SIEMENS

SIMATIC

**Embedded Automation
S7-modular Embedded Controller
EC31-RTX**

Operating Instructions

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠ DANGER
indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠ WARNING
indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠ CAUTION
with a safety alert symbol, indicates that minor personal injury can result if proper precautions are not taken.

CAUTION
without a safety alert symbol, indicates that property damage can result if proper precautions are not taken.

NOTICE
indicates that an unintended result or situation can occur if the corresponding information is not taken into account.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The device/system may only be set up and used in conjunction with this documentation. Commissioning and operation of a device/system may only be performed by **qualified personnel**. Within the context of the safety notes in this documentation qualified persons are defined as persons who are authorized to commission, ground and label devices, systems and circuits in accordance with established safety practices and standards.

Prescribed Usage

Note the following:

⚠ WARNING
This device may only be used for the applications described in the catalog or the technical description and only in connection with devices or components from other manufacturers which have been approved or recommended by Siemens. Correct, reliable operation of the product requires proper transport, storage, positioning and assembly as well as careful operation and maintenance.

Trademarks

All names identified by ® are registered trademarks of the Siemens AG. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

Introduction

Conventions

- *EC31-RTX, EC31*

  The terms *Embedded Controller* or device are also used in this documentation to denote the *EC31-RTX* and *EC31* products.

- *S7 Modular Embedded Controller*

  The entire *S7-modular Embedded Controller* system, consisting of an Embedded Controller with PC expansions, signal modules and expansion modules is abbreviated to *S7-mEC*.

Purpose of the manual

This manual provides information you need to commission and operate the *EC31-RTX* or *EC31* . It addresses programmers who commission the device.

Scope

This manual is valid for the following delivery variants of the *S7-mEC* :

- EC31-RTX, order no. 6ES7677-1DD00-0BB0
- EC31, order no. 6ES7677-1DD00-0BA0

Note

Note that the label on the Embedded Controller always shows the designation EC31 and order number 6ES7677-1DD00-0BA0, irrespective of ordering options.

Basic knowledge required

The *S7-mEC* system may only be implemented and operated by qualified personnel. Knowledge of the following is considered essential:

- SIMATIC S7-300 installation guidelines
- PC knowledge
- Windows XP/XP Embedded operating systems
- Programming with STEP 7
- PC-based automation with WinAC RTX

Position in the information scheme

For further information, refer to the following documents:

- S7-300 CPU 31xC and CPU 31x: Installation (http://support.automation.siemens.com/WW/view/de/13008499) Operating Instructions
- *Windows Automation Center RTX WinAC RTX 2008* Manual
- *WinLC RTX EC Online Help* in STEP 7
- PROFINET System Description (http://support.automation.siemens.com/WW/view/en/19292127) System Manual
- Commissioning PC stations (http://support.automation.siemens.com/WW/view/en/13542666)
- Programming Manual *Software Development Kit for EC31*

Standards and approvals

The General technical data chapter provides information pertaining to standards and approvals.

Recycling and disposal

All devices described in this manual can be recycled due to their ecologically compatible components. For environment-friendly recycling and disposal of your old equipment, contact a certified disposal facility for electronic scrap.

Technical Support

You can contact Technical Support for all SIMATIC products:

- Using the web form for Support Request (http://www.siemens.com/automation/support-request)
- Phone: + 49 180 5050 222
- Fax: + 49 180 5050 223

Service & Support on the Internet

Information on the following topics is available on the Internet:

- Service & Support (http://support.automation.siemens.com/)
- Contact partners for SIMATIC (http://www.siemens.com/automation/partner)

Table of contents

Safety notes 1

1.1 General safety instructions

> **⚠ CAUTION**
>
> Please observe the safety instructions on the back of the cover sheet of this documentation. You should not expand your device unless you have read the relevant safety instructions.

This device is compliant with the relevant safety measures to IEC, VDE, EN and cULus. If you have questions about the validity of the installation in the planned environment, please contact your service representative.

Repairs

Only authorized personnel are permitted to repair the device.

> **⚠ WARNING**
>
> Unauthorized opening of and improper repairs to the device may result in substantial damage to equipment or endanger the user.

System expansions

Only install system expansion devices designed for this device. The installation of other expansions can damage the system and violate the radio-interference suppression regulations. Contact your technical support team or where you purchased your PC to find out which system expansion devices may safely be installed.

> **CAUTION**
>
> If you install or exchange system expansions and damage your device, the warranty becomes void.

ESD guidelines

Modules containing electrostatic sensitive devices (ESDs) can be identified by the following label:

Strictly follow the guidelines mentioned below when handling modules which are sensitive to ESD:

- Always discharge yourself of static electricity before handling modules which are sensitive to ESD (for example, by touching a grounded object).

- All devices and tools must be free of static charge.

- Always pull the mains connector and disconnect the battery before installing or removing modules which are sensitive to ESD.

- Handle modules fitted with ESDs only by their edges.

- Do not touch any connector pins or conductors on modules containing ESDs.

Product overview

2

2.1   Scope of delivery

The table below lists the scope of delivery of the Embedded Controllers EC31-RTX and EC31.

EC31-RTX	EC31
EC31-RTX is shipped with preinstalled operating system Windows XP Embedded SP2 Feature Pack 2007, WinAC RTX 2008 and SIMATIC NET 2007.	EC31 shipped with preinstalled operating system Windows XP Embedded SP2 Feature Pack 2007 and the Software Development Kit (SDK EC31)
"Restore DVD S7-mEC EC31-RTX" for restoring the image	"Restore DVD S7-mEC EC31" for restoring the image
DVD "S7-mEC EC31 V1.1, EC31-RTX V1.0 Software and Documentation": • Operating Instructions *S7-modular Embedded Controller EC31-RTX* • *Windows Automation Center RTX WinAC RTX 2008* Operating Instructions • SIMATIC NET 2007 Industrial Communications • Programming Manual *Software Development Kit for EC31* • Software Development Kit (SDK) • Examples for the SDK user program	
Windows Certificate of Authenticity (CoA) with CoA sticker	
End User License Agreement (EULA)	
Product Information	
USB stick with SIMATIC License Keys	-
Certificate of License (CoL)	-

Unpacking the device

Note the following when unpacking:

- Keep the documentation included with the package in a safe place. It is required for initial commissioning and is part of the device.
- Check the package and contents for visible transportation damage.
- Check the shipment for completeness. Inform your local Siemens contact partner of any disagreement or transport damage.

Identification data

The device can be identified unambiguously for repairs with the help of the ID data.

- The serial number is available on the rating plate of the device.
- The "Certificate of License" is included for proof of the licensing of WinAC RTX 2008 and SIMATIC NET 2007 (SOFTNET S7-Lean and SOFTNET-S7 Basis).
- The "Microsoft Windows Product Key" is available on the "Certificate of Authenticity" label which is included with the device.
- The first MAC address is available underneath the module cover of the device.

Four MAC addresses

The MAC address consists of three bytes for the manufacturer ID and of three bytes for the device ID (consecutive number). Each device is assigned four MAC addresses with consecutive device IDs at the factory.

The first MAC address is assigned to interface X2 (IE LAN) and the next one to PROFINET interface X1 PN.

2.2 EC31-RTX

2.2.1 Embedded Controller EC31-RTX

Properties

- The Embedded Controller EC31-RTX is a PC that features an S7-300 design, the operating system Windows XP Embedded, WinAC RTX 2008 and SIMATIC NET 2007. The software is pre-installed and preconfigured.

- EC31-RTX can be installed in horizontal position on a mounting rail and can be expanded into a modular *S7-mEC* system by installing signal modules and commonly available PC expansion modules. A flash memory is used as storage medium.

- EC31-RTX can be expanded by installing S7-300 signal modules in the central rack or in the expansion rack.

- EC31-RTX can be operated as PROFINET IO controller. PROFINET IO devices are connected via the ports of the integrated interface.

- EC31-RTX provides high-level industrial performance:
  - Fanless operation
  - High degree of endurance

Figure 2-1   Embedded Controller EC31-RTX

Note

Note that the label on the EC31-RTX shows the designation "EC31" and order number 6ES7677-1DD00-0BA0, as the hardware is identical with EC31.

2.2.2   Display elements and interfaces of EC31-RTX

Display elements and interfaces

The figure below shows the display elements and interfaces of EC31-RTX.
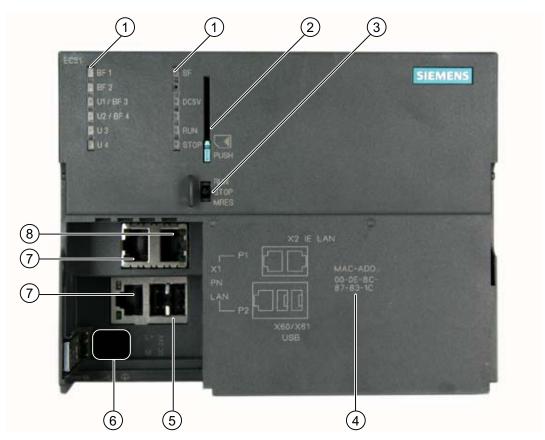
Figure 2-2   Display elements and interfaces of EC31-RTX

Table 2- 1   Display elements and interfaces of EC31-RTX

Number	Element
1	LED displays
2	MMC slot, including the ejector
3	Mode selector switch
4	MAC address of the standard Ethernet controller (X2 IE LAN)
5	USB 2.0 ports
6	Power supply connection
7	PROFINET IO connections (as submodule of WinAC)
8	Ethernet connection with basic PROFINET services

MMC slot

A Multi Media Card can be used as storage medium for backup data.

The S7 format of any SIMATIC Micro Memory Card used in the Embedded Controller will be overwritten. This prevents any further use of the SIMATIC Micro Memory Card in SIMATIC-S7 modules!

Power supply connection

The Embedded Controller is equipped with a double-pole power inlet. The connector with screw terminals is inserted into this inlet for shipping.

Mode selector switch

Meaning of the mode selector switch settings:

Table 2- 2   Settings of the mode selector switch on EC31-RTX

Position	Meaning	Notes
RUN	The controller processes the STEP 7 user program.	The RUN and STOP settings of the mode selector switch indicate the **selected** operating mode. The RUN and STOP LED displays indicate the **actual** operating mode of EC31-RTX.
STOP	The controller does not process the STEP 7 user program. The outputs are set to a "safe" state.	
MRES	**During startup:** Backup / Restore can be activated in the startup phase of the EC by pressing MRES.	-
	With active WinAC: CPU memory reset All data is deleted from the WinAC (EC) (SDB, DB, OB, FB...). All configuration data of EC31-RTX is lost!	**Difference compared to S7-300:** A memory reset on an S7-300 CPU triggers a re-initialization. That is, neither the user programs, nor configuration data are deleted.

