

# SIEMENS

## SIMATIC

### Microbox 420-RTX

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This documentation is part of the Microbox 420-RTX package with  
order number:  
6ES7 675-1BB30-0PA0

**Edition: 03/2006**

**A5E00739423-01**

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# Preface

## Purpose of the Documentation

This documentation describes the unique features of Microbox 420-RTX and differences between Microbox 420-RTX and WinAC RTX.

## Prerequisites

This documentation is intended for engineers, programmers, and maintenance personnel who have a general knowledge of programmable logic controllers. Persons using this documentation also need knowledge of Windows 2000/XP operating systems, STEP 7 programming, and PC-based automation with WinAC RTX.

## Scope

This document describes the features and the operation of Microbox 420-RTX.

## Location of Documentation

The Microbox 420-RTX documentation resides on the Documentation CD. Microbox 420-RTX does not have documentation on fixed storage media.

## Other Manuals

You can find additional information in the following documents:

- *Windows Automation Center RTX (WinAC) - WinAC RTX 2005*. This online help system or manual describes the complete functionality of WinAC RTX. WinAC RTX is pre-installed and pre-configured on the Microbox 420-RTX.
- *WinAC Time Synchronization*. This manual describes the configuration and operation of WinAC Time Synchronization. Microbox 420-RTX includes WinAC Time Synchronization and the corresponding documentation.
- *Windows Automation Center (WinAC) RTX 2005 incl. SP1 - Readme*. The readme file contains important information for the installation and use of WinAC RTX 2005 incl. SP1.
- *SIMATIC NET Manual Collection*. This set of manuals provides you with information about SIMATIC NET and industrial communications.
- *SIMATIC Industrial PC - SIMATIC Microbox PC 420*. This manual contains information for commissioning and using the SIMATIC Microbox PC 420.
- *Ardence RTX Runtime Release Notes*. These release notes include the system requirements for RTX and further information about RTX.
- *Ardence RTX Runtime Online Help*. This is the online help system for the Ardence RTX Runtime. RTX Runtime consists of a collection of utilities and tools that allow you to control RTSS processes, measure performance for applications, modify the behavior of RTSS applications, and manage devices controlled by RTX.
- *STEP 7 - Programming with STEP 7*. This manual provides basic information on how to design and program a STEP 7 user program. This manual is available on a computer with STEP 7.
- *STEP 7 - System and Standard Functions for S7-300 and S7-400*. This manual provides you with descriptions of the system functions, organization blocks, and loadable standard functions that are available for programming a STEP 7 user program. This manual is available on a computer with STEP 7.

- *STEP 7 - Working with STEP 7*. This manual explains the usage and the functions of the STEP 7 automation software. This manual describes how to configure controllers and networks. It also explains the organization and development of STEP 7 user programs. This manual is available on a computer with STEP 7.
- *SIMATIC S7-400 Instruction List*. This manual provides you with a complete list of instructions that are applicable for the WinAC controllers. It also provides address information and performance data. This manual is available on a computer with STEP 7.

To find the SIMATIC manuals, select the **Start > Simatic > Documentation** menu command from the Start menu of the computer where the SIMATIC software is installed. The WinAC RTX documentation, Microbox 420-RTX documentation, Microbox PC documentation, and the Ardence RTX Runtime Release Notes are on the documentation CD.

## Further Support

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You can find your contact person at:

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You can find a guide to the technical documentation offered for the individual SIMATIC Products and Systems here at:

<http://www.siemens.com/simatic-tech-doku-portal>

The online catalog and order system is found under:

<http://mall.automation.siemens.com/>

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For information about Ardence Real-Time Extensions (RTX): Internet: <http://www.Ardence.com>

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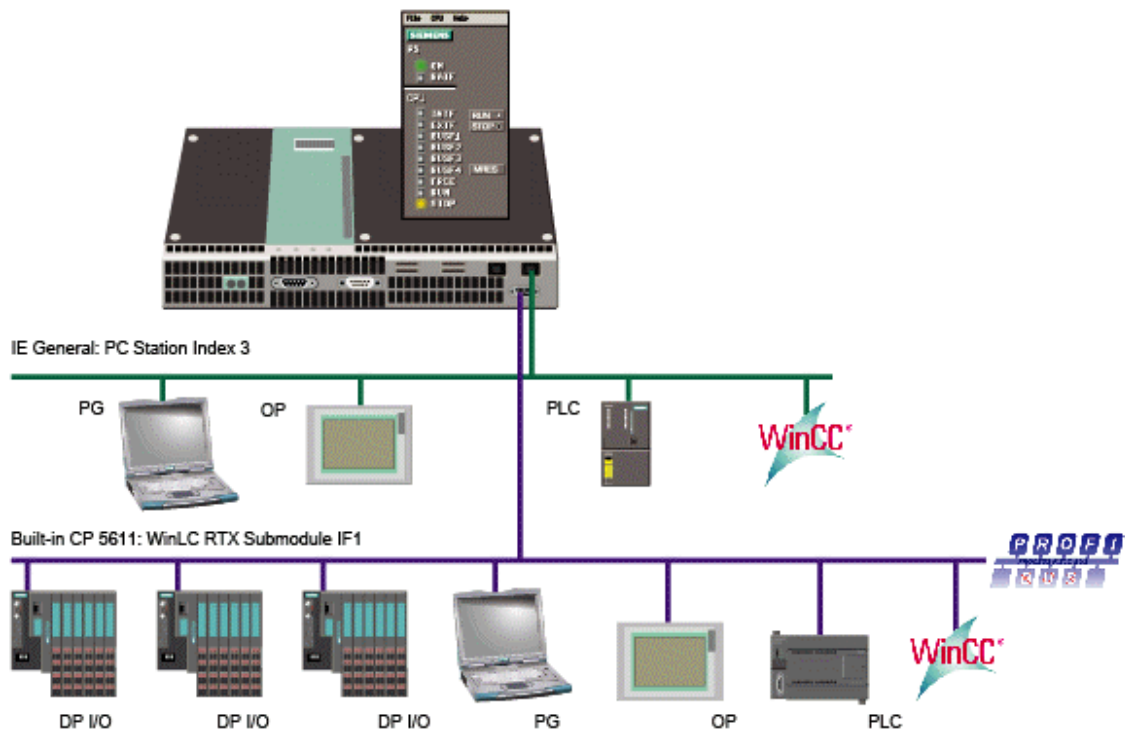
# Product Overview

## Pre-configured Microbox 420-RTX

Microbox 420-RTX is a SIMATIC Microbox PC 420 that includes the Windows XPe (embedded) SP2 operating system, WinAC RTX for PC-based control, and built-in PROFIBUS DP and Industrial Ethernet communication interfaces. No additional configuration is required.

