SIEMENS

SIMATIC NET

**Information Technology in
SIMATIC S7 with the
CP 343–1 IT / CP 343–1 IT GX20
and CP 443–1 IT**

Manual

Classification of Safety–Related Notices

This manual contains notices which you should observe to ensure your own personal safety, as well as to protect the product and connected equipment. These notices are highlighted in the manual by a warning triangle and are marked as follows according to the level 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 **can** result if proper precautions are not taken.

Caution

with a warning triangle indicates that minor personal injury can result if proper precautions are not taken.

Caution

without a warning triangle indicates that damage to property can result if proper precautions are not taken.

Notice

indicates that an undesirable result or status can occur if the relevant notice is ignored.

Note

highlights important information on the product, using the product, or part of the documentation that is of particular importance and that will be of benefit to the user.

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Safety Instructions Regarding your Product:

Before you use the product described here, read the safety instructions below thoroughly.

Qualified Personnel

Only **qualified personnel** should be allowed to install and work on this equipment Qualified persons are defined as persons who are authorized to commission, to ground, and to tag circuits, equipment, and systems in accordance with established safety practices and standards.

Correct Usage of Hardware Products

Note the following:

⚠ **Warning**

This device and its components 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 and safe operation of this product requires proper transport, storage, installation, and assembly as well as careful operator control and maintenance.

Before you use the supplied sample programs or programs you have written yourself, make certain that no injury to persons nor damage to equipment can result in your plant or process.

EU Directive: Do not start up until you have established that the machine on which you intend to run this component complies with the directive 89/392/EEC.

Correct Usage of Software Products

Note the following:

⚠ **Warning**

This software may only be used for the applications described in the catalog or the technical description, and only in connection with software products, devices, or components from other manufacturers which have been approved or recommended by Siemens.

Before you use the supplied sample programs or programs you have written yourself, make certain that no injury to persons nor damage to equipment can result in your plant or process.

Prior to Startup

Before putting the product into operation, note the following warning:

Caution

Prior to startup you must observe the notes in the relevant documentation. For ordering data of the documentation please refer to the catalogs or contact your local SIEMENS office.

Disclaimer of Liability

We have checked the contents of this manual for agreement with the hardware and software described. Since deviations cannot be precluded entirely, we cannot guarantee full agreement. However, the data in this manual are reviewed regularly and any necessary corrections included in subsequent editions. Suggestions for improvement are welcomed.

Subject to technical change.

Preface

We recommend the following procedure when you want to...

...Use the option of access to S7 stations with existing IT-CPs.

You only require the general information in Chapters 1 and 4. There, you will find information on what is required of your Web browser and the settings you should make.

...Set up the IT-CP for operation and use standard functions.

S7–300 /
S7–400

IT-CP
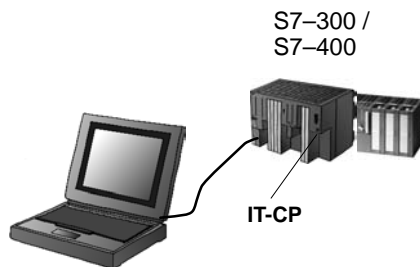
Chapter 1 provides information about network attachment and standard functions.

Chapter 2 deals with the topic of configuration and programming for sending E–mails.

Chapter 3 describes FTP functions for file management.

Chapter 4 introduces the IT–CP with its Web server functionality.

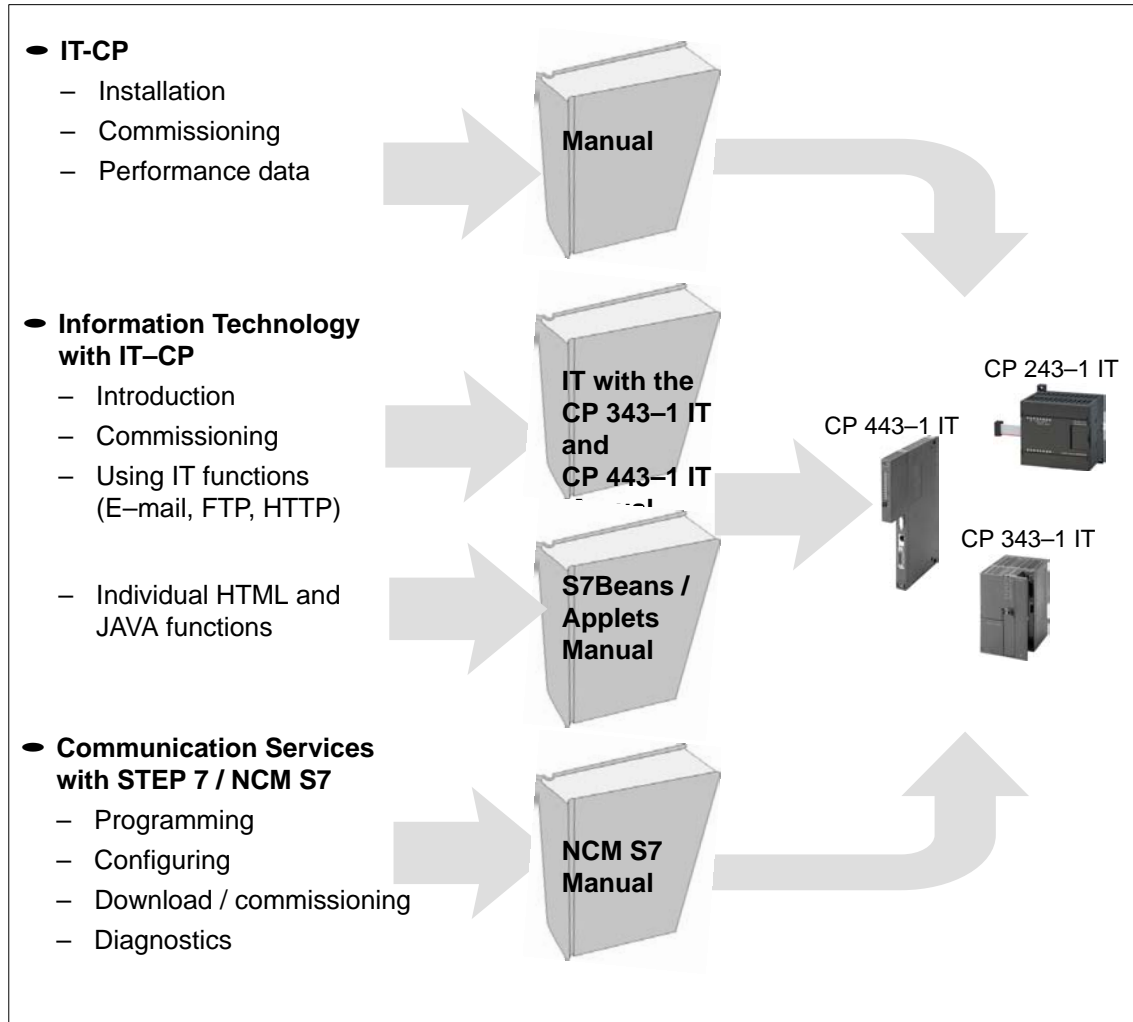### ...Create the displays of information for your processes individually.

You will find some preliminary information in Chapter 4.

The "S7 Beans / Applets for IT–CPs" manual explains the additional functions of the IT–CP. These allow you to create and use HTML pages for individual access and visualization of process data.
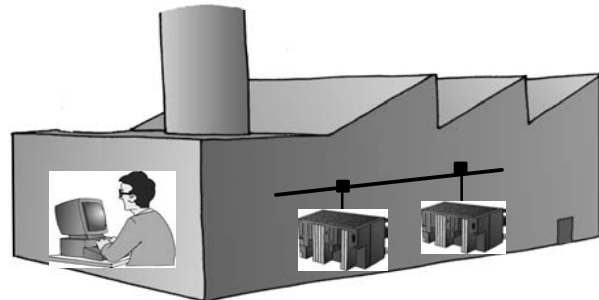
Manuals On the Subject of the IT–CP in SIMATIC

Information technology with IT–CPs in SIMATIC is described in the following manuals:

- **IT-CP**
  - Installation
  - Commissioning
  - Performance data

  Manual

- **Information Technology with IT–CP**
  - Introduction
  - Commissioning
  - Using IT functions (E–mail, FTP, HTTP)

  IT with the CP 343–1 IT and CP 443–1 IT

  - Individual HTML and JAVA functions

  S7Beans / Applets Manual

  CP 443–1 IT
  CP 243–1 IT
  CP 343–1 IT

- **Communication Services with STEP 7 / NCM S7**
  - Programming
  - Configuring
  - Download / commissioning
  - Diagnostics

  NCM S7 Manual

The complete manual and the programming tips are on the Manual Collection CD. This symbol is used at various points in the text to indicate that there is additional information and examples on the Manual Collection CD.

This manual is also part of the NCM S7 for Industrial Ethernet documentation package.

Note

You should also refer to the recommended reading on the topics of the Web, HTML etc. in the appendix of this manual.

New in this version

This version of the manual includes the new functions of the IT–CPs.

This document deals with the following enhancements:

- The standard HTML pages stored on the IT-CP have been extended.

- The file system of the current IT–CPs now consists of volatile and non–volatile memory.

The structure of the document has been streamlined to provide greater clarity:

The IT standard functions such as E–mail, FTP, and HTML system pages are described in this volume.

Other options provided by the Java beans concept and the S7 applets have been moved completely to a separate volume with the title "S7 Beans/Applets". This volume also contains additional programming examples.

You will also find information on the extended functionality of your IT–CP in the device manual /1/.

What You Should Already Know

- To install and start up the module, you should be familiar with the STEP 7 standard software and the use of computers or PCs, for example programming devices, with the Windows operating system.

- To adapt the functions to your requirements, you should also have experience in creating HTML pages.

- To use the module, you only require basic knowledge of handling one of the common Web browsers, for example the Microsoft Internet Explorer or Netscape Navigator. Even for the graphic creation or linking of applets, for example with the JBuilder from Borland, you do not need extensive programming experience.

- The maximum freedom and range of options are open to you if you are familiar with Java and are capable of creating your own Java programs. You will then be in a position to visualize and further process the data collected and transferred over the Web by the IT–CP in your Web browser, and, for example, store or evaluate the data in databases.

Scope of this Manual

These instructions are valid

- from version 5.x of the STEP 7 configuration software with the NCM S7 for Industrial Ethernet option; the new FTP functionality is supported from version 5.1 SP3 and higher.

- for the CP 443-1 IT for the SIMATIC S7-400

- for the CP 343-1 IT for the SIMATIC S7-300

- for the S7BeansAPI version V2.3 or higher

Access to the online help of STEP 7 and NCM S7

With the online help, you can obtain the following information:

- Contents with the **Help –> Contents menu command**

- Context-sensitive help on the selected object using the **Help –> Help menu command,** the **F1 function key** or the **question mark** in the toolbar.

  From the contents page, you can access further information relating to the current topic.

- Glossary for all STEP 7 applications by clicking the **"Glossary" button.**

Please note that each STEP 7 application has its own contents and context-sensitive help.

References /.../

References to further documentation are specified with documentation numbers in slashes /.../. Based on these numbers, you can check the title of the documentation in the list of references at the end of the manual.

❑

Contents

You will find the complete manual and the programming aid on the Manual Collection CD. This symbol indicates places in the text where there is additional information and samples on the Manual Collection CD.

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1 System Overview

To allow you to use the IT functionality of your IT–CP quickly, this chapter provides you with a compact overview of the functions available.

The chapter covers the following topics:

- Possibilities for process control
- Requirements for operation
- Configuring the IT-CP with STEP 7 and NCM S7

1.1 Keeping the Process Under Control Wherever You Are

Opportunities Provided by the IT-CP

With the IT-CP, you have decided to use the advantages of Internet technology in your automation system. For you, this means the following:

- You can use Web browsers available everywhere to call up information from your automation system.

- You can receive information about your plant by E-mail.

- To communicate with the automation system, you can use devices that are generally available everywhere such as mobile telephones or notebooks.

- Whenever necessary, you can obtain information from your process worldwide, even via the Internet.
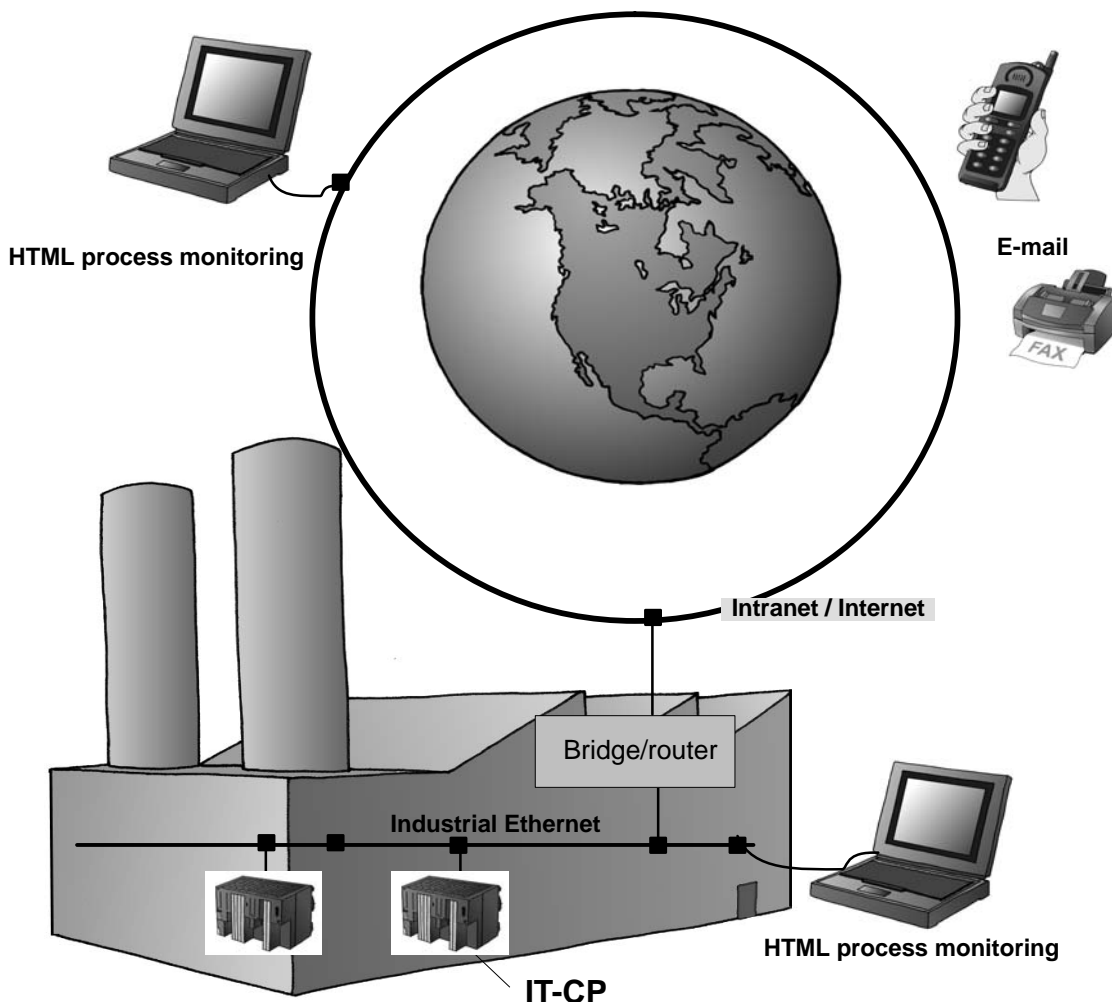
Overview of the Performance of the IT-CP

The IT-CP provides you with the following additional options for creating process control for your automation task:

- **Process communication via Industrial Ethernet**

  With the communication services S7 communication and SEND/RECEIVE interface (including the FETCH/WRITE services), the IT–CP supports communication between PLCs and with PGs/PCs.

- **Sending E-mails**

  The controller is capable of sending messages about process events.

- **File transfer with FTP**

  The IT–CP provides both FTP client and server functionality. You can therefore program the transfer of data blocks in the user program in the S7 station using FTP and exchange data with the S7 station using FTP when working at a PC/PG. The functionality can be distinguished as follows:

  – S7 Station with an IT–CP in the Role of FTP Server

  When working on an FTP client, for example a PG/PC, you can access the files in the file system of the IT–CP.

  or

  When working on FTP client, for example a PG/PC, you can access the data blocks on the CPU of the S7 stations via the IT–CP.

  – S7 Station with IT–CP in the FTP Client Role for CPU Data

  The user program on the CPU can access the IT–CP as an FTP client for the transfer of data blocks from or to an FTP server.

- **Monitoring devices and process data (HTML process monitoring)**

  You use the supplied functions and HTML pages to query important system data using a Web browser.

  To create a more complex information network, you can use the existing system functions (S7 applets and S7 beans) to create your HTML pages, for example, to visualize certain plant configurations and to supply current process values.

Accessing the IT-CP with a Web Browser

The basis of communication via an intranet or the Internet is the Internet TCP/IP protocol that is implemented on the IT-CP. In principle, the following few steps are all that is necessary to make your plant accessible via your intranet or the Internet:

- For intranet and Internet communication

    – Connect the IT-CP to Industrial Ethernet.

    – During configuration of the hardware, assign an IP address to the IT-CP.

- In addition, for Internet communication

    – You connect your manufacturing network to public transmission facilities using suitable connectivity devices, for example a router. Generally, you create access to your own company intranet. This already has the required protection mechanisms on the interface to Internet (firewall).

    For more information on the topic of security mechanisms, refer to our White Paper /2/.

The following sections will explain these steps in greater detail.

1.2 Process Control with Standard Tools

Using the Existing Infrastructure

To operate the IT-CP and to make full use of the functionality it provides, you only need to do the following:

- **Select a mail server**

  To handle data exchange using E-mail, you require a mail server access (for further information on the E-mail function, see Section 2.1).

- **Provide the required tools**

  You use a standard Web browser to display the information and an HTML editor if you want to design your own HTML pages.

  For extended graphics options, use the tools for creating and configuring Java beans such as the Borland JBuilder.

- **Establish a network attachment**

  You require an attachment to your intranet or to the Internet using appropriate Industrial Ethernet devices. Generally, you establish access to your own company intranet since this already has the required protection mechanisms on the interface to Internet (firewall/proxy server).

Guaranteeing Information Security

The access to process data by the IT–CP via Internet brings with it the danger of misuse. You should therefore always protect process data not only with passwords but also by restricting access to your network with suitable security mechanisms.

For more information on the topic of security mechanisms, refer to our White Paper /2/.

Establishing a Network Attachment – Operation with Firewall and Proxy Server

The operation of an internal company network (Intranet) is normally protected against external, uncontrolled access by a firewall. Operation with a firewall is possible if the IP addresses set in the S7 applets can pass through the filter mechanism of the firewall. Check with your network administrator whether a firewall is used and how certain ports can be enabled.

To use the full functionality of the IT-CP, the network administrator must allow breaks in the firewall for certain ports. The following table lists the ports and functions:

Table 1-1

TCP Port to be enabled	Function used	Enabling required for access in direction
80	Access to an HTML page on the IT-CP or on a Web server (the IT-CP or Web server is the HTTP server).	Web browser –> Firewall –> CP
25	Access by the mail client (IT-CP is SMTP client) to a mail server (SMTP server).	CP –> Firewall –> Mail Server
20 and 21	File access: Access to files on the IT-CP using FTP functions (IT-CP is the FTP server or client).	FTP client –> firewall –> CP CP–> firewall –> FTP server

1.3 Security when Accessing Process Data

Multi-Level Password Protection

If you want to exchange process information on the Internet, security plays an important role. Your process data are protected from unauthorized access by multi–level password protection.

It is generally the case that different groups of people require different types of access to process data. For this reason, it is possible

1. to assign different permissions for access to an S7 station.

2. to create additional write or read permissions for process variables themselves. You specify these access rights when you configure the IT–CP (see Section 1.4).

Figure 1-1   Password Query when Opening the "Status" System Page

1.4   Configuring the IT-CP with STEP 7 and NCM S7

Creating a Network Attachment

Like every other S7 module, the IT-CP is configured with STEP 7 hardware configuration (HW Config) in the S7 station. You will find the IT-CP in the catalog of HW Config in S7–300/CP/.. or S7–400/CP/. For more detailed information, refer to the STEP 7 / NCM documentation (see /3/).

You can configure the special properties of the IT-CP in the corresponding tabs of the Properties dialog of the IT-CP as explained in this chapter. You can open the Properties dialog, for example from within HW Config, by double-clicking the module.

Following this, the IT-CP must be networked in the STEP 7 project.

Further Tabs in the Properties Dialog for the IT-CP

In addition to the general tabs such as "Addresses", "Options" and "Diagnostics", the IT-CP also has the following:

- "Users" tab

  Contains the user names, passwords and rights of the authorized users.

- "Symbols" tab

  Contains the symbols or structure elements of a data block defined as a symbol that can be reached via this CP. Using this tab is described in detail in manual /5/.

- "DNS Parameters" tab

  Contains the addresses of the DNS (Domain Name Service). The DNS assigns the Internet address to symbolic addresses. If you prefer to use a symbolic address when you configure your E–mail (see Section 2.2), the absolute address is obtained by querying the DNS specified here.