Status and error displays with active WinAC

The following LED displays indicate the status of EC31-RTX with active WinAC:

Table 2- 3   Status and error displays with active WinAC

LED designation	Color	Meaning
BF1*	red	Bus error at interface X1 PN LAN P1 or X1 PN LAN P2
BF2*	red	Reserved
U1/BF3*	red	Reserved
U2/BF4*	red	Reserved
U3**	yellow	Status of Windows XP Embedded, Restore / Backup (see the next table).
U4**	green	
SF	red	Group error
DC5V	green	5 V supply for the backplane bus
RUN	green	Embedded Controller in RUN.
STOP	yellow	Embedded Controller in STOP

* The LED displays correspond to the IF slots of WinLC RTX. These are preconfigured in the Station Configuration Editor.

** The LED displays are not visible in the WinLC RTX Controller Panel.

Status and error displays during startup (Backup / Restore)

Power = ON if all LEDs are lit.

Table 2- 4   Status and error displays during startup (Backup / Restore)

LED				Meaning
U1/BF3	U2/BF4	U3	U4	
On	On	Off	Off	MRES can be pressed to start Backup / Restore operations if the LED displays are lit.
-	-	Off	Flashes	Booting from Flash memory (startup)
		Off	On	Windows boot operation completed, EC ready for operation / ready for remote desktop connection
-	-	Flashes	Off	Starting Backup / Restore via USB port
-	-	Flashes	On	Execution of a backup
-	-	Flashes	Flashes	Execution of a Restore
-	On	On	On	Backup / Restore error

See also

Controller Panel (Page 57)

2.2.3 Differences compared to WinAC RTX

Introduction

The PC-based WinLC RTX controller which is installed on the Embedded Controller corresponds with the WinLC RTX controller that is executed on standard PCs. The software is identical. However, compared to WinAC RTX on other platforms, there are certain differences in the usage of EC31-RTX with WinAC RTX:

● Layout and appearance of the panel

● Operation

● Configuration

Differences of WinAC RTX in EC31-RTX compared to WinAC RTX on a PC-based platform

The characteristics differ in the following context:

Table 2- 5   Differences of WinAC RTX in EC31-RTX compared to WinAC RTX on a PC-based platform

WinAC with EC31-RTX	WinAC RTX
Bus systems	
PROFINET	PROFINET, PROFIBUS
Central backplane bus	
Station configuration	
The Embedded Controller contains a default configuration for all components. For this reason, it is not necessary to configure anything in the Station Configuration Editor or in the WinLC properties. Exception: Scenarios in which you have to modify the configuration, or use different SIMATIC software components. It is not necessary to carry out any tasks for the EC31-RTX as described in the "Configuring the communication interfaces" section in the "Getting started" chapter of the WinAC RTX documentation.	The setup program installs WinLC RTX in Index 2 in the Station Configuration Editor. Configure all other components of the PC station you might require for your application in the Station Configuration Editor. For PROFIBUS DP or PROFINET IO applications you have to configure the submodules of WinLC RTX in the Station Configuration Editor and in the "WinLC properties" dialog box.
Archiving	
Configuration data can be archived in *.wld files for reuse and transfer. The wld files of WinAC RTX and of WinAC RTX with Embedded Controller are incompatible.	

Additional information

The documentation for WinAC RTX 2008 included with your Embedded Controller provides a description of the functionality of the WinAC RTX standard product that runs on a PC with Windows XP / Windows XP Embedded operating system.

2.3 EC31

2.3.1 Embedded Controller EC31

Properties

- The Embedded Controller EC31 is a PC with S7-300 design that runs on a preinstalled Windows XP Embedded operating system.

- EC31 can be installed in horizontal position on a mounting rail and can be expanded into a modular *S7-mEC* system by installing signal modules and commonly available PC expansion modules. A flash memory is used as storage medium.

- EC31 can be expanded by installing S7-300 signal modules in the central rack or in the expansion rack.

- EC31 provides high-level industrial performance:
  - Fanless operation
  - High degree of endurance

Figure 2-3   Embedded Controller EC31

User-specific functionality

EC31 is an open platform for user specific applications and is used, for example, to access S7-300 I/O.

Note

The behavior of EC31 depends on the user-specific application and can therefore differ from the that of an S7-300 CPU.

2.3.2   Display elements and interfaces of EC31

Display elements and interfaces

The figure below shows the display elements and interfaces of EC31.
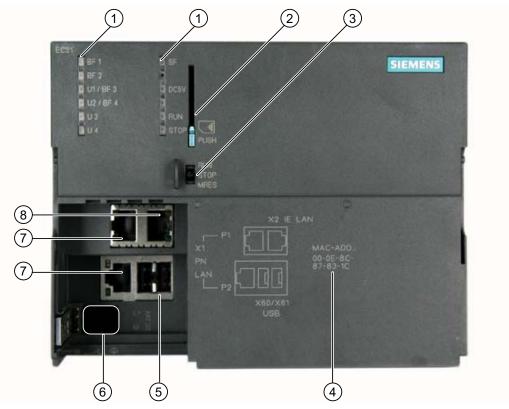
Figure 2-4   Display elements and interfaces of EC31

Table 2- 6   Display elements and interfaces of EC31

Number	Element
1	LED displays
2	MMC slot, including the ejector
3	RUN/STOPswitch
4	MAC address of the standard Ethernet controller (X2 IE LAN)
5	USB 2.0 ports
6	Power supply connection
7	PROFINET IO connections (available soon)
8	Ethernet connection

MMC slot

A Multi Media Card can be used as storage medium for backup data.

The S7 formatting is overwritten if a SIMATIC Micro Memory Card is used in the Embedded Controller. This prevents any further use of the SIMATIC Micro Memory Card in SIMATIC-S7 modules!

Power supply connection

The Embedded Controller is equipped with a double-pole power inlet. The connector with screw terminals is inserted into this inlet for shipping.

RUN/STOPswitch

Note

User-specific applications

The behavior EC31 depends on the user-specific application. That is, it can differ from the the behavior of an S7-300 CPU.

The switch can be assigned user-specific functions in the user program, for example for switching the backplane bus on and off.

The default setting of the SDK specifies deactivation of the channels at RUN to STOP transitions.

Table 2- 7   Positions of the RUN/STOP switch

Position	Default	Meaning
RUN	No function	Can be programmed in the user program
STOP	No function	Can be programmed in the user program
MRES	**During startup:** Backup / Restore can be activated in the startup phase of the EC by pressing MRES.	Can be programmed in the user program

LED displays

The LED displays EC31, with exception of LED DC5V, can be assigned user-specific functions in the user program for the phase following the startup of EC31. The LED displays can be activated separately. You can also synchronize the LED displays to enable their simultaneous flashing.

For further programming information, refer to the documentation for the SDK on the included DVD.

Status and error displays during startup (Backup / Restore)

Table 2- 8   Status and error displays during startup (Backup / Restore)

LED				Meaning
U1/BF3	U2/BF4	U3	U4	
EIn	On	Off	Off	MRES can be pressed to start Backup / Restore operations if the LED displays are lit.
-	-	Off	Flashes	Booting from Flash memory (startup)
		Off	On	Windows boot operation completed, EC ready for operation / ready for remote desktop connection
-	-	Flashes	Off	Starting Backup / Restore via USB port
-	-	Flashes	On	Execution of a backup
-	-	Flashes	Flashes	Execution of a Restore
-	On	On	On	Backup / Restore error

2.4 Windows XP Embedded

Features of Windows XP Embedded

The Windows XP Embedded SP2 Feature Pack 2007 is preinstalled with the typical features on EC31.

You can always install additional components. For latest information about the operating system, refer to www.windows.com.

Application planning and configuration

3

3.1 Configurations

Operating options

You can operate the Embedded Controller as follows:

- Locally
- Remotely - with access via *Remote Desktop Protocol*

Local

Input and output devices such as a keyboard, a mouse, a monitor or a printer can be connected directly to the Embedded Controller via the USB port.
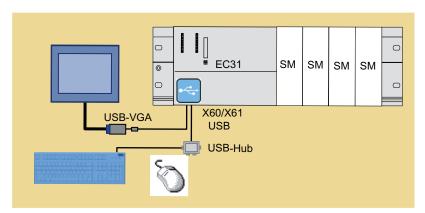
Figure 3-1   Embedded Controller - Local access

Remote

The Embedded Controller is installed in an equipment cubicle (control cabinet) and is interconnected via Ethernet, for example with a Field PG, with a PC, or with a Thin Client. The Embedded Controller is accessed via *Remote Desktop Protocol*.
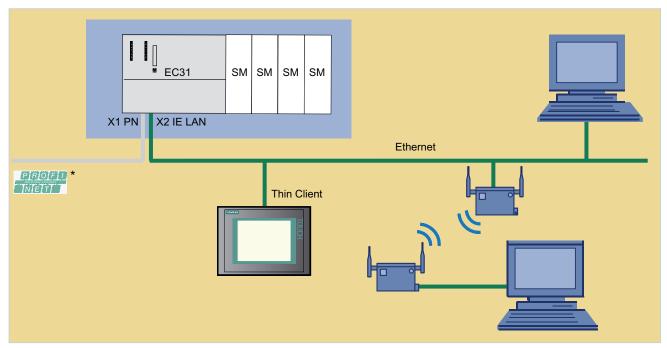
Figure 3-2   Embedded Controller - Access via RDP (* for EC31-RTX)

Remote or local

Configuration with PROFINET IO devices for EC31-RTX:
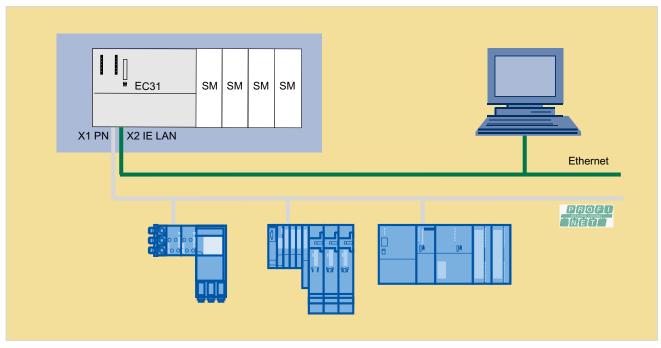
Figure 3-3   EC31-RTX - Configuration with PROFINET IO-Devices

3.2　　Installation with signal modules

S7-mEC maximum configuration

An S7-mEC can consist of up to four racks, each one with 8 signal modules (SM) of the S7-300 series. The racks are interconnected by means of interface modules (IM).
 A PS 305 or PS 307 can be used to supply power.
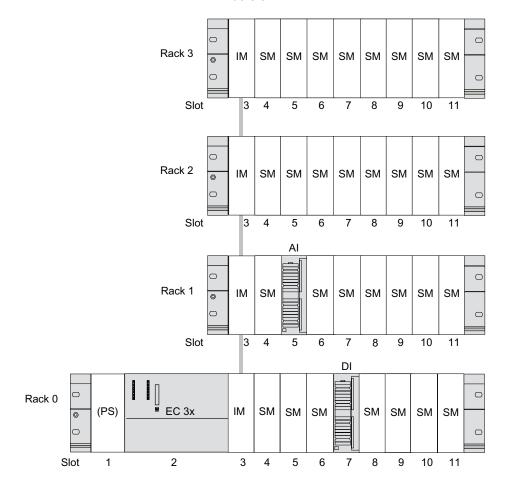
Figure 3-4　　Maximum configuration

3.3 Ambient and Environmental Conditions

Note the following aspects when planning your system application:

- Climatic and mechanical environmental conditions defined in the technical data section of the operating instructions.
- The device is only approved for indoor operation.
- Avoid extreme ambient conditions. Protect the device against dust, moisture and heat.
- Do not expose the device to direct sunlight.
- Do not obstruct the venting slots of the device.