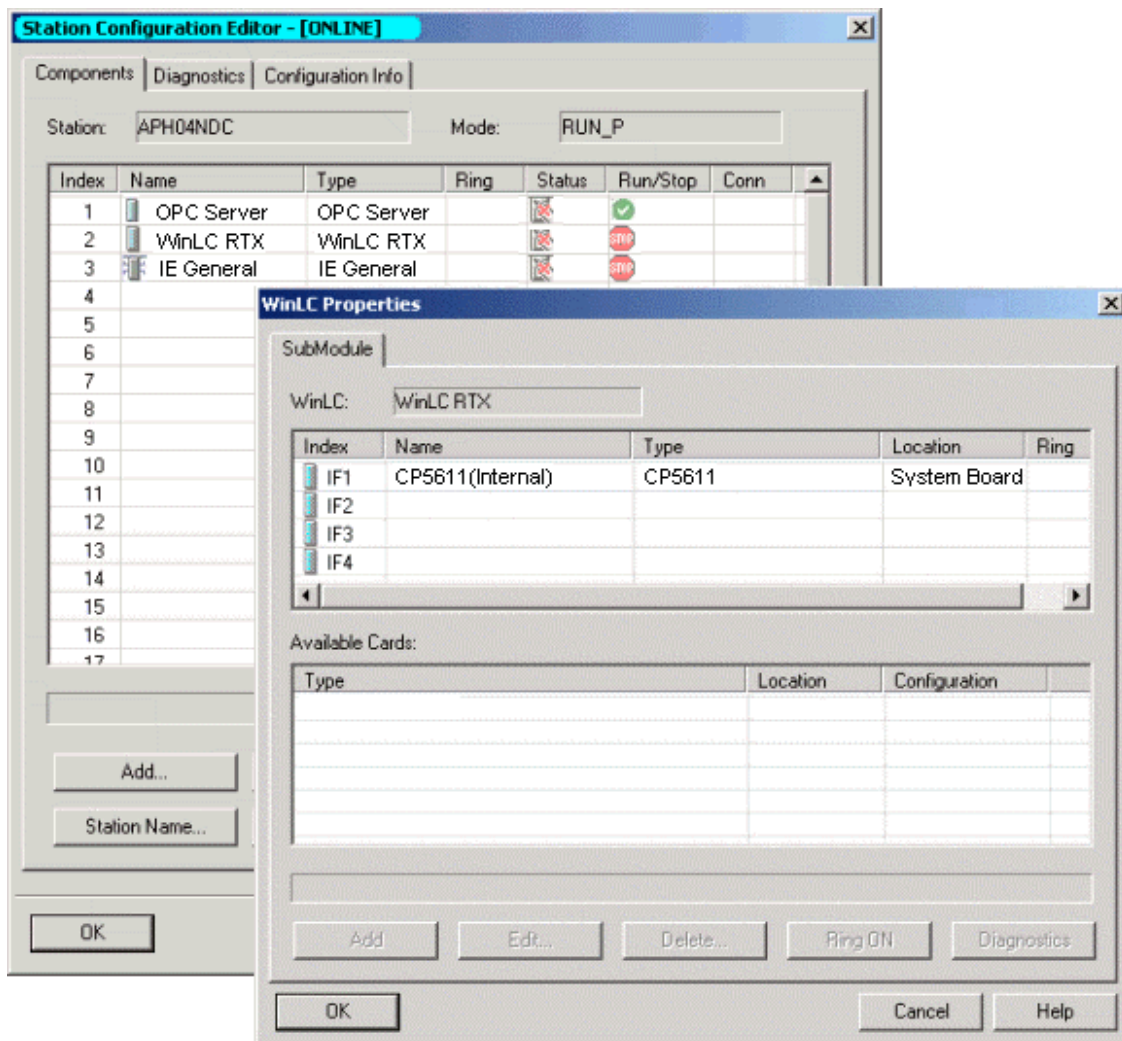
The initial configuration of Microbox 420-RTX, as shown below, includes the following components:

- OPC Server in index 1 of the PC station
- WinLC RTX in index 2 of the PC station
- Built-in CP 5611, configured as a WinLC RTX submodule in IF1, available for PROFIBUS DP communication
- Second on-board Industrial Ethernet interface, configured in index 3 of the PC Station



This configuration is already installed on Microbox 420-RTX; no additional configuration is necessary in the PC Station or in WinLC Properties. WinLC RTX submodules communicate in the RTX environment, and the PC Station components communicate in the Windows XPe environment.

The initial configuration as represented in the Station Configuration Editor and WinLC Properties appears below:



**Note:** If for any reason you need to reconfigure your PC Station with the Station Configuration Editor, you must choose "IE General" for the Industrial Ethernet interface.

You can connect other devices such as a monitor, mouse, keyboard, or storage device to Microbox 420-RTX through the USB ports. A monitor, USB mouse, and USB keyboard are necessary only for user interaction with the controller or with other software. You must initially be able to access the WinLC RTX control panel to change the operating mode of the controller to RUN; otherwise, these devices are optional. You need a USB floppy drive to install the initial authorization license. To use the restore CD you need a USB CD-ROM drive. You do not need these storage devices for WinLC RTX operation other than to license or restore your installation.

