event of power failure.

The aim of the application is to visualize the diagnostic data of the SITOP UPS500S device in WinCC flexible, to terminate the installed WinAC RTX in the event of a critical condition of SITOP UPS500S, to close all started programs and to shut down the SIMATIC IPC427C. The application describes all required settings necessary to achieve this.

Validity

The application is especially tailored to the SITOP UPS500S device. However, the functionality can also be used with other SITOP DC UPS devices that can output diagnostic data through an OPC server.

The application is based on the “UPS Software Application (2.0).pdf” manual. This manual is downloaded along with the SITOP DC UPS software (Link). This is where the commissioning of the software and the communication through the OPC server is described.

Table of Contents

1 Task

1.1 Introduction

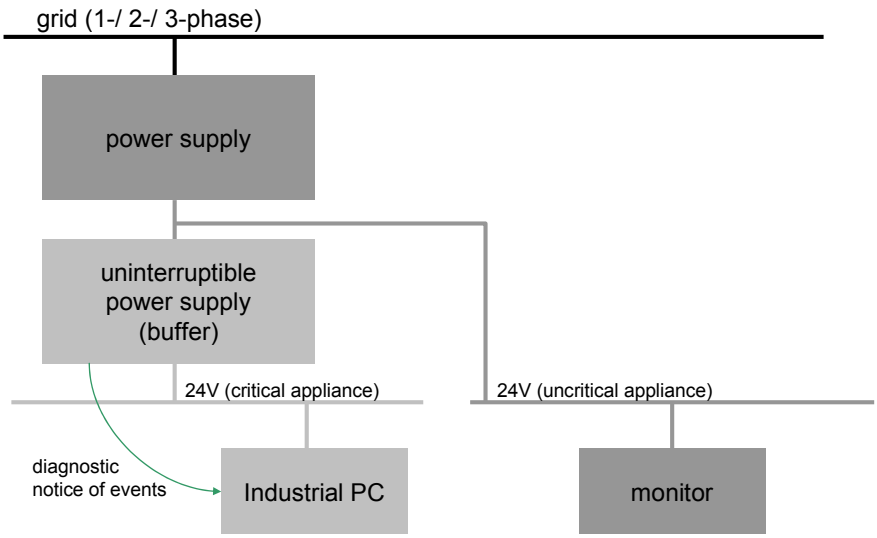
Requirement for plant operation is the reliable power supply of the automation technology.

Even in the case of critical network condition, unsafe plant conditions shall not occur. In the event of an error, an active response is desired.

1.2 Overview of the automation task

The figure below provides an overview of the automation task.

Figure 1-1



Description of the automation task

An industrial PC with software PLC and visualization shall be used for the automation.

If there is an interruption of the power supply network, safe closing of the software PLC, of WinCC flexible and a shutdown of the industrial PCs shall be ensured.

1.3 Requirements to the automation task

Requirements to the automation task

- Reliable 24V power supply in the event of an error, until the software PLC is safely terminated and the industrial PC shut down.
- Operation mode and diagnostic of the power supply through the visualization.

2 Solution

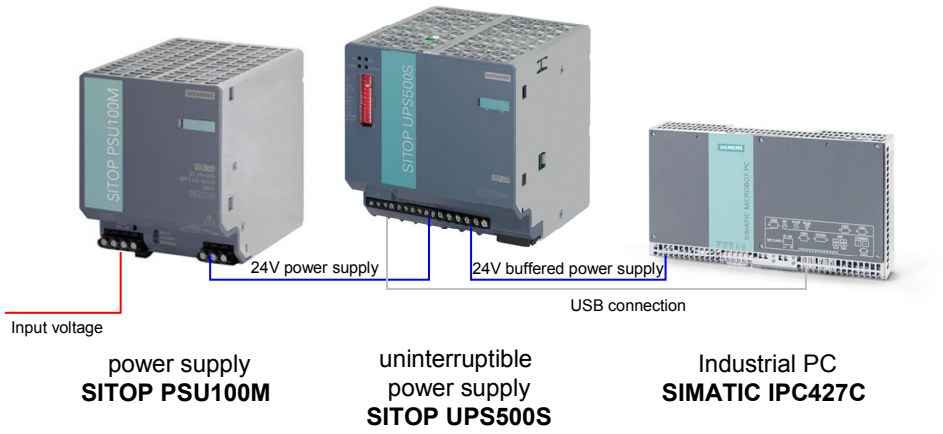
2.1 Overview of the general solution

Schematic layout

The following figure gives a schematic overview of the most important components of the solution:

- SITOP PSU100M
- SITOP UPS500S
- SIMATIC IPC427C

Figure 2-1



Structure

An industrial PC with installed WinAC RTX and WinCC flexible is in an industrial plant.

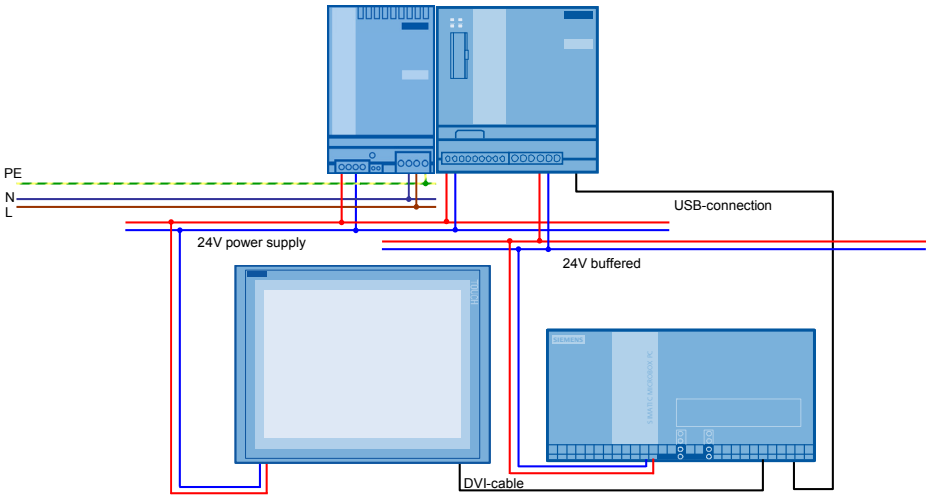
To avoid that the industrial PC turns itself off without saving the data if there is a power failure, it is supplied with 24 VDC through an UPS. If there is a network input voltage breakdown, the UPS terminates the WinAC RTX through a transmitted signal before the 24V input voltage falls below the critical point. This shuts down the application and the data of the PC application is saved.

Wiring

The figure below shows the wiring of the components.

Figure 2-2

SITOP current supply with DC UPS module



visualization with SIMATIC Industrial PC

Classification

For better overview, the application will only give information necessary for the reproduction of this example.

Where necessary, the document provides references to related links and manuals.

- This application does not include information on the following topics:
  - “Safety Notes and Standards”
  - “Directives and Approvals”
  - “Operational Safety”, etc.
- This application does not include a description of the SIMATIC WinCC flexible engineering tool.
- It only describes the settings of the used hardware and software components that are necessary for the application.
- The application does not elaborate on the SIMATIC STEP 7 software.

Basic knowledge of the above-listed topics is assumed. For detailed information, please refer to the associated manuals.

Required knowledge

Basic knowledge of the “USV Software Application (2.0)” manual regarding the SITOP DC UPS software is assumed.

2.2 Description of the core functionality

Core of this application is the data exchange between the SITOP UPS500S and WinCC flexible runtime.

If the input voltage breaks down and the set time in the SITOP DC UPS software has lapsed, WinAC RTX is terminated by executing a saved batch file. Thus, the data of the WinAC RTX is retentively stored.

The started applications are furthermore automatically terminated on the IPC427C and the operating system is shut down.

What can the application perform?

The program example included contains

- Instruction to create the batch file, so that various programs and the operating system can be terminated in the event of a critical condition of the SITOP UPS500S.
- A STEP 7 program which shows a data exchange between WinAC RTX and WinCC flexible RT. This creates a display in the WinCC Flexible RT if the WinAC RTX was terminated by the batch file.
- A WinCC flexible application to visualize the data of the SITOP UPS500S and WinAC RTX.

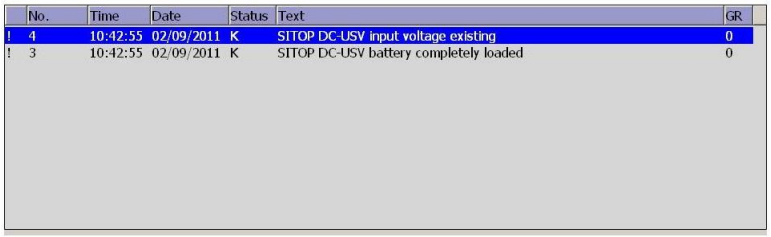
You can use the program as template for your applications.

Overview and description of the user interface

The sample project contains a visualization feature. It shows the operation mode of the power supply and allows a diagnosis of the power supply.

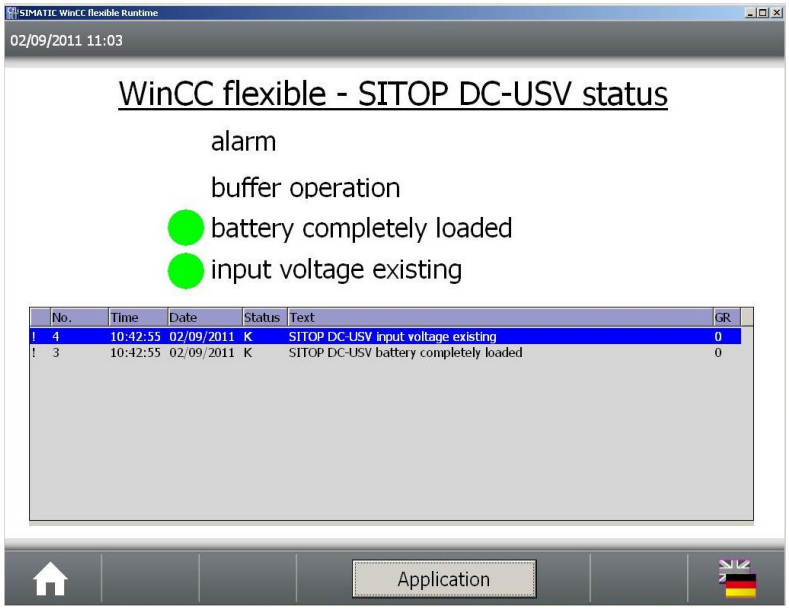
In addition, the connection to the WinAC RTX is represented by means of a “running light”. A message from the WinCC flexible message system informs you on the status of the DC UPS.