3.4 Installation

Introduction

NOTICE
The device is only approved for operation in closed rooms.
Always maintain a minimum clearance of 100 mm to components installed above or underneath the device, or to the walls of an enclosure.

Mounting the Embedded Controllers

The Embedded Controller is mounted onto a rail.

Install the Embedded Controller and the signal modules in accordance with installation guidelines for the S7-300 AS. Observe the corresponding information in the *S7-300 CPU3xC and CPU 31x: Installation* Operating Instructions.

Note

Restrictions

The following restrictions apply to the Embedded Controller and override the S7-300 installation guidelines:

- Permitted mounting position: Horizontal
- Permitted temperatures: 0 to +50 °C

Connecting

4

4.1 Connection elements

Connection elements / interfaces

The following connections are available on the Embedded Controller:
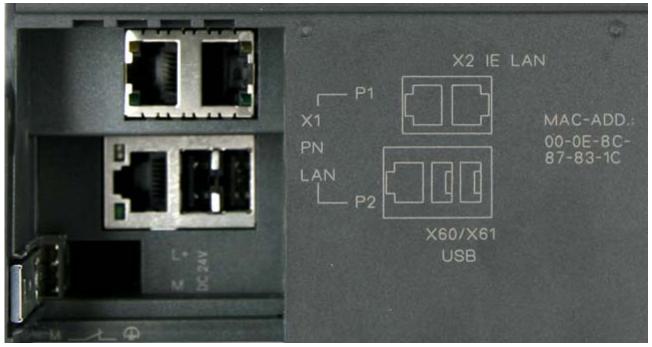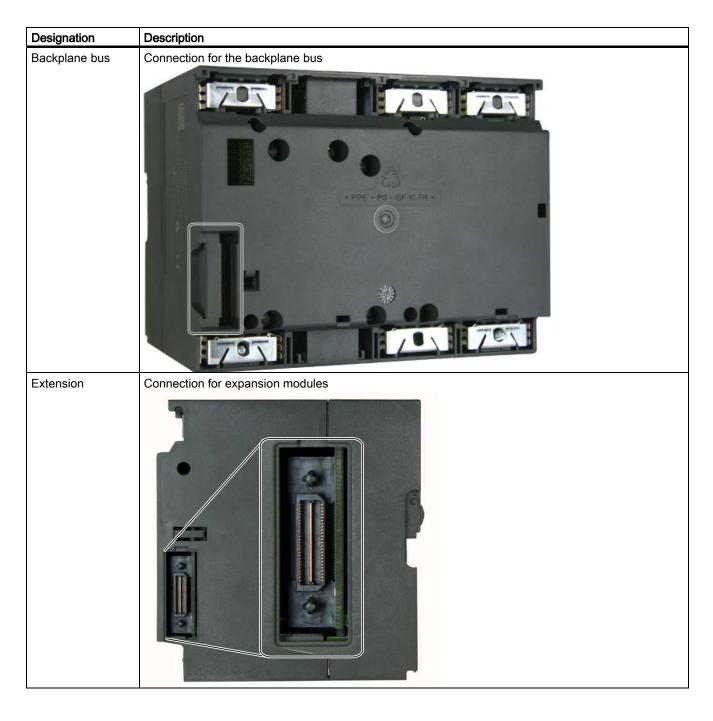
Figure 4-1   EC31-RTX connections

Designation	Description
X1 PN LAN P1	Two RJ45 PROFINET ports, 10/100 Mbps;
X1 PN LAN P2	90° angle connector required; Auto-crossover supported
X2 IE LAN	One RJ45 Ethernet port, 10/100 Mbps; Interface for PG / PC or Thin Client for commissioning with standard patch cable over RDP and for service purposes (not suitable for PROFINET IO -communication); Auto-crossover is not supported
X60/61 USB	Two USB 2.0 ports, 500 mA, for USB devices, e.g. monitor, keyboard, mouse or graphic adapter (USB to VGA converter).
DC 24 V	24 VDC power inlet (connector is included in the scope of delivery)

Designation	Description
Backplane bus	Connection for the backplane bus
Extension	Connection for expansion modules

See also

Configuring the Ethernet interfaces (Page 40)

4.2   Connecting the power supply

Connecting the power supply

Connect the power supply and ground conductors in accordance with the installation guidelines for the S7-300 automation system. For further information, refer to the operating instructions *S7-300, CPU 31xC and CPU 31x: Installation.*

To be noted before you connect the device

Observe the following rules and regulations for safe operation of the device:

⚠ WARNING
The device should only be connected to a 24V DC power supply which satisfies the requirements of safe extra low voltage (SELV).
When the device is operated on a wall, in an open rack or other similar locations, an NEC Class 2 current source is required for the compliance of the UL requirements (in accordance with UL 60950-1). In all other cases (in accordance with IEC / EN / DIN EN 60950-1) either a power source of limited performance (LPS = Low Power Source), or a line-side fuse or a line-side power switch is necessary. Limit the current to a value of less than 8 A. Recommended fusing: 4 A.
For the operation in closed cabinets or fireproofing cabinets (including the operation of a cabinet in accordance with UL508) there are no requirements for current limiting of the supply voltage.

NOTICE
Permissible conductor cross-section for the 24 VDC connecting cable: 0.75 mm² to 2.5 mm².

Connecting

Wiring the 24 VDC power supply	
1.	Switch off the 24 V DC power source.
2.	Connect the power supply using the plug (included in the package).

4.3 Connecting PC I/O

Observe the specifications provided in the documentation for the I/O devices used.

NOTICE
Connect only I/O devices that are approved for industrial applications in accordance with EN 61000-6-2:2005.

Ethernet devices

Connect Ethernet devices (Thin Client, Ethernet switch, ...) to the X2 IE LAN interface using standard patch cables.

CAUTION
Do not terminate the patch cable shield at the shield connecting element of the Embedded Controller.

Regenerative feedback from USB devices

CAUTION
Damage to the Embedded Controller
In accordance with USB specification 2.0, chapter 7.2.1, USB I/O devices may not generate any feedback current to the Host . Such currents can lead to damage to the Embedded Controllers.
Always use certified USB devices.

Hot-plug capable USB devices

Do not connect any hot-plug capable USB devices before you have closed all applications on the Embedded Controller.

CAUTION
The automatic device detection in Windows could have a negative impact on active automation applications if you insert or remove USB devices at runtime.
Always ensure that PLC functionality is deactivated before you insert or remove hot-plug-capable USB devices.

USB devices which are not hot-plug capable

CAUTION
Shut down power to the Embedded Controller before you connect USB devices which are not hot-plug capable.

Safely removing USB devices

NOTICE
Driver crash
Always select the Windows function "Safely Remove Hardware" or the "Eject" shortcut menu to deactivate or remove USB devices. Any other procedure could lead to driver crashes in Windows.

4.4   Connecting PROFINET IO devices

Connecting PROFINET IO

Connect PROFINET IO devices to the X1 PN (LAN) interface.

Additional information

For information about the connection, configuration and commissioning of PROFINET IO devices, refer to the *CPU 31xC and CPU 31x: Installation* Operating Instructions, chapter "Commissioning PROFINET IO".

Detailed information about addressing of the PROFINET IO interface and on the configuration of its properties and ports is provided in the following documentation:

- STEP 7 Online Help
- *PROFINET System Description* System Manual.

Configuring EC31-RTX

5

5.1 Preconfigured system

Configuration for EC31-RTX in the Station Configuration Editor
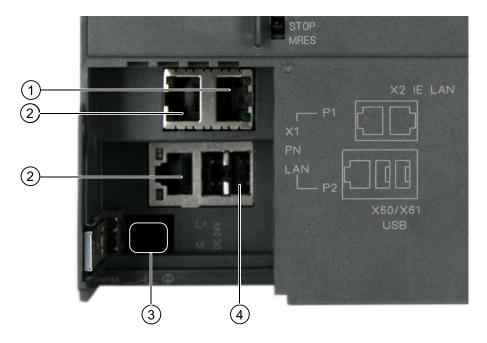
The default configuration of EC31-RTX encompasses the following components:

- "WinLC RTX EC" (Windows Logic Controller of WinAC RTX 2008) in Index 2 of the PC station

- An integrated PROFINET interface ("ERTEC 400..."), configured as submodule at slot IF1 of WinLC RTX (corresponds to X1 PN)

- An integrated Industrial Ethernet interface, configured as "IE General" at Index 3 of the PC station (corresponds to X2 PN)

Interfaces of the EC31-RTX

The figure below shows the interfaces of EC31-RTX. The table provides corresponding descriptions and shows how to integrate the Ethernet interfaces in the Station Configuration Editor.
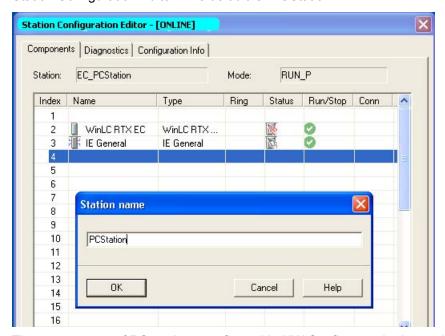
Number	Element	Preconfigured in the Station Configuration Editor
1	X2 PN (LAN) connection	IE General at Index 3 of the PC station
2	X1 PN (LAN) P1 X1 PN (LAN) P2	ERTEC 400 at slot IF1 as submodule of WinLC RTX The interface can be used after WinLC RTX has been started.
3	Power supply connection	-
4	USB 2.0 ports	-

Configuring the PC station in STEP 7

Observe the following rules when configuring the PC station in STEP 7:

- The naming of the PC station must be identical both in the STEP 7 project and in the Station Configuration Editor. The default is "PCStation".