Microbox 420-RTX uses a compact flash card for data storage. An Enhanced Write Filter (EWF) protects the C:\ drive of the compact flash card. You must take care to manage the EWF if you use the C:\ drive for any file storage. The D:\ drive is not protected by the EWF and thus requires no special handling.

In addition to this documentation, you can find technical specifications and other information in the SIMATIC Microbox PC product documentation. Refer to the accompanying WinAC RTX documentation for a complete description of WinAC RTX and how to use it for PC-based automation solutions. The preface of this documentation lists other manuals that can be useful.



## Differences from WinAC RTX

The PC-based controller, WinLC RTX, that executes on the Microbox PC is the same WinLC RTX controller that executes on standard PCs. The internal software is the same. Some differences exist, however, in how you install and license WinAC RTX, and how WinLC RTX interacts with the operating system and hardware. The documentation for WinAC RTX that you have with your Microbox 420-RTX product describes the functionality of the standard WinAC RTX product that executes on a Windows 2000 or Windows XP computer. The behavior is mostly the same, but with the following notable differences:

Microbox 420-RTX	WinAC RTX
<b>Installation</b>	
<p>Microbox 420-RTX includes the WinAC RTX installation. No further installation is necessary. The First Boot Agent of Windows XP embedded runs the first time you start the Microbox PC and finalizes the installation. No user entry is required. After the First Boot Agent completes, the PC reboots automatically.</p> <p>The Installation chapter of the WinAC RTX documentation is not applicable for Microbox 420-RTX.</p>	<p>Siemens distributes WinAC RTX as a software-only product. You must install WinAC RTX on a PC as described in the Installation chapter of the WinAC RTX documentation.</p>
<b>Licensing</b>	
<p>You use the Automation License Manager and the included license diskette to license WinAC RTX. Much of the topic "Licensing the WinAC RTX Software" topic of the Installation chapter of the WinAC RTX documentation applies to Microbox 420-RTX.</p> <p>If you transfer the authorization license to the D:\ drive, you do not have to perform any operations concerning the Enhanced Write Filter (EWF). If you move the authorization license to the C:\ drive or change settings stored on the C:\ drive, you must disable the Enhanced Write Filter if it is enabled. The initial EWF setting of the Microbox 420-RTX is "disabled".</p>	<p>You use the Automation License Manager to license WinAC RTX as described in the "Licensing the WinAC RTX Software" topic of the Installation chapter of the WinAC RTX documentation.</p>
<b>Station Configuration</b>	
<p>Microbox 420-RTX includes an initial configuration for all components. No configuration in the Station Configuration Editor or WinLC Properties is necessary.</p> <p>The tasks described in the "Configuring Communication Interfaces" section of the Getting Started chapter of the WinAC RTX documentation are not necessary for Microbox 420-RTX.</p>	<p>The setup installs WinLC RTX in index 2 of the Station Configuration Editor. You use the Station Configuration Editor to configure any other components of the PC Station that you require for your application. For DP I/O, you must configure the submodules of WinLC RTX with the Station Configuration Editor and the WinLC Properties dialog.</p> <p>The Getting Started chapter of the WinAC RTX documentation describes this configuration process.</p>

### Storing Retentive Data

Microbox 420-RTX can store retentive data to the compact flash card of the PC or to non-volatile RAM (NVRAM).

The section "Storing Retentive Data" of the Controller Operations chapter of the WinAC RTX documentation describes the use of retentive data, but does not describe the use of the WinAC Data Storage tool or the role of the Enhanced Write Filter (EWF). The topic "Configuring WinAC Data Storage" in this documentation describes the tasks you perform to store retentive data.

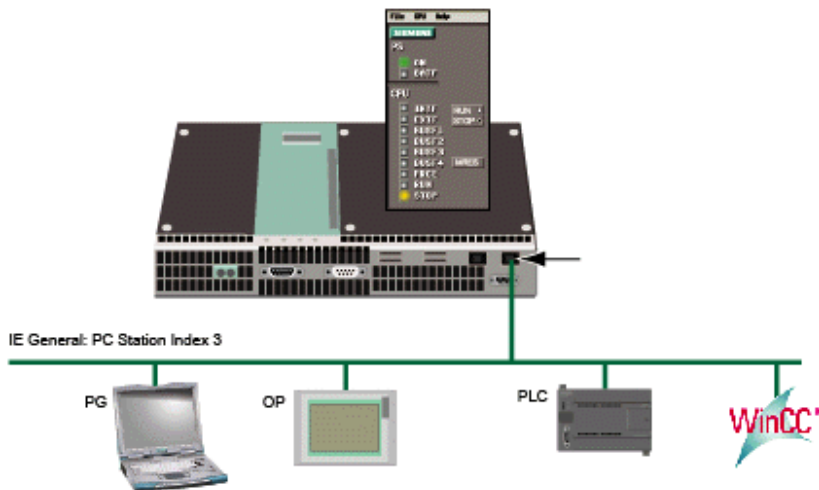
WinLC RTX stores retentive data to the hard disk of the PC and reloads from the hard disk.

The section "Storing Retentive Data" of the Controller Operations chapter of the WinAC RTX documentation describes the use of retentive data.

# Embedded Control Tasks

## Configuring the Windows Ethernet Interface

Microbox 420-RTX is equipped with two built-in Industrial Ethernet interfaces. The pre-configuration specifies that the rightmost Ethernet connection is a component of the PC Station in index 3. You must configure the IP address of the Industrial Ethernet interface that Microbox 420-RTX assigns to the PC Station.