Figure 2-3



The figure below of the WinCC flexible RT shows the visualized data of the SITOP UPS500S that is to be transferred to the OPC server interface.

Figure 2-4



SITOP-DC UPS software

The SITOP DC UPS software is used to provide information and diagnostics of SITOP UPS500S to the user. The software furthermore provides information on the OPC server interface that can be visualized through WinCC flexible RT.

The configuration of the connection to the OPC server interface in WinCC flexible is dealt with in Chapter 5.4.2.

To make sure that all programs and the operating system on the SIMATIC IPC427C are terminated in the event of a critical state of the SITOP UPS500S, you have to link a batch file to the SITOP-DC UPS software.
The description of the procedure can be found in Chapter 3.2.

2.3 Hardware and software components used

The application document was generated using the following components:

Hardware components

Table 2-5

Component	No.	MLFB / order number	Note
Power supply	1	6EP1336-3BA10	Alternatively, other 24V power supplies can also be used
Uninterruptable Power Supply	1	6EP1933-2EC51	Alternatively, the following modules can be used: 6EP1933-2EC41 6EP1933-2NC01 6EP1933-2NC11 Or together with the respective battery modules: 6EP1931-2DC31 6EP1931-2DC42 6EP1931-2EC31 6EP1931-2EC42 6EP1931-2FC42
SIMATIC IPC427C	1	6ES7647-7BL30-0QA0	Alternatively, other IPCs can also be used

Note

The use of a SIMATIC IPC427C bundle is recommended. In a bundle, for example, with the type designation 6ES7675-1DL30-7AM0 the runtime packages WinAC RTX and WinCC Flexible RT with 2048 tags are already preinstalled and customized, next to the IPC hardware.

Other bundle configurations are available.

Standard software components

Table 2-6

Component	No.	MLFB / order number	Note
WinCC flexible 2008 Advanced	1	6AV6613-0AA51-3CA5	
WinCC flexible 2008 **SP2**	1	See Customer Support pages Link	SP2 is available for download.
STEP 7 V5.5	1	6ES7810-4CC10-…	
SITOP Software	1	See Customer Support pages Link	The software is available for download.
SIMATIC NET Software 2008	1	6GK1704-1LW71-3AA0	or higher
Restore for IPC427C	1	A5E02568399	This restore contains the following software: WinLC RTX V4.5.0 (6ES7611-4SB00-0YB7), Simatic Net Software 2008, WinCC flexible Runtime 2008 SP2 and WinXP embedded SP3

Note For the communication and the data exchange between SITOP UPS500S and the IPC only a PC runtime can be used.

3 Basics

3.1 EWF filter

Task and function

The EWF (Enhanced Write Filter) is a function that is only available under the Windows Embedded operating system. It represents a write filter that can be configured by the user.

The Enhanced Write Filter makes it possible

- to boot Windows Embedded Standard from write-protected media (e.g., from CD-ROM)
- to provide write-protection for individual partitions
- to adjust the performance of the file system to the needs of the user (for example, when using CompactFlash cards).

Write accesses to CompactFlash cards can be minimized with the EWF. This is important because the number of write cycles on CompactFlash cards is restricted for technical reasons.
When using CompactFlash cards, we recommend to switch on EWF.

Note The Enhanced Write Filter is disabled by default in Windows Embedded Standard. Once you have set up the operating system, you should save your data and subsequently switch on the EWF.

Setting up EWF

To set up the EWF and to switch it on/off, you can use the “EWFMGR.EXE” program. Calling the program is performed through the “Start > Execute > cmd" command prompt. The following functions are available:

Table 3-1

Function	Command
Switch on write protection on drive C:	ewfmgr c: enable
Switch off write protection on drive C: (changed data is accepted)	ewfmgr c: -commitanddisable
Accept changed data on drive C:	ewfmgr c: -commit
Display information on EWF drive	ewfmgr c:
Display help	ewfmgr c: /h

If you would like to install or update software in a EWF mode protected system (Windows Embedded Standard), proceed as follows:

Table 3-2

No.	Procedure
1	Reboot the system.
2	Open the "Start > Execute" Windows command prompt and enter the command "cmd" followed by <ENTER>.
3	Switch off the EWF by entering the command "ewfmgr c: -commitanddisable" followed by <ENTER>.
4	Exit the command prompt by entering "exit" followed by <ENTER>.
5	Reboot the system.
6	Execute the update.
7	Switch on the EWF again with the command "ewfmgr c: -enable".
8	Reboot the system.

3.2 Closing the WinAC RTX

Description

The WinAC RTX offers the option to save data retentively when closing. Closing the WinAC RTX is triggered by a manual trigger through the WinLC Panel or by shutting down Windows. To avoid the loss of extensive retentive data or data of other applications through a power failure, it is necessary to use an uninterruptable power supply (UPS)
(e.g., SITOP DC UPS with serial or USB interface).

Sequence:

- In the event of a power failure, the software requests the UPS to shut down the operating system after a configured time.
- When Windows is shut down, all applications are requested to close down one after the other.
- After a predefined time, the UPS switches off the voltage.
  WinAC RTX is only closed when all applications have closed down before.
  If one of the previous applications is waiting for an entry in an open dialog box, such as, for example, with Microsoft Office Word "Do you want to save the changes?", then WinAC RTX is not properly ended and data may get lost.

Note

Many SIMATIC IPC (e.g., Microbox PC SIMATIC IPC427C, Panel PC SIMATIC HMI IPC477C, Box PC SIMATIC IPC627C,...) have a SRAM which is saved during the buffer time of the own power supply. This also secures a reliable storage of retentive data of WinAC (note maximal buffer size!).

Remedy

The installation CD of WinAC RTX contains an executable file ("WinLC_Shutdown.exe") and is installed on the SIMATIC IPC.

To ensure data retention, the WinAC RTX has to be closed with the help of the shutdown file of the SITOP DC UPS. To call this shutdown file, the creation of an executable batch file is required.

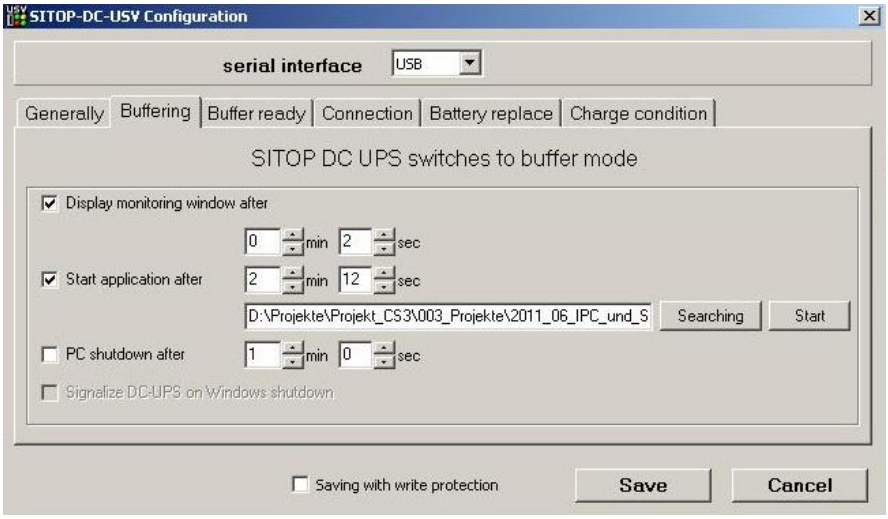
The section below describes the creation of this executable batch file.

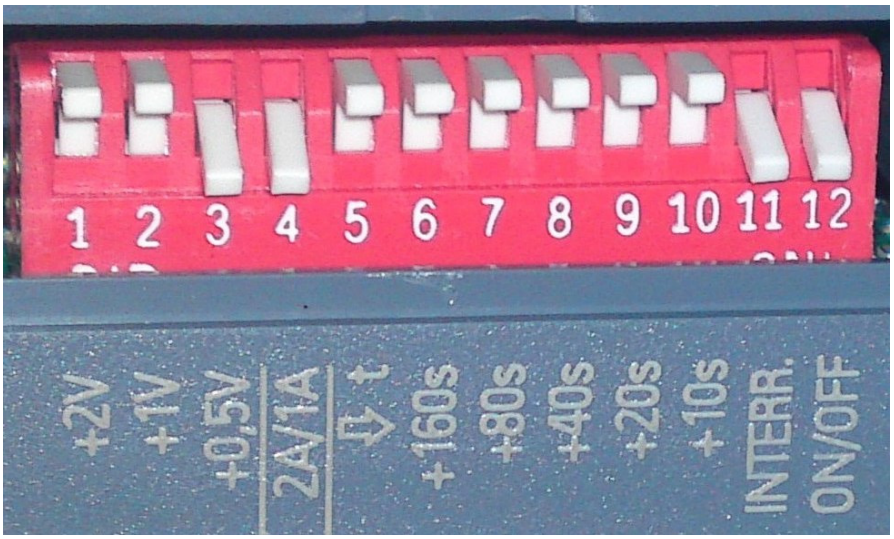
Procedure

Now proceed as follows to create the batch file and data retention.