- The components of PC stations configured in HW Config must be located at the same IF slots and Index positions as in the Station Configuration Editor.

- Configuring the Ethernet interface

  When configuring the Industrial Ethernet interface in the PC station, use the IP address and subnet mask configured in the Windows Control Panel in the EC31-RTX CPU. The X2 interface is assigned the default IP address 192.168.2.1 / 255.255.255.0.
  If using a different IP address or a gateway, configure the corresponding values in the Windows network configuration and in STEP 7.

See also

Configuring the Ethernet interfaces (Page 40)

5.2 Configuring and programming S7-mEC

5.2.1 Basic procedure

Configuring and programming the Embedded Controller in STEP 7

As EC31-RTX is a preconfigured system, carry out the usual actions for WinLC RTX in STEP 7:

1. Create a project in SIMATIC Manager
2. Insert a PC Station
3. Configure the hardware
4. Create an S7 program in STEP 7
5. Download the data to WinLC RTX EC

Special features

You can add the following features for the EC31-RTX in HW Config:

● Connection of a PROFINET IO system with PROFINET IO devices to the integrated PROFINET interface

● S7-300 signal modules

5.2.2 Configuring in HW Config

Note

Preconfigured system

EC31-RTX is a preconfigured system.

Edit the hardware configuration only to configure S7-300 signal modules, or after having expanded an EC31 by installing WinAC RTX.
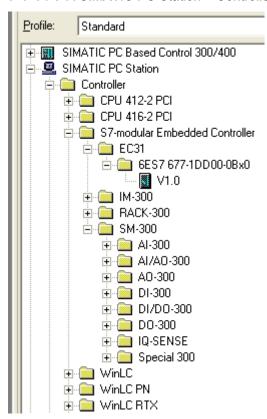
Prerequisites

The STEP 7 project contains a PC station.
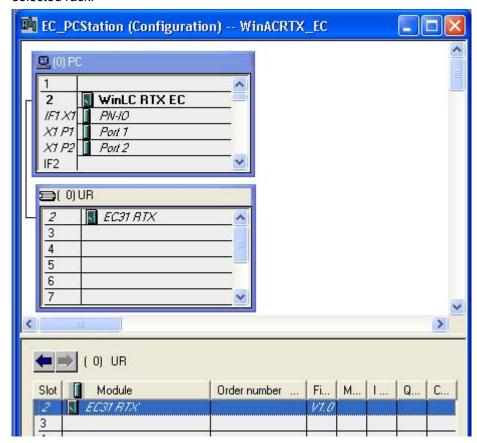
The name of the PC station in the STEP-7 project corresponds with the name of the PC station in the Station Configuration Editor on EC31-RTX.

Hardware Configuration

1. Select the PC station in SIMATIC Manager and then open HW Config.

2. Select EC31 from the hardware catalog and insert it into the rack. The modules is available at **SIMATIC PC Station > Controller > S7-modular Embedded Controller**.
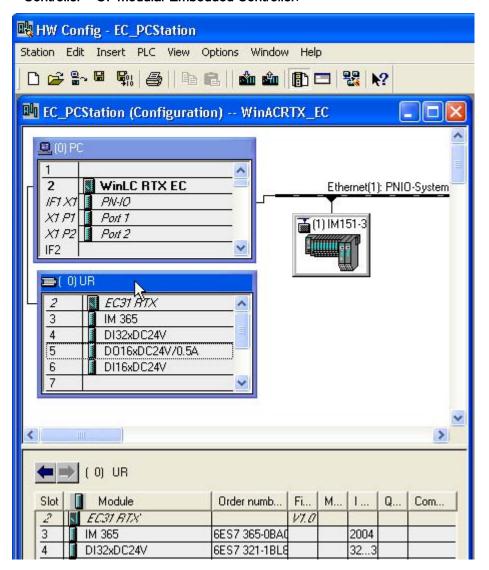
Result: The WinLC RTX EC module is visualized at slot 2 of the PC station ((0) PC) rack. WinLC RTX EC is interconnected with a further rack ((0) UR). (0) UR represents the central rack of EC31-RTX. The configuration table displays the configuration of the selected rack.

WinLC RTX EC and EC31-RTX represent the same module and have identical object properties.

3. Optional: Insert a PROFINET IO system at slot IF1 X1 (PN IO) of the PC Station WinLC RTX EC. Define the properties of the PROFINET IO system and configure the PROFINET IO devices.

4. Configure the hardware of the central rack.
   Signal modules (SM-300), interfaces for the central / expansion rack (IM-300), as well as
   additional racks (Rack-300) are available in the hardware catalog at **SIMATIC PC Station
   > Controller > S7-modular Embedded Controller**.

Note

Set up and configure the modules in the central / expansion racks similar to the S7-300
modules.

5. Edit the object properties of the modules in the properties dialog as required.

5.2.3 Configuring the Ethernet interfaces

EC31-RTX Ethernet interfaces

EC31-RTX features two integrated Industrial Ethernet interfaces:

- The X1 PN LAN P1 / X1 PN LAN P2 interface which can be configured for operation as PROFINET interface.
- Interface X2 IE LAN which is assigned to the PC station in Index 3 at IE_General and is configured by default for Industrial Ethernet communication.

EC31-RTX IP addresses

Ethernet port	Configuration		Application
X1 PN LAN P1 / X1 PN LAN P1	IP address	Must be assigned.	• PROFINET IO with RT/IRT • PROFINET CBA • Support for PROFINET Basic functions for commissioning and diagnostics
X2 IE LAN	IP address	Preconfigured for use with DHCP, or default 192.168.2.1 / 255.255.255.0 IE_General in Index 3 of the PC station.	• Support for PROFINET Basic functions for commissioning and diagnostics • Standard Ethernet communication of Windows

Configuring the IP addresses for EC31-RTX

Note

Windows XP Embedded has an English GUI. The English language is always used for the Control Panel and all other dialog fields.

Configure the Ethernet address for the X2 IE LAN interface of SIMATIC communication as follows:

1. Open the Windows Control Panel.
2. Select **Network Connections > Local Area Network**
3. Click "Properties" in the "Local Area Connection Status" dialog.
4. Double-click the "Internet Protocol (TCP/IP)" entry in the list.
5. Set the "Use the following IP address" option in the "Internet Protocol (TCP/IP) Properties" dialog and then type in the IP address and the subnet mask.
6. Confirm the "Internet Protocol (TCP/IP) Properties" and "Local Area Connection Properties" dialogs with "OK". Close the other dialogs.

Entering the selected IP address in the STEP 7 project

If you select a different IP address, subnet mask or gateway for the Ethernet port, configure this IP address or the other parameters for the Embedded Controller and for the "IE General", in STEP 7.

Configure the IP address in STEP 7 as follows:

1. Right-click ""IE General" in Index 3 of the PC station in the hardware configuration of your STEP 7 project.

2. Select "Object properties" from the shortcut menu.

3. Select the "General" tab in the "Properties - IE General" dialog box and the click "Properties".

4. Enter the IP address in the "Parameters" tab of the "Properties - PROFIBUS - Ethernet IE General" dialog box. You can also define a subnet mask or a gateway address in this dialog:

See also

Connection elements (Page 27)

5.2.4 Configuring the PROFINET IO system

Connecting PROFINET IO

Insert a PROFINET IO system at slot IF1 X1 (PN IO) of the PC Station WinLC RTX EC. Define the properties of the PROFINET IO system and configure the PROFINET IO devices.

Connect the PROFINET IO devices to the Embedded Controller in accordance with SIMATIC S7-300 guidelines.

Rule: Assigning a device name

Verify that the following conditions are met when assigning names to PROFINET IO devices:

● The Embedded Controller, PROFINET IO devices and the Engineering System are connected to the same subnet.

● The Embedded Controller is interconnected with the Engineering System via PROFINET IO interface.

Additional information

For information pertaining to the connection, configuration and commissioning of PROFINET IO devices, refer to the *CPU 31xC and CPU 31x: Installation* Operating Instructions, chapter "Commissioning PROFINET IO".

For detailed information with regard to the addressing of the PROFINET IO interface and to the configuration of its properties and ports, refer to the following documentation:

● STEP 7 Online Help

● *PROFINET System Description* System Manual.

5.2.5 Creating an S7 program

Prerequisites

You created a project in SIMATIC Manager and inserted a SIMATIC PC station you configured in HW Config in accordance with the standard configuration of EC31-RTX.

Creating programs for the Embedded Controller (WinAC RTX)

Create the S7 program for WinLC RTX EC in SIMATIC Manager similar to the S7 programs for SIMATIC PLCs.

For information on supported program blocks, refer to the documentation for WinAC RTX 2008.

Note

Global access for I/O modules

By contrast to S7-300 central racks, WinAC RTX in the Embedded Controller does not global support I/O access outside the process image.

5.2.6 Download

Download options

You can download the following configuration data from STEP 7 to the Embedded Controller:

- The entire PC station (including IE General, for example)
- Only the configuration data of WinLC RTX
- Only the S7 program of WinLC RTX

Prerequisites

- The enhanced write filter (EWF) must be deactivated on the EC31-RTX if the entire PC station is to be downloaded. (refer to chapter "Managing the enhanced write filter" in the *WinAC RTX 2008* documentation).
- EC31-RTX is online to the PG/PC via Industrial Ethernet. The PG/PC interface must be set to TCP/IP.

Note

The Embedded Controller must be interconnected with the Engineering System at a port of the X1 PN LAN interface to enable the following functionality:

- Assign PROFINET IO device names
- PROFINET CBA: Interconnections download and online functions in SIMATIC iMAP

Procedure

1. Start WinLC RTX EC on the EC31-RTX.

2. Disable the EWF on EC31-RTX.

3. Activate the PC station in the Station Configuration Editor ("Enable station" button).

4. Switch the EC31-RTX to STOP state.

5. Call the following menu command in STEP 7:

   – In HW Config: **PLC > Download to module** to download the hardware configuration

   – In SIMATIC Manager: **PLC > Download** to download the S7 -program and configuration data of WinLC RTX

   – In the block editor **PLC > Download** to download the S7 -program of WinLC RTX.

6. Several messages guide you until the download is completed.

Preparing EC31-RTX for operation

Carry out the following steps:

● Set the enhanced write filter for drive C:\ to the "activated" state.