"Users" tab: Configuring Access Rights
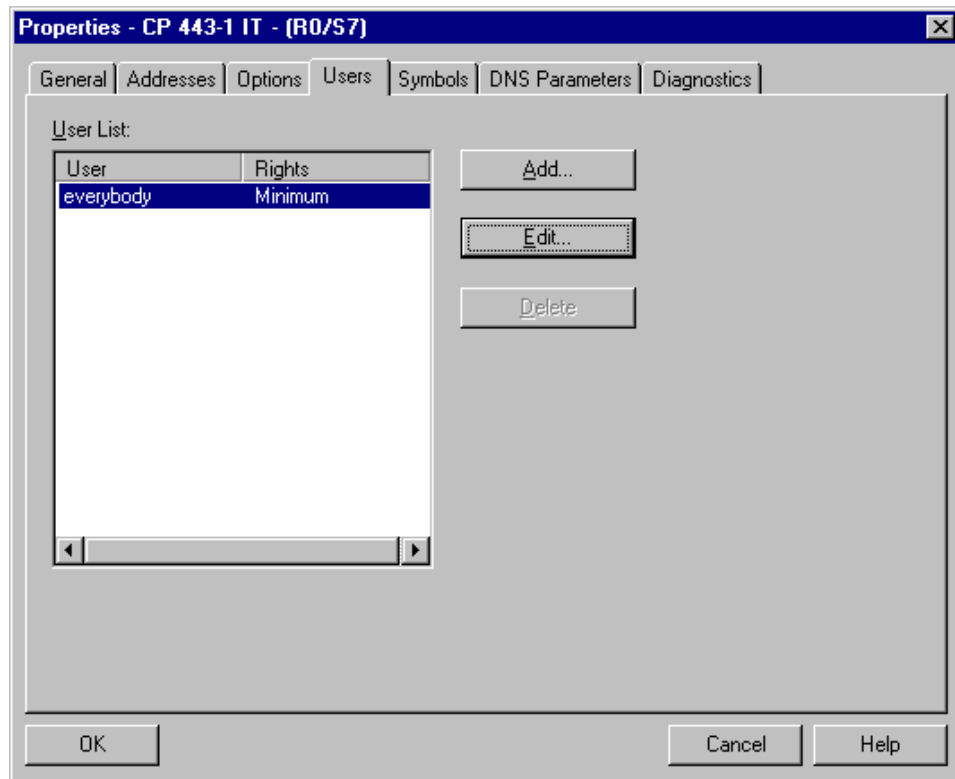
Figure 1-2

In this tab, you specify which users should have which rights.

Under User, you will find a list in alphabetical order with the users already entered for whom a password has already been recorded.

The "everybody" entry is present as default. This cannot be deleted. No password can be assigned to it. As default, no rights whatsoever are assigned to this entry. For service purposes, it is however possible to assign rights. Remember to cancel the rights again following service!

Notice

Make sure that you cancel any access rights assigned to "everybody". Otherwise you allow access to the corresponding services without any authorization whatsoever.

With the "Add" or "Edit" buttons, you display the dialog box in which you can specify or modify rights.

The dialog illustrated shows the possible settings.
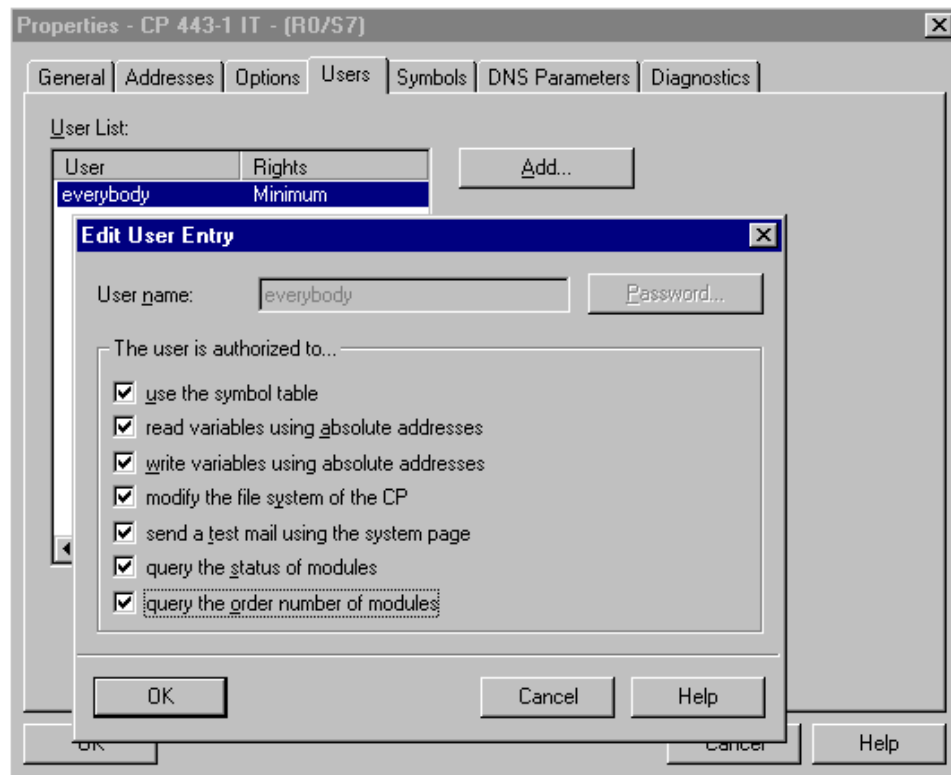
Figure 1-3

Here, select the access rights for the entered user.

- If you select the "Add..." button in the "Users" tab,
  entries are only accepted after a password has been entered.

- If you select the "Edit..." button in the "Users" tab,
  you can modify rights without entering a password.

No password is necessary to delete an entry in the list, you are simply asked for confirmation.

Printing the Configuration Data

The print function of HW Config provides a clear printout of the configuration data created for operation with the IT-CP such as authorization, symbols and other user entries. The following printout is a typical example:

```
SIMATIC                    ICP/SIMATIC 400(1)                    11/10/1998

Rack 0, Slot 5
  Short Name:                          CP 443-1 IT
  Order No.:                           6GK7 443-1GX00-0XE0
  Description:                         CP 443-1 IT(1)
  Location
    Width:                             1
  Comment:
    - - -
  Addresses
    Inputs
      Start:                           512
      Length:                          0
    Outputs
      Start:                           - - -
      Length:                          - - -

  Assigned CPU:                        CPU Number 1 - Slot 3


  User table:

    everybody

    The user is authorized to...
      o use the symbol table
      o read variables using absolute addresses
      o read and write variables using absolute addresses
      o modify the file system of the CP
      o send a test mail using the system page
      o query the status of modules
      o query the MLFB (item no.) of modules

    The user is not authorized to...
      o --
```

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2   Sending Process Messages by E-Mail

This chapter contains instructions on the E−mail functions of the IT−CP.
The following topics are covered:

- What preparations need to be made?

- What options are there for sending E−mails from the IT−CP?

- How can you test the E−mail function?

You can see an outline of the procedures in the flowchart on the following page.

2.1   Overview of the Functions

The Controller Signals Process Events

With the E-mail function of the IT-CP, the programmable controller can send messages containing process information either process-dependent or at specific times.
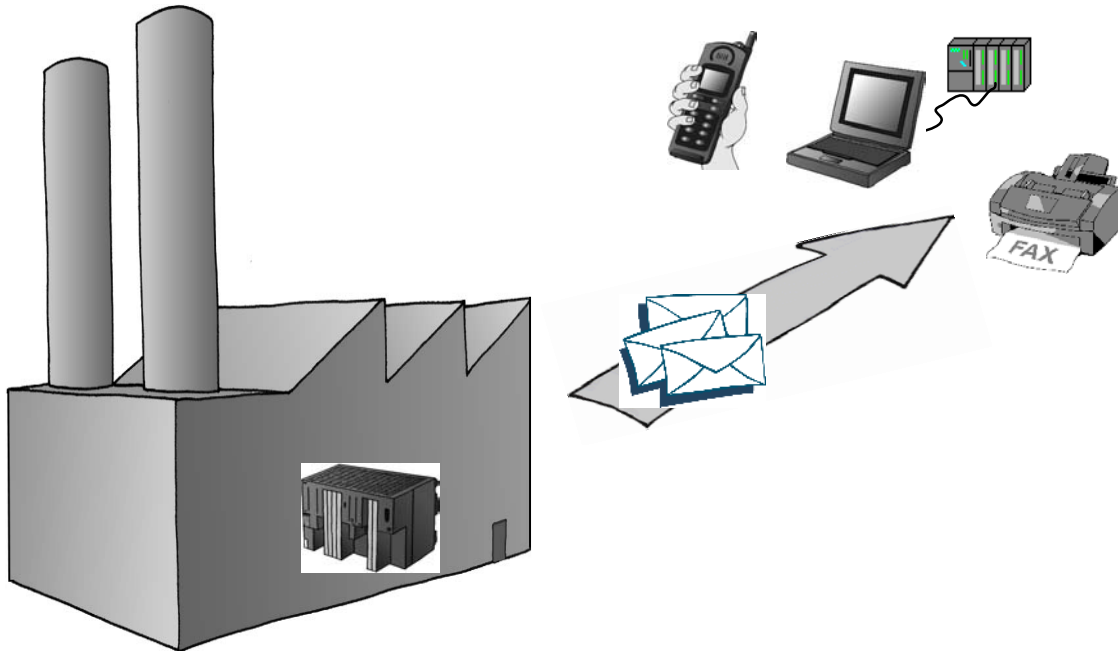
Figure 2-1   Sending E-Mails

As usual with electronic mail, a message can be sent alone or with attachments. The form you choose depends on the amount of data and the properties of the E-mail recipient you are using. It is sometimes necessary to send E-mails with attachments, for example to transfer binary-coded information from the controller for evaluation.

Further features:

- The IT-CP operates as an E-mail client. It supports the SMTP service (Simple Mail Transfer Protocol).

- E-mails can be sent by the programmable controller but cannot be received.

  To send E-mail in the user program of the S7 CPU, use the send call of the SEND/RECEIVE interface (FC AG_SEND / AG_LSEND).

How to...

...follow the steps outlined below:

Clarify the mail server situation
- Is there already an E–mail server in your network environment?
- Who can set up access for the CP?

With STEP 7 and NCM S7 for Ind. Ethernet

Configure the E-mail connection
See Section 2.2

With the Web browser or NCM diagnostics

Check availability: Start/send a test mail
See Section 2.4

Use FC AG_SEND /AG_LSEND

Send E-mails from the user program
See Section 2.3

Receive E–mail on receiving device

- Configure the E-mail connection

  By configuring an E-mail connection you establish a connection between the S7 CPU and the IT-CP for sending E-mails.

- Check availability

  You can check the availability of the E-mail function at any time by initiating a test mail on the IT-CP. For more detailed information, refer to Section 2.4.

- Send E-mails from the user program

  The information to be sent by E-mail including the address information is stored in a data block (DB). The information is sent via the user program using an FC AG_SEND/AG_LSEND.

Mail Server Operation

In principle there are three ways of operating the required mail server. The following table explains the advantages and special features:

Table 2-1

Mail Server Operation	Advantage	Special Features	Steps Necessary
Internal/local You use the mail server software on a PC available in your LAN.	• Fast installation • Inexpensive	• E-mail reception only within the company	• Use of mail server software.
Internal with external connection You use a mail server set up in your intranet that can pass on mails to the outside.	• Use of an existing infrastructure • Output to external devices such as mobile phones, fax possible [1]	• Administrative tasks involved	
External You address a mail server outside your intranet.	• Inexpensive if you do not have your own infrastructure • Output to external devices such as mobile phones, fax possible [1]		• Register with provider • Make a router available

[1] Sending E–mails to mobile phones or to fax devices is possible using "SMS/Fax Gateway". How to address the gateway and to enable the recipient depends on the particular service provider.

Configuring a Mail Server and Addressing Recipients

Addressing the recipient takes two stages:

- Configured Mail Server Address
  You specify the address of the mail server when you configure the connection. For this configuration, you must know the IP address (absolute or symbolic) of the mail server.

  In the following schematic, one possibility is assumed, namely that of a mail server connected to your intranet (see Table 2-1; Mail server operation "internal with external connection") .

  Example: server.local

- Programmed recipient address
  You specify the recipient address in the data block in the user program in which the E-mail is prepared.

  Example: plant.control@provider.com
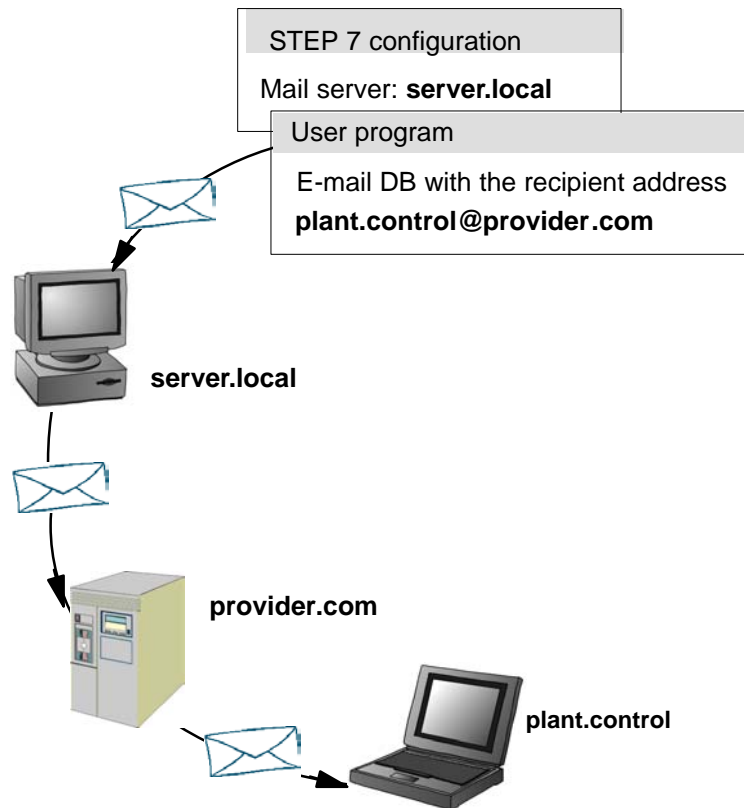
Figure 2-2

2.2   Configuring an E–Mail Connection

Overview

To send E-mails, **one** E-mail connection must be set up per IT-CP. The E-mail connection specifies the E-mail server via which all the mails sent by the IT-CP are delivered.

You can set up an E–mail connection as follows:

- During connection configuration in STEP 7 (standard application)

  This situation is described below.

- In the user program with FB CP_CONFIG and the configuration data block.

  There are situations in which it is an advantage to set up the communication connections not over the configuration interface of STEP 7 but rather program–controlled by specific applications.

  This situation is described in detail in the NCM S7 for Ind. Ethernet manual /3/.

Requirement

You can set up an E-mail connection after the IT-CP has been configured in the station with STEP 7 HW Config.

How to Configure an E–mail Connection

Creating a new connection with STEP 7 is described in detail in the NCM S7 for Industrial Ethernet manual and in the online help. In contrast to other types of connection, follow the steps outlined below:

1. Select the connection type E-mail in the "New Connection" dialog. As the connection partner, select "(Unspecified)" or "Other station".

2. Select the Option "Open Properties Dialog" and confirm your entry.

3. Select the Addresses tab in the Properties dialog and specify the address parameters.

Properties - E-Mail Connection

General | Addresses | Overview | Status Information

To address the E-mail server (SMTP), you can use both an alias and a decimal IP address.

	Local	E-mail server (SMTP)
IP address:	140.80.0.2	140.80.0.2
PORT (dec):		25

Default sender address: station2.CPU@xy.company.de

OK   Cancel   Help
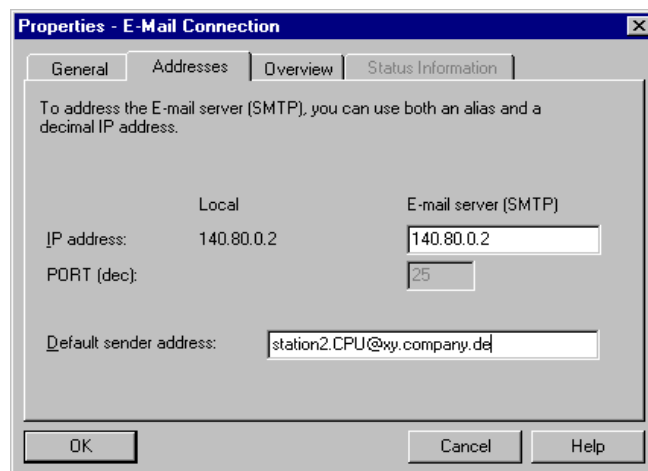
Table 2-2   Available Parameters

Parameter	Description	Examples:
E-mail Server – IP Address	Address of the mail server via which the E-mails are sent. You can specify an absolute or alias IP address. The use of an alias assumes that the IT-CP knows the address of the domain name server (DNS). This entry must be made when configuring the IT-CP in HW Config; For more detailed information refer to the STEP 7 online help.	• absolute: 140.80.0.4 • As an alias: mail.compuserve.com
Default sender name	Specifies an address that is always inserted in the E–mail as the sender address if the sender information (FROM parameter) is empty in the header of the E–mail (DB, refer to Section 2.3). A maximum of 126 characters can be specified.	Station2.CPU412@xy.company.de

4. Confirm your entry and close the dialog. After downloading the configuration data, the user program can send E-mails on this E-mail connection.

2.3   Sending E-Mails

Overview

To send an E-mail:

- ➡ Prepare the E-mail data in a data block.
- ➡ Use the function (FC) AG_SEND or AG_LSEND in the user program.

Requirements

You can send E-mails if the E-mail connection was set up in the connection configuration with STEP 7 (see Section 2.2). You use the ID specified in the connection configuration for the FC AG_SEND/AG_LSEND call.

Data Block

The entire E-mail, in other words, the address information and the message itself, is put together in a data block. Below, you will find an example of the DB structure required based on an example in STL notation.

Use the LAD/FBD/STL editor for creating and entering the DB data.

Table 2-3   E-Mail Data Block in STL Notation in STEP 7

Address	Name	Type	Initial value	Comment	Entry
0.0		STRUCT			
+0.0	TO[1]	STRING[40]	'TO:name.name@t–online.de;'	Recipient	Mandatory
+42.0	CC[1]	STRING[40]	'CC:name.name@t–online.de;'	CC recipient	optional
+84.0	FROM	STRING[40]	'FROM:plant.works2@xyz–online.de;'	Sender	optional
+126.0	SUB	STRING[40]	'SUB:Status Station 7;'	Topic	optional
+168.0	Text	STRING[100]	'TXT:Fault in plant Sector 2;'	Mail text	Mandatory

Table 2-3   E-Mail Data Block in STL Notation in STEP 7, continued

Address	Name	Type	Initial value	Comment	Entry
+270.0	Attach ment	STRING[4]	'BNY:'	The attachment is introduced here[3]	optional
+276.0	Value1	BYTE	**B#16#27**[2]	Plant/binary value[3]	optional
+277.0	Value2	BYTE	**B#16#03**[2]	Plant/binary value[3]	optional
=278.0		END_STRUCT			

1) Several recipients can be specified. In this case, separate recipients by a comma.
2) The information shown in bold face is sent to the recipient as an attachment.
3) (Data can also be supplied dynamically)

Notes on Table 2-3:

- Structure and syntax of the data in the E-Mail DB

    The structure suggested here with several STRINGs is one of several variations. The entries in the "Initial value" column with the IDs (TO:, SUB:, CC:, FROM:, TXT:, BNY:) are decisive. These must be used with exactly this syntax in the DB to identify the mail contents! All the entries must be completed with a semicolon; no semicolon is permitted after the last entry.

    The string length indicated in the table is only an example; it can be adapted to the actual number of characters (exception: the string length for the plant identifier must be specified as [4]).

    Another variation, could be, for example, to use only one STRING and to assign the entire text with the IDs.

- If you have problems entering the @ character, use ALT+64.

- Attachments

    The user data entered in the E-mail DB can be sent to the recipient entirely or in part as an attachment. The sender must assign the 'BNY:' ID to the data.

    The data specified after this ID are sent to the recipient as an attachment.

    In Table 2-3, the plant is two bytes long; this is purely an example! Plants of any complexity can be entered.

- Data Length

    The data length specified in the AG_SEND/AG_LSEND call must be at least the length of the data in the DB; Note the information in the address column in the STL editor (the information is the number of bytes).

Sending E-Mail with AG_SEND/AG_LSEND [1]

Use FC AG_SEND (FC 5) to send an E-mail or with data lengths >240 bytes, use AG_LSEND (FC 50). For a detailed description of the call parameters, refer to /3/.

Example:

```
STL                                      Explanation

call fc 50                               //AG_LSEND block call
ACT     :=      M 10.0                   //Bit for triggering job
ID      :=      MW 12                    //Connection ID (connection configuration)
LADDR   :=      W#16#0100                //Module address 256_Dec. In HW configuration
SEND    :=      P#db99.dbx10.0 byte 278, //Address of the data block; DB length
LEN     :=      MW 14                    //Length of the data area to be sent
DONE    :=      M 10.6                   //Address for return parameter DONE
ERROR   :=      M 10.7                   //Address for return parameter ERROR
STATUS  :=      MW 16                    //Address for return parameter STATUS
```

Note

The STATUS parameter only provides information about the sending of the E–mail (mail arrived at the configured mail server); the parameter does not provide any information as to whether the E–mail arrived at the recipient.

[1] Notes on the FCs for S7–300 and S7–400

- S7–300:

  With older versions of the Ethernet CPs, the data length per job is restricted to less than or equal to 240 bytes (this applies up to block version V3.0 of AG_SEND / AG_RECV);. with later versions, large amounts of data (up to 8192 bytes) can be transferred using FC AG_LSEND or DC AG_LRECV.

  With the current versions of the IT–CPs (6GK7 343–1GX11–0XE0 as of version 1 / as of firmware version V2.0 and 6GK7 343–1GX20–0XE0), only the FCs AG_SEND and AG_RECV are used; due to a new, more efficient internal protocol, data up to 8192 bytes can be transferred.

- S7–400:

  With FC AG_SEND / AG_RECV, the data per job is restricted to less than or equal to 240 bytes.

  Larger data records (up to 8192 bytes) can be transferred using FC AG_LSEND or FC AG_LRECV.

Please refer to the device manual of the S7–CP you are using /1/ for the supported data range. You will find an overview of the versions of the FCs/FBs in the documentation and block history.