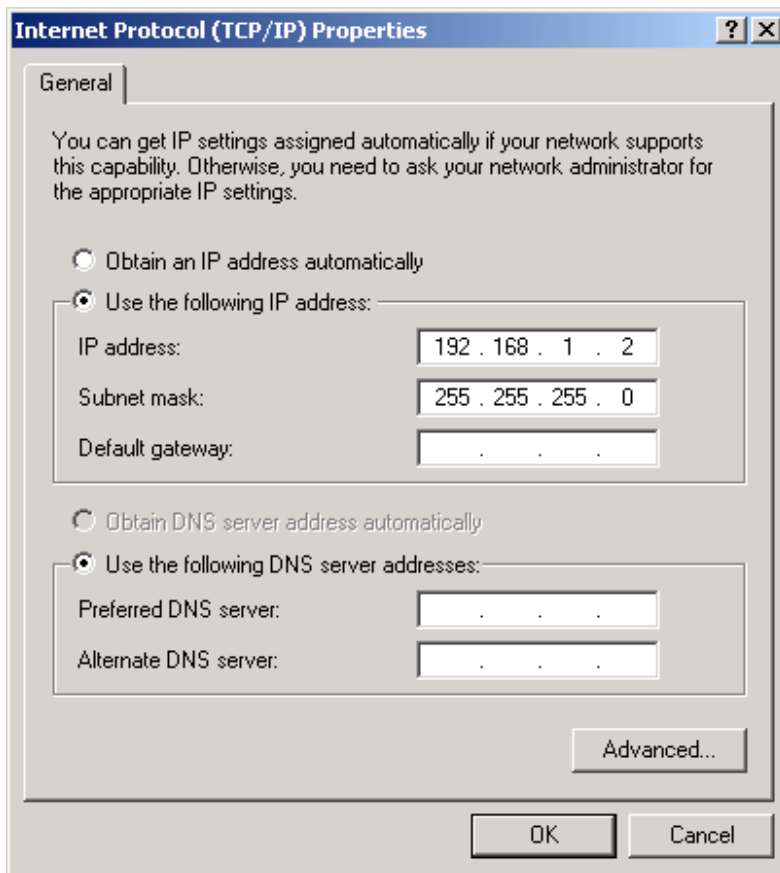
To specify this Ethernet address, follow these steps:

1. Open the Windows control panel.

**Note:** The user interface for Windows XP Embedded on Microbox 420-RTX is English. The control panel and all other dialogs are always in English.

2. From the control panel, open **Network Connections > Local Area Network**.
3. Click the Properties button on the "Local Area Connection Status" dialog.
4. Scroll to and double-click the "Internet Protocol (TCP/IP)" connection from the list.

5. On the "Internet Protocol (TCP/IP) Properties" dialog, select the button for "Use the following IP address" and enter the default values of "192.168.1.2" for the field "IP address" and "255.255.255.0" for the field "Subnet mask":

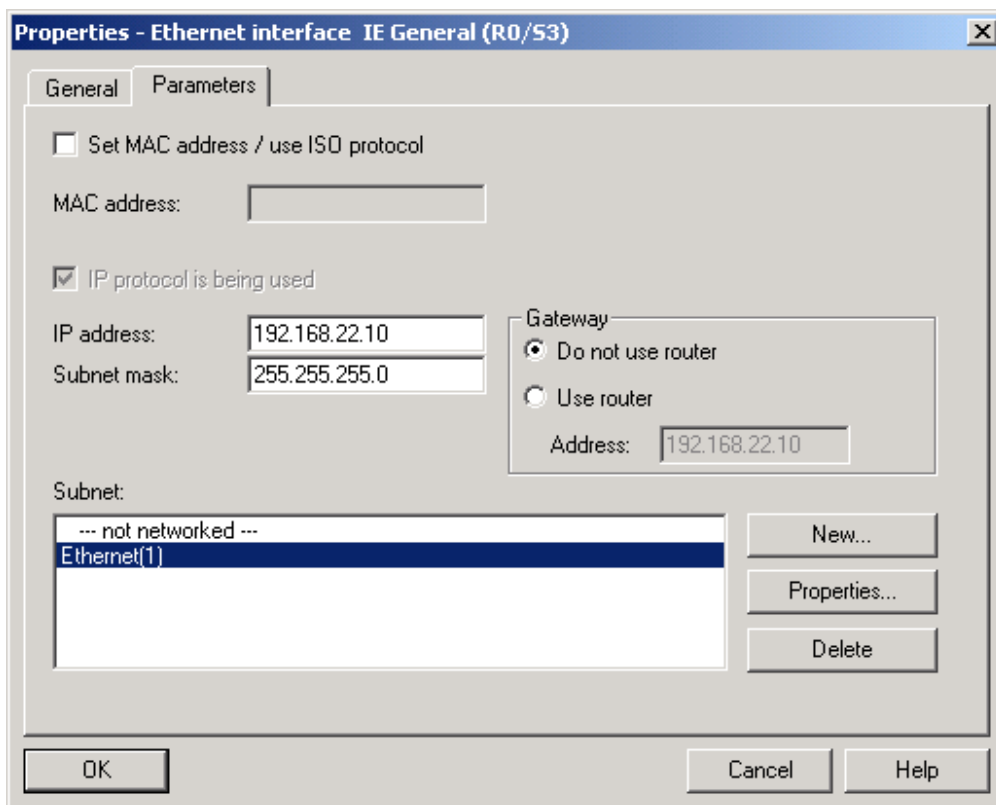


6. Click OK on the "Internet Protocol (TCP/IP) Properties" and "Local Area Connection Properties" dialog, and close the remaining dialogs.