CAUTION
Enhanced Write Filter
If you leave the enhanced write filter in "deactivated" state, you risk an early failure of your flash memory due to the persistent write access of the operating system. For further information, refer to the "Managing the enhanced write filter" chapter in the WinAC RTX 2008 documentation.

● Record all special settings (such as changes to the IP addresses) made in the course of application development. Save such settings alongside with your STEP 7 project.

Commissioning

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6

</div>

6.1 Overview of initial commissioning

Options of initial commissioning

There are two methods for initial commissioning of the Embedded Controller:

- Local, with interconnected I/O devices (monitor, keyboard and mouse)
- Remote - using a PC / PG via *Remote Desktop Protocol*

CAUTION
Risk of damage!
If condensation has developed on the Embedded Controller, wait at least 12 hours before you start to commission it.

EC31-RTX: After initial commissioning

After having completed initial commissioning, install the License Keys for WinAC RTX 2008 and SIMATIC NET 2007 on EC31-RTX using the *Automation License Manager* (ALM). EC31-RTX is now ready for operation. WinAC RTX 2008 is activated and the WinLC RTX panel can be opened by clicking the icon in the task bar.

EC31: After initial commissioning

After having completed initial commissioning, you can load and run a user program you created using the Software Development Kit (SDK) from the MMC, or from an external data carrier.

See also

EC31-RTX: Installing License Keys (Page 56)

6.2 Initial commissioning - Local

Hardware requirements

The following devices are connected to the Embedded Controller:

- 24 VDC power supply
- Keyboard and mouse via USB hub
- VGA monitor via USB graphic adapter USB to DVI/VGA
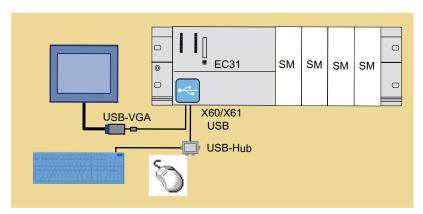
Figure 6-1   EC31 - Local access

Initial commissioning - Local

The preinstalled Windows XP Embedded operating system is set up automatically on the Embedded Controller after **initial** power on. Proceed as follows:

1. Switch on power to the Embedded Controller.
   Result: The Embedded Controller starts and LED display U4 flashes.
   The logon dialog opens.

2. Enter the user name "Administrator" and the password "admin".
   Result: The Windows user interface opens. You can now configure Windows.

NOTICE
Installation procedure
The installation procedure during initial commissioning can take up to 15 minutes.
You must prevent any of the following actions in the course of installation (LED display U4 flashes):
- Switching off the device - Keyboard input - Connecting additional USB devices

Restart after initial commissioning:

The Logon dialog of the Windows XP Embedded operating system opens approx. one minute after each subsequent restart. The default user name is "Administrator". The password is "admin".

Changing between local access and access over RDP

> **Note**
>
> You might have to restart the EC after having changed from access over *Remote Desktop Protocol* to local access.

6.3 Initial commissioning - Remote

Introduction

Interface X2 must be assigned an IP address for initial commissioning of the Embedded Controller via *Remote Desktop Protocol* . There are three corresponding options:

● IP address assignment via DHCP server (default)

● Using the default IP address 192.168.2.1 / 255.255.255.0

● IP address assignment via DCP (*Discovery and Basic Configuration Protocol*)

Requirements

● PC / PG or Thin Client (the term PC is used as synonym hereafter)

● Standard patch cable

● Prerequisite for IP address assignment via DCP is the installation of SIMATIC STEP 7 V5.4 SP4 or higher, or of the *Primary Setup Tool* V3.2 on the PC.

The *Primary Setup Tool* V3.2 is available for download from the Internet (http://support.automation.siemens.com/WW/view/en/19440762).

Preparing for initial commissioning

1. Connect the PC to the Embedded Controller via the X2 IE LAN interface.

2. Switch on the 24 V DC power supply of the Embedded Controller.
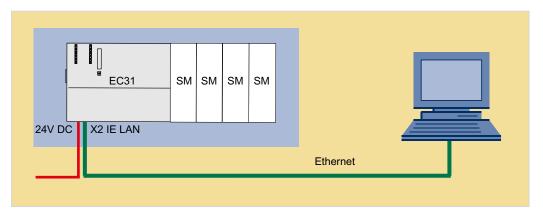
Figure 6-2   Connection for initial commissioning via remote PC

3. Switch on the power supply.

   Result: The Embedded Controller starts and LED display U4 flashes.

IP address via DHCP server

The Dynamic Host Configuration Protocol (DHCP) is used to assign free IP addresses via DHCP server to new devices to be logged on to the LAN.

Default IP address

If a DHCP server is not available, you can set up a connection to the Embedded Controller using the default IP address 192.168.2.1 / 255.255.255.0. The Embedded Controller is available if LED display U4 flashes.

Select the following command to set up the connection to the Embedded Controller:
Start > Programs > Accessories > Communications > Remote Desktop Connection.

Initial commissioning via DCP

The preinstalled Windows XP Embedded operating system is set up automatically on the Embedded Controller after **initial** power on. Proceed as follows:

1. Open STEP 7 or the *Primary Setup Tool* to assign an IP address to the Embedded Controller.
Follow the instructions of the program.
Result: The Login dialog of Windows XP Embedded opens.

2. Enter the user name "Administrator" and the password "admin".
Result: The Windows user interface opens. You can now configure Windows.

NOTICE
Do not switch off the Embedded Controller while the installation process is active.

Note

A system startup can take approx. 15 minutes during initial commissioning.

Restart after initial commissioning:

The Logon dialog of the Windows XP Embedded operating system opens approx. one minute after each subsequent restart. The default user name is "Administrator". The password is "admin".

See also

Disclaimer (Page 80)

6.4 Switching the Embedded Controller on and off

Requirements

Initial commissioning was successfully completed.

Switching on power to the Embedded Controller

Switch on the power supply of the Embedded Controller.
Result: Windows XP Embedded starts.

Setting up a Remote Desktop Connection

Select **Start > Programs > Accessories > Communication > Remote Desktop Connection**.

Result: The lit LED U4 indicates that a connection to the Embedded Controller via Remote Desktop is available.

Switching off the Embedded Controller / closing Windows XP Embedded

Always use the **Start > Shutdown** command or the icon on your desktop to close Windows XP Embedded.

Note

If the Enhanced Write Filter is activated and no data is written to flash memory, the Embedded Controller can be switched off by disconnecting it from the power supply.

See also

Enhanced Write Filter (EWF) (Page 52)

6.5   Activating safety mechanisms

6.5.1   Safety mechanisms for data carriers

Systems that rely on flash media as data carrier require special protection due to the limited number of rewrite cycles. Any cyclic data transfers from a PLC lead to a significant reduction of the useful life of those memory media. Failure of the Embedded Controllers can be the consequence. Safety mechanisms such as write filters are a suitable means of prolonging the useful life of flash memory.

Write filters in Windows XP Embedded

Write access can be routed to the RAM area in order to protect the data carriers.
Windows XP Embedded SP2 Feature Pack 2007 provides two corresponding write filters:

- Enhanced Write Filter (EWF)
    - Protects the entire partition against write access
    - Compressed NTFS volumes are supported
- File-Based Write Filter (FBWF):
    - Protects the entire partition against write access
    - Allows direct write access to files and folders

CAUTION
Activate **only one** of the two write filters. If both are activated, the EWF inhibits direct write access of the FBWF. Write access data are lost after a computer restart.

6.5.2 Enhanced Write Filter (EWF)

Purpose and function

The Enhanced Write Filter allows you to boot Windows XP Embedded from write-protected media (such as CD-ROM), to write protect specific partitions and adapt file system performance to suit user requirements.

NOTICE
Activating the EWF after data backup
The EWF is deactivated by default in Windows XP Embedded SP2 or higher. After having completed the setup of your operating system, generate a backup copy of your data and then activate the EWF.

Set EWF

Activate / deactivate the EWF using the EWFMGR.EXE program which is called at the Command Prompt.
The following functions are available:

Table 6- 1   Enhanced Write Filter functions

Function	Command
Write-protect drive C: Switching on	`ewfmgr c: -enable`
Write-protect drive C: disable (modified files are accepted)	`ewfmgr c: -commitanddisable`
Modified files on drive C: Accept	`ewfmgr c: -commit`
Display information about the EWF drive	`ewfmgr c:`
Display help	`ewfmgr c: /h`

Note

You must perform a restart to activate the write protection command.

Special features of the EWF application

- If the EWF is active all changes made on drive C are lost after power failure. Use an UPS to prevent data losses after power failure.

- You can backup the files in the EWF RAM overlay to flash memory or to the hard disk before you shut down the device. To do so, enter the following command in the command prompt:

```
ewfmgr c: -commit
```

Restart the device

Or
```
ewfmgr c: -commitanddisable
```

Restart the device
```
ewfmgr c: -enable
```
Restart the device

NOTICE
Data loss
Your data is lost if EWF is active and you discard a restart after having set the -`commitanddisable` or -`commit` option!

Note

Disabling automatic daylight saving changes

At systems without central time management and with activated EWF, the time is advanced or set back by one hour in the daylight saving time or standard time period each time the system performs a cold or warm restart, due to the system-specific function for automatic daylight saving changes.

Reason for this behavior: Windows XP Embedded sets a flag in a registry entry that indicates completion of the conversion to daylight saving time. Since this file is also protected against modification by the EWF, the marker is lost during the boot sequence and the adjustment is made again.

We therefore recommend that you deactivate the automatic adjustment and change the clock manually.

Proceed as follows:

1. Deactivate the EWF (ewfmgr c: -commitanddisable) and reboot the system.
2. Deactivate automatic adjustment in the Control Panel.
   Select Start > Control Panel > Date and Time > "Time Zone" tab and clear the check mark at "Automatically adjust clock for daylight saving changes".
3. Enable EWF again (ewfmgr c: -enable) and reboot the system.

6.5.3 File-Based Write Filter (FBWF)

Purpose and function

The FBWF can be used to protect specific files and folders against write access.

Write access to the folders is enabled by default on EC31.

CAUTION
Activate **only one** of the two write filters. If both are activated, the EWF inhibits direct write access of the FBWF. Write access data are lost after a restart of the Embedded Controller.