2.4 Testing the E-Mail Function

Purpose and Possibilities

With E-mail functionality, you make your programmable controller capable of sending specific up-to-date information from the process at any time.

To allow you to check that E-mail is functioning correctly at any time, you can initiate a test mail. The following mechanisms are available for the test mail:

- Test mail using the Web browser
- Test mail using NCM diagnostics

Both tests are triggered on the CP which means that the tests do not indicate whether or not there is an E–mail connection between the CPU and CP. If this was configured incorrectly, it is not possible to send E–mails from the user program.

Conclusions Drawn from Receiving a Test Mail

If the test mail is received, you can conclude the following:

- The IT-CP is ready to send E-mails
- An E-mail connection is established that can be used by the user program.
- The recipient specified in the request is available.

You cannot draw conclusions about the following:

- The status of the user programs in which the sending of E-mails is started by calling FC AG_SEND/AG_LSEND
- The time required from a mail being sent until it is received.

Note:

E–mail is an unreliable service. It is therefore possible that an E–mail does not arrive. The reception of a test E–mail is only a temporary indication that the connection is working and is no guarantee that it will work at other times.

Triggering a Test Mail with the Web Browser

The "Test–Mail" (/SYS/SendMail.htm) system page allows you to specify a test mail in your Web browser and to trigger the sending of the mail on the IT–CP (see also Section 4.3).
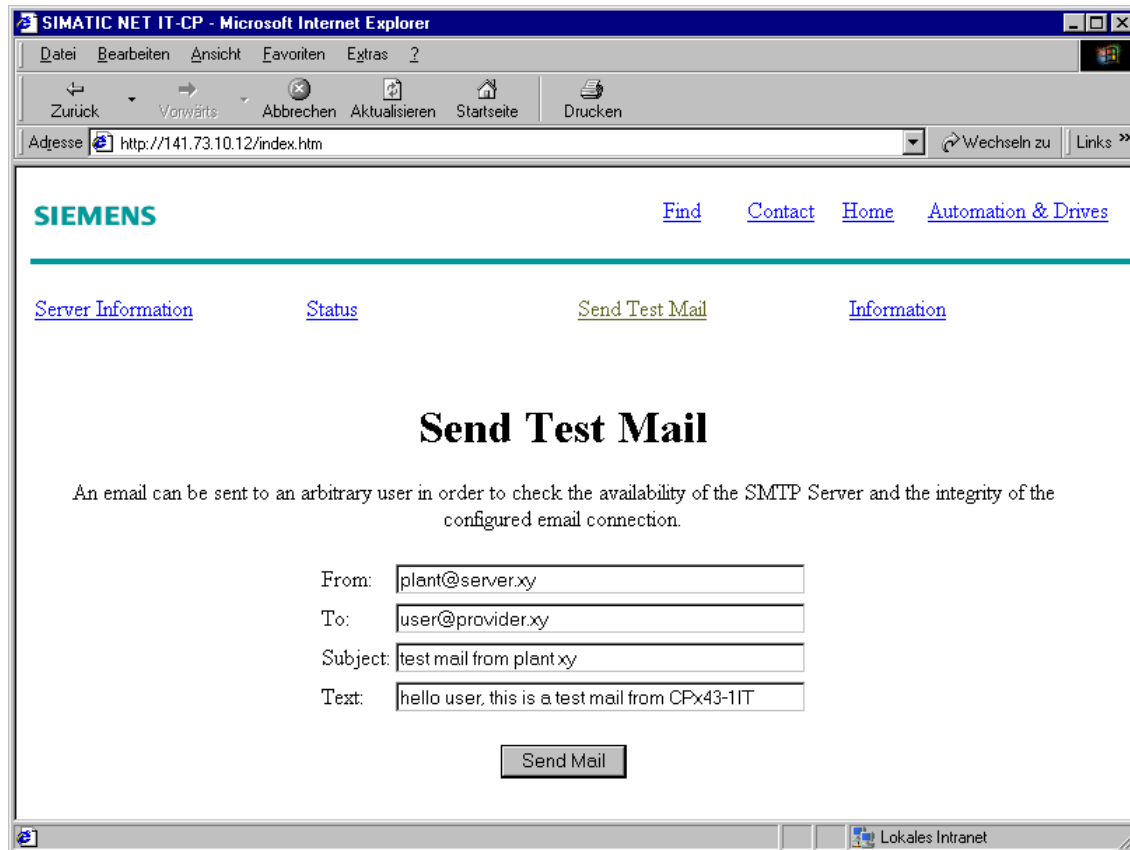
Figure 2-3

Immediately after sending the test mail you receive a message indicating whether the mail could be transferred to the configured mail server.

Remember the following restrictions regarding input in the fields:

- Length (TO) < 128 characters
- The rule for the total length is:

    Length (FROM) + Length (TO) + Length (SUBJECT) + Length (TEXT)
        < 220 characters

Requesting Test Mail with NCM Diagnostics

In the "E-mail" tab of NCM diagnostics, you can also specify and trigger a test mail. To do this, you require an online connection between you PC/PG and your S7 station.

NCM diagnostics can be called either directly from the Windows Start menu "Industrial Ethernet Diagnostics" or using the Properties dialog of the IT/CP in the "Diagnostics" tab.

When you select the menu command **Options ▶ Send E–mail**, a test mail is sent to the specified address.
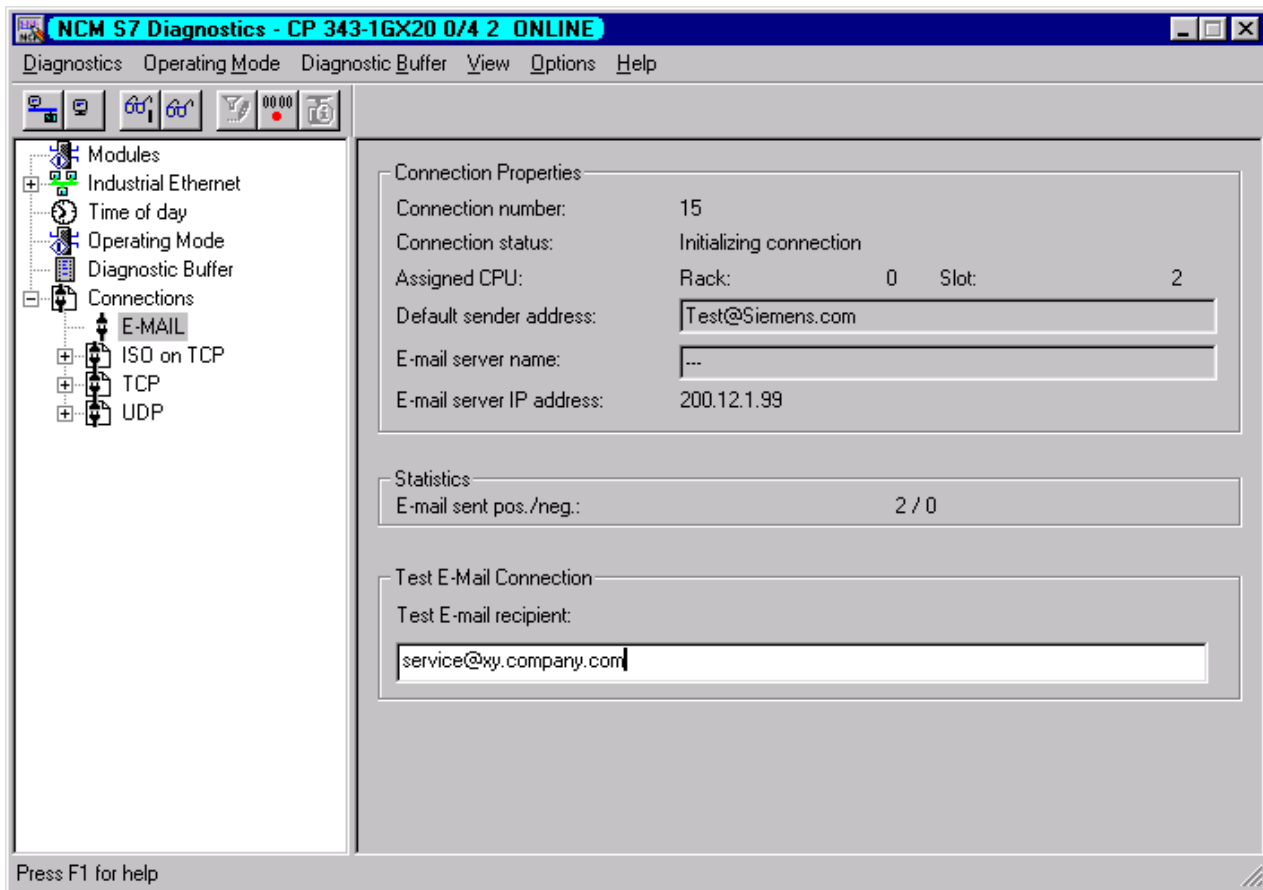
Figure 2-4

For further information about working with NCM diagnostics, refer to the NCM S7 for Industrial Ethernet manual /6/ and the online help.

❑

3 File Management and File Access with FTP

With its file transfer functions (FTP), the IT–CP provides a useful tool for transferring files to and from your S7 station.

Files can be transferred both from the PG/PC to the S7 station or initiated by the S7 station to an FTP server; this could be, for example, a PC/PG station or another S7 station.

This chapter will familiarize you with the FTP client and FTP server functionality of the IT–CP in the S7 station.

The chapter also includes a detailed description of the FCs you require for file transfer functions in your S7 station.

Note

We recommend that you always use the current block versions for all module types.

You will find information on the current block versions and the current blocks to download from the Internet in our customer support.

http://www4.ad.siemens.de/view/cs/de/8797900

Entry ID: 8797900

With the older module types, this recommendation assumes that you are using the latest firmware for the particular block type.

3.1 FTP Functions in an S7 Station with the IT–CP

Range of Functions

The FTP functions of the IT–CP support both FTP client and FTP server functionality on the S7 station.

S7 Station with an IT–CP in the Role of FTP Server

The server role can be divided into two distinct functions:

- **The IT–CP as FTP server for the file system on the IT–CP**

  You can access the files of the file system on the IT–CP (CP 443–1 IT / CP 343–1 IT) from an FTP client, for example a PG/PC. These files are made up mainly of the HTML pages intended for display in the Web browser.
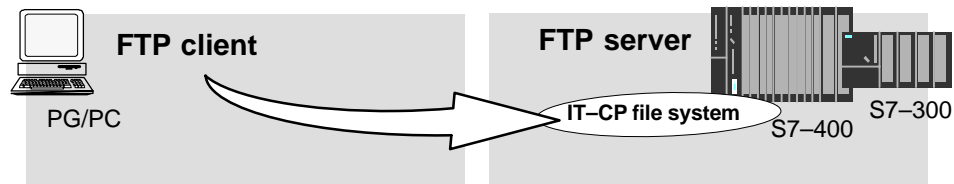
- **The IT–CP as FTP server for CPU data**

  When working on FTP client, for example a PG/PC, you can access the data blocks on the CPU of the S7 stations via the IT–CP.
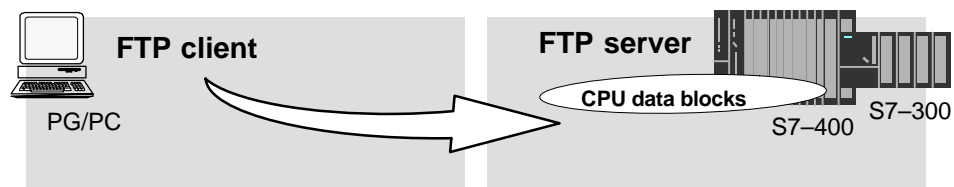
S7 Station with IT–CP in the FTP Client Role for CPU Data

The user program on the CPU can access the IT–CP as an FTP client for the transfer of **data blocks** from or to an FTP server.
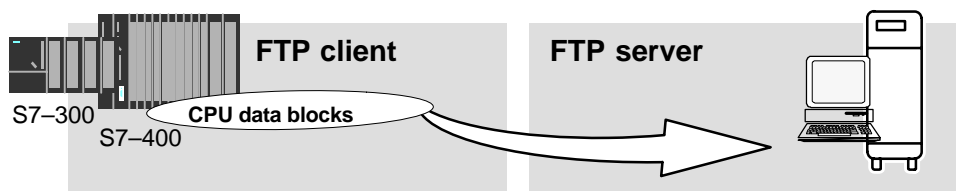
3.2 The IT–CP as FTP Server for the IT-CP File System

3.2.1 How it Works

The IT-CP manages the predefined HTML system pages as well as the HTML pages you have created yourself in a special memory area.

Using FTP (File Transfer Protocol) you have standardized access to the files managed on the IT-CP.
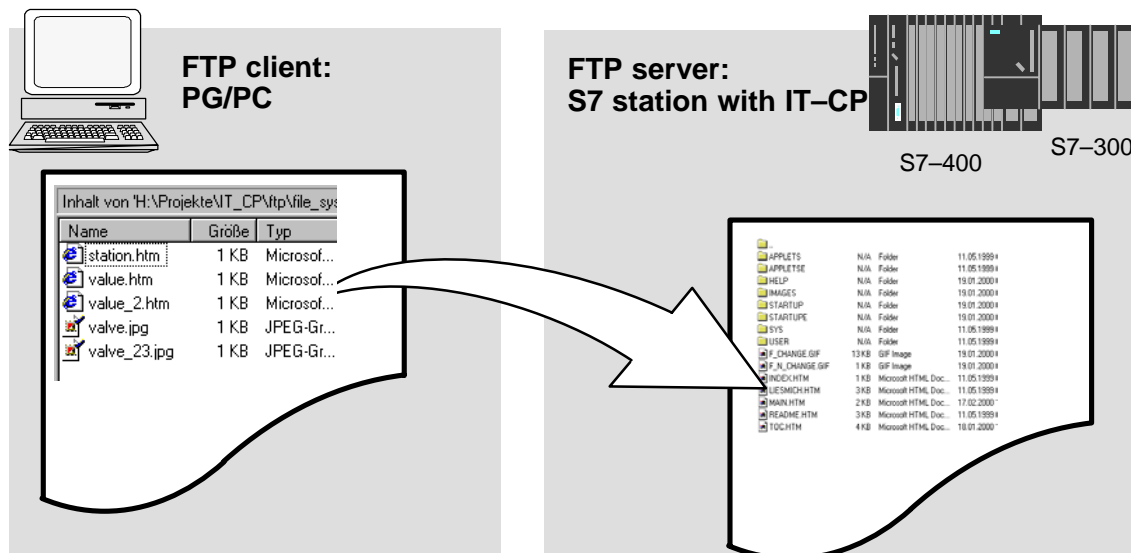
The following screen shot is an **example** of a typical access sequence in the MS–DOS window:

3.2.2 File System – Structure and Features

Structure of the File System on the IT–CP as Shipped

When accessing using an FTP tool, the file system of the IT–CP appears as follows:
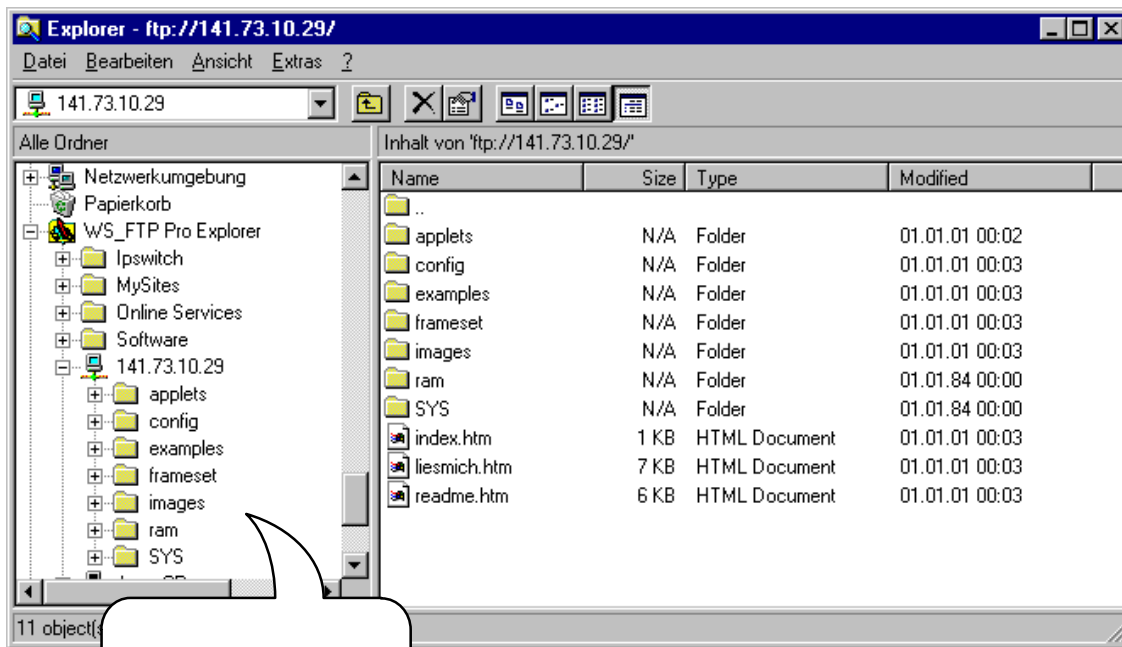
Figure 3-1

Memory Areas

On the current IT–CPs, the file system is divided into 2 areas:

● Flash area (non–volatile memory):

The flash area allows data to be stored and retained if there is a power down.

Since the number of times it is possible to write to this area is restricted, you should avoid repetitive write operations to this area, when such operations are necessary, write to RAM.

● RAM area (volatile memory):

In contrast to the flash area, the RAM can be written to and read from any number of times. The data in the RAM are retained as long as the IT–CP is supplied with power.

The RAM is intended to store data that change during operation and need to be recorded (data recording services). The RAM is also suitable for temporary storage.

The RAM is located in the file system below the "/ram" folder. All files and folders below this folder are lost when there is a power down.

The "Server Information" system page of your IT–CP informs you of the memory available in your file system and other operating data (see Section 4.3) and the manual for your IT–CP /1/.

Available Storage

The currently available storage space in flash and RAM is displayed in the "Server Information" system page (see also Section 4.3).

Files are protected by Access Rights

Chapter 1.3 explains the security mechanisms governing information exchange using a Web browser. Chapter 1.4 explains how access rights are created when you configure the IT-CP.

The IT-CP reacts to file access using FTP according to the access rights; in other words you must authorize the access using a password. The specified user must also have the right to access files on the S7 station with FTP (see Section 1.4).

Notice

Remember that using the "everybody" user name, access is possible without a
password, however this user name normally has no access rights.

File Access with FTP Tools

Depending on your requirements, you can use different methods and tools for FTP
access.

- **Special FTP Tools**

  Special FTP tools are available that allow convenient use of FTP commands.
  Generally, working with these tools is very similar to working with the Windows
  Explorer. This means that you will use functions such as copying, moving or
  deleting files intuitively rather than having to worry about the syntax of FTP
  commands. You will only need the MS DOS prompt occasionally.

Notice

Please note that the file names in the file system described here are
case–sensitive.

⋅ **MS DOS Prompt**

In the MS DOS prompt of Windows, you can establish an FTP connection and then execute all the FTP commands supported by the IT-CP.

The following example shows how you can find out which FTP commands are available using the 'quote help' command.

```
MS-Dos - ftp 142.11.49.69

c:\>ftp 142.11.49.69
Verbunden zu 142.11.49.69.
220 CP 443-1 IT FTP-Server V1.02 ready for new user
Benutzer (142.11.49.69:(none)): ftpadmin
331 User name okay, need password.
Kennwort:
230 User logged in, proceed.
Ftp> remotehelp
214-The following commands are recognized (* =>'s unimplemented).
      USER      PWD      LIST      RETR      MODE      REST      APPE*
      PASS      MKD      NLST      STOR      STRU      ABOR      REIN*
      QUIT      RMD      RNFR      PORT      HELP      NOOP      SITE*
      CWD       XMKD     RNTO      PASV      STAT      ACCT*     SMNT*
      CDUP      XRMD     DELE      TYPE      SYST      ALLO*     STOU*
214 End of help.
Ftp> _
```

Figure 3-2

Notice

If the FTP connection to the FTP server of the IT–CP is not used, the IT–CP closes down the FTP connection after some time.

3.3   The IT–CP as FTP Server for S7 CPU Data

3.3.1   How it Works

The functionality described here allows you to transfer data in the form of files to data blocks or from data blocks of an S7 station using FTP commands. At the same time, the conventional FTP commands for reading, writing and managing files can also be used.

For FTP transfer, you therefore create data blocks in the CPU of your S7 station that are known as file DBs due to their special structure.

When the IT–CP in the FTP server role receives an FTP command, it checks a file allocation table (file_db.txt) to find out how the data blocks used on the S7 station for file transfer are mapped to files.

Using the information in the file allocation table, it is possible to address data blocks in one or more (up to 4) CPUs on an S7 station.

FTP client:
PG/PC

Inhalt von 'H:\Projekte\IT_CP\ftp\S7-Station_12'

Name	Grö...	Typ
DB127.dat	1 KB	DAT Datei
DB244.dat	1 KB	DAT Datei
DB30.dat	1 KB	DAT Datei

FTP server:
S7 station with IT–CP

File allocation table
file_db.txt

cpu1db30
cpu1db127
...