Table 3-3

No.	Procedure
1	Disable the EWF filter as described in Chapter 3.1
2	Open a text editor, e.g. notepad.
3	Enter the following commands in the text editor. If you installed the program in a different path, then you have to change the respective path details. Otherwise you can copy the following four instructions. **start /d "C:\Program Files\SIEMENS\SIMATIC WinCC flexible\WinCC flexible 2008 Runtime" HmiRtmShutdown.exe** **start /d "C:\Program Files\SIEMENS\WINAC\WinLCRTX" WinLC_Shutdown.exe -auto** **start /d "C:\Program Files\SITOP" Shutdown.exe** **%windir%\system32\shutdown.exe -s -f -t 10 -c "Shutdown by SITOP UPS Module"** **Note**: The first entry ensures that WinCC flexible Runtime was properly shut down and that settings and (internal) tag contents can be stored, if necessary. The second entry ensures that WinAC RTX was properly shut down. The "**-auto**" switch detects the WinAC independently. The "Shutdown.exe" program is automatically installed into the SITOP directory together with the SITOP software from version 3.x.2.14 onwards. The program gives the DC UPS the command to switch off once the PC was shut down (no more data traffic on the USB connection) and once the buffer time has lapsed that was set through the DIP switches on the UPS device. When shutting down Windows (last command of the batch file) attention has to be paid that a delay time of "**–t 10**" has passed in order to safely send the remote command to the UPS even if there is a heavily loaded system. When configuring the SITOP DC UPS software, care must be taken that "PC Shutdown after" is **not** ticked (figure 01), since the shutdown is executed by the batch file. If you installed the WinAC RTX in a different directory, then you have to change the path accordingly.

No.	Procedure
4	**Save file as “Batch file”:** Save the text file with the ending "***.bat**". The path must not have any spaces. Example: "Programs\SITOP\SITOP_DC_UPS_Software\buffer_operation**.bat**". **Note:** Note the Windows permission settings: It is essential that you save the batch file in a user independent directory (e.g. "Programs" or root directory) to ensure access to the batch file.
5	**Monitoring software SITOP-DC UPS:** Open the monitoring software of SITOP DC UPS. The installation of the software is described in Chapter 5.1.3.
6	Click the "**Configuration**" button.
7	Enter the path of the created batch file (step 3) in the "Buffering" tab. Enter a time after which the batch file (application) shall be started once the SITOP DC UPS has changed to buffer mode. An overview of the possible buffer time in relation to the load current and the UPS used, can be found in Chapter 3.3.2 and Chapter 3.3.3. 
8	Save the changes.

No.	Procedure
9	The DIP switches on the SITOP DC UPS also have to be switched to INTERR. (interruption) = ON. After the lapse of the set buffer time the output voltage is interrupted for approx. 5 seconds, even if the input voltage has returned in the meantime. Thus, a restart of the SIMATIC IPC is guaranteed. 

Note

When using an UPS with a SIMATIC IPC with WinAC RTX (also S7-mEC), the SITOP UPS tool has to be configured as service, in order for to be active without a registered user.

3.3 Information on DC UPS

3.3.1 General information

To bridge longer network failures without any data loss, there are various DC UPS.

- The buffer module for the SITOP modular power supplies allows the bridging of network failures of up to ten seconds
- Up to the minute range the maintenance-free SITOP UPS500 with capacitor technology
- Up to the hour range the DC UPS modules with battery modules.

3.3.2 DC UPS with capacitors

The SITOP UPS500 is based on maintenance-free capacitors with a long life. After 8 years the capacitors still have 80 % of their capacity at 50 °C. I.e. replacing the energy storage device is not required. Because the capacitors emit no gas at all, it is not necessary to ventilate the control cabinet due to the use of the UPS. Fast buffer readiness after a network failure is guaranteed because of the considerably shorter recharging time of the double-layer capacitors.

The 24 V UPS is available in protection class IP20 for the installation on a top-hat rail and in protection class IP65 for decentralized use. The IP20 version SITOP UPS500S for the installation in a control cabinet consists of a 15 A basic device with integrated energy storage in 2.5 or 5 kW design. To prolong the buffer time, the compact basic unit can be expanded with UPS501S expansion modules (5 kW). Up to 3 expansion modules can be simply connected in parallel through plug-in connections, so that a total capacity of up to 20 kW can be achieved. The SITOP UPS500P IP65 version has capacitors for 5 or 10 kW and supplies up to 7 A output current.

Buffer and charging times

Figure 3-1

Technische Daten[1]											
Verfügbare Energie		**SITOP UPS500S/501S**								**SITOP UPS500P**	
Grundgeräte		2,5 kWs	5 kWs	2,5 kWs	5 kWs	2,5 kWs	5 kWs	2,5 kWs	5 kWs	5 kWs	10 kWs
Erweiterungsmodule		–	–	1 x 5 kWs	1 x 5 kWs	2 x 5 kWs	2 x 5 kWs	3 x 5 kWs	3 x 5 kWs	–	–
Kombiniert		2,5 kWs	5 kWs	7,5 kWs	10 kWs	12,5 kWs	15 kWs	17,5 kWs	20 kWs	5 kWs	10 kWs
Pufferzeiten											
bei Laststrom ...	0,5 A	134 s	236 s	390 s	478 s	632 s	748 s	851 s	1007 s	284 s	647 s
	0,8 A	90 s	167 s	266 s	346 s	440 s	527 s	580 s	706 s	190 s	435 s
	1 A	75 s	138 s	219 s	296 s	365 s	414 s	490 s	572 s	153 s	351 s
	2 A	38 s	76 s	122 s	156 s	203 s	230 s	265 s	306 s	80 s	152 s
	3 A	26 s	52 s	82 s	106 s	136 s	159 s	186 s	213 s	53 s	108 s
	4 A	19 s	39 s	61 s	81 s	101 s	120 s	139 s	160 s	40 s	84 s
	5 A	15 s	31 s	49 s	65 s	81 s	95 s	111 s	130 s	30 s	68 s
	6 A	12 s	26 s	40 s	55 s	67 s	80 s	94 s	106 s	25 s	57 s
	7 A	10 s	21 s	34 s	47 s	58 s	69 s	81 s	82 s	21 s	49 s
	8 A	8 s	18 s	29 s	40 s	50 s	59 s	69 s	79 s	–	–
	10 A	6 s	15 s	23 s	32 s	39 s	47 s	54 s	62 s	–	–
	12 A	4 s	12 s	19 s	26 s	32 s	38 s	44 s	52 s	–	–
	15 A	3 s	9 s	14 s	20 s	25 s	30 s	35 s	40 s	–	–
Ladezeiten											
bei Ladestrom ...	2 A	54 s	120 s	158 s	223 s	263 s	318 s	355 s	417 s	130 s	360 s
	1 A	110 s	205 s	311 s	425 s	503 s	625 s	695 s	816 s	–	–

Buffer time of the described application

The SIMATIC Microbox 427C used has a Core 2 Duo processor with a current consumption of 750 mA. This results in a buffer time of 167s.

Figure 3-2

Technische Daten[1]									
Verfügbare Energie		**SITOP UPS500S/501S**							
Grundgeräte		2,5 kWs	5 kWs	2,5 kWs	5 kWs	2,5 kWs	5 kWs	2,5 kWs	5 kWs
Erweiterungsmodule		–	–	1 x 5 kWs	1 x 5 kWs	2 x 5 kWs	2 x 5 kWs	3 x 5 kWs	3 x 5 kWs
Kombiniert		2,5 kWs	5 kWs	7,5 kWs	10 kWs	12,5 kWs	15 kWs	17,5 kWs	20 kWs
Pufferzeiten									
bei Laststrom ...	0,5 A	134 s	236 s	390 s	478 s	632 s	748 s	851 s	1007 s
	0,8 A	90 s	167 s	266 s	346 s	440 s	527 s	580 s	706 s
	1 A	75 s	138 s	219 s	296 s	365 s	414 s	490 s	572 s

DC UPS with battery modules

The DC UPS additional modules are the best possible supplements to the 24 V SITOP power supplies if you cannot afford longer network failures. Through externally connectable lead-gel batteries of 1.2 to 12 Ah, load currents of up to 40 A are maintained. The transition from network to buffer mode is performed absolutely interruption free.

The compact DC UPS modules with 6 A, 15 A or 40 A output current have extensive protection and monitoring functions for maximum availability such as, for example, the monitoring of operational readiness, battery cable, battery age and

charging status. The modules can communicate through various interfaces, e.g. via USB.

Buffer times

Figure 3-3

Technische Daten[1)]						
Batteriemodule		**1,2 Ah**	**3,2 Ah**	**7 Ah**	**12 Ah**	**2,5 Ah Hochtemperatur**
Pufferzeiten						
bei Laststrom ...	1 A	30 min	2,5 h	6 h	11 h	2 h
	2 A	11 min	45 min	2,5 h	5 h	45 min
	3 A	4 min	25 min	1,5 h	3 h	30 min
	4 A	2 min	20 min	45 min	2 h	20 min
	6 A	1 min	10 min	30 min	1 h	13 min
	8 A	–	4 min	20 min	40 min	9 min
	10 A	–	1,5 min	15 min	30 min	7 min
	12 A	–	1 min	10 min	25 min	5,5 min
	14 A	–	50 s	8 min	20 min	4,5 min
	16 A	–	40 s (15 A)	6 min	15 min	4 min
	20 A	–	–	3 min	11 min	–
	25 A	–	–	2 min	9 min	–
	30 A	–	–	1 min	6 min	–

3.3.3 Advantages of the SITOP DC UPS with capacitors and the SITOP DC UPS with battery modules

The advantages of the SITOP DC UPS with capacitors

- Bridging of network failures of up to the minute range
- Absolutely maintenance-free DC UPS with high-capacity double-layer capacitors
- Modularly cascadable for top-hat rail installation:
  SITOP UPS500S 24V/15A basic unit with integrated energy storage 2.5 or 5 kW, can be combined with up to 3 UPS501S (5 kW) expansion modules
- SITOP UPS500P 24V/7A, 5 or 10 kW in protection type IP65 for decentralized use
- Durable capacitors saves the replacement of rechargeable batteries:
  After 8 years, the UPS500 still has a nominal capacity of 80 % at an ambient temperature of 50 °C
- No ventilation of the installation place required (VDE 0510 Part 2 / EN 50272-2)
- Fast restoration of the buffer readiness

The advantages of the SITOP DC UPS with battery modules

- Bridging of network failures of up to the hour range
- DC UPS modules 6A, 15A und 40A
- Maintenance-free battery modules of 1.2 to 12Ah
- Long life of the consumer and the rechargeable batteries due to integrated battery management

4 Functional Mechanisms

4.1 SITOP DC UPS software

The SITOP DC UPS software provides further information through an OPC server that the user can evaluate in his/her application. The table below shows you provided data:

Table 4-1

Item Name	Type	Values	Description
AKKU	Bool	= true: replacement of rechargeable battery required	Tags that represent the status of SITOP UPS The “true” status corresponds to the active LED on the device.
ALARM	Bool	= true: no buffer readiness	
BAT	Bool	= true: buffer operation	
BAT85	Bool	= true: battery fully charged	
DC_OK	Bool	= true: input voltage o. k.	
Connection	Longint	= 0: no connection = 1; 2: Connection available; status changes between 1 and 2 to monitor the connection	
Status	Longint		Binary coded status word. For this purpose, see the “UPS Software Application (2.0).pdf” manual, table 2, included in delivery with the SITOP DC UPS software Link
Device	String		Type of the connected device (e.g.: SITOP DC UPS 40)
Last_Message	String		Last message/log file entry
Received	String		Last message of the UPS

Furthermore, an executable batch file is stored with the SITOP-DC UPS software. The batch file is automatically executed after a set time when the SITOP UPS500S is in buffer mode.