Setting the FBWF

Set up, activate and deactivate the FBWF using the FBWF Manager. This application is available in the console program "fbwfmgr" (command prompt). The following functions are available:

Table 6- 2   File-Based Write Filter

Function	Command
Display the status of the FBWF drive	`fbwfmgr`
Enable write protection for protected drives	`fbwfmgr /enable`
Disable write protection for protected drives	`fbwfmgr /disable`
Write to protected files	`fbwfmgr /commit c: \<path>\<file name>`
Display help	`fbwfmgr /?`
Add drive to the list of protected drives	`fbwfmgr /addvolume <drive letter>:`
Remove drive from the list of protected drives	`fbwfmgr /removevolume <drive letter>: 0|1`
Defining exclusions:	
Add file	`fbwfmgr /addexclusion c: \<path>\<filename.ext>`
Add folder	`fbwfmgr /addexclusion c: \<path>`
Remove file	`fbwfmgr /removeexclusion c: \<path>\<filename.ext>`
Remove folder	`fbwfmgr /removeexclusion c: \<path>`

Note

- Correct notation:
  Drive letter: space character "\" relative file path
- The write protection commands become effective only after a restart.

Rule

The following sequence applies if you define exclusions for files and folders that do not yet exist:

- Defining exclusions
- Embedded Controller restart
- Create file / folder

Display of the partition size while FBWF is active

The partition size displayed in the Explorer does not agree with the actual size if the FBWF is active. The size displayed is derived from the amount of memory occupied on the partition and from memory released by the FBWF. After the maximum size of the overlay was reached, a message is output warning of insufficient space on the partition.

Reference

For further information on the FBWF, refer to:
http://msdn2.microsoft.com/en-us/library/aa940817.aspx

6.6 EC31-RTX: Installing License Keys

Licensing the WinAC RTX and SIMATIC NET software

The product-specific License Keys for WinAC RTX 2008 and SIMATIC NET 2007 must be installed prior to commissioning using *Automation License Manager*. The License Keys are available on the USB stick included with your package.

The licenses can be installed either directly using the EC31-RTX, or via PG/PC.

Requirements

Initial commissioning of EC31-RTX was successfully completed; EC31-RTX is in operation.

Installing License Keys with local configuration

Automation License Manager is preinstalled on the EC31-RTX and can be opened using the desktop icon or a menu command.

1. Select the **Start > SIMATIC > License Management > Automation License Manager** menu command.

2. Follow the instructions of *Automation License Manager*.

Using a programming device / PC to install the License Keys

Automation License Manager is preinstalled on programming device / PC with STEP 7 and on the EC31-RTX.

1. Connect the EC31-RTX to a programming device / PC via the X2 IE LAN interface.

2. Select the **Edit > Connect computer** command and enter the IP address of EC31-RTX (Default: 192.168.2.1).

3. Connect the USB stick to the programming device / PC.

4. Select the **Start > SIMATIC > License Management > Automation License Manager** menu command.

5. Drag-and-drop the License Keys from the USB stick to partition C: or D: of the EC31-RTX.

Retrieving the License Keys

If your License Keys do not work properly on the Embedded Controller, contact your Siemens representative and have the "Certificate of License" (CoL) at hand.

Remove the License Keys **before** you generate a backup copy of your data, as you will otherwise risk the loss of your License Keys during backup. Transfer the License Keys to a USB stick and reinstall them after you completed the Restore operation.

Operating the EC31-RTX

<div style="text-align: right; font-size: 3em;">7</div>

7.1 WinLC with EC31-RTX

7.1.1 Controller Panel

Introduction to the controller panel

The controller panel WinLC RTX EC serves on your PC as display window for the Embedded Controller. It contains the following elements:

● Menus with EC functions

Not all menus are necessary for operating WinLC of EC31-RTX. The inactive menus are grayed out and cannot be selected.

● Status display for the EC

The EC31-RTX-specific LED displays U3 and U4 for backup / restore and startup monitoring are not displayed.
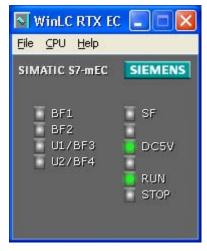
Figure 7-1   Controller Panel WinLC RTX EC

Opening the controller panel

The ▮N▮ icon is displayed in the Windows taskbar when WinAC is in operation.

You can double-click this icon to open the controller panel after WinAC is in operation.

Opening and closing the controller panel does not influence the state of the Embedded Controller.

See also

Display elements and interfaces of EC31-RTX (Page 12)

7.1.2 Status displays

Status displays

The status displays on the Controller Panel indicate the current operating state and support troubleshooting.

Note

The RUN and STOP settings of the mode selector switch indicate the **selected** operating mode. The RUN and STOP LED displays indicate the **actual** operating state of EC31-RTX.

You cannot change the controller status by clicking in the status displays.

The RUN LED flashes and the STOP LED is lit during a transition from STOP to RUN. The STOP LED goes dark to indicate that the transition to RUN state was completed.

Status displays of the WinLC EC Controller Panel

The table below provides a description of the status displays of the Controller Panel.

Table 7- 1　Status displays of the Controller Panels

Display	Description
BF1	Bus error at interface X1 PN LAN P1 or X1 PN LAN P2
BF2	Reserved
U1/BF3	Reserved
U2/BF4	Reserved
SF	Group error
DC5V	5 V supply to the backplane bus (switched off after you shut down the Controller by means of "Shutdown").
RUN	WinLC on the Embedded Controller is in RUN.
STOP	WinLC on the Embedded Controller is in STOP.

7.1.3 RUN/STOP states

Permitted and forbidden functions in the RUN / STOP states

The operating state either allows or rejects access to specific functions on the Embedded Controller.

Table 7- 2   EC31-RTX: Permitted and forbidden functions in the RUN / STOP states

Operating state	Description
RUN	**Permitted functions:** • Download of a program to the controller • Download of selected blocks to the controller • Editing of program tags in STEP 7 and changes to the operating state of the controller • CPU memory reset using STEP 7 Start by setting the controller to STOP state. **Functions which are not allowed:** • Archiving and restoring of a STEP 7 user program
STOP	**Permitted functions:** • Download of a program or of selected blocks to the controller • Editing of program tags using STEP 7 • CPU memory reset using STEP 7 • Archiving and restoring of a STEP 7 user program

Service and maintenance

8

8.1 Backup and Restore

EC-Backup_Restore Tool

The *EC-Backup_Restore Tool* is preinstalled on the Embedded Controller to support the following actions:

● Backup: Backup of data

● Restore: Restoring data and the factory state

The *EC-Backup_Restore Tool* is available in English language.

Requirements

● Restore DVD (included in scope of delivery)

● DVD-ROM drive

● Data carrier: USB stick or Multi Media Card with at least 4 GB. The *EC-Backup_Restore Tool* addresses the USB stick if both types of data carrier are inserted.

● Do not use a USB hub when backing up and restoring data.

Starting the *EC-Backup_Restore Tool*

To start the *EC-Backup_Restore Tool*, go to the Windows Start bar and select **Start > SIMATIC > S7-mEC > EC31 > EC-Backup_Restore.** Follow the instructions in the software.

The *EC-Backup_Restore Tool* cancels the operation if the data carrier is corrupted.

Removing a Multi Media Card or a SIMATIC Micro Memory Card

⚠ CAUTION
Always use the "Eject" shortcut menu to remove a Multi Media Card or a SIMATIC Micro Memory Card. Do **not** use the "Safely Remove Hardware" function in Windows.

8.2 Backing up and restoring data

Introduction

Always backup the data to a storage medium so that you can quickly resume your work after the failure of an Embedded Controller.

To backup your data in Windows XP Embedded, generate an image of your installation using the preinstalled *EC-Backup_Restore Tool* and an USB stick. This method lets you quickly restore your original partitions C: and D:.

Note

Backing up data

You should generate a backup copy of your EC data after having parameterized the signal modules and when making changes to the configuration.

Requirements

- Restore DVD (included in scope of delivery)
- DVD-ROM drive
- Data carrier: USB stick or Multi-Media Card with at least 4 GB
- All other USB devices and any SIMATIC Micro Memory Card have been removed from the EC.

NOTICE
License Keys
Remove the License Keys before you generate a backup copy of your data, as you will otherwise risk the loss of your licenses during backup.

Data backup to USB stick using the *EC-Backup_Restore Tool*

Proceed as follows:

1. Insert the USB stick **directly** into a USB port of the EC / insert the Multi Media Card into the slot.

2. Start the *EC-Backup_Restore Tool* in the Windows Start bar by selecting **Start > SIMATIC > S7-mEC > EC31 > EC-Backup_Restore.**

3. Select "Backup" to generate a backup copy of your EC data. Follow the instructions of the tool.

   Result: The data carrier is formatted. LED display U3 flashes and U4 is lit while the data is being backed up. The EC is restarted.

   Note

   Data backup successful?

   The LED displays BF4/U2, U3 and U4 start flashing if the backup has failed. Restart the operation.

Result

You can use the data carrier and the *EC-Backup_Restore Tool* to restore the data to the Embedded Controller.

Restoring data (Restore)

Proceed as follows:

1. Insert the USB stick into a free USB port on the EC.

2. Start the *EC-Backup_Restore Tool* in the Windows Start bar by selecting **Start > SIMATIC > S7-mEC > EC31 > EC-Backup_Restore.**

3. Select "Restore" to restore your EC data. Follow the instructions of the tool.

   Result: LED displays U3 and U4 are flashing while the data is being restored

4. Install the License Keys using *Automation License Manager*.

8.3 Restoring to factory settings

Introduction

You can restore the original software of the Embedded Controller using the included Restore DVD. The operation restores the entire flash memory.

You have two options of restoring the content of flash memory in the EC:

- Using the Restore DVD and USB DVD-ROM
- Using the Restore DVD, USB stick / Multi Media Card (at least 4 GB)

  Compared to a USB stick, it takes longer to restore the system to factory settings from a Multi Media Card, depending on the card used.

⚠ CAUTION
Data loss
When restoring the system to factory settings, flash memory is going to be erased and formatted, and is then loaded with the original software. All modified or added data, all programs and authorizations, as well as the partitions on flash memory will be lost! You should generate a backup copy of your EC data after having parameterized the signal modules and when making changes to the configuration.

NOTICE
License Keys
Remove the License Keys before you restore the factory settings.

1. Option: Using the Restore DVD and USB DVD-ROM to restore factory settings

Proceed as follows:

1. Switch off power to the EC.
2. Disconnect all USB devices and remove any MMC from the EC.
3. Connect the USB DVD-ROM to a free USB port on the EC.
4. Place the Restore DVD into the drive.
5. Power up the EC.
   Result: All LED displays will briefly light up within one second.
6. Press the MRES switch as soon as the LED displays U1/BF3 and U2/BF4 are lit.
   Keep the switch pressed until LED display U3 starts flashing. Release the MRES switch.
   Result: The data is now being restored. This operation takes approx. 40 minutes, depending on the data carrier used. LED display U4 flashes while this process is active. The EC starts after the LED displays U3 and U4 flash and then go dark.
7. Wait for the automatic shutdown of the EC.
8. Switch off the power supply and reconnect the USB devices.