File DBs

DB30
DB127
DB244

Header

User data
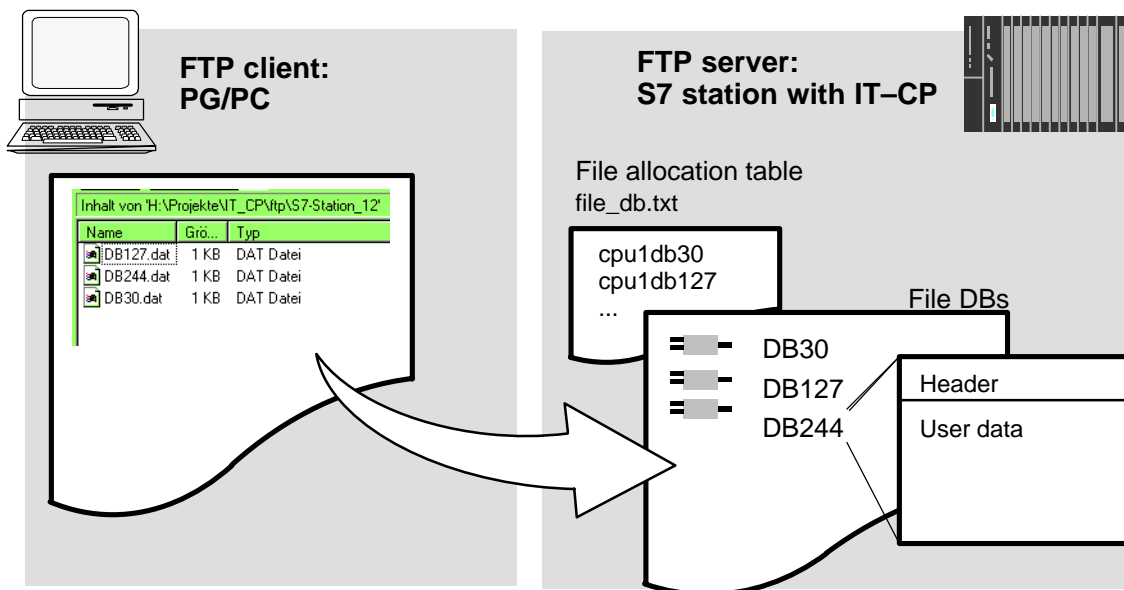
3.3.2   FTP Commands on the FTP Client

Example of Access

The following screen shot shows an example of a typical access sequence in the MS–DOS window.


```
MS-Dos - ftp 141.73.10.33                                    _ □ ×

c:\>ftp 141.73.10.33
Verbunden zu 141.73.10.33.
220 CP 443-1 IT FTP-Server V1.06 ready for new user
Benutzer (141.73.10.33:(none)): ftpadmin
331 User name okay, need password.
Kennwort:
230 User logged in, proceed.
Ftp> dir /cpu1
200 Command okay.
150 File status okay; about to open data connection.
-r--r--r--    1 root root          740 Sep 13 14:14 cpu1db20
-rw-rw-rw-    1 root root          987 Aug 28 14:16 cpu1db30
--w--w--w-    1 root root        64000 Mar 18  2001 cpu1db40
226 Transfer ok. Closing data connection.
183 Bytes empfangen in 0,04 Sekunden (4,58 KB/s)
Ftp> get cpu1db30
200 Command okay.
150 File status okay; about to open data connection.
226 Transfer ok. Closing data connection.
987 Bytes empfangen in 0,15 Sekunden (6,58 KB/s)
Ftp>
```

How typical FTP functions use the permitted FTP commands

The following table shows which FTP commands can be executed to access file DBs on the CPU. The table also shows which FTP functions are used for these FTP commands in typical input consoles such as the MS–DOS prompt.

Table 3-1

Typical FTP Functions						FTP Command	Meaning
open	dir	put	get	close	del		
x						user	Login
x						pass	Authorization by password
	x	x	x			port	
	x					list	Lists the file DBs in the addressed CPU.

Table 3-1   , continued

Typical FTP Functions						FTP Command	Meaning
open	**dir**	**put**	**get**	**close**	**del**		
					x	dele	Deletes a file DB by setting the EXIST bit in the file DB header to "0".
			x			retr	Reads the user data in the specified file DB into the specified file on the FTP client.
		x				stor	Transfers the specified file from the FTP client to the user data area in the specified file DB.
				x		quit	Closes down the current FTP connection.

Note

You cannot use a "rename" FTP command with the file DBs.

How FTP Commands are Executed on the IT–CP

To illustrate how the FTP interface to the file DBs on the CPU works, the execution sequence is explained below based on the example of the stor command.

The FTP server on the IT–CP executes the sequence shown below:

1. Identifies the addressed file DBs based on the entry in the file allocation table.

2. Checks the bits in the file DB header (see Section 3.3.4); the write function is executed only when the following applies:

   LOCKED bit = 0
   NEW bit = 0
   WRITEACCESS bit = 1

3. Writes the file content to the user data area of the file DB on the CPU. At the beginning of the write function, the LOCKED bit is set and reset when writing is completed.

4. When the write function is completed, the NEW bit is also set in the file DB header and the current date entered in the DATE_TIME field.

5. The FTP server sends a message about the file transfer event to the FTP client.

Notice

If you specify a file for the transfer that is **not** included in the file allocation table, the requested file system operation is executed on the current folder.

Transfer Mode for File Transfer

File transfer only uses the binary mode.

3.3.3   File Allocation Table

Meaning

In the FTP server role, the IT–CP requires information on how the data blocks used in the S7 station for file transfer are mapped to files. You store this file assignment table in the **file_db.txt** file in the file system of the IT–CP.

Structure

The file allocation table contains two areas in which the assignments are entered row–oriented as shown in the example below:

- Rack/slot assignment of the CPU
- DB assignment

Notes on the Syntax

- Relevant rows can be recognized by the character string "cpux" (where x = a character "1–4"); this applies to both areas.

Notice

Please note the use of lower–case letters. The files will otherwise not be recognized.

Please use a text editor that does not create invisible control characters or save the data in the TXT mode so that no invisible control characters are stored.

- Valid separators for the entries are "blanks" or "tabs".
- All other characters are interpreted as comment characters.
- The rules for the file names of a file DB are as follows:
    - Length: Maximum 64 characters
    - Permitted characters: Letters "A–Z,a–z"; numbers "0–9", "_", "."
- Row length: Maximum 256 characters

Example:

```
# CONFIGURATION FILE for file transfer between an FTP client of a remote system
# and an S7–CPU using the FTP server of the IT–CP

# This is an ASCII file and may be edited.
# This file must be located in the directory "/config" of the file system
# of the IT–CP. Its file name must be "file_db.txt" (all lowercase).

# All lines that do not begin with "cpu" (lowercase AND no leading blanks)
# are interpreted as comment.
# Maximum length per line is 256 characters.
# Delimiters are (one or more) blanks or tabs.

# The following table defines the rack and slot of the CPU(s).
# Definitions of "cpu1", "cpu2", "cpu3" and "cpu4" are allowed.

# CPU      Rack     Slot
# ———————————————————————————————
cpu1      0      4
cpu2      0      7


# The following table defines pairs of file names and file DBs in the CPU.
# The maximum number of pairs is 100.
# The file name must begin with "cpuX" (where X = 1, 2, 3 or 4).
# Note that "cpuX" must be defined in the table above!
# The file name must consist of the characters "a–z", "A–Z", "0–9", "_" or "."
# It must not include a path. The maximum length of a file name is 64 characters.

# File Name        File DB Number
# ———————————————————————————————————————————
cpu1db20              20
cpu1db35              35
cpu2_test.dat          5
```

Rack/slot assignment

DB assignment

In the example shown here, the FTP command

> C:> PUT   s7daten.txt   cpu1db35

is used to transfer the s7daten.txt file to DB35 (file DB) that must be located on CPU1.

How to Create and Manage the File Allocation Table

The file **file_db.txt** is located in the file system of your IT–CP in the folder **/config**. You can upload the file as originally shipped with your CP to your PG/PC and use it as a template for your application.

You can manage this file with the normal FTP commands as described in Section 3.2 for the IT file system.

If the file **file_db.txt** does not exist, it is not possible to access file DBs using the FTP server of the IT–CP. After editing the file and transferring it to the file system of the IT–CP, you should therefore make sure that the transfer was successful.

If both the transfer and syntax were correct, the following message is displayed:

```
"226 Transfer ok; closing data connection"
```

If the syntax is incorrect, a message similar to the one shown below will be displayed:

```
"450 Requested action aborted – configuration file error in line 16"
```

If an error was reported, check your system configuration and repeat the transfer. You can check your configuration with the following command:

```
ftp> dir cpux    (where x = 1-4)
```

Notice

Please note the use of lower–case letters. The files will otherwise not be recognized.

Example

```
MS-Dos - ftp 141.73.10.12                                    _ □ ✕

c:\>ftp 141.73.10.12
Verbunden zu 141.73.10.12.
220 CP 443-1 IT FTP-Server V1.04 ready for new user
Benutzer (141.73.10.12:(none)): ftpadmin
331 User name okay, need password.
Kennwort:
230 User logged in, proceed.
Ftp> dir
200 Command okay.
150 File status okay; about to open data connection.
total 7
drwxrwxrwx   1 root root                0 Jan  1  1994 .
drwxrwxrwx   1 root root                0 Jan  1  1994 ..
drw-rw-rw-   1 root root                0 Jan  1  1994 applets
drw-rw-rw-   1 root root                0 Jan  1  1994 config
drwxr-xr-x   1 root root                0 Jan  1  1984 ram
dr-xr-xr-x   1 root root                0 Jan  1  1984 SYS
dr--r--r--   1 root root                0 Sep 13 14:49 cpu1
226 Transfer ok. Closing data connection.
406 Bytes empfangen in 0,07 Sekunden (5,80 KB/s)
Ftp> dir cpu1
200 Command okay.
150 File status okay; about to open data connection.
--w--w--w-   1 root root            64000 Mar 18 11:11 cpu1db20
-r--r--r--   1 root root              740 Sep 13 14:14 cpu1db30
-rw-rw-rw-   1 root root               40 Aug 14 17:08 cpu1db40
lrw-rw-rw-   1 root root              987 Aug 28 14:16 cpu1db20
----------   1 root root                0 Sep 13 14:49 cpu1db30
226 Transfer ok. Closing data connection.
370 Bytes empfangen in 0,10 Sekunden (3,70 KB/s)
Ftp>
```

In contrast to a directory listing of the file system, when the CPU folders are configured, not only the file name is displayed but also the number of the corresponding file DB.

Meaning of the Flags of "cpu" Folders with the dir Command:

- –r– –r– –r– – (read flag) :

  If this flag is displayed, the EXIST bit is set in the file DB. It is possible to read this file DB as long as the LOCKED bit is not set.

- – –w– –w– –w– (write flag):

  If this flag is displayed, the NEW bit is not set in the file DB and the WRITEACCESS bit is set. It is possible to write to this file DB as long as the LOCKED bit is not set.

- l– – – – – – – – – (locked flag):

  If this flag is displayed, the LOCKED bit is set in the file DB. Neither reading nor writing the file DB is possible. If the "r" or "w" flags are set in addition to this flag, this means that reading or writing will be possible if the LOCKED bit is cleared.

If a file DB does not physically exist but is configured in the file allocation table "file_db.txt", all the flags are reset in the display (display: – – – – – – – – – –) and the file size is indicated as 0 bytes.

Note

It is possible to change from one folder to another on the CPU. Remember, however, that only the commands listed in Table 3-1 can be executed.

3.3.4 Structure of the Data Blocks (File DB) for FTP Services

How the Function Works

To allow the transfer of data with FTP, you create data blocks (file DBs) in the CPU of your S7 station. These data blocks must have a specific structure so that they can be used as transferable files by the FTP services. These blocks consist of the following sections:

- **Section 1**: File DB header (has a fixed length (20 bytes) and structure)
- **Section 2**: User data (variable length and structure)

File DB Header for FTP Server Operation

Note: The file DB header described here is largely identical to the file DB header for client operation described in Table 3-4; the differences relate to the following parameters:

- WRITEACCESS
- FTP_REPLY_CODE

Table 3-2

Parameter	Type	Value / Meaning	Value set by
EXIST	BOOL	The EXIST bit indicates whether the user data area contains valid data. The retrieve FTP command executes the job only when EXIST=1. - 0: The file DB does not contain valid user data ("file does not exist"). - 1: The file DB contains valid user data ("file exists").	The dele FTP command sets EXIST=0 The stor FTP command sets EXIST=1

Table 3-2   , continued

Parameter	Type	Value / Meaning	Value set by

LOCKED	BOOL	The LOCKED bit is used to restrict access to the file DB.
		
		● 0:
		  The file DB can be accessed.
		● 1:
		  The file DB is locked.
			The stor and retr FTP commands set LOCKED=1 when they are executed.
			
			The following function is also possible when writing from the user program:
			
			The user program on the S7 CPU can set or reset LOCKED during write access to achieve data consistency.
			
			Recommended sequence in the user program:
			1. Query LOCKED bit;
			   If =0
			2. Set WRITEACCESS Bit=0
			3. Query LOCKED bit;
			   If =0
			4. Set LOCKED Bit=1
			5. Write data
			6. Set LOCKED Bit=0

NEW	BOOL	The NEW bit indicates whether data have been modified since the last read access.
		
		● 0:
		  The content of the file DB is unchanged since the last write access. The user program of the S7 CPU has registered the last modification.
		● 1:
		  The user program of the S7 CPU has not yet registered the last write access.
			After execution, the stor FTP command sets NEW=1
			
			The user program on the S7 CPU must set NEW=0 after the data have been read to allow a new stor or allow the file to be deleted with the dele FTP command.

WRITE_ACCESS	BOOL	0: The FTP client on the PG/PC has **no** write access rights for the file DBs on the S7 CPU. 1: The FTP client on the PG/PC has write access rights for the file DBs on the S7 CPU.	During the configuration of the DB, the bit is set to an initialization value. Recommendation: Whenever possible, the bit should remain unchanged! In special situations, adaptation during operation is possible.
ACT_LENGTH	DINT	Current length of the user data area. The content of this field is only valid when EXIST = 1.	The current length is updated following write access.
MAX_LENGTH	DINT	Maximum length of the user data area (length of the entire DB less 20 bytes header).	The maximum length should be specified during configuration of the DB. The value can also be modified by the user program during operation.

Table 3-2   , continued

Parameter	Type	Value / Meaning	Value set by
FTP_REPLY_CODE	INT	This parameter is **irrelevant** in FTP server operation.	Is set to "0" by the FTP server.
DATE_TIME	DATE_AND_TIME	Date and time of the last modification to the file. The content of this field is only valid when EXIST = 1.	The current date is updated following a write access. If the function for forwarding the time of day is used, the entry corresponds to the time that was passed on. If the function for forwarding the time of day is **not** used, a relative time is entered. This time relates to the startup of the IT–CP (the initialization value is 1.1.1994 0.0 (midnight)).

Example and Reference for the File DB Header

After installing the NCM S7 for Industrial Ethernet option, you will find a predefined data type (UDT1 = FILE_DB_HEADER) in the block library that you can copy to your STEP 7 project and reference directly as a header in a file DB.

In the declaration, you will see the following structure.

Table 3-3

Address	Name	Type	Initial value	Comment
0.0		STRUCT		
+0.0	bit08	BOOL	FALSE	reserved
+0.1	bit09	BOOL	FALSE	reserved
+0.2	bit10	BOOL	FALSE	reserved
+0.3	bit11	BOOL	FALSE	reserved
+0.4	bit12	BOOL	FALSE	reserved
+0.5	bit13	BOOL	FALSE	reserved
+0.6	bit14	BOOL	FALSE	reserved
+0.7	bit15	BOOL	FALSE	reserved
+1.0	EXIST	BOOL	FALSE	if TRUE: FileDB content is valid data
+1.1	LOCKED	BOOL	FALSE	it TRUE: FileDB is locked caused by changes of the content
+1.2	NEW	BOOL	FALSE	if TRUE: FileDB content is new and may not be overwritten
+1.3	WRITEACCESS	BOOL	FALSE	if TRUE: FTP server of the IT–CP has write access, else FTP server
+1.4	bit04	BOOL	FALSE	reserved

Table 3-3   , continued

Address	Name	Type	Initial value	Comment
+1.5	bit05	BOOL	FALSE	reserved
+1.6	bit06	BOOL	FALSE	reserved
+1.7	bit07	BOOL	FALSE	reserved
+2.0	ACT_LENGTH	DINT	L#0	current size of the content in bytes (not including the header of 20 bytes)
+6.0	MAX_LENGTH	DINT	L#0	current size of the content in bytes (not including the header of 20 bytes)
+10.0	FTP_REPLY_CODE	INT	0	last reply code from the remote FTP server
+12.0	DATE_TIME	DATE_AND_TIME	DT#00–1–1–0:0:0.000	date and time of last change of the content of the FileDB
=20.0		END_STRUCT		

3.4 The IT–CP as FTP Client for S7 CPU Data

3.4.1 How it Works

To transfer data using FTP, you create data blocks (file DBs) in the CPU of your S7 station (for structure, refer to Section 3.3.4).

Using special FCs (functions), the user program sends FTP jobs that are then executed by the IT–CP in the role of FTP client.

The data are transferred on FTP connections. FTP connections are special TCP connections that you configure in STEP 7 / NetPro.

In the job, you specify the IP address of the FTP server in an additional destination parameter, the storage location of the file on the FTP server and the file name along with access information.
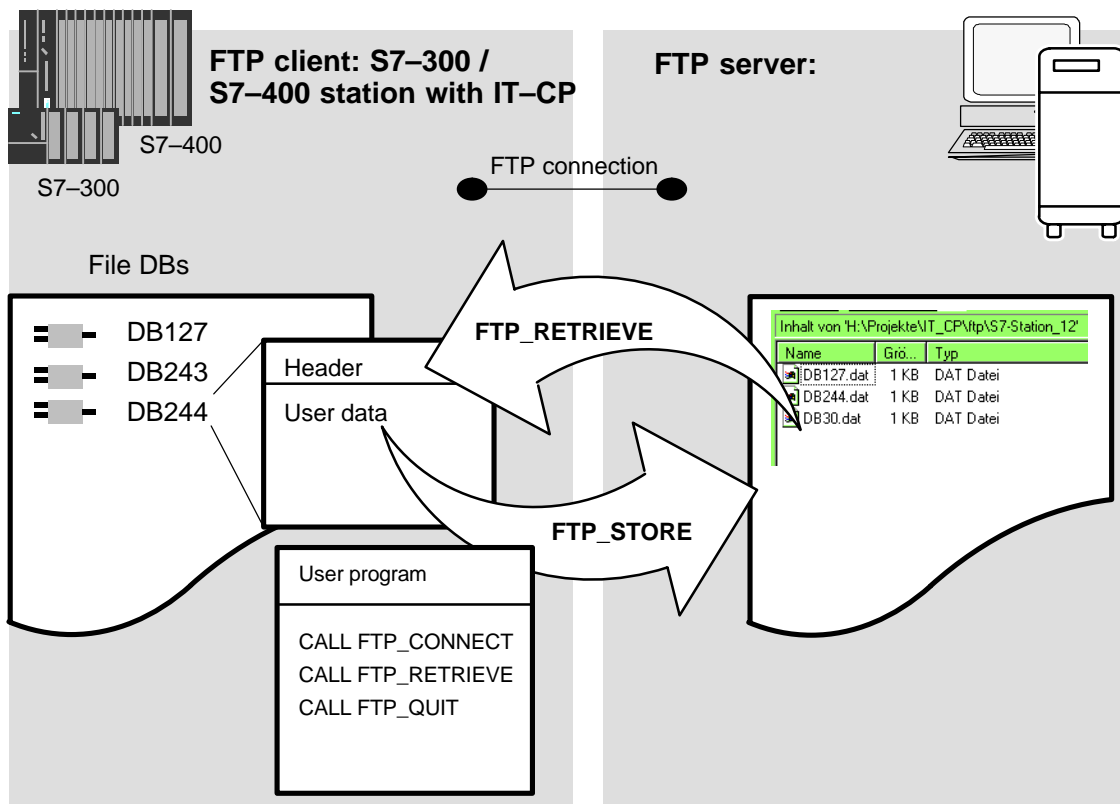
FTP Job Sequence with FC Calls

The following FCs are available for the FTP services; they must be used in the order shown (see also the example in Appendix A):

1. FTP_CONNECT: Establish FTP connection

2. Productive services when the FTP connection is established:

   – FTP_RETRIEVE: Retrieve file from FTP server and store in DB

   – FTP_STORE: Read DB and store as file on FTP server

   – FTP_DELETE: Delete file on FTP server

3. FTP_QUIT: Close FTP connection

Example of an FTP Job Sequence

Appendix A contains an example of STL code that you can also copy from the Manual Collection CD.

3.4.2 Setting up FTP Connections

Meaning

To run an FTP job sequence between the S7 station acting as the FTP client and an FTP server, the IT–CP must establish a connection to the S7 CPU. This connection is known as an FTP connection.

You can set up an FTP connection as follows:

● During connection configuration in STEP 7 (standard application)

   This situation is described below.

● In the user program with FB CP_CONFIG and the configuration data block.

   There are situations in which it is an advantage to set up the communication connections not over the configuration interface of STEP 7 but rather program–controlled by specific applications.

   This situation is described in detail in the NCM S7 for Ind. Ethernet manual /3/.