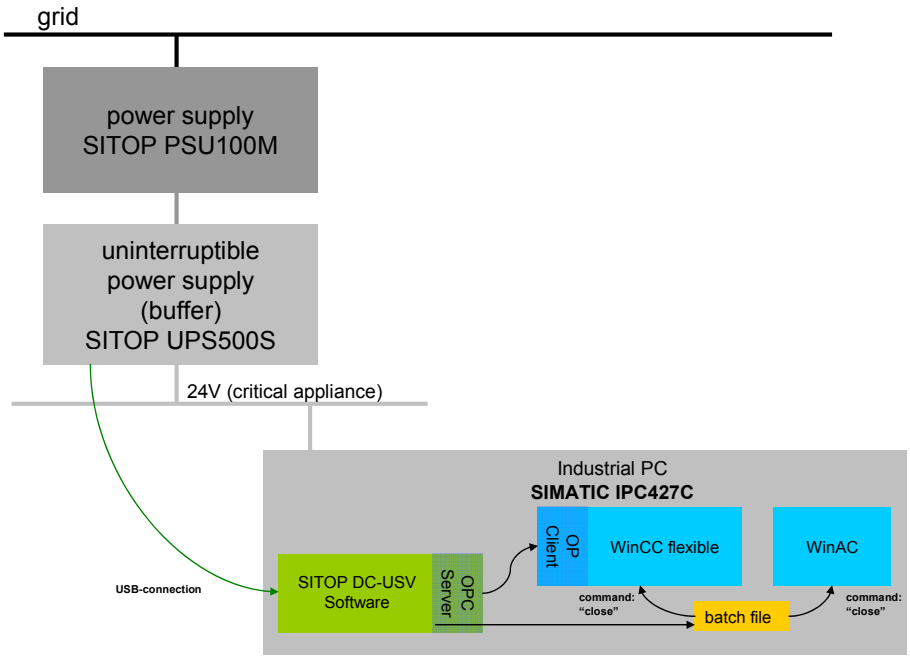
The aim is to close the started applications on the Microbox before the buffer mode of the SITOP UPS500S can no longer be maintained (e.g. WinAC RTX and the WinCC flexible Runtime).

Note

Batch file:
A batch file is an executable file that contains consecutive commands. When a batch file is called, the stored commands are processed.

4.2 Communication (data flow) between SITOP DC UPS and industrial PC (WinAC RTX/WinCC flexible)

Figure 4-1



4.3 STEP 7 configuration

For the application a Simatic PC Station with WinLC RTX (6ES7 611-4SB00-0YB7) was used.

Apart from the hardware configuration, the WinLC RTX controller contains the following blocks in order to create a data exchange with the WinCC flexible RT.

Note The names of the blocks can be adjusted as desired.

Table 4-2

No.	Block	Comment
1	OB1	Main Program
2	OB35 Time OB	The time of the OB35 interrupt is specified in the properties of WinLC. 1000 ms in the example.
3	FB1 Running light	The block is called in OB35
4	DB1 Instance DB	Instance DB of FB1

4.4 WinCC flexible message configuration

Diagnostic of the SITOP DC UPS in the WinCC flexible message system

The diagnostic information of the SITOP DC UPS is to be included in the WinCC message system.

Below, it is described what functional mechanisms are realized in this example.

Alarm tag

The diagnostic information of the SITOP DC UPS is provided through the OPC server as “Bool” data type.

The WinCC flexible bit messages use the “Integer” data type.

In order for the message display in the “SITOP_Diagnostic” screen, to show the messages of the SITOP DC UPS, the following “Alarm tags” tags were created in the integer format. The tags are copied into these “Alarm tags”. As a result, this diagnostic information of the SITOP DC UPS can be used in the message system of WinCC flexible.

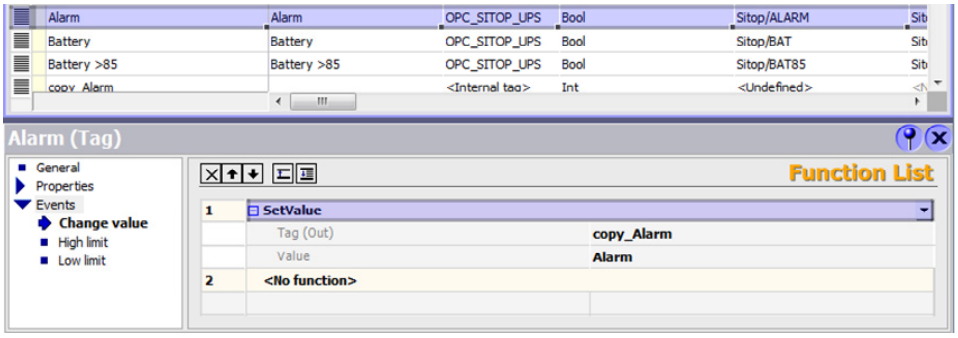
Table 4-3

No.	Tag	Respective “Alarm tag”
1.	Alarm	copy_Alarm
2.	Battery	copy_Battery
3.	Battery >85	copy_Battery >85
4.	DC_OK	copy_DC_OK

Assigning the alarm tags

The diagnostic information of the SITOP DC UPS of the “Bool” data type has to be copied in the respective alarm tag of the “Integer” data type. For this purpose, the following configuration has to be made in WinCC flexible.
(Shown on the example of the "Alarm" → "copy_Alarm" tag.)

Figure 4-2



The configuration has been created for all four diagnostic tags.

5 Configuration Process

5.1 Preparatory measures for the configuration

Before you start with the configuration, determine the addresses of the individual hardware components.

5.1.1 IP addresses

Define the IP addresses of the individual Ethernet nodes.
The table below lists the IP addresses used for the application.

Table 5-1

Device	IP address
Configuration PC	192.168.2.5
SIMATIC IPC427C	192.168.2.1

5.1.2 Addresses, parameters and passwords used

Table 5-2

No.	Parameters	Address, name and password
1	**Ending runtime:** To end the WinCC flexible Runtime on the SIMATIC IPC427C, you have to enter a password. The user can change the password at any time in the configuration software of WinCC flexible.	User: Admin Password: admin100

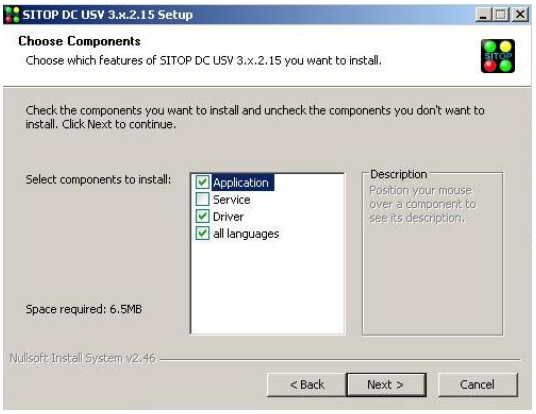
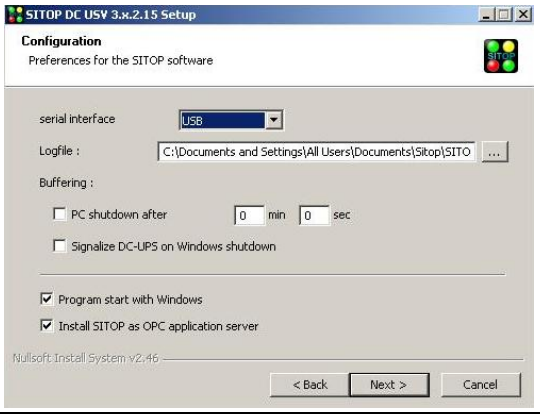
5.1.3 Installation of the SITOP-DC UPS software

You can download the SITOP DC UPS software tool under the following Link. To be able to shut down your system in the event of a critical battery state of the SITOP UPS500S, you have to install this software package on the PC SIMATIC IPC427C microbox.

Procedure

Proceed as explained bellow, to install the SITOP-DC UPS software on the SIMATIC IPC427C:

Table 5-3

No.	Action	Screens
1	**Starting installation:** Execute the “Setup_Sitop_3.x.2.15.exe” file. The installation of the SITOP-DC UPS software is started	
2	**Carrying out installation:** During the installation you will come upon the selection box on the right. Select the same settings for your installation as described in the screen on the right.	
3	**Carrying out installation:** During the installation you will come upon the selection box on the right. Select the same settings for your installation as described in the screen on the right.	

5.1.4 Installation of the WinAC RTX on the SIMATIC IPC427C

Ensure that the WinAC RTX V4.5 is installed on the SIMATIC IPC427C.

5.1.5 Installation of the WinCC flexible Runtime 2008

Ensure that WinCC flexible Runtime 2008 SP2 is installed on the SIMATIC IPC427C.

5.1.6 Installation of SIMATIC NET

Make sure that SIMATIC NET software 2008 or higher is installed on the SIMATIC IPC427C.