## Using a Different IP Address

You can choose a different IP address, subnet mask, or gateway for the Ethernet interface, but if you do, you must configure this IP address or other parameters for both the Microbox 420-RTX and for the IE General properties in STEP 7. To configure the IP address in STEP 7, follow these steps:

1. Right-click the IE General in PC Station index 3 in the hardware configuration of your STEP 7 project.
2. Select Object Properties from the context menu.
3. Click the Properties button from the General tab of the Properties - IE General dialog.
4. Enter the IP address from the Parameters tab of the "Properties - Ethernet interface IE General" dialog. You can also specify a subnet mask or gateway address from this dialog:

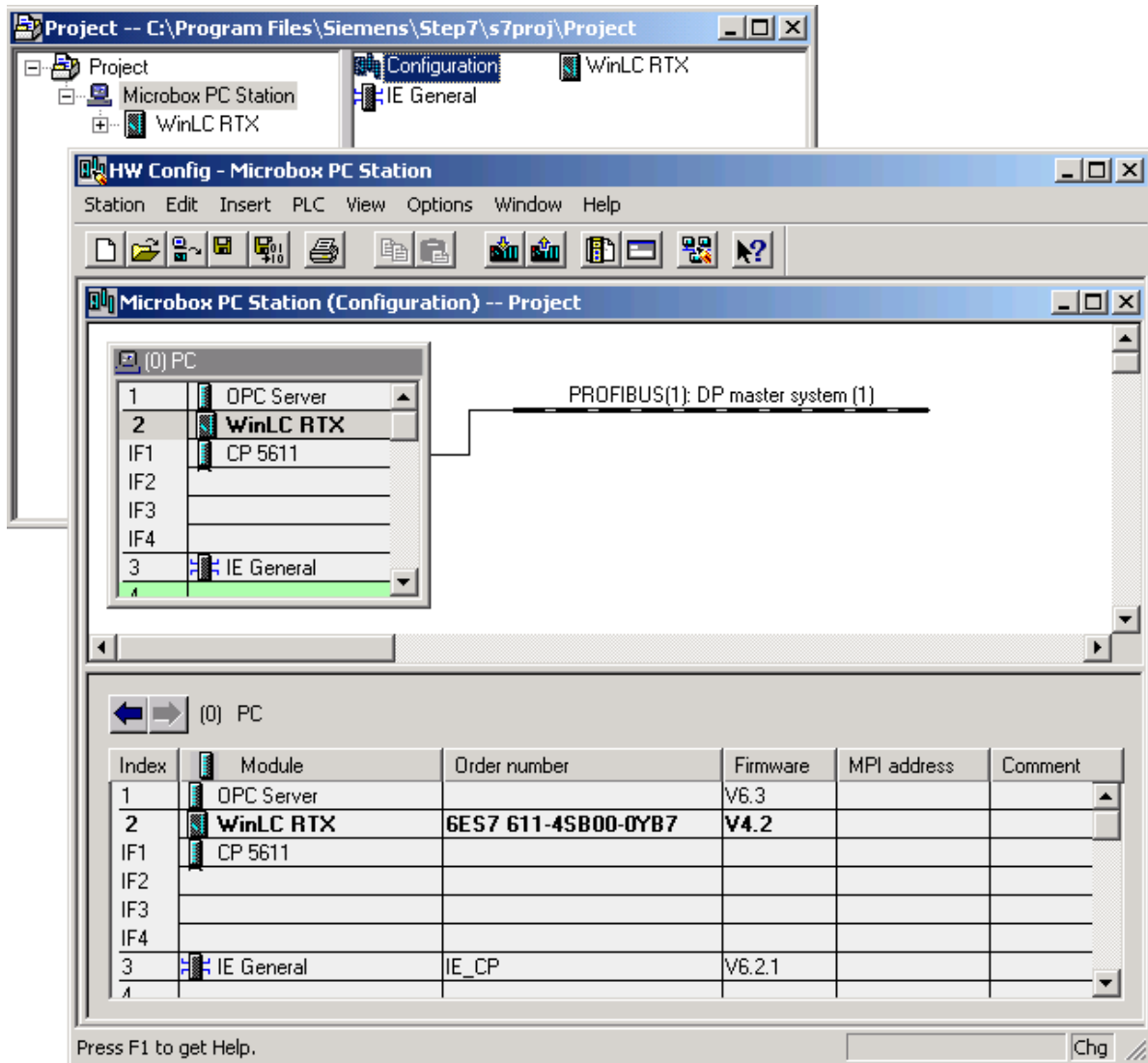


## Configuring the STEP 7 Project

You must configure the hardware configuration to correspond to the default configuration of the Microbox 420-RTX: WinLC RTX in index 2 with submodule CP 5611 in IF1 and an Industrial Ethernet interface in PC Station index 3.

When you configure the Industrial Ethernet interface in the PC Station, configure the default IP address as 192.168.1.2 and the default subnet mask as 255.255.255.0. If you use a different IP address, subnet mask, or if you use a gateway, configure these values in both the Windows network configuration and in STEP 7. See the topic "Configuring the Windows Ethernet Interface" for more information.

The picture below shows the STEP 7 configuration for Microbox 420-RTX:



## Managing the Enhanced Write Filter

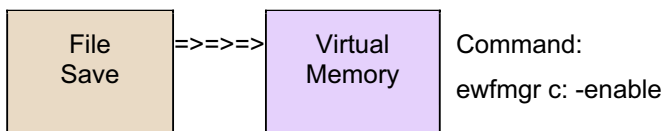
The Enhanced Write Filter (EWF) is a Windows XP utility for protecting a compact flash card. Compact flash cards allow a limited number of write accesses. When the Enhanced Write Filter is enabled, Windows XP writes no data to the compact flash card. Instead, the file writes are kept in virtual memory. No difference is apparent to the user when viewing file contents. Data on the C:\ drive appears the same whether it actually resides on the compact flash card or in virtual memory. The difference in file storage is evident when you reboot the computer or it loses power. All data in virtual memory is lost, and the computer restarts with the file contents of the compact flash card.

You can manage the EWF to maintain data that must persist after a reboot. If you disable the EWF, all file writes go to the compact flash card. This does result in all data persisting after a power loss; however, it causes the most stress over time to the compact flash card. The initial setting of the EWF on Microbox 420-RTX is "disabled."

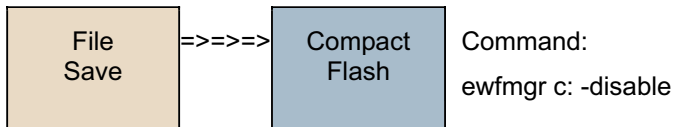
You can also commit all data that is stored in virtual memory to the compact flash card at any point in time. The "commitanddisable" EWF command disables the EWF and then writes all data that has accumulated in virtual memory to the compact flash card. Typically, this command is followed by an enable command to once again protect the compact flash card.