How to Configure FTP Connections

To use FTP functionality, you require TCP connections with special properties. Follow the steps outlined below to configure the connection in STEP 7 / NetPro:

1. Create a TCP connection with an unspecified connection partner for the CPU in your S7 station.
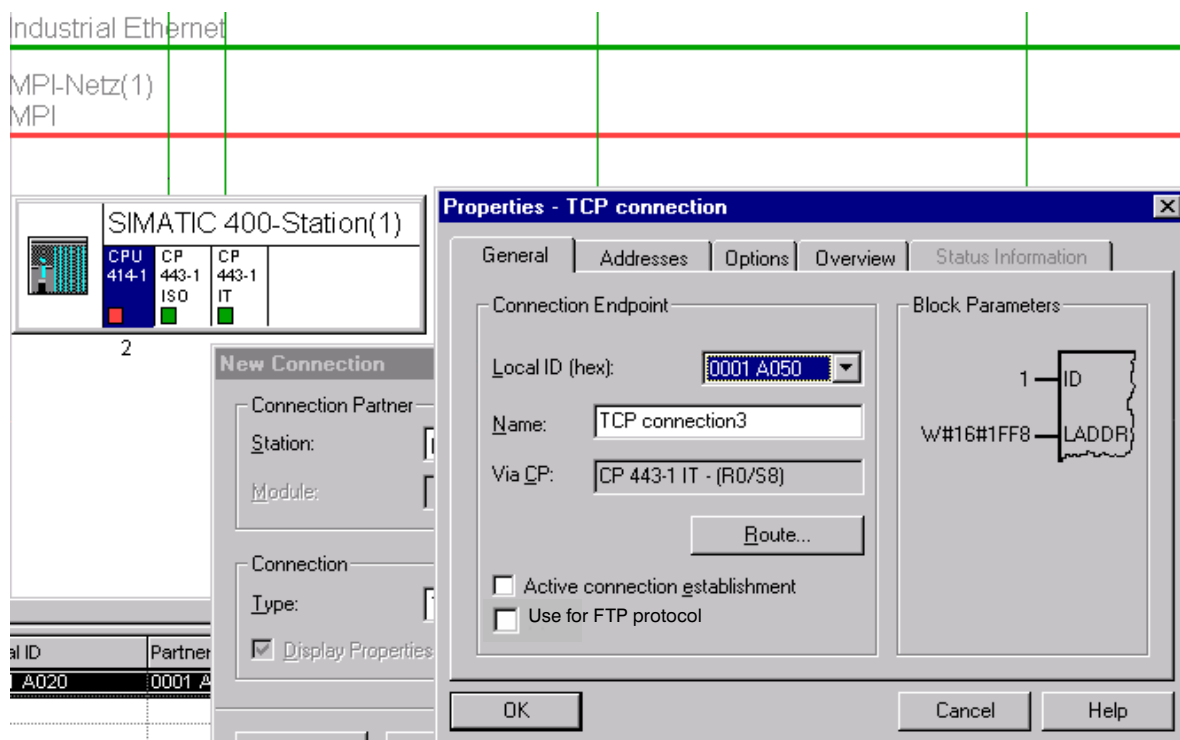
2. Select the option "Use for FTP protocol"

    Selecting this option has the following consequences:

    –   The TCP connection is now used as an FTP connection.

    –   "Addresses" tab: The addresses are specified automatically (Port=21)

    –   "Options" tab: The mode is set permanently to FTP.

3.4.3 Structure of the Data Blocks (File DB) for FTP Services

How the Function Works

To allow the transfer of data with FTP, you create data blocks (file DBs) in the CPU of your S7 station. These data blocks must have a specific structure so that they can be used as transferable files by the FTP services. These blocks consist of the following sections:

- **Section 1**: File DB header (has a fixed structure and a length of 20 bytes).
- **Section 2**: User data (variable length and structure)

File DB Header for FTP Client Operation

Note: The file DB header described here is largely identical to the file DB header for server operation described in Table 3-2; the differences relate to the following parameters:

- WRITEACCESS
- FTP_REPLY_CODE

Table 3-4

Parameter	Type	Value / Meaning	Value set by
EXIST	BOOL	The EXIST bit indicates whether the user data area contains valid data. The retrieve FTP command executes the job only when EXIST=1. - 0: The file DB does not contain valid user data ("file does not exist"). - 1: The file DB contains valid user data ("file exists").	The dele FTP command sets EXIST=0 The stor FTP command sets EXIST=1

Table 3-4   , continued

Parameter	Type	Value / Meaning	Value set by
LOCKED	BOOL	The LOCKED bit is used to restrict access to the file DB. ● 0: 　The file DB can be accessed. ● 1: 　The file DB is locked.	The stor and retr FTP commands set LOCKED=1 when they are executed. The following function is also possible when writing from the user program: The user program on the S7 CPU can set or reset LOCKED during write access to achieve data consistency. Recommended sequence in the user program: 1. Query LOCKED bit; 　If =0 2. Set WRITEACCESS Bit=0 3. Query LOCKED bit; 　If =0 4. Set LOCKED Bit=1 5. Write data 6. Set LOCKED Bit=0
NEW	BOOL	The NEW bit indicates whether data have been modified since the last read access. ● 0: 　The content of the file DB is unchanged since the last write access. The user program of the S7 CPU has registered the last modification. ● 1: 　The user program of the S7 CPU has not yet registered the last write access.	After execution, the stor FTP command sets NEW=1 The user program on the S7 CPU must set NEW=0 after the data have been read to allow a new stor or allow the file to be deleted with the dele FTP command.
WRITE_ ACCESS	BOOL	0: The user program (FTP client blocks) has write access to file DBs on the S7 CPU. 1: The user program (FTP client blocks) has **no** write access to file DBs on the S7 CPU.	During the configuration of the DB, the bit is set to an initialization value. Recommendation: Whenever possible, the bit should remain unchanged! In special situations, adaptation during operation is possible.
ACT_LENGTH	DINT	Current length of the user data area. The content of this field is only valid when EXIST = 1.	The current length is updated following write access.
MAX_LENGTH	DINT	Maximum length of the user data area (length of the entire DB less 20 bytes header).	The maximum length should be specified during configuration of the DB. The value can also be modified by the user program during operation.

Table 3-4   , continued

Parameter	Type	Value / Meaning	Value set by
FTP_REPLY_C ODE	INT	Unsigned integer (16–bit) containing the **last** reply code from FTP as a binary value. The content of this field is only valid when EXIST = 1.	This is updated by the FTP client when the FTP command is executed.
DATE_TIME	DATE_A ND_TIME	Date and time of the last modification to the file. The content of this field is only valid when EXIST = 1.	The current date is updated following a write access. If the function for forwarding the time of day is used, the entry corresponds to the time that was passed on. If the function for forwarding the time of day is **not** used, a relative time is entered. This time relates to the startup of the IT–CP (the initialization value is 1.1.1994 0.0 (midnight)).

Example and Reference for the File DB Header: See Section 3.3.4

3.4.4   FCs for FTP Services

Block Library

The functions described here (blocks of the type FC) are supplied with standard STEP 7 package (V5.1 SP1 or higher, for 343–1IT SP3).

Note

We recommend that you always use the current block versions for all module types.

You will find information on the current block versions and the current blocks to download from the Internet in our customer support.

http://www4.ad.siemens.de/view/cs/de/8797900

Entry ID: 8797900

With the older module types, this recommendation assumes that you are using the latest firmware for the particular block type.

The following list shows the numbers of the FCs as they are supplied with the configuration tool. You can change these numbers.

The blocks are available after you have installed the NCM S7 for Industrial Ethernet option.

Notice

Note that the FTP client services of old SIMATIC S7–300 CPUs, for example the CPU 312 or CPU 315–1AF01, cannot be executed because they do not support SFC24.

To run the FTP FCs, the CP 343–1 IT also requires FC5 (AG_SEND). This can also be loaded from the SIMATIC Manager library "SIMATIC_NET_CP".

FC		SIMATIC Manager Library	
		SIMATIC_NET_CP	
		CP 300	CP 400
FC40	FTP_CONNECT	x	x
FC41	FTP_STORE	x	x
FC42	FTP_RETRIEVE	x	x
FC43	FTP_DELETE	x	x
FC44	FTP_QUIT	x	x

Setting Parameters for FC Calls

The following sections describe all the FCs and their specific call parameters.

It is possible to make the following general statements about the following parameter groups that occur in all FCs:

- Parameters for CP and connection assignment (input parameters)

  For a detailed description, refer to Section 3.4.10.

- Status information (output parameters)

  For a detailed description, refer to Section 3.4.11.

3.4.5   FC40 FTP_CONNECT

Meaning

With this function call, the FTP client establishes an FTP connection to an FTP server.

The IP address of the FTP server, the user identification (username) and (if necessary) the password for user identification must be transferred to the FTP server.

All further access by the FTP server is then based on this user identification if you use the same FTP connection ID. Data is then exchanged with the FTP server specified for this user.

Call Interface

```
                            FTP_CONNECT

          BOOL ──  ACT          DONE  ── BOOL
          INT  ──  ID           ERROR ── BOOL
          WORD ──  LADDR        STATUS── WORD
   Input  ANY  ──  LOGIN                          Output
          INT  ──  BUFFER_DB_NR
```
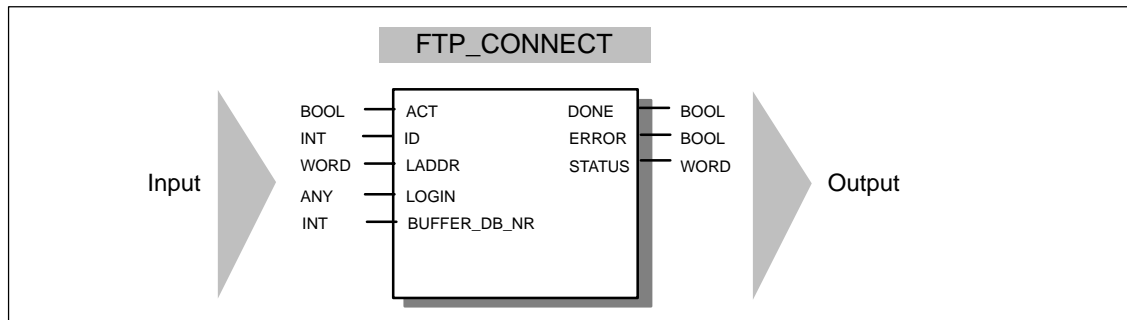
Example of a call in STL representation

```
STL                                   Explanation

call fc40 (                           //FTP_CONNECT block call

ACT            := M 420.0,            // Job triggered by memory bit
ID             := 4,                  // FTP conn. ID acc. to configuration
LADDR          := W#16#3FFD,          // Module address acc. to configuration
LOGIN          := P#DB40.DBX 0.0 BYTE 170,  // Information for LOGIN in DB40
BUFFER_DB_NR   := 9,                  // Buffer area for FTP service
DONE           := M 420.1,
ERROR          := M 420.2,
STATUS         := MW 422);
```

Explanation of the General Call Parameters

The general parameters have the same significance in every FTP function call; they are therefore described in one section.

- Parameters for CP and connection assignment (input parameters)

  see Section 3.4.10

- Status information (output parameters)

  see Section 3.4.11

Explanation of the Formal Parameters Specific to the Call

Table 3-5   Formal Parameters for FTP_CONNECT

Parameter	Declaration	Type	Remarks
LOGIN	INPUT	ANY (as VARTYPE only BYTE	This parameter specifies the FTP server to be accessed on the FTP connection.
			(for further details, refer to the following table)
			Here, you specify the address and length of the data area in which the target data are entered.
			The address references a data block area.
			The ANY pointer data type is used to address this area. For more detailed information on this data type, refer to the STEP 7 online help under the topic "Format of the Parameter Type ANY". You will also find a detailed description of the ANY point in /22/.
BUFFER_DB_NR	INPUT	INT	Here, you enter a data block required as a buffer area by the FTP client for FTP transfer.
			You can use the same data block as the buffer area for all FTP jobs.
			Note: The length of the reserved DB must be **at least 255 bytes**!

LOGIN Parameter

This parameter record has the following content for FTP_CONNECT

Relative Address [2]	Name	Type [1]	Example	Meaning
0.0	ip_address	STRING[100]	'142.11.25.135'	IP address of the FTP server.
102.0	username	STRING[32]	'user'	User name for the login on the FTP server.
136.0	password	STRING[32]	'password'	Password for the login on the FTP server.
170.0	filename	STRING[220]	'../S7_Station\blocks /db127.txt'	File name of the source or destination file

1) The **maximum possible** string length is specified in each case
2) The specified values relate to the string lengths specified in "Type".
Note: The rows shown on a gray background are irrelevant for this call.

3.4.6 FC41 FTP_STORE

Meaning

This function call transfers a data block (file DB) from the FTP client (S7 CPU) to the FTP server.

Here, you specify the data block that contains the file. The path/file name with which the file will be created on the FTP server must also be specified.

If the file (file DB) already exists on the FTP server, it is overwritten.

Call Interface

Example of a call in STL representation

STL	Explanation
`call fc41 (`	`//FTP_STORE block call`
`ACT         := M 420.0,`	`// Job triggered by memory bit`
`ID          := 4,`	`// FTP conn. ID acc. to configuration`
`LADDR       := W#16#3FFD,`	`// Module address acc. to configuration`
`FILE_NAME   := P#DB40.DBX 170.0 BYTE 220,`	`// Information for dest file in DB40`
`BUFFER_DB_NR := 9,`	`// Buffer area for FTP service`
`FILE_DB_NR  := 42,`	`// DB no. of the source file`
`DONE        := M 420.1,`	
`ERROR       := M 420.2,`	
`STATUS      := MW 422);`	

Explanation of the General Call Parameters

The general parameters have the same significance in every FTP function call; they are therefore described in one section.

- Parameters for CP and connection assignment (input parameters)

   see Section 3.4.10

- Status information (output parameters)

   see Section 3.4.11

Explanation of the Formal Parameters Specific to the Call

Table 3-6   Formal Parameters for FTP_STORE

Parameter	Declaration	Type	Remarks
FILE_NAME	INPUT	ANY (as VARTYPE only BYTE	This parameter specifies the data destination. (for further details, refer to the following table) Here, you specify the address and length of the data area in which the target data are entered. The address references a data block area. The ANY pointer data type is used to address this area. For more detailed information on this data type, refer to the STEP 7 online help under the topic "Format of the Parameter Type ANY". You will also find a detailed description of the ANY point in /22/.
BUFFER_DB_NR	INPUT	INT	Here, you enter a data block required as a buffer area by the FTP client for FTP transfer. You can use the same data block as the buffer area for all FTP jobs. Note: The length of the reserved DB must be **at least 255 bytes**!
FILE_DB_NR	INPUT	INT	The data block specified here, contains the file DB to be read.

FILE_NAME Parameter

This parameter record has the following content for FTP_STORE

Relative Address [2]	Name	Type [1]	Example	Meaning
0.0	ip_address	STRING[100]	'142.11.25.135'	IP address of the FTP server.
102.0	username	STRING[32]	'user'	User name for the login on the FTP server.
136.0	password	STRING[32]	'password'	Password for the login on the FTP server.
170.0	filename	STRING[220]	'../S7_Station/blocks /db127.dat'	File name of the source or destination file

1) The **maximum possible** string length is specified in each case
2) The specified values relate to the string lengths specified in "Type".
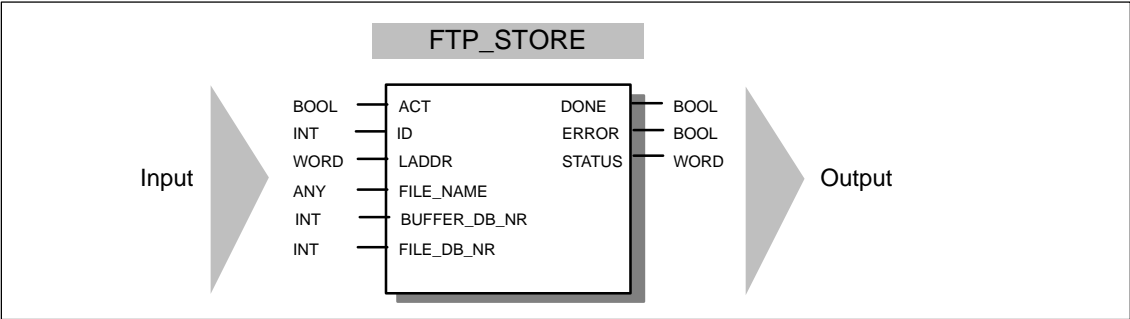Note: The rows shown on a gray background are irrelevant for this call.

3.4.7 FC42 FTP_RETRIEVE

Meaning

This function call transfers a file from the FTP server to the FTP client (S7–CPU).

Here, you specify the data block in which the file will be stored. The path/file name under which the file is located on the FTP server must also be specified.

If the data block (file DB) on the FTP client already contains a file, this is overwritten.

Call Interface

```
                        FTP_RETRIEVE

         BOOL ─── ACT          DONE ─── BOOL
         INT  ─── ID          ERROR ─── BOOL
         WORD ─── LADDR       STATUS ─── WORD
  Input  ANY  ─── FILE_NAME                      Output
         INT  ─── BUFFER_DB_NR
         INT  ─── FILE_DB_NR
```

Example of a call in STL representation

```
STL                                    Explanation

call fc42 (                            //FTP_RETRIEVE block call

ACT            := M 420.0,             // Job triggered by memory bit
ID             := 4,                   // FTP conn. ID acc. to configuration
LADDR          := W#16#3FFD,           // Module address acc. to configuration
FILE_NAME      := P#DB40.DBX 170.0 BYTE 220,  // Information for source file in DB40
BUFFER_DB_NR   := 9,                   // Buffer area for FTP service
FILE_DB_NR     := 42,                  // DB no. of the dest file
DONE           := M 420.1,
ERROR          := M 420.2,
STATUS         := MW 422);
```

Explanation of the General Call Parameters

The general parameters have the same significance in every FTP function call; they are therefore described in one section.

- Parameters for CP and connection assignment (input parameters)

  see Section 3.4.10

- Status information (output parameters)

  see Section 3.4.11

Explanation of the Formal Parameters Specific to the Call

Table 3-7   Formal Parameters for FTP_RETRIEVE

Parameter	Declaration	Type	Remarks
FILE_NAME	INPUT	ANY (as VARTYPE only BYTE	This parameter specifies the data source. (for further details, refer to the following table) Here, you specify the address and length of the data area in which the target data are entered. The address references a data block area. The ANY pointer data type is used to address this area. For more detailed information on this data type, refer to the STEP 7 online help under the topic "Format of the Parameter Type ANY". You will also find a detailed description of the ANY point in /22/.
BUFFER_DB_NR	INPUT	INT	Here, you enter a data block required as a buffer area by the FTP client for FTP transfer. You can use the same data block as the buffer area for all FTP jobs. Note: The length of the reserved DB must be **at least 255 bytes**!
FILE_DB_NR	INPUT	INT	The data block specified here contains the file DB to be written to (data destination).

FILE_NAME Parameter

This parameter record has the following content for FTP_RETRIEVE

Relative Address [2]	Name	Type [1]	Example	Meaning
0.0	ip_address	STRING[100]	'142.11.25.135'	IP address of the FTP server.
102.0	username	STRING[32]	'user'	User name for the login on the FTP server.
136.0	password	STRING[32]	'password'	Password for the login on the FTP server.
170.0	filename	STRING[220]	'e:/S7_Station/blocks/db127.dat'	File name of the source or destination file

1) The **maximum possible** string length is specified in each case
2) The specified values relate to the string lengths specified in "Type".
Note: The rows shown on a gray background are irrelevant for this call.

3.4.8 FC43 FTP_DELETE

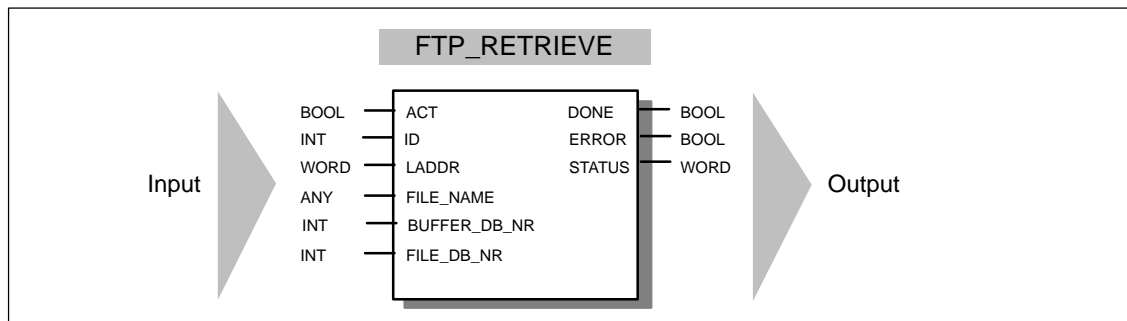**Meaning**

This function call deletes a file on the FTP server.

Call Interface

```
                        FTP_DELETE

        BOOL ──── ACT         DONE ──── BOOL
        INT  ──── ID        ERROR ──── BOOL
        WORD ──── LADDR     STATUS ──── WORD
Input   ANY  ──── FILE_NAME                   Output
        INT  ──── BUFFER_DB_NR
```

Example of a call in STL representation

```
STL                                          Explanation

call fc43 (                                   //FTP_DELETE block call

ACT           := M 420.0,                     // Job triggered by memory bit
ID            := 4,                           // FTP conn. ID acc. to configuration
LADDR         := W#16#3FFD,                   // Module address acc. to configuration
FILE_NAME     := P#DB40.DBX 170.0 BYTE 220,   // Information for dest file in DB40
BUFFER_DB_NR  := 9,                           // Buffer area for FTP service
DONE          := M 420.1,
ERROR         := M 420.2,
STATUS        := MW 422);
```

Explanation of the General Call Parameters

The general parameters have the same significance in every FTP function call; they are therefore described in one section.

- Parameters for CP and connection assignment (input parameters)

  see Section 3.4.10

- Status information (output parameters)

  see Section 3.4.11

Explanation of the Formal Parameters Specific to the Call

Table 3-8   Formal Parameters for FTP_DELETE

Parameter	Declaration	Type	Remarks
FILE_NAME	INPUT	ANY (as VARTYPE only BYTE	This parameter specifies the data destination. (for further details, refer to the following table) Here, you specify the address and length of the data area in which the target data are entered. The address references a data block area. The ANY pointer data type is used to address this area. For more detailed information on this data type, refer to the STEP 7 online help under the topic "Format of the Parameter Type ANY". You will also find a detailed description of the ANY point in /22/.
BUFFER_DB_NR	INPUT	INT	Here, you enter a data block required as a buffer area by the FTP client for FTP transfer. You can use the same data block as the buffer area for all FTP jobs. Note: The length of the reserved DB must be **at least 255 bytes**!