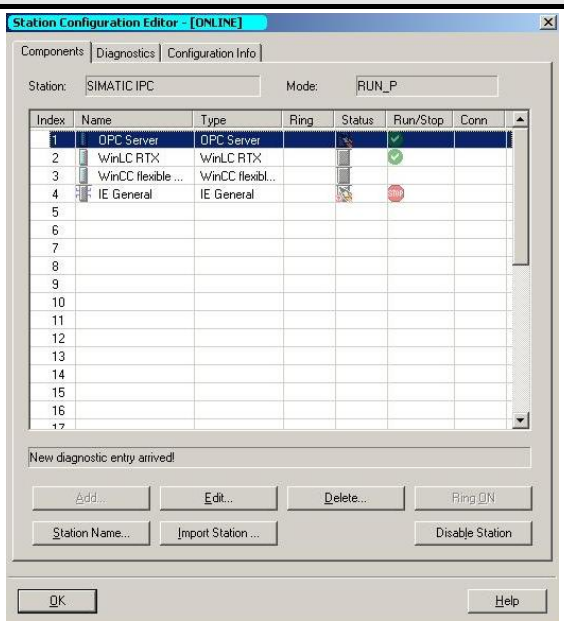
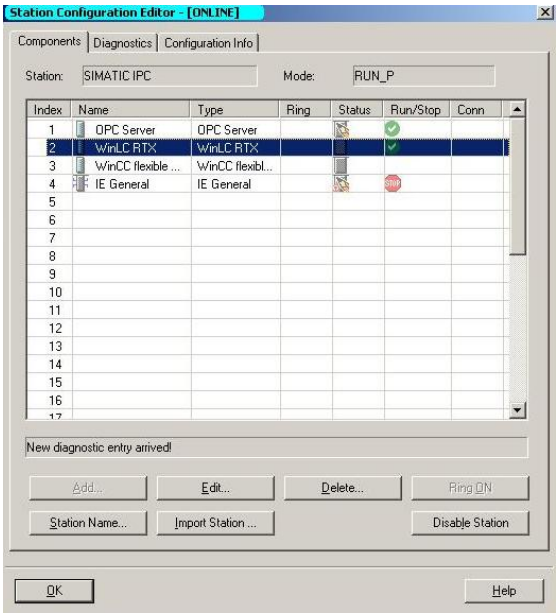
Note If you use a SIMATIC IPC427C as bundle with WinAC RTX and WinCC Flexible Runtime 2008, then the required software packages are already contained and preinstalled.

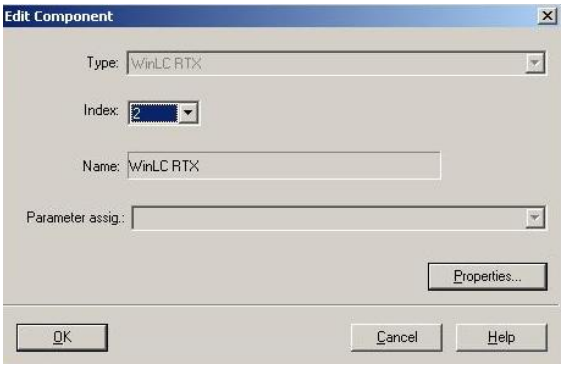
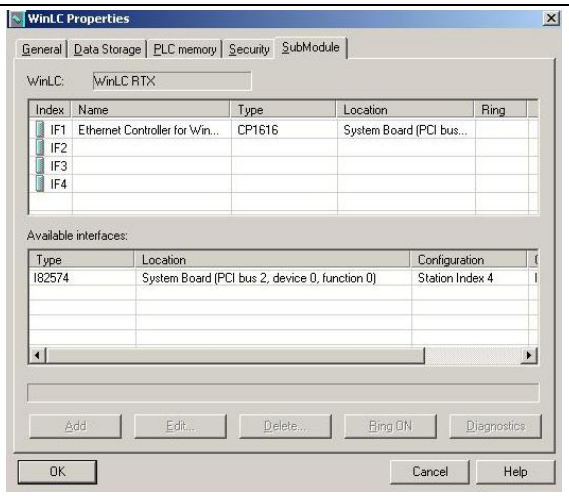
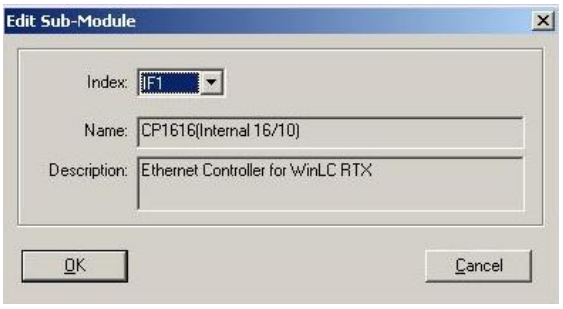
5.2 Station configurator

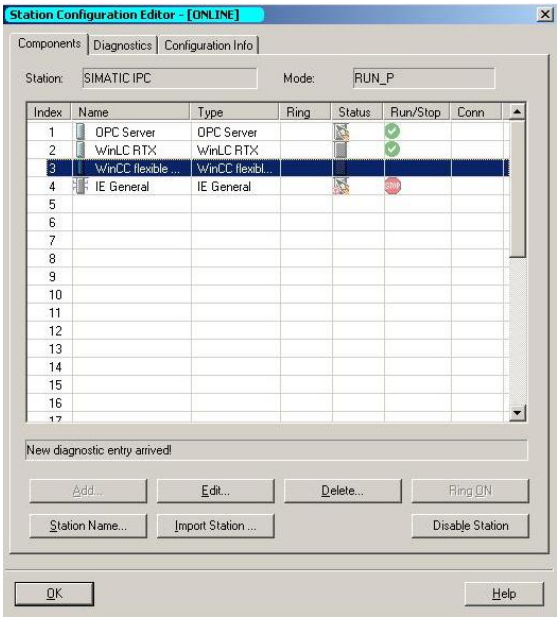
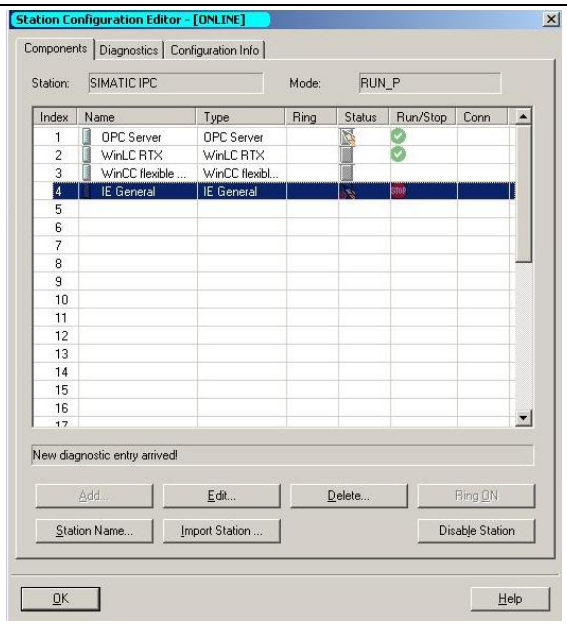
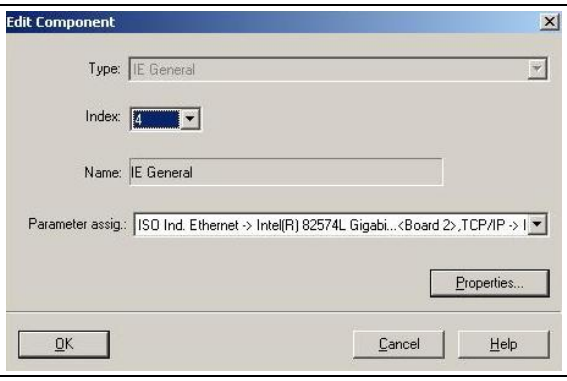
Below, it is described how you configure the station configurator on the **SIMATIC IPC427C**. The components configurator is the central administrative instance for the components of the PC station.

Start the component configurator:

Table 5-4

No.	Action	Screens
1	**Inserting OPC server:** Insert the OPC server in slot “1” through the “Add” button • Select the first slot • Click the “Add…” button. The “Add…” window opens up: • Select the “OPC Server” type in the “Add…” window. As index select no “1”. • Confirm the entry with “OK”.	
2	**Inserting WinLC RTX:** Insert the WinLC RTX in the same slot as in the hardware configuration with the “Add…” button In this example this is slot “2”. • Select the second slot • Click the “Add…” button. The “Add…” window opens up: • Select the “WinLC RTX” type in the “Add…” window. As index select no “2”. • Confirm the entry with “OK”. Once you have added the station, the window for configuring the WinLC RTX properties opens automatically.	

No.	Action	Screens
3	**Configuring WinLC RTX:** In this screen click the “Properties...” button, to get to other configurations.	
4	**Configuring WinLC RTX:** Select the installed Ethernet card in the “Available interfaces” field and add it to the WinLC through the “Add…” button. Subsequently you can edit the added Ethernet interfaces through the “Edit…” button.	
5	**Configuring WinLC RTX:** Edit sub-module. In this setting mask, you can select the index of the network card. It has to be the same index as in the hardware configuration. In this example this is the “IF1” index.	

No.	Action	Screens
6	**Inserting WinCC flexible RT:** Insert the WinCC flexible RT in the same slot as in the hardware configuration with the “Add…” button In this example this is slot “3”. • Select the third slot • Click the “Add…” button. The “Add…” window opens up: • Select the “WinCC flexible RT” type in the “Add…” window. As index select no “3”. • Confirm the entry with “OK”.	
7	**Inserting IE General:** Insert the “IE General” in slot “4” through the “Add…” button. • Select the fourth slot • Click the “Add…” button. The “Add…” window opens up: • Select the “IE General” type in the “Add…” window. As index select no “4”. • Confirm the entry with “OK”.	
8	**Configuring IE General:** Select the Ethernet interface through which the SIMATIC IPC427C communicates in this screen at “Parameter assig.”.	

Note

Note that the station name in the component configurator is identical with the name of the SIMATIC PC Station in the SIMATIC manager.

In this example the name is “SIMATIC IPC”.

If the names are not identical, rename the name in the SIMATIC manager.

Note

Note that the name of the IE general in the component configurator is identical with the name of the IE general in the SIMATIC manager.

In this example the name is “IE General”.