From a command prompt, you enter "ewfmgr" followed by a drive designation and a command:

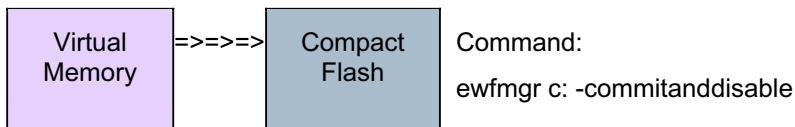
### Enable EWF



### Disable EWF



### Commit Data to Compact Flash



## Configuring WinAC Data Storage

The controller typically stores the retentive data in a filesystem on your computer. The SIMATIC Microbox PC 420 also contains SRAM (static RAM) that is non-volatile. You can use this non-volatile RAM (NVRAM) for retentive data storage.

### Using the WinAC Data Storage Tool

WinAC RTX includes a WinAC Data Storage tool that allows you to configure where WinAC RTX stores retentive data as well as the pathname for the STEP 7 user program and configuration.

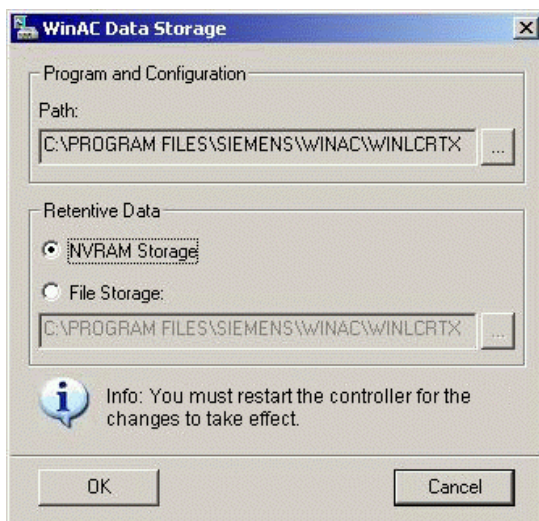
#### Notice

If you change the program and configuration path, WinLC RTX can no longer access the STEP 7 user program and configuration data stored at the original location. If you change the retentive data storage settings, WinLC RTX can no longer access the existing retentive data from the original location.

For this reason, archive your STEP 7 user program and data prior to changing any WinAC data storage parameters. You can restore the archive file after you restart the controller with the new WinAC data storage parameters. Alternatively, you can upload the STEP 7 user program and configuration to STEP 7 prior to making changes, and download the program to the controller after making changes.

To use the WinAC Storage Tool, follow these steps:

1. Archive your STEP 7 user program and configuration as described in the WinAC RTX documentation. Alternatively, you can upload the STEP 7 user program and configuration to STEP 7 using the **Tools > Upload Station to PG** menu command in STEP 7.
2. Shut down the controller.
3. Select the **Start > SIMATIC > PC based Control > WinAC Data Storage** menu command. The WinAC Data Storage dialog appears:



4. In the Program and Configuration Path field, accept the default path or use the "..." button to browse to a folder to use for the storage of the STEP 7 user program and configuration.
5. If your computer has NVRAM (SIMATIC Microbox PC 420 internal SRAM), you can select either NVRAM Storage or File Storage for the Retentive Data specification. Otherwise, File Storage is your only choice. You can use the "..." button to browse to a folder for the storage of the retentive data, or accept the default path.



6. Click OK.
7. Restart the controller to make your changes take effect.
8. Restore the STEP 7 user program and configuration that you archived in Step 1, as described in the WinAC RTX user documentation. Alternatively, you can download the program and configuration from STEP 7 to the controller.

**Notice**

On the Microbox, the Enhanced Write Filter does not protect the D:\ drive. If you specify a file storage location on the D:\ drive for the STEP 7 user program and configuration and for the retentive data, WinAC RTX always recovers these files after a reboot. For this reason, specify a D:\ drive location for STEP 7 files and retentive data.

If however, you choose to store either program data or retentive data on the C:\ drive, you must manage the Enhanced Write Filter to commit data to the flash card. If you have files on the C:\ drive and you have not committed these files to the flash card, WinAC RTX cannot recover these files following a reboot. You must commit data on the C:\ drive to the flash card for it to be available after a reboot.

If you choose "File Storage" for retentive data, you must use an Uninterruptible Power Supply (UPS) to maintain data following a power loss. If you choose "NVRAM Storage", Siemens recommends the use of a UPS, but a UPS is not a requirement.

**NVRAM Restrictions for a Microbox PC 420**

The amount of available NVRAM in a Microbox PC depends on the power supply load from other devices, as shown below:

Storage Size	Additional Power Supply Load
25 KByte	Sum of USB devices and PC 104/Plus cards: Maximum: 6 W

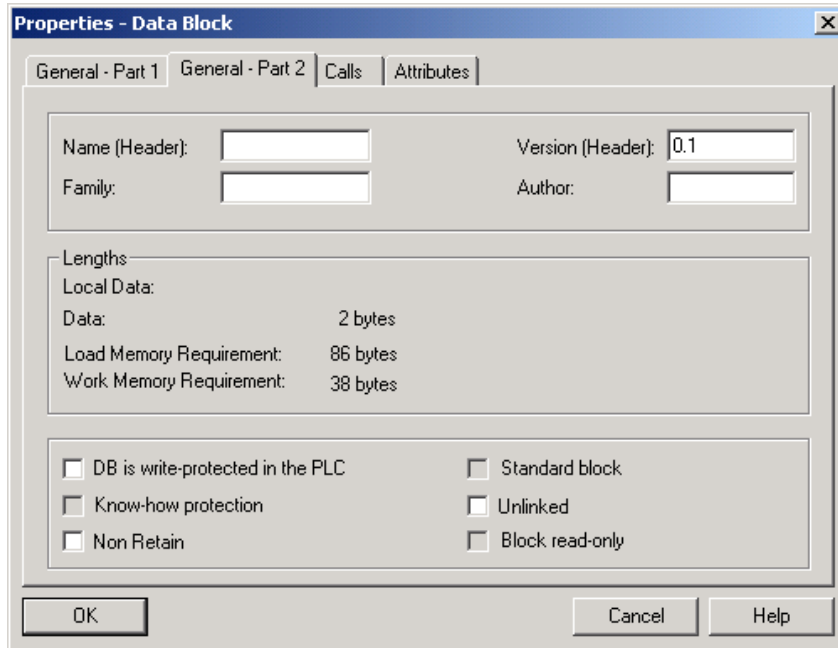
The available NVRAM must be shared between the following types of information:

Item	Memory Consumption	Default	
System Startup Information	1 KByte	1 KByte	
Diagnostic Buffer	Number of entries * 20 bytes	2400 bytes	120 entries
Flag (M) Memory	Number of flag memory bytes	16 bytes	MB0 – MB15
S7-Timers	Number of timers * 2 bytes	0 bytes	No timers are retentive by default
S7-Counters	Number of counters * 2 bytes	16 bytes	C0 - C7
Retentive DBs configured with STEP 7 or created by SFC 85 with ATTRIB=0x00	Number of KBytes in retentive DBs	User program configuration	
Overhead for DBs created by SFC 85	Number of DBs * 45 bytes	0 bytes	

## Retentive Data Indication for Data Blocks

By default, STEP 7 configures all data blocks as retentive. As shown below, the Properties dialog for a retentive data block displays all three of the following checkboxes as not selected (not checked):

- DB is write-protected in the PLC
- Non-retain
- Unlinked



If you select (check) any of these three checkboxes, the DB data is not affected by the NVRAM restrictions for a Microbox PC 420.

## Data Blocks Created by SFC 85

A data block created by SFC 85 is retentive if the ATTRIB parameter is 0x00. When considering NVRAM usage for a Microbox PC 420, these data blocks require memory for the overhead and for the retentive data. For data blocks created by SFC 85 with the ATTRIB parameter not equal to 0x00, the data block requires memory only for the overhead.

## Exceeding NVRAM Restrictions

### Notice

If you switch from File Storage to NVRAM Storage on a Microbox PC 420 for your retentive data, and the retentive data in your STEP 7 user program requires more memory than the NVRAM supports, no retentive data can be reloaded after a startup. A message in the Diagnostic Buffer indicates that an unbuffered startup occurred.

You must either reduce the size of the retentive data in your STEP 7 user program, or use File Storage instead of NVRAM Storage for the retentive data.

## Creating a System Image

After you have configured Microbox 420-RTX for your application, you can create an image of your system.

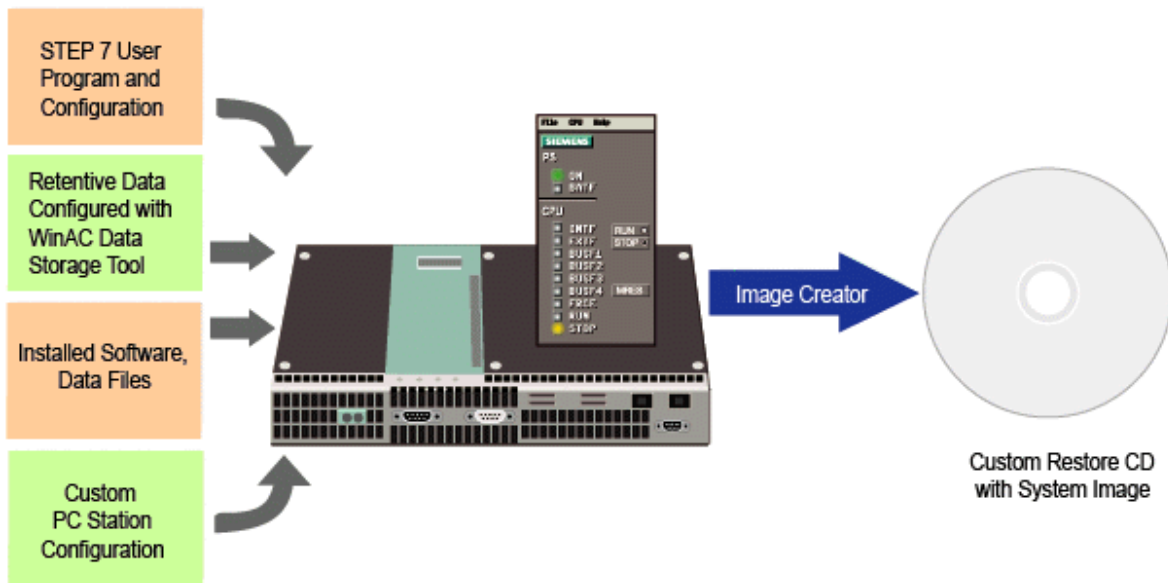
Make the system image (custom restore CD) after you have performed any customization tasks required by your application, such as those listed below:

- Downloaded a STEP 7 user program and configuration
- Configured WinAC Data Storage
- Modified the initial configuration from the Station Configuration Editor
- Installed any custom software or data files

**Note:** If you have installed the WinAC RTX authorization license on Microbox 420-RTX, the license cannot be recovered from the custom restore CD. Use the Automation License Manager to remove the WinAC RTX license, as well as any other SIMATIC authorization licenses, prior to making a custom restore CD. Also note that if you plan to use the custom restore CD for more than one Microbox 420-RTX installation, each SIMATIC authorization license is applicable for one and only one computer.

Use the Image Creator to make your system image. The Image Creator is part of the tool "SIMATIC PC/PG Image and Partition Creator" available from Siemens. You can find ordering information for the Image Creator at:

<https://mall.automation.siemens.com/WW/guest/index.asp?aktprim=0&lang=en&nodeid=10017304&foldersopen=-1080-3948-3966-3970->. Refer to the Image Creator instructions for additional help on making and restoring system images.