FILE_NAME Parameter

This parameter record has the following content for FTP_DELETE

Relative Address [2]	Name	Type [1]	Example	Meaning
0.0	ip_address	STRING[100]	'142.11.25.135'	IP address of the FTP server.
102.0	username	STRING[32]	'user'	User name for the login on the FTP server.
136.0	password	STRING[32]	'password'	Password for the login on the FTP server.
170.0	filename	STRING[220]	'e:/S7_Station/blocks/db127.dat'	File name of the source or destination file

1) The **maximum possible** string length is specified in each case
2) The specified values relate to the string lengths specified in "Type".
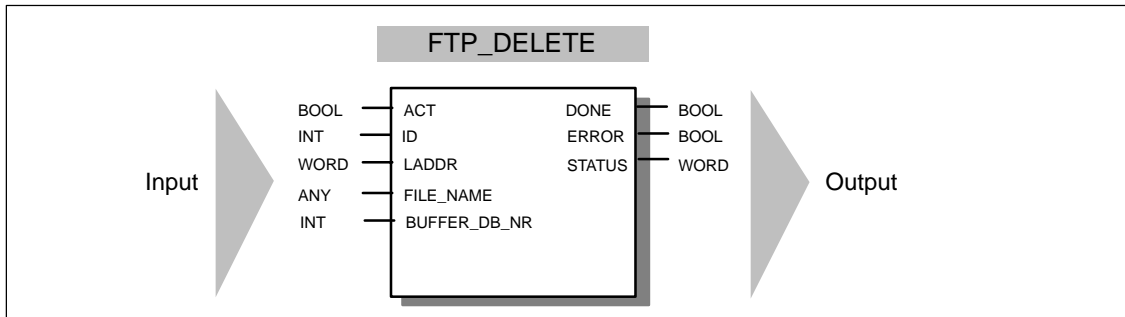Note: The rows shown on a gray background are irrelevant for this call.

3.4.9 FC44 FTP_QUIT

Meaning

This function call closes the FTP connection identified by the ID.

Call Interface
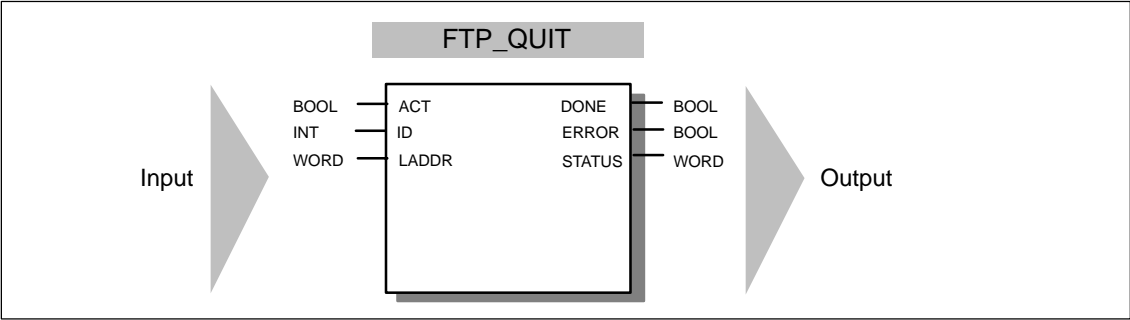
Example of a call in STL representation

```
STL                                        Explanation

call fc44 (                                //FTP_QUIT block call

ACT            := M 420.0,                 // Job triggered by memory bit
ID             := 4,                        // FTP conn. ID acc. to configuration
LADDR          := W#16#3FFD,                // Module address acc. to configuration
DONE           := M 420.1,
ERROR          := M 420.2,
STATUS         := MW 422);
```

Notice

The output of FC44 must receive a memory word as value. If you enter DBx.DWy,
an error message appears (applies only to the S7–300).

Explanation of the General Call Parameters

The general parameters have the same significance in every FTP function call;
they are therefore described in one section.

- Parameters for CP and connection assignment (input parameters)

  see Section 3.4.10

- Status information (output parameters)

  see Section 3.4.11

3.4.10 Parameters for CP and Connection Assignment (Input parameters)

Apart from the input parameters specific to the jobs started with each FTP block call, the following general input parameters must also be set:

Table 3-9   Formal Parameters for FTP FCs – Input Parameters

Parameter	Declaration	Type	Possible Values	Meaning / Remarks
ACT	INPUT	BOOL	0,1	The parameter contains the initialization bit for triggering the job. ● If ACT = 1, the job is executed. During job execution, the FC returns the following codes: – DONE = 0 – ERROR = 0 – STATUS=8181$_H$ ● If ACT = 0, the called FC does not execute any actions; the status codes are then set as follows with this parameter setting: – DONE = 0 – ERROR = 1 – STATUS=8F70$_H$ Note / Recommendation: You should execute the FTP calls conditionally in your application, for example by evaluating the codes. It is not a good idea to control the call using the ACT bit. The ACT bit must be set to 1 until the execution is signaled by the DONE bit.
ID	INPUT	INT	1,2...64	The FTP jobs are handled on FTP connections. The parameter identifies the connection being used.
LADDR	INPUT	WORD		Module start address When you call an FC, you transfer the module base address IT–CP in the LADDR parameter. The module base address of the IT–CP can be found in the properties dialog of the IT–CP in the "Addresses/Inputs" tab.

Caution

Make sure that only one FTP client block is called per ID used as long as ACT = 1 is set.

For example, FC STORE and FC RETRIEVE must not be active on the same FTP connection at the same time. This corresponds to normal FTP functionality. If this is nevertheless attempted, you cannot rely on the output parameters (DONE bit, ERROR bit and STATUS word) being correct.

3.4.11 Status Information (Output Parameters)

For status evaluation, the following parameters must be evaluated in the user program:

Table 3-10 Formal Parameters for FTP FCs – Output Parameters

Parameter	Declaration	Type	Possible Values	Meaning / Remarks
DONE	OUTPUT	BOOL	0: – 1: Job executed	This parameter indicates whether or not the job was completed without errors.
ERROR	OUTPUT	BOOL	0: – 1: error	Error code This parameter indicates that the job could not be executed error–free.
STATUS	OUTPUT	WORD	see following table	Status code This parameter supplies detailed information about the execution of the job.

For the meaning of this parameter in conjunction with the ERROR and STATUS parameters, refer to the following table.

Notice

For FC FTP_QUIT, use only the data type memory word for the STATUS parameter (applies only to the CP 343–1 IT).

Example

During job execution, the FC returns the following codes:

- DONE = 0
- ERROR = 0
- STATUS=8181_H

Evaluating Status Codes

Remember that the status codes DONE, ERROR, STATUS are updated at each block call.

Note

For entries coded with 8Fxx$_H$ in STATUS, refer to the information in the STEP 7 Standard and System Functions reference manual. The chapter describing error evaluation with the RET_VAL output parameter contains detailed information.

Table 3-11   Status Codes of the FCs for FTP

DONE	ERROR	STATUS	Meaning
1	0	0000$_H$	Job completed without error.
0	0	0000$_H$	No job being executed.
0	0	8181$_H$	Job active.
0	1	8090$_H$	• No module with this base address exists. • The FC being used does not match the system family being used (remember to use different FC for S7–300 and S7–400).
0	1	8091$_H$	Logical base address not at a double word boundary.
0	1	8092$_H$	Type information in the ANY pointer is not byte.
0	1	80A4$_H$	The communication bus connection between the CPU and CP is not established. (with newer CPU versions). This can, for example, be caused by the following: • No connection configuration; • The maximum number of CPs that can be operated at the same time has been exceeded.
0	1	80B0$_H$	The module does not recognize the data record.
0	1	80B1$_H$	• Destination area invalid. For example, destination area > 240 bytes.
0	1	80B2$_H$	The communication bus connection between the CPU and CP is not established.(with older CPU versions; otherwise 80A4$_H$; ; for further information, refer to this code)
0	1	80C0$_H$	The data record cannot be read.
0	1	80C1$_H$	The specified data record is currently being processed.
0	1	80C2$_H$	There are too many jobs pending.
0	1	80C3$_H$	Resources occupied (memory).
0	1	80C4$_H$	Communication error (occurs temporarily, it is usually best to repeat the job in the user program).
0	1	80D2$_H$	Module start address incorrect.
0	1	8183$_H$	The configuration does not match the job parameters.
0	1	8184$_H$	• Bad data type specified for the FILE_NAME / LOGIN parameter.
0	1	8186$_H$	ID parameter invalid. ID!=1,2 to 64.
0	1	8F22$_H$	Source area invalid; for example: Area does not exist in the DB

Table 3-11   Status Codes of the FCs for FTP, continued

DONE	ERROR	STATUS	Meaning
0	1	8F24$_H$	Area error reading a parameter.
0	1	8F28$_H$	Alignment error reading a parameter.
0	1	8F32$_H$	Parameter contains a DB number that is too high.
0	1	8F33$_H$	DB number error.
0	1	8F3A$_H$	Area not loaded (DB).
0	1	8F50$_H$	File DB DB 0 or DB does not exist
0	1	8F51$_H$	Specified file DB data area larger than existing data area
0	1	8F52$_H$	File DB in write–protected memory
0	1	8F53$_H$	File DB max. length < current length
0	1	8F54$_H$	File DB does not contain any valid data
0	1	8F55$_H$	Header status bit: Locked
0	1	8F56$_H$	The NEW bit in the file DB header was not reset
0	1	8F57$_H$	The FTP client does not have write access to the file DB but rather the FTP server (header status bit: WriteAccess)
0	1	8F5A$_H$	Buffer DB DB 0 or DB does not exist
0	1	8F5B$_H$	Buffer DB data area too short
0	1	8F5C$_H$	Buffer DB in write–protected memory
0	1	8F60$_H$	Bad user data, for example bad IP address of the FTP server
0	1	8F61$_H$	FTP server not obtainable
0	1	8F62$_H$	Job not supported or rejected by FTP server
0	1	8F63$_H$	File transfer aborted by the FTP server
0	1	8F64$_H$	Error on the FTP control connection; data could not be sent or received; the FTP control connection must be established again after such an error.
0	1	8F65$_H$	Error on the FTP data connection; data could not be sent or received; the job (FTP_STORE or FTP_RETRIEVE) must be called again. This error can, for example, be caused by FTP_RETRIEVE when the addressed file is already open on the FTP server.
0	1	8F66$_H$	Error reading/writing data from/to the CPU (for example DB does not exist or too short)
0	1	8F67$_H$	Error in the FTP client on the IP–CP; for example attempting to open more than 10 FTP connections.
0	1	8F68$_H$	The job was rejected by the FTP client This error can, for example, be caused by FTP_RETRIEVE when the value for the parameter MAX_LENGTH was selected too low in the file DB header.
0	1	8F69$_H$	FTP connection in the incorrect status for this call, for example a double connect call or when attempting to retrieve without previously connecting (using the same NetPro ID)
0	1	8F6A$_H$	No new socket could be opened, temporary resource problem, repeat the block call.
0	1	8F70$_H$	Calling an FTP client block with ACT = 0
0	1	8F7F$_H$	Internal error; for example, bad ANY reference

4 IT–CP as Web Server: HTML Process Control

The IT–CP provides you with the functionality of a Web server for access with the Web browser.

The IT–CP has a storage area for files. This area is used to store HTML pages and S7 applets.

HTML pages are used to indicate and display information in a Web browser. S7 applets are Java applets specially written for SIMATIC S7 and that used to allow write or read access to the S7–CPU.

When supplied, the IT–CP has HTML system files, S7 applets, S7 beans and other information in the file system.

This chapter answers the following questions:

- How are the HTML pages supplied with the IT–CP used to access information on the S7 station?
- What options exist to adapt HTML process control to my individual requirements?
- How do I store my own HTML pages?

4.1 Overview of HTML Process Control

Multilevel Concept

The IT–CP provides several levels to implement device and process data monitoring with HTML pages:

System and sample pages over Web browser

Creating HTML pages with S7 applets

Individual solutions with S7 beans
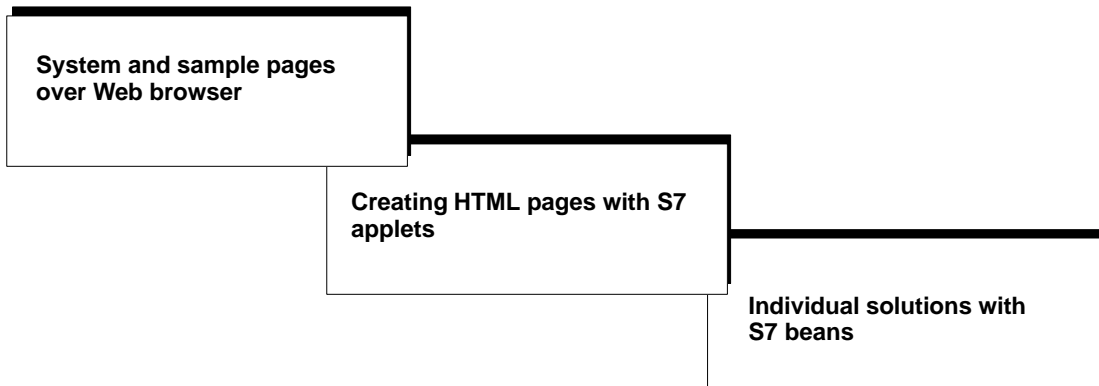
- ➤ **System and sample pages over Web browser**

  You want to use the options of the HTML process control predefined for the IT-CP without extensive programming.

  The possibilities available to you are introduced in this chapter.

- ➤ **Creating HTML pages with S7 applets**

  The IT–CP provides you with predefined S7 applets with which you can create HTML pages and adapt them to your task.

  The calls and call parameters are described in the manual on the S7 applets / beans /4/.

- ➤ **Individual solutions with S7 beans**

  You want to use graphics options adapted to your application and create more complex applets.

  You not only want to display your process data in the plant pictures but also want to use the data, for example, for evaluation in a database.

  You can achieve this with the following options:

  – Use application-specific applets and the supplied S7 beans.

  – Create Java source code; use application-specific applets, Java beans and the supplied S7 beans.

  You will find a detailed description in the manual on the S7 applets / beans /4/.

S7 applets are applets for SIMATIC S7

The IT-CP provides several applets with which you can access the controller from the Web browser on your PC. You do not need to be familiar with Java to use these S7 applets. By following the instructions below, you will be able to integrate the calls in your HTML page simply and quickly.

Extended Access and Display Options – The Java Beans Concept

The Java Beans concept allows you to create objects (Java components) and to link them simply to executable programs.

There is an S7 beans class library available for the IT-CP (S7BeansAPI). The object classes contained in this library can be used for object-oriented access to a variety of information on the SIMATIC S7 and for graphic display of process variables.

The S7 beans class library provides an open interface allowing you to extend process data evaluation for example with databases, table calculation or management information systems.

Organizing Files – Resources of the IT-CP

The IT-CP has memory available for storing your HTML pages. For further information refer to the manual of the IT-CPLEERER MERKER.

Please note the information in the readme.htm file on the IT-CP. The simplest way to open the readme.htm file is by clicking the "Information" link on the home page of the IT-CP.

This contains information about the meaning and purpose of the shipped files. You can then decide which files might be useful for your application. Using FTP functions (see Section 3) can organize the files on the IT-CP to suit your requirements.

4.2 Contacting the IT-CP using a Web Browser

Web Browser – What is Required?

To access the HTML pages on the IT-CP as a Web server you require a Web browser on your PG/PC/MOBIC, for example Netscape Navigator or Internet Explorer. The Web browser must meet the following requirements:

● JDK (Java Development Kit) 1.1.X is supported.

The Netscape Navigator and Internet Explorer meet these requirements. Other Web browsers with the same range of functions can also be used.

Note

JDK 1.2.x, 1.3.x and 1.4.x are also supported. To use applets created specially for these JDK versions with the Microsoft Internet Explorer or the Netscape Browser, you do, however require a plug–in.

Other Web browsers meet these requirements only with certain restrictions. Here, you also require a plug-in component corresponding to the Java reference implementation of a SUN Java Virtual Machine.

When using S7 applets / beans, certain settings must be made in the Web browser.

You will find more information on this topic and on the requirements outlined above in the documents on the S7 applets / beans /4/, /5/ and /25/.

URL: Uniform Resource Locator

In the World Wide Web, addressing using URL has become standard. You can also contact the IT-CP with your Web browser using the URL. This URL can have almost any complexity but consists in principle of four essential parts. The following schematic illustrates the structure (typical URL) and shows the contents for calling IT-CPs.

	Protocol	Server name[:Port]	[Folder]	File name
Typical URL		http://www.ad.siemens.de/net/page.htm		
URL for IT-CP		http://142.80.00.01/user/index.htm		
	HTTP protocol	IP address	[Folder]	Name of the HTML page

When accessing the IT-CP using a Web browser, use the HTTP protocol to address the Web server on the IT-CP:
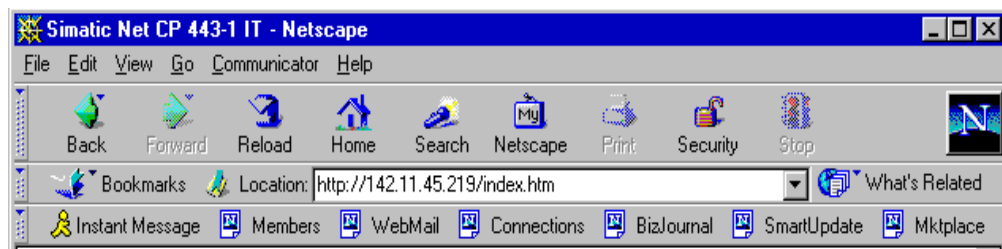
You inform the CP of the IP address during configuration with STEP 7 (see Section 1.4). If you have an attachment from Industrial Ethernet to your intranet or to the Internet, the CP can be contacted using the IP address in the intranet or Internet.

A detailed description of the structure of the IP address and the options of creating subnets or subnet masks is beyond the scope of this manual. You will find more detailed information in the STEP 7 online help and in the documentation listed in the references, for example in /24/.

Setting a Proxy Server on the PG/PC/MOBIC

For more information, check with your system administrator.

4.3   Accessing HTML System Pages – Examples

Basic information is available immediately

HTML system pages are HTML pages saved on the IT-CP containing system information that you can display without any further adaptation using your Web browser.

Using the IT-CP File System

The IT–CP provides you with a file system consisting of volatile and non–volatile memory. When the IT–CP is supplied, this file system contains predefined system pages. During operation, you can store your HTML pages and other data.

Please refer to the description in Section 3.2.2.

System Pages

From the Start page that you can adapt and replace by an application-specific home page, you can call up other HTML pages.

The **Start page** is obtainable under http://<IP_address>/index.htm.

Figure 4-1

If you only enter the IP address without the file name (http://<IP_address>), the file is searched for in the following order in the file system of the IT–CP:

1. /user/index.htm

2. /index.htm

3. Root

Access Protection

The HTML system pages are protected by the access protection you configured on the IT-CP. In the administration page shown, this affects the Send Test Mail function.

4.3.1   "Test Mail" System Page

The "Send Test Mail" system page allows you send a test mail from your Web browser. For more detailed information, refer to Section 2.4.
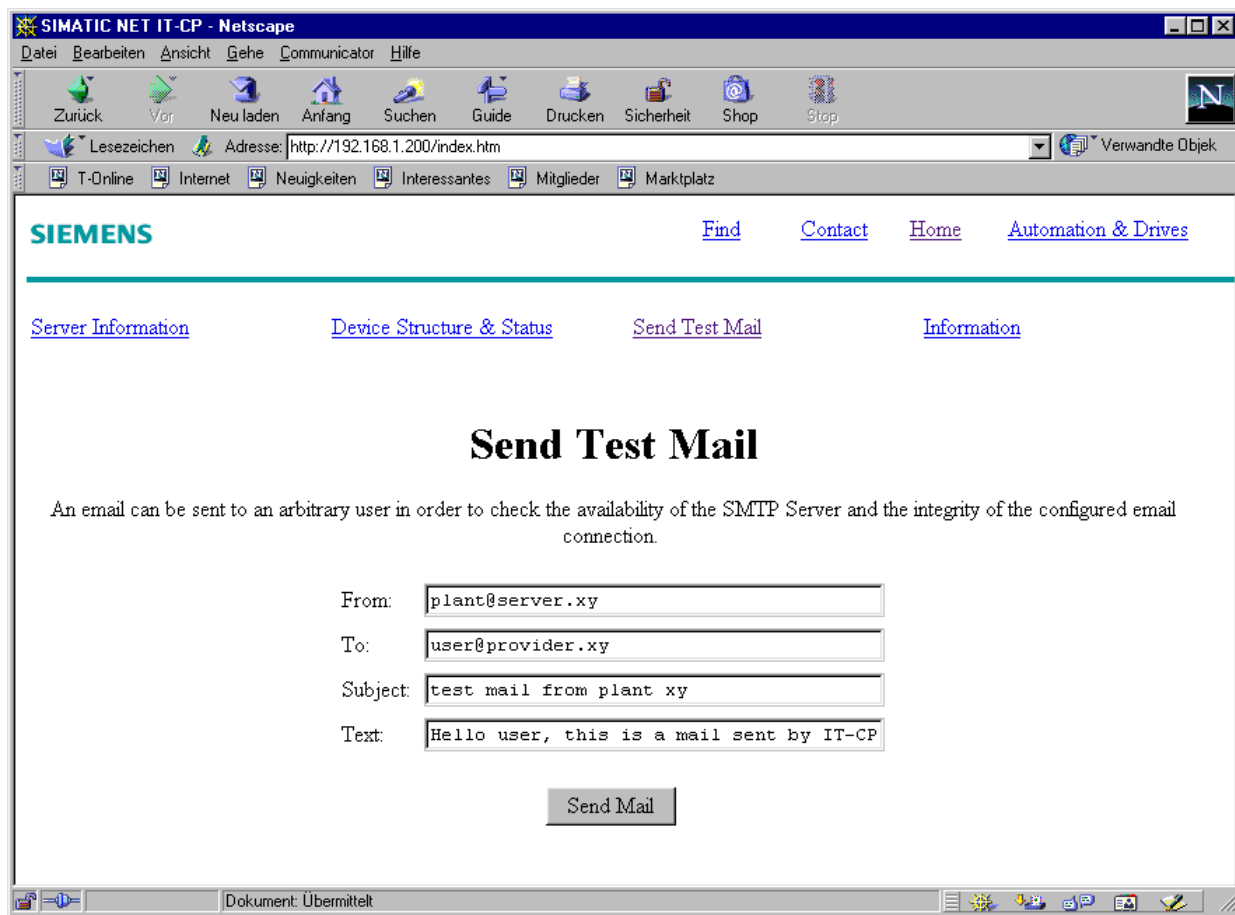
Figure 4-2

4.3.2 "Server Information" System Page

This provides you with additional information on the IT–CP (server information):

- Name and firmware version of the IT–CP

- Software version of the HTTP server

- Total and available memory (volatile and non–volatile area)

  In contrast to the flash area, the RAM can be written to and read from any number of times. The data in the RAM are retained as long as the IT–CP is supplied with power.