If the names are not identical, rename the name in the SIMATIC manager.

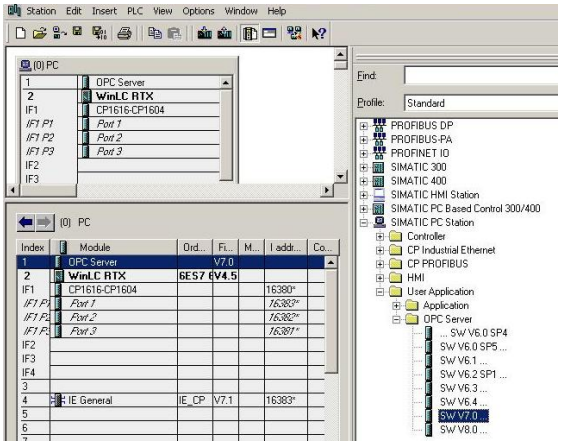
5.3 STEP 7 configuration

5.3.1 Hardware settings

Insert a SIMATIC PC station in the Simatic Manager. Subsequently open the configuration of the SIMATIC PC station. Below, you will find the settings for the individual modules in the configuration under STEP 7:

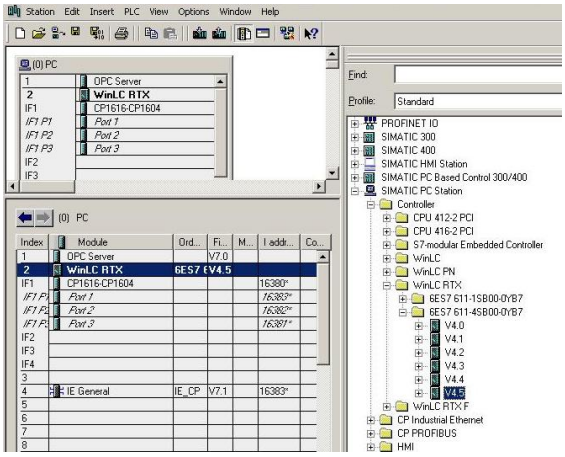
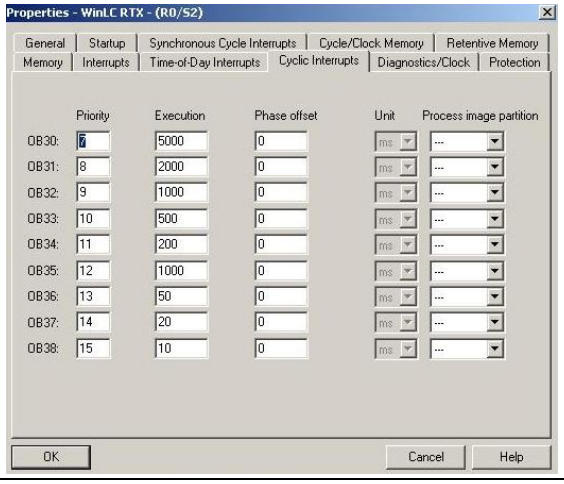
Inserting the OPC server

Table 5-5

No.	Action	Screens
1	**Inserting OPC server:** From the hardware catalog of the HW config, insert an OPC server, by dragging it into the rack on slot 1 using "Drag&Drop" You find the OPC server in the hardware catalog under “SIMATIC PC Station > User Application > OPC Server > SW 7.0”.	

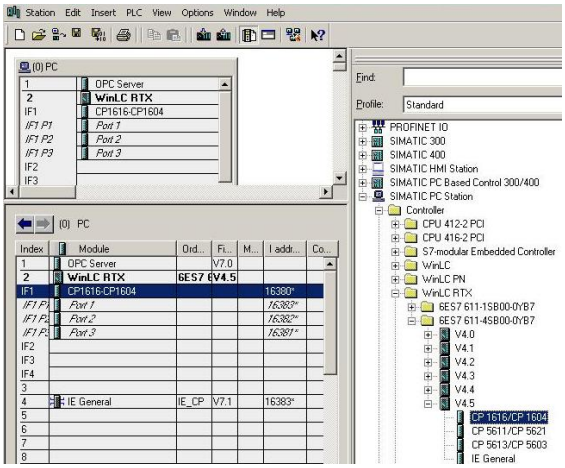
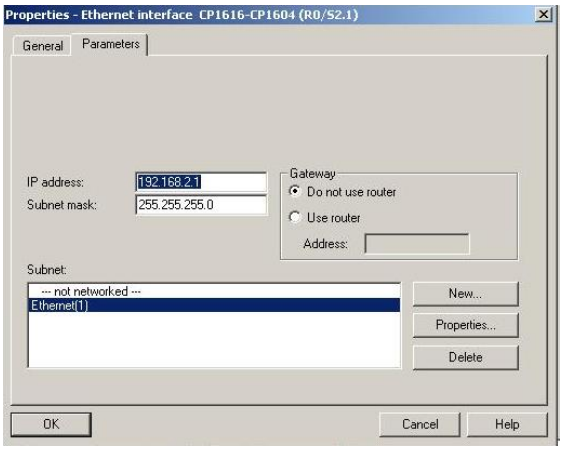
Inserting the WinLC RTX

Table 5-6

No.	Action	Screens
1	**Inserting WinLC RTX:** From the hardware catalog of the HW config, insert an WinLC RTX, by dragging it into the rack on slot “2” using "Drag&Drop" You find the WinLC RTX in the hardware catalog under “SIMATIC PC Station > Controller > WinLC RTX > 6ES7611-4SB00-0YB7 > V4.5”. **Note:** Make sure that you use the WinLC RTX that is installed on the SIMATIC IPC427C. **In this example:** 6ES7611-4SB00-0YB7 > V4.5	
2	**Properties of the WinLC RTX:** Once you have inserted the WinLC RTX in the slot, open the object properties of the WinLC RTX. In the “**Cyclic Interrupts**” tab, enter the execution time “1000” for OB35. This corresponds to 1000 ms. The OB35 is automatically called by the system every 1000ms for one cycle.	

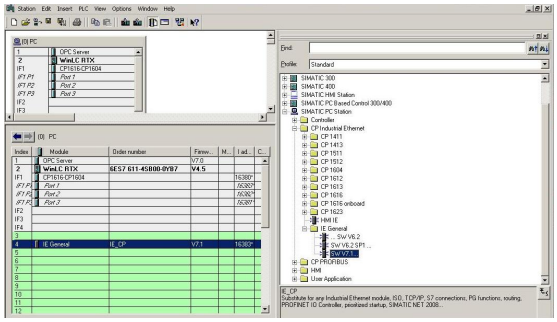
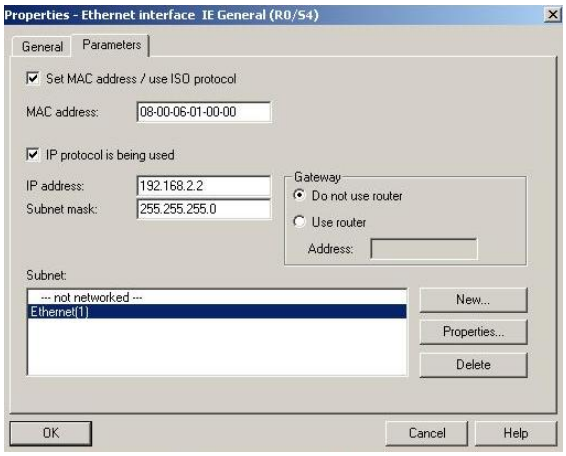
Inserting the CP 1616

Table 5-7

No.	Action	Screens
1	**Inserting the CP 1616:** From the hardware catalog of the HW config, insert a CP 1616, by dragging it into the rack on slot “IF1” using "Drag&Drop" You find the CP 1616 in the hardware catalog under “SIMATIC PC Station > Controller > WinLC RTX > 6ES7611-4SB00-0YB7 > V4.5 > CP 1616/CP 1604“.	
2	**Properties of the CP 1616:** If you insert the CP in the slot, the property window of the CP opens up. In the “**Parameters**” tab enter the • IP address • Subnet mask • Subnet Confirm the entries with “**OK**”. **Note:** Here, enter the address of the SIMATIC IPC427C. **In this example:** IP address: 192.168.2.1 Sub-network mask: 255.255.0.0 Subnet: Ethernet (1) If there is no subnet yet, please create a new one through the “New…” button. You can leave the default settings as they are.	

Inserting the IE General

Table 5-8

No.	Action	Screens
1	**Inserting IE General:** From the hardware catalog of the HW config insert an “IE General”, by dragging it into the rack on slot “4” using "Drag&Drop" You find the “IE General” in the hardware catalog under “SIMATIC PC Station > CP Industrial Ethernet > IE General > SW V7.1…”	
2	**Properties of the IE General:** Once you have inserted the IE General into a slot, the properties of the IE General open up. Navigate to the settings of the network address. In the “**Parameters**” tab enter the • IP address • Subnet mask • Subnet . Confirm the entries with “**OK**”. **Note:** Here, you enter an IP address that is in the same band as the IP address of the SIMATIC IPC427C. **In this example:** IP address: 192.168.2.2 Sub-network mask: 255.255.0.0 Subnet: Ethernet (1)	

Note Note that the name of the IE General in the hardware config has to be identical with the name of the IE General in the station configurator. In this example the name is “IE General”.