Result

- You successfully restored the EC to factory settings.
- You can remove the USB DVD-ROM from the EC.
- The License Keys must be reinstalled.

2. Option: Data backup with Restore DVD and USB-Stick / Multi Media Card

NOTICE
Data loss
The special command ufdprep.exe must be executed to prepare the data carrier. As this operation deletes all data from the data carrier,   you should generate a backup copy of all data on the carrier before you execute this command.

Preparing the USB stick / Multi Media Card

1. Place the Restore DVD into the DVD-ROM drive of the PC.
2. Insert the USB stick into a free USB port on the PC. / insert the Multi Media Card into the slot.
3. Type in the following command at the command prompt:

   <DVD-ROM drive letter>:\Restore_Tools\ufdprep.exe <USB stick
   (or Multi Media Card) drive letter>:
4. Copy the content of the Restore DVD to the root directory of the data carrier.
5. Remove the data carrier **safely** from the PC.

   Result: The data carrier can now be used to restore the EC to factory settings.

Using the USB stick / Multi Media Card to restore the factory settings

Proceed as follows:

1. Switch off power to the EC.
2. Disconnect all USB devices and remove any SIMATIC Micro Memory Card from the EC.
3. Insert the USB stick **directly** into a USB port of the EC. / insert the Multi Media Card into the slot.
4. Power up the EC.

   Result: All LED displays will briefly light up within one second.
5. Press the MRES switch as soon as the LED displays U1/BF3 and U2/BF4 are lit.
   Keep the switch pressed until LED display U3 starts flashing. Release the MRES switch..
   Result: The data is now being restored. This operation takes approx. 40 minutes, depending on the data carrier used. LED display U4 flashes while this process is active. The EC starts after the LED displays U3 and U4 flash and then go dark.
6. Wait for the automatic shutdown of the EC.
7. Switch off the power supply and reconnect the USB devices.

Result

- You can now remove the data carrier from the EC.
- You successfully restored the EC to factory settings.
- The License Keys must be reinstalled.

See also

Backing up and restoring data (Page 62)

8.4 Micro Memory Card

Properties

The SIMATIC Micro Memory Card behaves in the Embedded Controller as in a Windows file system.

CAUTION
The S7-formatting will be overwritten
The S7 formatting of a SIMATIC Micro Memory Card used in the Embedded Controller will be overwritten. This prevents any further use of the SIMATIC Micro Memory Card in SIMATIC S7 modules!

8.5 BIOS update

When do I have to update the BIOS?

New BIOS versions ensure compatibility with new operating systems and software, or with new hardware. It is also possible to integrate new BIOS functionality.

A BIOS update could be necessary if you cannot resolve a problem by installing new drivers or software.

BIOS updates on the Internet

BIOS updates are available on the Internet at:

http://www.siemens.com/automation/service&support

Migrating from EC31 to EC31-RTX

<div align="right">

9

</div>

Introduction

You need the WinAC RTX 2008 software to migrate from EC31 to EC31-RTX.

The SIMATIC NET 2007 software is only required to enable the use of S7 functionality via X2 IE LAN on the "upgraded" EC31.

The WinAC RTX 2008 and SIMATIC NET 2007 software is included on the "WinAC RTX 2008" DVD.

Prerequisites

- Initial commissioning of the EC31 was successfully completed and EC31 is in operation.
- No user program is active.
- A DVD drive is connected locally to the EC31.

  ### Note

  Installation of SIMATIC NET 2007 using the Remote Desktop Protocol is not supported.

Installing SIMATIC NET and WinAC RTX

1. Place the "WinAC RTX 2008" into the drive and start the setup of SIMATIC NET 2007.
2. Select only the following components for installation:
   - Automation License Manager (ALM)
   - SIMATIC NET PC software
3. Follow the setup instructions.
4. Start the setup of WinAC RTX 2008.
5. Follow the setup instructions.

Result

- SIMATIC NET 2007 and WinAC RTX 2008 are installed. You can use *Automation License Manager* to install the License Keys.
- EC31 features the RTX functionality.

Additional information

For additional information, refer to the SIMATIC NET 2007 and WinAC RTX 2008 documentation.

Technical data 10

10.1   General technical data

General technical data

The general technical data of the S7-300 modules are always valid for the *S7-mEC* .
Observe the corresponding information provided in the S7-300, CPU 31xC and
CPU 31x: Technical data Reference Manual, release date 12/2006

Corresponding deviations are described below.

Climatic ambient conditions

S7-mEC may be operated at the following climatic ambient conditions:

Ambient conditions	Valid range
Temperature range in horizontal mounting position	from 0 to 50 °C

10.2   Standards and certifications

Introduction

Contents of general technical data:

- The standards and test values the S7-mEC system conforms to.
- Test criteria for the S7-mEC system.

Note

Currently valid approvals are specified on the rating plate of the corresponding module.

CE label

The S7-mEC system meets the general and safety-related requirements of the following EC directives and conforms to the harmonized European standards (EN) for programmable controllers published in the official gazettes of the European Community:

- 2006/95/EC "Electrical Equipment Designed for Use within Certain Voltage Limits" (Low-Voltage Directive)
- 2004/108/EC "Electromagnetic Compatibility" (EMC Directive)
- 94/9/EC "Equipment and protective systems intended for use in potentially explosive atmospheres" (Explosion Protection Directive)

The EC declaration of conformity is held on file available to responsible authorities at:

Siemens Aktiengesellschaft
Industry Sector
I IA AS RD ST PLC
P.O. Box 1963
D-92209 Amberg

UL approval

Underwriters Laboratories Inc. complying with

- UL 508 (Industrial Control Equipment)
- CSA C22.2 No. 142 (Process Control Equipment)

or

HAZ. LOC.

Underwriters Laboratories Inc. complying with

- UL 508 (Industrial Control Equipment)
- CSA C22.2 No. 142 (Process Control Equipment)
- UL 1604 (Hazardous Location)
- CSA-213 (Hazardous Location)

APPROVED for use in
Class I, Division 2, Group A, B, C, D Tx;
Class I, Zone 2, Group IIC Tx

FM approval

Factory Mutual Research (FM) to
Approval Standard Class Number 3611, 3600, 3810
APPROVED for use in Class I, Division 2, Group A, B, C, D Tx;
Class I, Zone 2, Group IIC Tx

ATEX approval

to EN 60079-15:2005 (Electrical apparatus for potentially explosive atmospheres; Type of protection "n")

Note

Currently valid approvals are specified on the rating plate of the corresponding module.

⟨Ex⟩ II 3 G Ex nA II Parts 4 to 6

Tick-mark for Australia

The S7-mEC system fulfills requirements of the standard AS/NZS 2064 (Class A).

IEC 61131

The S7-mEC system meets requirements and criteria to IEC 61131-2, (Programmable logic controllers, part 2: Equipment Requirements and Tests).

Ship building certification (pending)

Classification societies:

- ABS (American Bureau of Shipping)
- BV (Bureau Veritas)
- DNV (Det Norske Veritas)
- GL (Germanischer Lloyd)
- LRS (Lloyds Register of Shipping)
- Class NK (Nippon Kaiji Kyokai)

Use in industry

SIMATIC products are designed for industrial applications.

Table 10- 1   Use in industry

Fields of application	Noise emission requirements	Noise immunity requirements
Industry	EN 61000-6-4: 2007	EN 61000-6-2: 2005

10.3   EC31-RTX

Technical data of EC31-RTX

Table 10- 2   Technical data of EC31-RTX

Product version	
Order no.:	6ES7677-1DD00-0BB0
• Hardware version	02
• Firmware version	V1.0
• Associated programming package	STEP 7 V5.4 SP4 with HSP 135
Performance features	
Processor	Intel Core Duo 1.2 GHz
Main memory	1 GB RAM
Flash memory, integrated	2 GB
Operating system	Windows XP Embedded SP2 Feature Pack 2007
Memory for program blocks	Max. 4 MB
Memory for data blocks	Max. 4 MB
Memory for non-volatile data	512 KB
NVRAM	512 KB
Power supply	
Rated value, 24 VDC	Yes
• Valid range, lower limit	20.4 V
• Valid range, upper limit	28.8 V
Input current	
Rated value at 24 VDC	typically 0.8 A; without backplane bus and USB supply
Supply voltages	
Power and voltage failure backup	5 ms
Reverse polarity protection	Yes; protection against destruction

Potentials	
Permitted potential difference (to the rail)	75 VDC, 60 VAC
Electrical isolation	
• Between Ethernet and electronic circuits	Yes
Insulation	
• Test voltage	500 VDC
• For Ethernet	1500 V rms (IEEE802.3)
Power loss	typically 20 W; without backplane bus and USB supply
Module-specific data	
Data transmission rate	100 Mbps full duplex
Transmission mode	100BASE-TX
Autonegotiation	Yes
MAC addresses	4
Configuration	
Racks, max.	4
Modules per rack, max.	8
Monitoring and safety functions	
RUN/STOP switch	Yes
LED display	Yes
Transient voltage interruption	Up to 5 ms
Environmental conditions	
Ambient temperature	
• Min.	0 °C
• Max.	50 °C
IP20	Yes
CE label	Yes
cULus	Yes
FM approval	Yes
ATEX approval	Yes
Interfaces	
USB	2 x USB 2.0 high-speed / 500 mA
PROFINET	2 x 10/100 Mbps with RJ45
Ethernet (PROFINET basic services)	1 x 10/100 Mbps with RJ45
Dimensions	
Width (mm)	160
Height (mm)	125
Depth (mm)	115
Weight (kg)	1.5

WinAC RTX 2008

The technical data of WinAC RTX 2008 is available on the Internet.