  The RAM is intended to store data that change during operation and need to be recorded (data recording services). The RAM is also suitable for temporary storage.
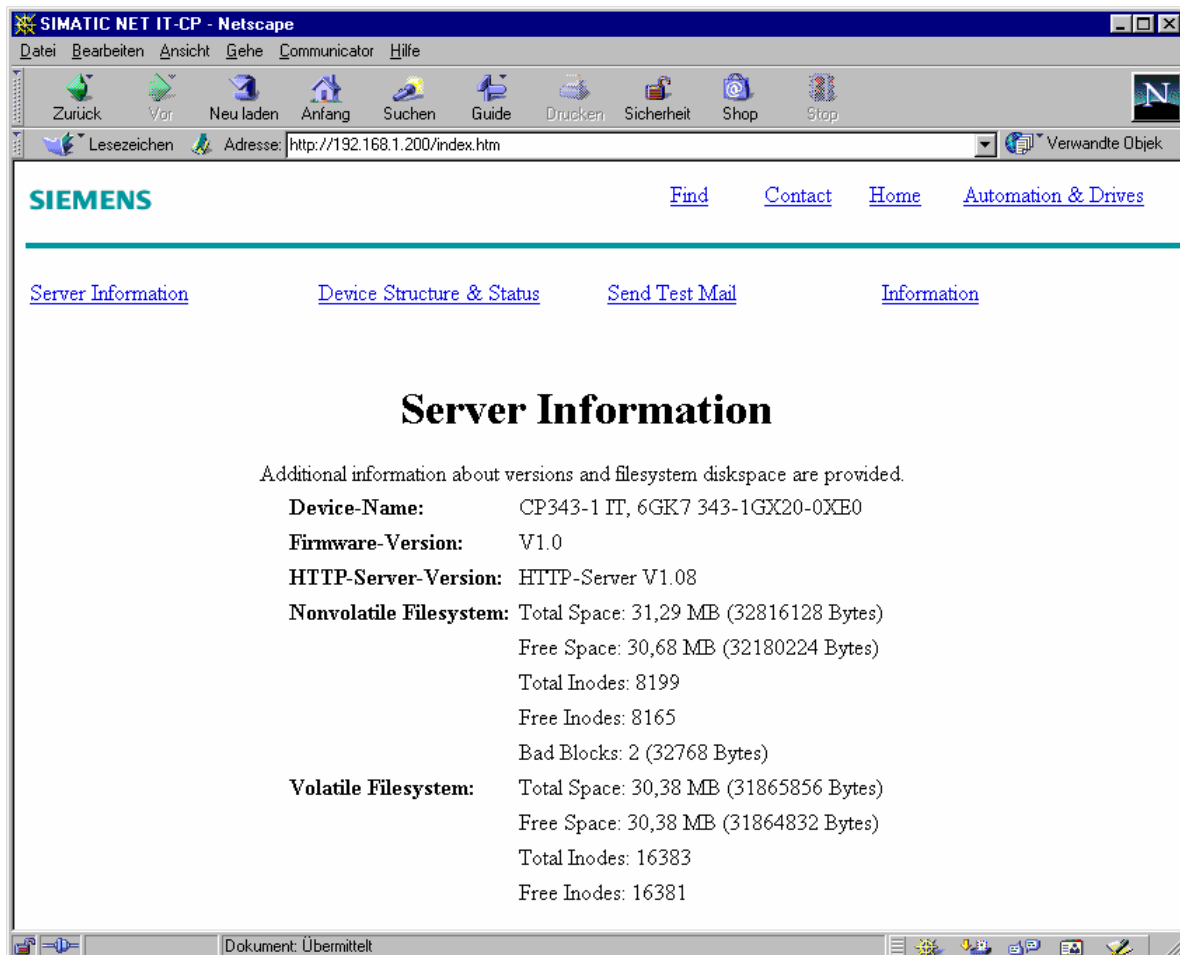
Figure 4-3

4.3.3 "Device Structure and Status" System Page

Meaning

This page provides general information on the actual structure of the S7 station in which the IT–CP is located.

You can see the modules attached to the communication bus such as CPUs and CPs. You obtain detailed information on these modules.

When you open it, this system page displays the current status information; this information is updated automatically every 20 seconds.
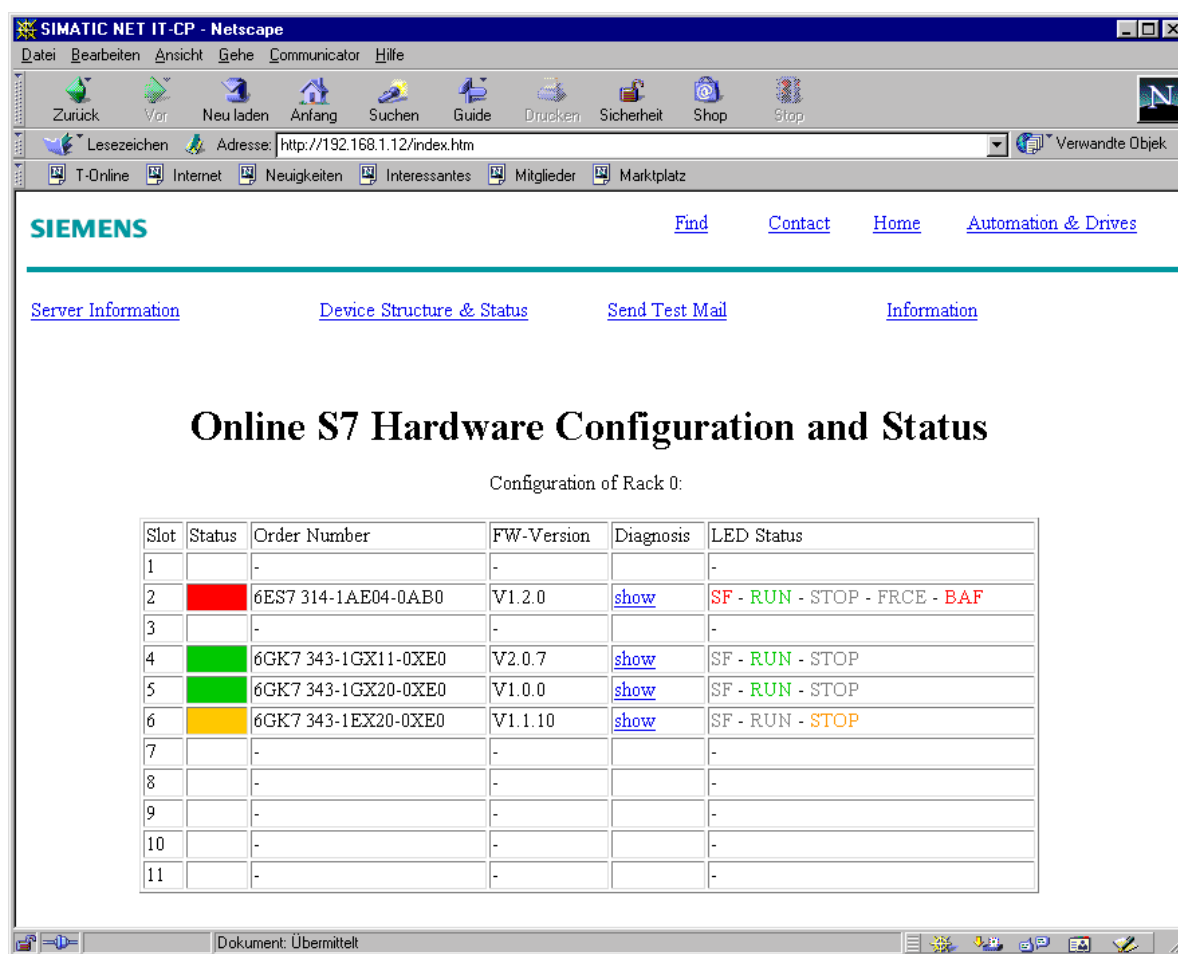
Figure 4-4

Querying the Diagnostic Buffer

For CPU modules and Ethernet and PROFIBUS CP modules, the "Diagnosis" column also contains a link to the Web page with which you can query the last 10 diagnostic messages from an excerpt of the diagnostic buffer.
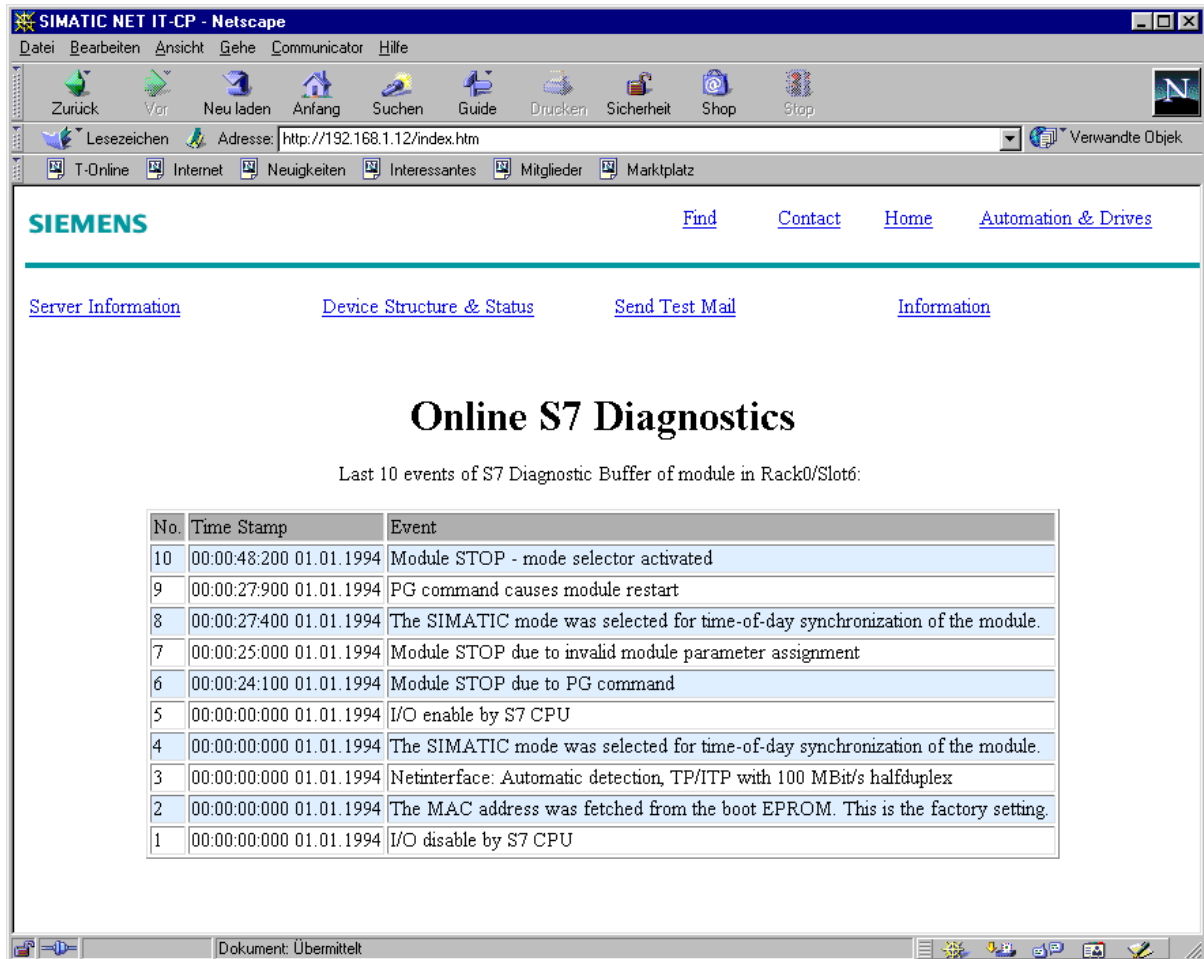
Figure 4-5

Setting the Language for the Diagnostic Buffer Display

You can only display diagnostic texts if the STEP 7 events database is located in the file system of the CP. The STEP 7 event database must be stored there under the following file name:

/config/S7wmeld.edb (case–sensitive)

When the CP is supplied, this file exists in the file system in English. You can change the language of the diagnostic messages by copying the events database from your STEP 7 installation on a PC/PG and replacing the existing file.

This is located in the folder <Dr:>\Siemens\Common\S7wmedb\data.

Within this folder there are files with the names S7wmeldA.edb, S7wmeldB.edb, S7wmeldC.edb, etc.

The last letter before the file extension is the identification letter for a language, assigned as follows:

A = German,
B = English,
C = French,
D = Spanish and
E = Italian
When you copy the file you require, please delete the last letter before the extension. This procedure also allows you to update an out–of–date events database with a new STEP 7 installation.

4.4 Creating and Storing your own "Home Page"

Flexible Use of the IT–CP File System

The existing start page provides you with basic functions that are adequate for a large number of requirements.

The IT-CP file system provides a flexible instrument for the presentation of functions and data adapted to your plant. By creating your own start page, you have the tool to extend the view to cover your entire plant or even further.

You can modify the existing start page or can replace it by your own home page.
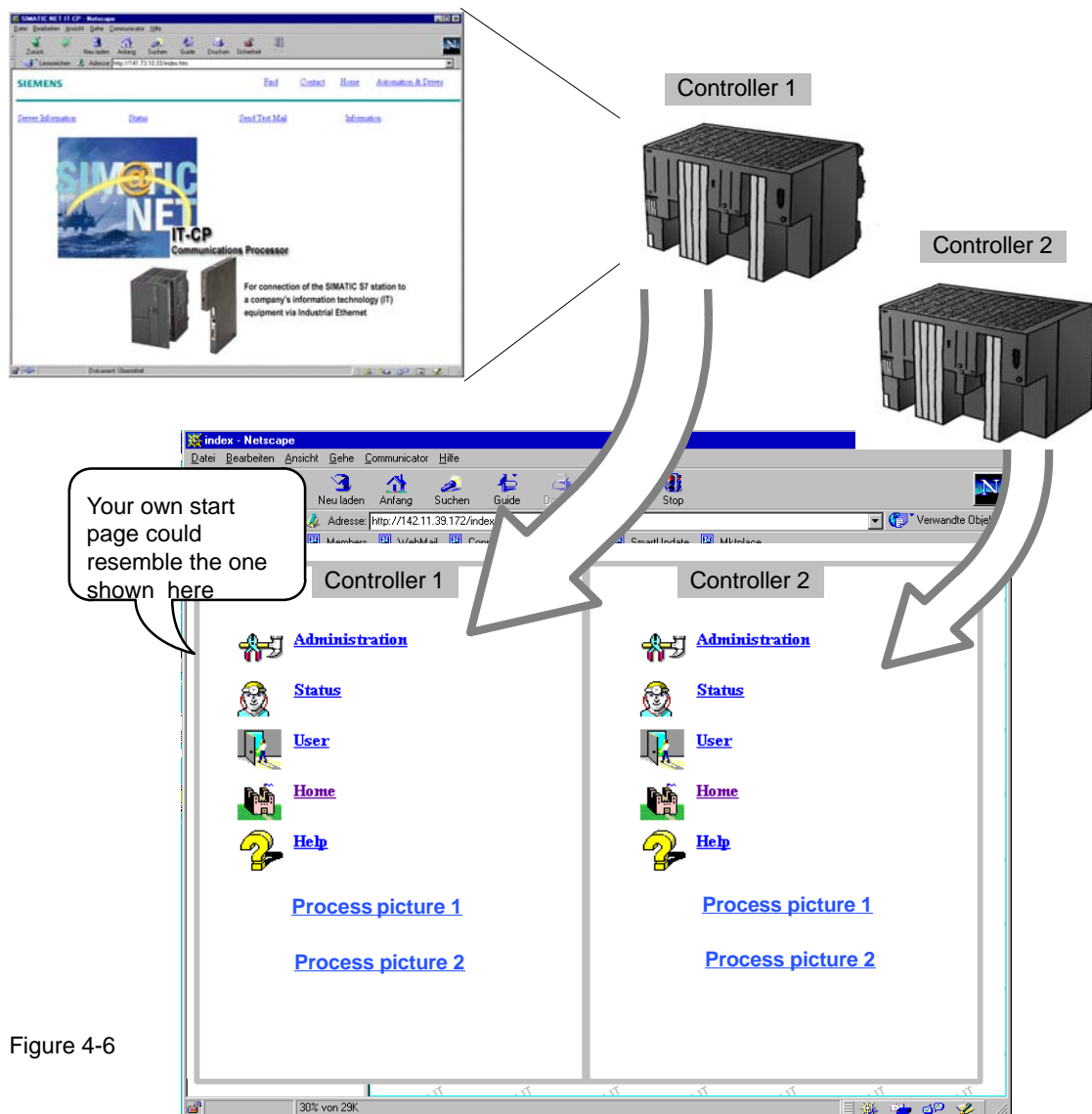
Figure 4-6

What to Do

If you want to start with the existing start page, load this in your HTML editor and add the additional instructions you require.

- The online option

  Load the HTML start page from your IT-CP in your HTML editor and save it for further editing locally on your PC.

- The offline option

  You will also find the HTML start page on the Manual Collection CD. You can then adapt your start page regardless of whether you have access to the IT-CP and then download it to the IT-CP.

Points to Remember

Refer to the information in the manual of the IT–CP /1/ regarding the following points.

- The size of the file system is limited.
- The number of characters in the URLs to be specified is limited.
- The length of the file names is limited.

Including S7 Applets

Flexible access to distributed HTML system pages is **one** aspect of designing the home page.

You have further opportunities for querying information if you include the S7 applets and S7 Beans in your HTML pages.

The calls and call parameters are described in the manual on the S7 applets / beans /5/.

Examples:

You will find examples of HTML pages designed for specific purposes both on the Manual Collection CD and in the CP file system in the /examples folder.

Downloading HTML Pages

Use the FTP file management functions (FTP client) as described in Chapter 3.2 to add to or replace the existing HTML pages.

4.5   S7 Applets – An Overview

Meaning

S7 applets are special applets that allow read and write access to an S7 station via the IT–CP.

The Web browser in which the applet was started is responsible for execution of the applets. This activates the applet and assigns a frame to it within the current HTML page according to the parameter settings.

The following example illustrates the situation where supplied S7 standard applets are used within an HTML page. You can see that the S7 applets in this case are embedded in an HTML table.
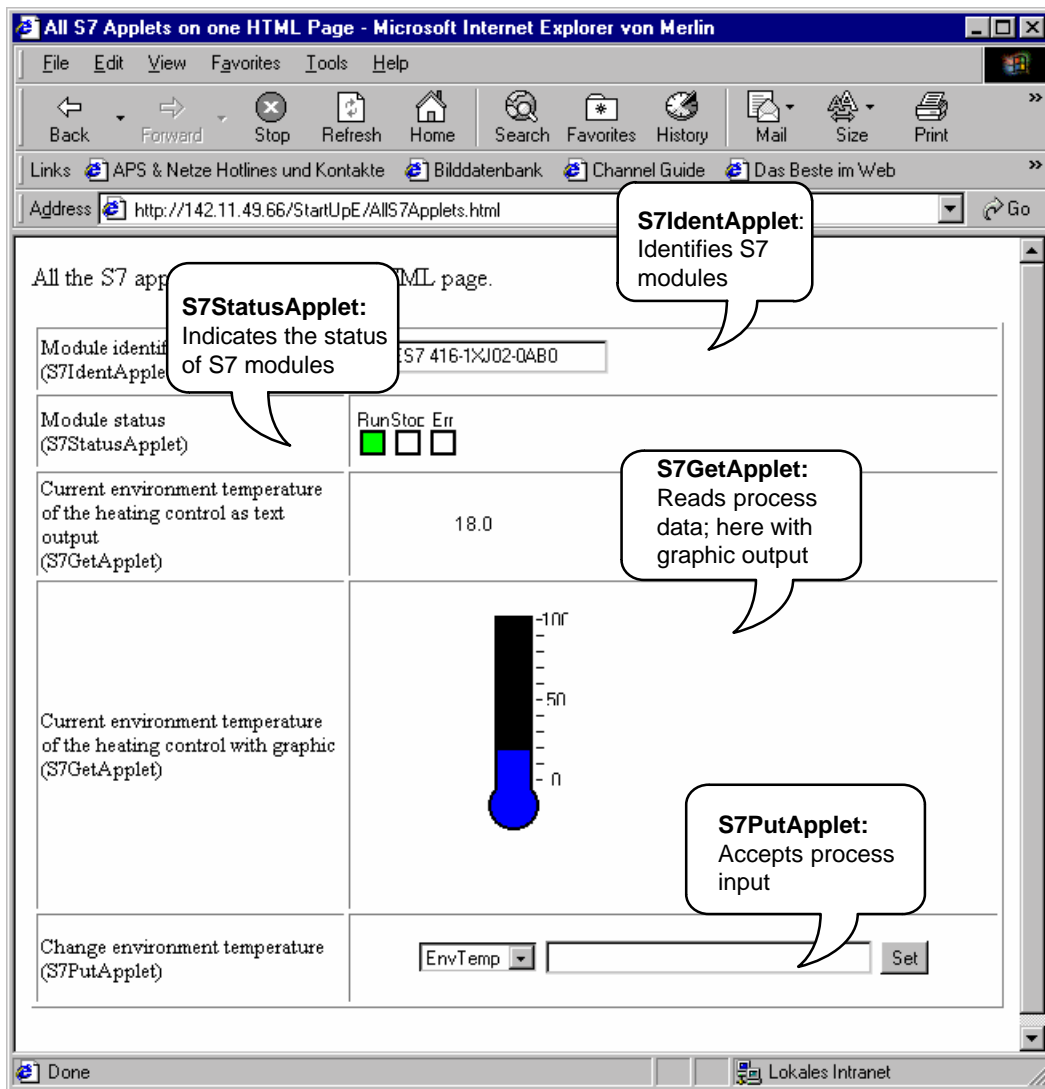
Figure 4-7

The calls and call parameters are described in the manual on the S7 Applets / Beans /5/.