This system image on a custom restore CD is useful if you need to restore all of the files and registry settings for your application. You can also use the BIOS Manager tool to save BIOS settings if you changed them from the initial settings.

If your system hardware fails, you can then restore your application from this system image (custom restore CD), and, if applicable, restore the BIOS settings that you saved.

## Restoring the Initial Configuration

The Microbox 420-RTX product release includes a restore CD that you can use to restore your system to the initial Microbox 420-RTX configuration.

### Notice

Restoring from the restore CD clears all load memory and retentive data, as well as any applications or data files that you have stored on the Microbox PC. A restore also eradicates the authorization license and reloads the registry with initial values.

You can restore from a custom restore CD that includes all of your files and registry settings, as described in the topic "Creating a System Image". Otherwise, the restore CD included with Microbox 420-RTX restores the system to the initial configuration.

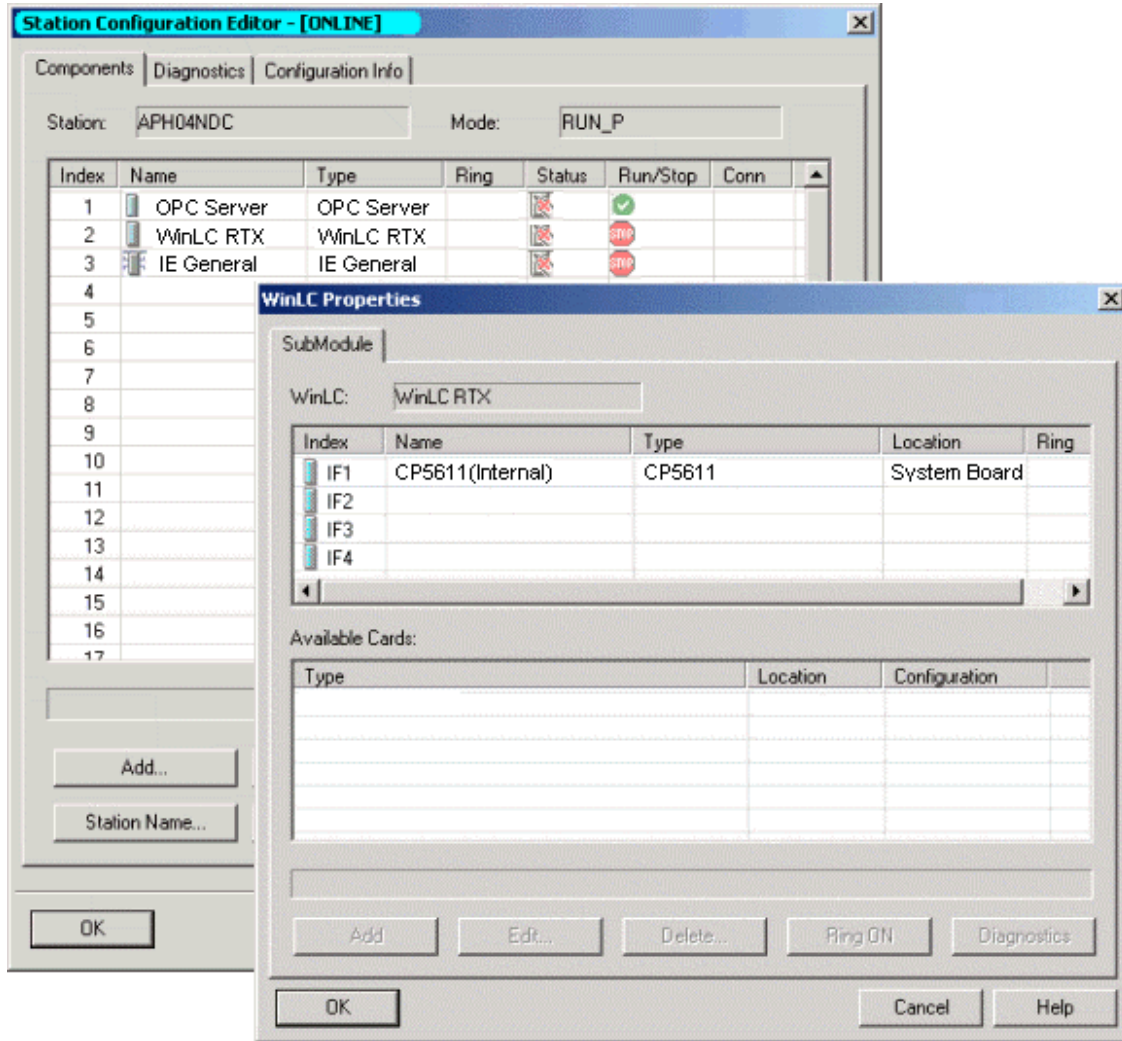
To restore your initial configuration from the Microbox 420-RTX restore CD, follow these steps:

1. Use the Automation License Manager to transfer your WinAC RTX license from the Microbox PC to a storage device, for example, a USB stick.
2. Connect a USB CD-ROM drive to your Microbox and insert the restore CD.
3. Follow the instructions to restore from the restore CD.
4. Transfer the license from the storage device to the Microbox.

After the restore process completes, your system consists of the following configuration:

- OPC Server in index 1 of the PC station
- WinLC RTX in index 2 of the PC station
- Built-in CP 5611, configured as a WinLC RTX submodule in IF1, available for PROFIBUS DP communication
- Second on-board Industrial Ethernet interface, configured in index 3 of the PC Station

The restored configuration is shown below:



### Modifying BIOS Settings

The following table lists the pre-installed Microbox 420-RTX BIOS settings that Siemens tested and recommends. If you replace parts in your Microbox PC 420, set the BIOS settings to these values:

- PCI IRQ line 1: 11
- PCI IRQ line 2: 5
- PCI IRQ line 3: 7
- PCI IRQ line 4: 3



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