Technical data of WinAC RTX 2008
(http://support.automation.siemens.com/WW/view/en/6ES7671-0RC06-0YA0)

10.4 EC31

Technical data of EC31

Table 10- 3   Technical data of EC31

Product version	
Order no.:	6ES7677-1DD00-0BA0
• Hardware version	02
• Firmware version	V1.0
• Corresponding programming interface	Software Development Kit (SDK EC31)
Performance features	
Processor	Intel Core Duo 1.2 GHz
Main memory	1 GB RAM
Flash memory, integrated	2 GB
Operating system	Windows XP Embedded SP2 Feature Pack 2007
Memory for non-volatile data	256 KB
Power supply	
Rated value, 24 VDC	Yes
• Valid range, lower limit	20.4 V
• Valid range, upper limit	28.8 V
Input current	
Rated value at 24 VDC	typically 0.8 A; without backplane bus and USB supply
Supply voltages	
Power and voltage failure backup	5 ms
Reverse polarity protection	Yes; protection against destruction
Potentials	
Permitted potential difference (to the rail)	75 VDC, 60 VAC
Electrical isolation	
• Between Ethernet and electronic circuits	Yes
Insulation	
• Test voltage	500 VDC
• For Ethernet	1500 V rms (IEEE802.3)
Power loss	typically 20 W; without backplane bus and USB supply

Module-specific data	
Data transmission rate	100 Mbps full duplex
Transmission mode	100BASE-TX
Autonegotiation	Yes
MAC addresses	4
Configuration	
Racks, max.	4
Modules per rack, max.	8
Monitoring and safety functions	
RUN/STOP switch	Yes; the switch can be programmed via SDK
LED display	Yes; the LED functions can be programmed via SDK
Transient voltage interruption	Up to 5 ms
Environmental conditions	
Ambient temperature	
• Min.	0 °C
• Max.	50 °C
IP20	Yes
CE label	Yes
cULus	Yes
FM approval	Yes
ATEX approval	Yes
Interfaces	
USB	2 x USB 2.0 high-speed / 500 mA
PROFINET	2 x 10/100 Mbps with RJ45
Ethernet (PROFINET basic services)	1 x 10/100 Mbps with RJ45
Dimensions	
Width (mm)	160
Height (mm)	125
Depth (mm)	115
Weight (kg)	1.5

Appendix

<div style="text-align: right; font-size: 3em;">A</div>

Dimensional drawings of the Embedded Controller EC31
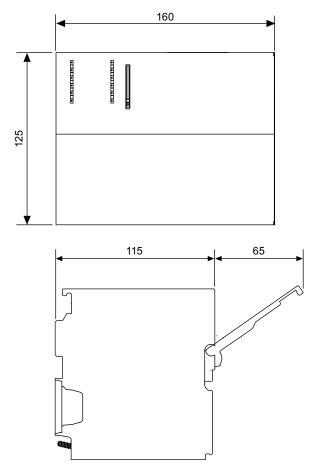
Figure A-1   Dimensional drawings EC31

A.1 Order numbers

Embedded Controller and accessories

Table A- 1   Order numbers for the Embedded Controller and accessories

Designation	Order no.:
EC31-RTX Embedded Controller with Intel Core Duo 1.2 GHz processor, 1 GB RAM, 2 GB Flash memory, interfaces: 2 x USB, 2 x PROFINET, 1 x Fast Ethernet, 1 Slot MMC, with Windows XP Embedded SP2 FP 2007, WinAC RTX 2008 and SIMATIC NET 2007	6ES7677-1DD00-0BB0
EC31 Embedded Controller with Intel Core Duo 1.2 GHz processor, 1 GB RAM, 2 GB Flash memory, interfaces: 2 x USB, 2 x PROFINET, 1 x Fast Ethernet, 1 Slot MMC, with Windows XP Embedded SP2 FP 2007	6ES7677-1DD00-0BA0
SIMATIC NET IE FC RJ45 PLUG 90 (for connector X1) Connector with rugged metal shell and FastConnect terminating technology, 90° cable outlet • 1 per pack, 1 pack • 10 per pack, 1 pack • 50 per pack, 1 pack	 6GK1901-1BB20-2AA0 6GK1901-1BB20-2AB0 6GK1901-1BB20-2AE0
WinAC RTX 2008	6ES7671-0RC06-0YA0

Interface modules

Table A- 2   Interface module order numbers

Designation	Order no.:
IM 360	6ES7360-3AA01-0AA0
IM 361	6ES7361-3CA01-0AA0
IM 365	6ES7365-0BA01-0AA0

Digital and analog electronic modules

The following signal modules are approved for use with EC31 and for access via SDK user program:

Table A- 3   Order numbers electronic modules

Designation	Order no.:
SM 321; DI 16 x DC 24 V	6ES7321-1BH02-0AA0
SM 321; DI 32 x DC 24 V	6ES7321-1BL00-0AA0
SM 321, DI 16 x DC 24 V, sourcing	6ES7321-1BH50-0AA0
SM 321; DI 64 x DC 24 V; Sinking/Sourcing	6ES7 321-1BP00-0AA0
SM 322; DO 16 x DC 24 V/ 0,5 A	6ES7322-1BH01-0AA0
SM 322; DO 32 x DC 24 V/ 0,5 A	6ES7322-1BL00-0AA0
SM 322; DO 8 x DC 24 V/ 0,5 A; diagnostics interrupt	6ES7322-8BF00-0AB0
SM 322; DO 64 x DC 24 V/ 0,3 A; sourcing	6ES7322-1BP00-0AA0
SM 331; AI 8 x 13 bit	6ES7331-1KF01-0AB0
SM 331; AI 8 x 12 Bit diagnostic interrupt / process interrupt	6ES7331-7KF02-0AB0
SM 331; AI 2 x 12 Bit diagnostic interrupt / process interrupt	6ES7331-7KB02-0AB0
SM 332; AO 4 x 12 Bit diagnostics interrupt	6ES7332-5HD01-0AB0
SM 332; AO 2 x 12 Bit	6ES7332-5HB01-0AB0
SM 332; AO 8 x 12 Bit	6ES7332-5HF00-0AB0

A list of currently approved modules is available on the Service and Support pages on the Internet.

Note

The signal modules listed in the HW Config catalog at "S7-modular Embedded Controller > SM-300" are approved for operation with EC31-RTX.

A.2 Tips and Tricks

Software

Use only the software approved for Windows XP Embedded SP2 on the Embedded Controller.

Connecting I/O devices

> **Note**
>
> Always install the **latest software version** for connected I/O devices such as CD drives or monitors connected (included with the I/O devices, or available on the Website of the manufacturer).

Windows XP setup CD requested

The drivers for many devices have already been installed. If a driver is not found for operation of a device and the installation program requests you to insert the setup CD of Windows XP Embedded, navigate to the following path:

C:\Windows\System32\drivers

Most installation programs will then continue their setup. Contact the device manufacturer if this does not solve the problem.

A.3 Disclaimer

Disclaimer for the Primary Setup Tool

This software is freeware. It is provided to you free of charge. It may be copied, modified and used, and be passed on to third-parties. However, if passed to a third party, the software must be in its complete and unmodified form, and all copyrights must be observed. Any commercial distribution to third parties (e.g., for shareware/freeware distribution) is subject to the express written approval of Siemens AG. As the software is provided free of charge, the authors and copyright owners **disclaim any liability** for this software. Users of the software act at their own risk and responsibility. The authors and rights holders shall only be held liable for criminal intent and gross negligence. Any further claims are excluded. In particular, the authors and copyright holders shall not be deemed liable for any defects or subsequent damages. Please inform us of any software errors you might discover.

See also

Initial commissioning - Remote (Page 47)

List of abbreviations

<div style="text-align: right; font-size: 2em;">B</div>

B.1   Abbreviations

Abbreviation	Term	Meaning
AC	Alternating current	Alternating current
ALM	Automation License Manager	
BIOS	Basic Input Output System	Basic Input Output System A set of vital software routines used to perform a hardware test after the startup of a computer, to load the operating system and to provide the routines for data exchange between hardware components.
CD-ROM	Compact Disc – Read Only Memory	Removable storage medium for large data volumes
CE	Communauté Européenne	CE label
CoA	Certificate of Authentication	Microsoft Windows Product Key
CoL	Certificate of License	License Key
DC	Direct Current	DC current
DCP	Discovery and Basic Configuration Protocol.	
DHCP	Dynamic Host Configuration Protocol	
DVD	Digital Versatile Disc	Digital versatile disk. Standard that describes a data carrier which is similar to a conventional CD, but allows read/write operations on both sides of the DVD; storage capacity up to 8.5 GB of data.
EC	Embedded Controller	
ESD	Components sensitive to electrostatic charge	
EN	European standard	
EWF	Enhanced Write Filter	
FAT 16 / FAT 32	File Allocation Table 16-bit / 32-bit	File allocation table The table is maintained and managed by the operating system; provides details of the distribution of hard disk data.
FBWF	File-Based Write Filter	
HMI	Human Machine Interface	User interface
IEC	International Electronical Commission	
IF Slot	Interface Slot	
IM	Interface module	
LAN	Local Area Network	Computer network that is limited to a local area.
LED	Light Emitting Diode	Light emitting diode
MMC	Multi-Media Card	
MUI	Multilanguage User Interface	Language localization in Windows

Abbreviation	Term	Meaning
NTFS	New Technology File System	File system that provides access at file level by contrast to FAT, for example.
OPC	OLE for Process Control	
PC	Personal Computer	
PG	Programming device	Compact programming device which meets the special requirements of industry. The PG is fully equipped for programming SIMATIC PLCs.
PS	Power supply	Power supply
PST	Primary Setup Tool	Software for assigning IP addresses
RAM	Random Access Memory	Main or work memory of a computer with direct access, allowing read access to data and editing.
RDP	Remote Desktop Protocol	Network protocol
RTX	Real-time extensions	
SM	Signal module	Signal modules interface the process and the automation system. There are input modules, output modules, input/output modules (in each case, digital and analog)
SNMP	Simple Network Management Protocol	Network protocol
SDK	Software Development Kit	
UL	Underwriters Laboratories Inc.	
USB	Universal Serial Bus	Serial bus with a maximum bandwidth of 480 Mbps with USB 2.0, used to connect I/O devices to a computer. USB can connect up to 127 peripherals, such as external CD-ROM drives, printers, modems, mice, and keyboards, to the system through a single, general-purpose port.
VDE	Verein deutscher Elektrotechniker	
VGA	Video Graphics Array	Video adapter which meets industrial standard; can be used for any commonly available software

Index

S

S7 Modular Embedded Controller, 3
S7-300
    Signal modules, 24
S7-mEC, 3
Safety instructions, 7
Scope, 3
Scope of delivery, 9
Serial number:, 10
Setting up a Remote Desktop Connection, 50
Signal modules
    S7-300, 24
SIMATIC NET 2007, 67
Slot
    MMC, 13
    Multi-Media Card, 18
Software, 80
Standards, 69
Status display
    Controller Panel, 58
    EC31-RTX, 14
STOP, 13

T

Technical data
    EC31, 74
    EC31-RTX, 72
Temperature range, 25

U

Unpacking
    Device, 9
Update
    BIOS, 66
User name, 47

V

Venting slots, 25

W

Warranty, 7
Windows Certificate of Authenticity, 9
Windows XP, 80
Windows XP Embedded
    Closing, 50