Compiling the hardware

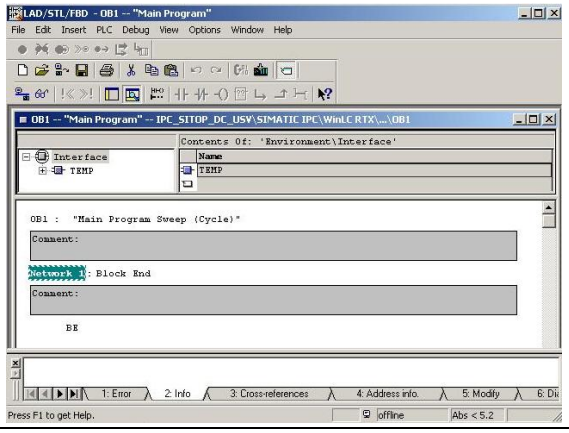
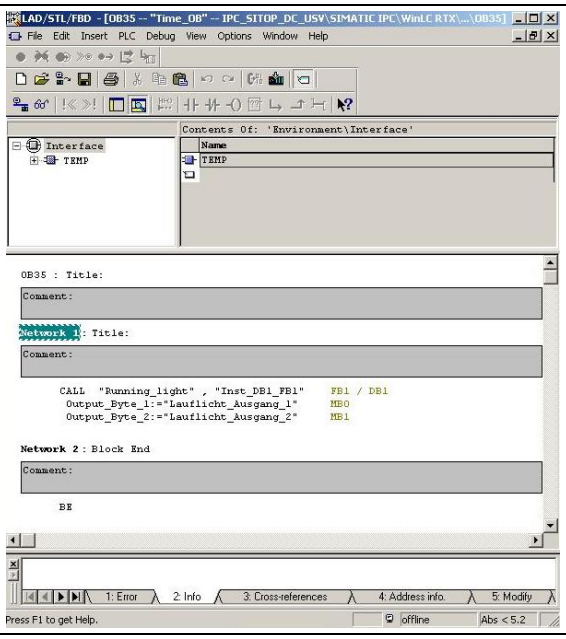
Table 5-9

No.	Action
1	**Compiling the hardware:** Once you have completed the hardware configuration, you have to **"Save and Compile"** the settings. By compiling the program, STEP 7 automatically creates the system data.
2	**Transferring the hardware:** After **"Save and Compile"**, you have to transfer the hardware to the PLC. This completes the changes within the hardware configuration. Under the following Link you can find a description on how the WinAC configuration from the STEP 7 configuration PC is transferred to the SIMATIC IPC427C through Industrial Ethernet (TCP/IP).

5.3.2 S7 program

Below, you find a description of the used S7 blocks. The blocks are used for the simulation of a data exchange between the WinLC RTX and the WinCC flexible RT.

Table 5-10

No.	Action	Screens
1	**OB1, Main Program** Since no cyclic program is running in the sample application, the OB1 has no control program.	
2	**OB35, Time_OB** The FB1 block is called through the OB35 with its instance DB “DB1”. The OB35 is automatically called every 1000 ms by the system.	
3	**FB1, Running_light** On this block two bytes can be configured on the outputs. The block controls the bytes bit by bit, so that the next bit is set every 1000 ms (call cycle of the OB35). In this example: Output byte 1: MB0 Output byte 2: MB1	
4	**DB1, Inst_DB1_FB1** The DB1 is the instance DB of the FB1.	

5.4 WinCC flexible configuration

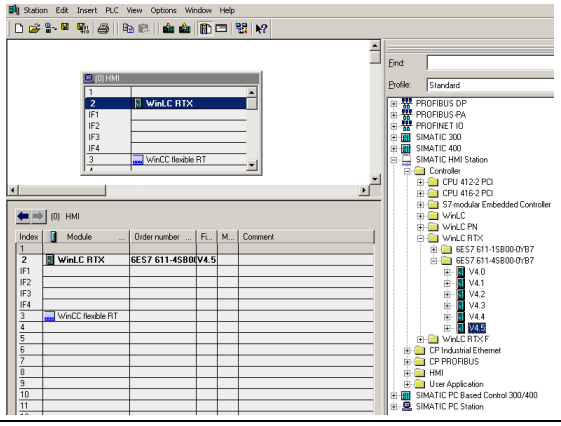
As operator panel a PC > WinCC flexible RT is used:

5.4.1 Hardware settings

Add a SIMATIC HMI station in the Simatic Manager. Subsequently open the configuration of the SIMATIC HMI station.

Inserting the WinLC RTX

Table 5-11

No.	Action	Screens
1	**Inserting the WinLC RTX:** From the hardware catalog of the HW config, insert an WinLC RTX, by dragging it into the rack on slot “2” using "Drag&Drop" You find the WinLC RTX in the hardware catalog under “SIMATIC HMI Station > Controller > WinLC RTX > 6ES7611-4SB00-0YB7 > V4.5”.	

Compiling the hardware

Table 5-12

No.	Action
1	**Compiling the hardware:** Once you have completed the hardware configuration, you have to **“Save and Compile”** the settings. By compiling the program, STEP 7 automatically creates the system data.

5.4.2 WinCC flexible configuration

The individual configuration steps are explained below.

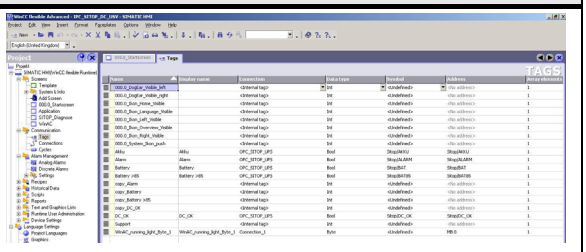
Tags used

Internal tags for switching the screens and languages are created for the application.
The tags have to be created for the data exchange between the SITOP UPS500S and the WinCC flexible Runtime, which are to be visualized by the WinCC flexible Runtime. In Table 4-1 you find the tags that are provided by the SITOP UPS500S.

The data exchange is through OPC_SITOP_UPS.

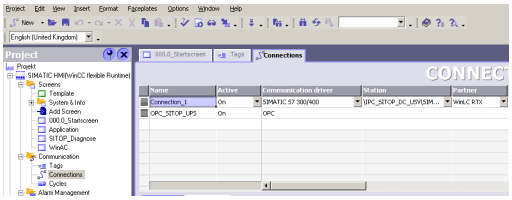
To visualize the data from WinLC RTX, two tags have been created that access the WinLC RTX.

Table 5-13

No.	Action	Screens
1	**General:** Acquisition mode: Cyclic at use Acquisition cycle: 1 s **The following tags were created:** 000.0_DogEar_Visible_left 000.0_DogEar_Visible_right 000.0_Ikon_Home_Visible 000.0_Ikon_Language_Visible 000.0_Ikon_Left_Visible 000.0_Ikon_Overview_Visible 000.0_Ikon_Right_Visible 000.0_System_Ikon_push Akku Alarm Battery Battery >85 copy_Alarm copy_Battery copy_ Battery >85 copy_DC_OK DC_OK Support WinAC_running_light_Byte_1 **Note:** a longer time for the acquisition cycle can also be selected.	

Configured connections

Table 5-14

No.	Action	Screens
1	For the communication in the application two connections of WinCC flexible are required. • Connection 1 to SITOP UPS500S through OPC • Connection 2 to WinLC RTX through SIMATIC S7 300/400. The connection to WinLC RTX (Connection_1) is automatically created, based on the configuration under STEP 7. The connection to SITOP UPS500S has to be created manually. Take the OPC server names from the “Considerations for use of the SITOP DC UPS Software V3” manual under chapter 4.2. This manual is included when you download the SITOP software. In this example the name for the OPC server name is: SITOP_UPS.OPC	

Transferring the configuration

Table 5-15

No.	Action
1	**Transferring the configuration:** Once you have generated and saved the project, you have to transfer it to the SIMATIC IPC427C. A description of the settings you have to make to be able to transfer a WinCC flexible Runtime file from the configuration PC to a visualization PC can be found under the following Link .

Configured screens

The configured screens in WinCC flexible are described in Chapter 7 in the document.

6 Startup of the Application

6.1 Preparing measures

Table 6-1

No.	Action
1.	**Linking all nodes:** Link all nodes through the Ethernet and make sure that there is a connection to all nodes. • Controller (WinAC RTX to SIMATIC IPC427C) • Programming device / PC / Laptop
2.	**Connecting SITOP UPS500S:** Connect the SITOP UPS500S through USB to the SIMATIC IPC427C.
3.	**Transferring S7 configuration:** Transfer the STEP 7 configuration to the controller (WinLC RTX). Make sure that the PLC controller is subsequently in “RUN” mode. How to transfer the S7 configuration is described in Chapter 5.3.1 under “Compiling hardware”.
4.	**Transferring WinCC flexible configuration:** Transfer the WinCC flexible configuration. How to transfer the WinCC flexible configuration is described in Chapter 5.4.2 under “Transferring configuration”.

6.2 Commissioning

After completing the preparatory measures, the WinCC flexible RT establishes a connection to the controller. The SITOP UPS500S furthermore establishes a connection to the SIMATIC IPC427C and transfers your data through the OPC_SITOP_UPS to the WinCC flexible RT.

To check whether the SITOP UPS500S of the SIMATIC IPC427C is shut down if there is a critical situation and all running programs are closed down, proceed as follows:

Table 6-2

No.	Action
1.	**Switch off the supply voltage:** The SITOP UPS500S continues to supply the SIMATIC IPC427C with supply voltage DC 24V.
2.	After the set time in the SITOP-DC UPS software (Closing the WinAC RTX) the saved batch file is executed. The stored programs in the batch file are ended and the operating system of the SIMATIC IPC427C is shut down.

7 Operating the Application

WinCC flexible configuration

For the application a Simatic HMI station with a WinCC flexible Runtime was configured.

The project consists of the following screens.

7.1 “000.0_Startscreen” screen

If WinCC flexible Runtime is started, this screen is shown first. From this screen, you navigate to the other screens.

Figure 7-1

7.2 “Application” screen

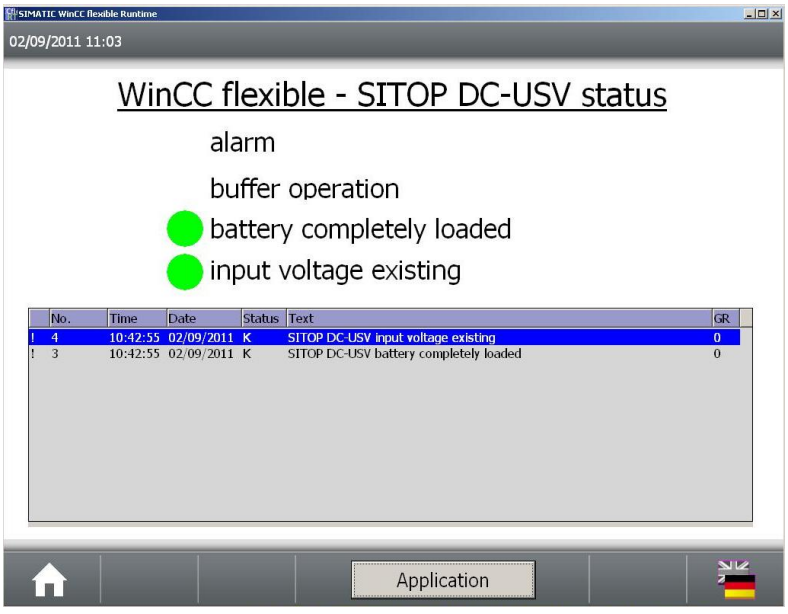
From the “Application” screen you can either navigate to the “SITOP Diagnostic” screen or to the “WinAC connection” screen. In these two screens the communication to the SITOP UPS500S or to WinAC is shown.

Figure 7-2

7.3 “SITOP_Diagnostic” screen

In this screen the diagnostic data of the SITOP UPS500S is visualized.

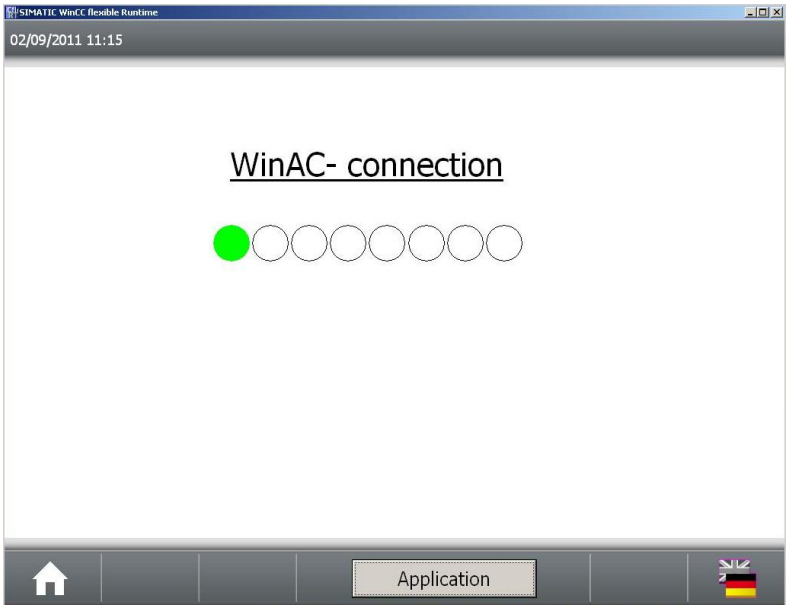
Figure 7-3



7.4 “WinAC” screen

In the WinAC there is a running light to display the communication between WinAC RTX and the WinCC flexible Runtime. If the connection breaks down, the data exchange also stops and the running light stops working.

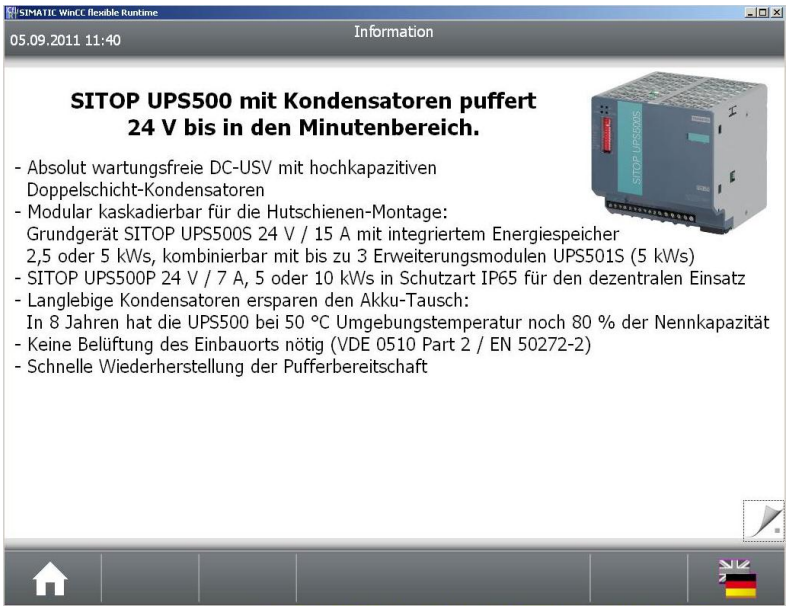
Figure 7-4



7.5 “000.1_Info” screen

In the “000.1_Info” screen, the user is given a technical description to the SITOP UPS500S module.

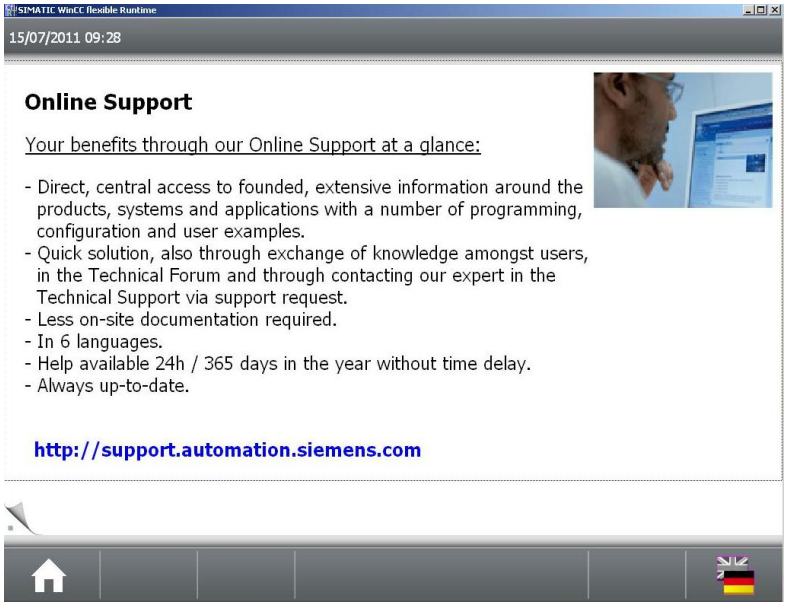
Figure 7-5



7.6 “000.2_Info” screen

In this screen, the user is provided information on the Online Support.

Figure 7-6

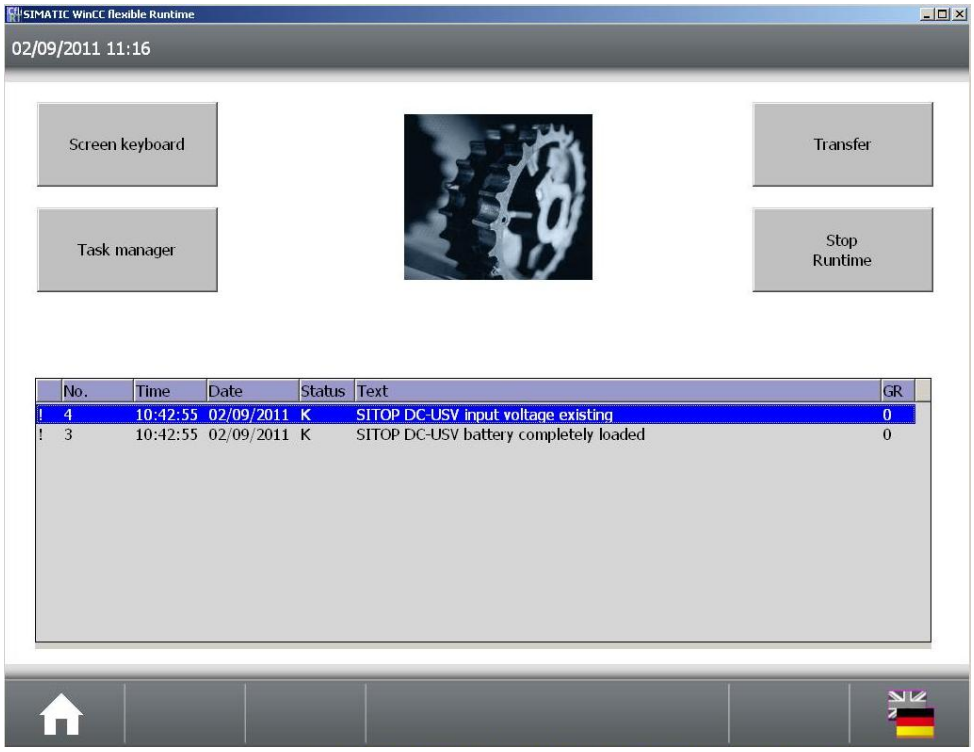


7.7 “000.2_Settings” screen

In “000.2_Settings” screen, the user has the following options:

- display screen keyboard
- start task manager
- go to the transfer mode
- exit runtime

Figure 7-7



8 Notes, Tips and Tricks

8.1 Hardware used

The application is designed for the SITOP UPS500S module in connection with the SIMATIC IPC427C with installed WinCC flexible RT and WinAC RTX. If you only need the communication between the SITOP UPS500S and the WinCC flexible RT, you can also leave out the link to WinAC RTX.

You can also use another IPC instead of the SIMATIC IPC427C (e.g. Panel PC SIMATIC HMI IPC477C).

8.2 Changing CPU

If you are using a different CPU for your application, note down the addresses and settings used in this application. This facilitates the change.

9 Links & Literature

9.1 Bibliographic references

This list is by no means complete and only presents a selection of suitable literature.

Table 9-1

No.	Topic	Title
1.	STEP 7	Automating with STEP7 in STL and SCL Hans Berger Wiley-VCH ISBN 3-89578-341-2
2.	Operating instructions	Operating instruction SIMATIC IPC427C http://support.automation.siemens.com/WW/view/en/37028954
3.	Considerations for use	Considerations for use of the SITOP DC UPS Modules http://support.automation.siemens.com/WW/view/de/42725875

9.2 Internet link specifications

This list is by no means complete and only presents a selection of suitable information.

Table 9-2

No.	Topic	Title
1.	Reference to this entry	http://support.automation.siemens.com/WW/view/en/51945069
2.	Siemens I IA/DT Customer Support	http://support.automation.siemens.com

10 History

Table 10-1

Version	Date	Modification
V1.0	21.07.2011	First issue