A Sample Program – IT–CP as FTP Client

This sample program shows you a typical sequence of FCs for the FTP services in the FTP client mode of the IT–CP. The following FCs are used:

- FTP_CONNECT (FC40)
- FTP_RETRIEVE (FC42)
- FTP_QUIT   (FC44)

You will also find this example on the Manual Collection CD and can copy it from there.

```
// -------------------------------------------------------------------------------
// S7 DEMO PROGRAM FOR ONE FTP CLIENT CONNECTION
//
// This program performs the following actions in an endless loop as long as
// no error occurs:
//      FTP_CONNECT  (FC40)
//      FTP_RETRIEVE (FC42)
//      FTP_QUIT     (FC44)
//
// The code is located in FC1. It is called in OB35.
// To use this simple demo successfully, follow the steps below:
//
// 1.) Use STEP 7 V5.1 Service Pack 3 (or higher) and create a project with
//     at least 1 CPU and 1 IT–CP (6GK7 343/443–1GX11–0XE0 or higher)
//
// 2.) Create an FTP client connection by opening NetPro and creating an
//     unspecified TCP connection and checking the option 'Use FTP protocol'.
//     Enter the ID of this connection at the beginning of FC1. See also
//     comment: "user modification (1)"
//
// 3.) Obtain the LADDR of your IT–CP and enter this value at the beginning of
//     FC1. See comment: "user modification (2)"
//
// 4.) Some modification is required in DB40. This DB defines the login
//     properties for the FTP server and the file that will be retrieved
//     in this example.
//
// 5.) Run an FTP server on a network that can be reached by your IT-CP.
//     Create a small file (a few hundred bytes) with the name you specified
//     in DB40. Place it in the root of the user you also specified in DB40.
//
// 6.) Copy UDT1 and the FCs FC40 – FC44 from the SIMATIC_NET_CP library and
//     insert them in your project. If you use a CP343-1 IT you will also
//     have to copy FC5 from the library. Compile this source, download
//     FC40 – FC44 (and if necessary FC5) and all the objects created from
//     this source to the CPU. These objects are: DB9, DB40, DB42, FC1, OB35.
//     The compiler should not report any errors or warnings.
//     Set MW200 to 0 to start the sequence.
//
// -------------------------------------------------------------------------------

DATA_BLOCK DB40
NAME : FTP_DATA
STRUCT
   ip_addr   : STRING [100];    // Do not change the lengths
   user      : STRING [32];     // of the following items.
   password  : STRING [32];     //
   file_name : STRING [220];    //
END_STRUCT;
BEGIN
   ip_addr   := '142.11.41.50'; // IP address, user and password of the
   user      := 'eric';         // FTP server that will be used in this
   password  := 'clapton';      // example. Modify the items to match
   file_name := 'testfile.dat'; // your environment.
END_DATA_BLOCK

// -------------------------------------------------------------------------------

DATA_BLOCK DB42
NAME : FTP_FILE
STRUCT
   hdr           : UDT 1;
   filedata      : ARRAY [0 .. 999] OF BYTE;
END_STRUCT;
BEGIN
   hdr.exist     := FALSE;   // is set after the first FTP_RETRIEVE
```

```
    hdr.locked     := FALSE;   // temp. is set and reset by FTP_RETRIEVE
    hdr.new        := FALSE;   // is set after every FTP_RETRIEVE. Manual reset is necessary.
    hdr.writeaccess:= FALSE;   // write access: FALSE
                               // -->for FTP client on IT-CP, TRUE-->for server on IT-CP
    hdr.act_length := L#0;     // is set by FTP_RETRIEVE
    hdr.max_length := L#1000;  // initial value; change only if size of array "filedata" is changed.
END_DATA_BLOCK


// ------------------------------------------------------------------------

DATA_BLOCK DB9
NAME : FTP_BUFFER
STRUCT
    reserved : ARRAY [0 .. 255] OF BYTE;
END_STRUCT;
BEGIN
END_DATA_BLOCK


// ------------------------------------------------------------------------

FUNCTION FC1: VOID
NAME : FTPCdemo
BEGIN
NETWORK
//To start, set MW200 to 0 in a VAT
    SET;
// ---------------------------------------- user modification (1) ----------
    L 1;              // Load connection ID of the FTP connection and store it
    T MW 202;         // in MW202 for use in the FTP function calls
// ---------------------------------------- user modification (2) ----------
    L 520;            // Load LADDR of your IT-CP and store it
    T MW 204;         // in MW204 for use in the FTP function calls
// ------------------------------------------------------------------------
    S M 210.0;        // ACT:=1 for FTP_CONNECT, FTP_RETRIEVE and FTP_QUIT.
    S M 220.0;        // Never call the FTP_xxx funtions with ACT:=0,
    S M 230.0;        // this will cause an error with STATUS 0x8F70 !
// ------------------------------------------------------------------------
    L MW 200;         // This is a simple state machine so that commands
    L 0;              // are executed in the right order.
    ==I;              //
    JC conn;          // Initiate or poll FTP_CONNECT
// ------------------------------------------------------------------------
    L MW 200;         //
    L 1;              //
    ==I;              //
    JC retr;          // Initiate or poll FTP_RETRIEVE
// ------------------------------------------------------------------------
    L MW 200;         //
    L 2;              //
    ==I;              //
    JC quit;          // Initiate or poll FTP_QUIT
// ------------------------------------------------------------------------
    JU end;           // Not a legal value for MW200, so do nothing.
                      // By setting MW200 to 0, the command sequence will start again
                      // and connect to the specified FTP server
// ------------------------------------------------------------------------
conn: CALL "FTP_CONNECT" (
        ACT          := M 210.0,
        ID           := MW 202,
        LADDR        := MW 204,
        LOGIN        := P#DB40.DBX 0.0 BYTE 170,
        BUFFER_DB_NR := 9,
        DONE         := M 210.1,
        ERROR        := M 210.2,
        STATUS       := MW 212
      );
```

```
// ----------------------- if ( error == 1 ) -----------------------------------
    SET;            // { Run a simple error routine. (An extended error routine
    A M 210.2;      //   could repeat the connect command if the error code is
    JC err;         //   0x8F61 : FTP server is off;  0x8F6A : temporary no resource on IT-CP) }
// ----------------------- if ( done == 0 ) ------------------------------------
    SET;            // {
    AN M 210.1;     //   Poll again next cycle
    JC end;         // }
// --------------------- else ---------------------------------------------------
    L 1;            // { Set MW200 so that the program activates the RETRIEVE command
    T MW 200;       //   in the next cycle. This allows an FTP_RETRIEVE command on this DB.
    R DB42.hdr.new; // }
// -----------------------------------------------------------------------------
retr: CALL "FTP_RETRIEVE" (
        ACT           := M 220.0,
        ID            := MW 202,
        LADDR         := MW 204,
        FILE_NAME     := P#DB40.DBX 170.0 BYTE 222,
        BUFFER_DB_NR  := 9,
        FILE_DB_NR    := 42,
        DONE          := M 220.1,
        ERROR         := M 220.2,
        STATUS        := MW 222
     );
// ----------------------- if ( error == 1 ) -----------------------------------
    SET;            // {
    A M 220.2;      //   Run a simple error routine
    JC err;         // }
// ----------------------- if ( done == 0 ) ------------------------------------
    SET;            // {
    AN M 220.1;     //   Poll again next cycle
    JC end;         // }
// --------------------- else ---------------------------------------------------
    L 2;            // { Set MW200 so that the program activates
    T MW 200;       //   the FTP_QUIT command in the next cycle }
// -----------------------------------------------------------------------------
quit: CALL "FTP_QUIT" (
        ACT     := M 230.0,
        ID      := MW 202,
        LADDR   := MW 204,
        DONE    := M 230.1,
        ERROR   := M 230.2,
        STATUS  := MW 232
     );
// ----------------------- if ( error == 1 ) -----------------------------------
    SET;            // {
    A M 230.2;      //   Run a simple error routine
    JC err;         // }
// ----------------------- if ( done == 0 ) ------------------------------------
    SET;            // {
    AN M 230.1;     //   Poll again next cycle
    JC end;         // }
// --------------------- else ---------------------------------------------------
    L 0;            // { Set MW200 so that the program activates
    T MW 200;       //   the FTP_CONNECT command in the next cycle
    JU end;         // }
// -----------------------------------------------------------------------------
err: L 255;         // This is the error exit for FC1. MW200 is set to 255.
    T MW 200;       // After this, the state machine will not execute any more
                    // FTP_xxx calls. Setting MW200 to 0 starts the sequence again.
// -----------------------------------------------------------------------------
end: BEU;
END_FUNCTION


// -----------------------------------------------------------------------------
```

```
ORGANIZATION_BLOCK OB 35
TITLE = FTP_TRIGGER
VAR_TEMP
   OB35_EV_CLASS : BYTE;          // Bits 0-3 = 1 (event entering state), Bits 4-7 = 1 (event class
1)
   OB35_STRT_INF : BYTE;          // 16#36 (OB 35 has started)
   OB35_PRIORITY : BYTE;          // Priority of OB Execution
   OB35_OB_NUMBR : BYTE;          // 35 (organization block 35, OB35)
   OB35_RESERVED_1 : BYTE;        // Reserved for system
   OB35_RESERVED_2 : BYTE;        // Reserved for system
   OB35_PHASE_OFFSET : WORD;      // Phase offset (msec)
   OB35_RESERVED_3 : INT;         // Reserved for system
   OB35_EXC_FREQ : INT;           // Frequency of execution (msec)
   OB35_DATE_TIME : DATE_AND_TIME; // Date and time OB35 started
END_VAR
BEGIN
NETWORK
   call FC1;
END_ORGANIZATION_BLOCK

// -----------------------------------------------------------------------------
```

❑

B Sample Program – Logging Data in the File System of the IT–CP

This sample program illustrates a typical use of the volatile RAM file system; the sample shows how to save your application data cyclically. The following FCs are used:

- FTP_CONNECT (FC40)
- FTP_STORE (FC41)
- FTP_QUIT (FC44)

Note

You should only use the RAM area of the file system to record data (due to the limited write cycles, you should not use the flash; see also notes in Section 3.2.2).

You will also find this example on the Manual Collection CD and can copy it from there.

```
// -------------------------------------------------------------------------------
// S7 DATALOGGING DEMO PROGRAM WITH ONE FTP CLIENT CONNECTION
// TO THE FTP SERVER ON THE SAME DEVICE.
//
// This program performs the following actions in an endless loop as long as
// no error occurs:
//       FTP_CONNECT  (FC40)
//       FTP_STORE    (FC41)
//       FTP_QUIT     (FC44)
//
// The code is located in FC2. It is called in OB35.
// To use this simple demo successfully, follow the steps below:
//
// 1.) Use STEP 7 V5.1 Service Pack 3 (or higher) and create a project with
//     at least 1 CPU and 1 IT-CP (6GK7 343/443-1GX11-0XE0 or higher)
//
// 2.) Create an FTP client connection by opening NetPro and creating an
//     unspecified TCP connection and checking the option 'Use FTP protocol'.
//     Enter the ID of this connection at the beginning of FC2. See also
//     comment: "user modification (1)"
//
// 3.) Obtain the LADDR of your IT-CP and enter this value at the beginning of
//     FC2. See comment: "user modification (2)"
//
// 4.) Some modifications are required in DB40. This DB defines the login
//     properties for the FTP server and the file that will be written
//     in this example. Enter the IT-CP's own address.
//
// 5.) Copy UDT1, FC40, FC41 and FC44 from the SIMATIC_NET_CP library and
//     insert them into your project. If you use a CP343-1 IT you will also
//     have to copy FC5 from the library. Compile this source, download
//     FC40, FC41 & FC44 ( and if necessary FC5 ) and all the objects created
//     from this source to the CPU. These objects are: DB9, DB40, DB43, FC2,
//     OB35. The compiler should not report any errors or warnings.
//     Set MW200 to 0 to start the sequence.
//
// 6.) The program will connect to the local FTP server and store a file with the
//     filename "datalog00.txt" into the volatile file system ( /ram ). The
//     content of the written file is the following 10 bytes: "DATALOG:00".
//     Then the program will disconnect the FTP connection and increment a
//     counter. This is done cyclically (depending on the execution cycle of
//     OB35. The file name "/ram/datalogXX.txt" and the content of the file
//     "DATALOG:XX" depend on the counter (where X = [0..9]). If the counter
//     reaches 99 it is reset to 0. As a result you will have one hundred data
//     logging files. The file with the latest time stamp is the one with the
//     newest contents.
//     A LAN analyzer will not see any packets at all. There is no way
//     of finding errors using a LAN controller !
// -------------------------------------------------------------------------------
DATA_BLOCK DB 40
NAME : FTP_DATA
  STRUCT
   ip_addr   : STRING  [100]; // Do not change the lengths
   user      : STRING  [ 32]; // of the following items.
   password  : STRING  [ 32];
   file_name : STRING  [220];
  END_STRUCT ;
BEGIN                        // Please enter:
   ip_addr := '192.168.1.12'; // IP address of the IT-CP
   user := 'eric';            // User with the right to modify the file system
   password := 'clapton';     // User's password
// Do not change the file name; Use the volatile file system ( /ram )
   file_name := '/ram/datalog00.txt';
END_DATA_BLOCK
// -------------------------------------------------------------------------------
DATA_BLOCK DB 43
```

```
NAME : FTP_FILE
  STRUCT
    hdr : UDT 1;
    logging_data : ARRAY  [0 .. 9 ] OF CHAR ;
  END_STRUCT ;
BEGIN
    hdr.EXIST := TRUE;
    hdr.LOCKED := FALSE;
    hdr.NEW := FALSE;
    hdr.WRITEACCESS := FALSE;
    hdr.ACT_LENGTH := L#10;
    hdr.MAX_LENGTH := L#10;
    logging_data[0] := 'D';
    logging_data[1] := 'A';
    logging_data[2] := 'T';
    logging_data[3] := 'A';
    logging_data[4] := 'L';
    logging_data[5] := 'O';
    logging_data[6] := 'G';
    logging_data[7] := ':';
    logging_data[8] := ' '; // these 2 bytes will be modified
    logging_data[9] := ' '; // during the data logging.
END_DATA_BLOCK
// ----------------------------------------------------------------------------
DATA_BLOCK DB 9
NAME : FTP_BUFF
  STRUCT
    reserved : ARRAY  [0 .. 255 ] OF BYTE ;
  END_STRUCT ;
BEGIN
END_DATA_BLOCK
// ----------------------------------------------------------------------------
FUNCTION FC 2 : VOID
NAME : FTPCdemo
BEGIN
NETWORK
TITLE =
// To start, set MW200 to 0 in a VAT.
      SET;
// -------------------------------- user modification (1) --------------------
      L    1;        // Load connection ID of the FTP connection and store it
      T    MW   202; // in MW202 for use in the FTP function calls.
// -------------------------------- user modification (2) --------------------
      L    272;      // Load LADDR of your IT-CP and store it
      T    MW   204; // in MW204 for use in the FTP function calls
// ----------------------------------------------------------------------------
      S    M 210.0; // ACT:=1 for FTP_CONNECT, FTP_RETRIEVE and FTP_QUIT.
      S    M 220.0; // Never call the FTP_xxx funtions with ACT:=0,
      S    M 230.0; // this will cause an error with STATUS 0x8F70 !
// ----------------------------------------------------------------------------
      L    MW   200; // This is a simple state machine so that commands
      L    0;        // are executed in the right order.
      ==I  ;
      JC   conn;     // Initiate or poll FTP_CONNECT
// ----------------------------------------------------------------------------
      L    MW   200;
      L    1;
      ==I  ;
      JC   stor;     // Initiate or poll FTP_STORE
// ----------------------------------------------------------------------------
      L    MW   200;
      L    2;
      ==I  ;
      JC   quit;     // Initiate or poll FTP_QUIT
// ----------------------------------------------------------------------------
      JU   end;      // Not a legal value for MW200, so do nothing. By setting
```

```
// -------------------------------------------------------------------------
quit: CALL "FTP_QUIT" (
          ACT          := M    230.0,
          ID           := MW   202,
          LADDR        := MW   204,
          DONE         := M    230.1,
          ERROR        := M    230.2,
          STATUS       := MW   232);
// ------------------------------- if ( error == 1 ) ----------------
     SET;            // {
     A    M 230.2; // Run a simple error routine
     JC   err;     // }
// ------------------------------- if ( done == 0 ) -----------------
     SET;            // {
     AN   M 230.1; // Poll again next cycle
     JC   end;     // }
// ------------------------------- else ----------------------------
     L    0;         // { Set MW200 so that the program activates
     T    MW  200; //   the FTP_CONNECT command in the next cycle
     JU   end;     // }
// -------------------------------------------------------------------------
err: L    255;      // This is the error exit for FC2. MW200 is set to 255.
     T    MW  200; // After this, the state machine will not execute any
                     // further FTP_xxx calls. Setting MW200 to 0 starts the
                     // sequence again.
// -------------------------------------------------------------------------
end:  BEU;
END_FUNCTION
// -------------------------------------------------------------------------
ORGANIZATION_BLOCK OB 35
TITLE = FTP_TRIGGER
VAR_TEMP
  OB35_EV_CLASS : BYTE ;    // Bits 0-3 = 1 (event entering state), Bits 4-7 = 1 (event
class 1)
  OB35_STRT_INF : BYTE ;    // 16#36 (OB 35 has started)
  OB35_PRIORITY : BYTE ;    // Priority of OB Execution
  OB35_OB_NUMBR : BYTE ;    // 35 (organization block 35, OB35)
  OB35_RESERVED_1 : BYTE ;  // Reserved for system
  OB35_RESERVED_2 : BYTE ;  // Reserved for system
  OB35_PHASE_OFFSET : WORD ;   // Phase offset (msec)
  OB35_RESERVED_3 : INT ;   // Reserved for system
  OB35_EXC_FREQ : INT ; // Frequency of execution (msec)
  OB35_DATE_TIME : DATE_AND_TIME ;  // Date and time OB35 started
END_VAR
BEGIN
NETWORK
     CALL FC    2 ;
END_ORGANIZATION_BLOCK
// -------------------------------------------------------------------------
```

❏

C References

/1/   SIMATIC NET CP Manual
             Description of Handling the Device and Installation
             SIEMENS AG

/2/   Information Technology in Automation Engineering
             White Paper
             SIEMENS AG

/3/   NCM S7 for Industrial Ethernet Manual
             Part
             – of the documentation package NCM S7 for Industrial Ethernet
             – of the online documentation in the STEP 7 optional package NCM S7
             for Industrial Ethernet
             SIEMENS AG

/4/   Programming Aid for S7 Beans (for Visual Age)
             SIEMENS AG
             Can be downloaded from the Internet

/5/   Programming Aid for S7 Beans / Applets
             SIEMENS AG
             Part of the Manual Collection CD or can be downloaded from the
             Internet

/6/   NCM S7 for Industrial Ethernet "Primer", part
             – of the documentation package NCM S7 for Industrial Ethernet
             – of the online documentation in the STEP 7 optional package NCM S7
             for Industrial Ethernet
             SIEMENS AG

/7/   SIMATIC STEP 7 User Manual
             Part of the STEP 7 documentation package STEP 7 Basic Knowledge
             SIEMENS AG

/8/   SIMATIC Communication with SIMATIC
             Manual
             SIEMENS AG

/9/   SIMATIC STEP 7 Programming Manual
             Part of the STEP 7 documentation package STEP Basic Knowledge

SIEMENS AG

/10/   SIMATIC STEP 7 Reference Manual Documentation Package
                 SIEMENS AG

/11/   SIMATIC NET Industrial Twisted Pair Networks Manual
                 SIEMENS AG

/12/   Ethernet, IEEE 802.3
                 (ISO 8802-3)

/13/   SINEC CP 1413
                 Manuals for MS-DOS, Windows
                 SIEMENS AG

/14/   SIMATIC S7
                 S7-300 Programmable Controller
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                 Manual
                 SIEMENS AG

/15/   SIMATIC NET Triaxial Networks for Industrial Ethernet Manual
                 SIEMENS AG

/16/   SIMATIC NET Ethernet Manual
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/17/   Lokale Netze –
                 Kommunikationsplattform der 90er Jahre
                 Andreas Zenk
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/18/   TCP/IP
                 Internet-Protokolle im professionellen Einsatz
                 Mathias Hein
                 International Thomson Publishing
                 ISBN 3-8266-400-4
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/19/   RFC1006

/20/   RFC793 (TCP)

/21/   RFC791 (IP)

/22/   Berger, Hans
                           Automation with STEP 7 in STL

Order Numbers

The order numbers for the SIEMENS documentation listed above can be found in the catalogs "SIMATIC NET Industrial Communication, Catalog IK10" and "SIMATIC Programmable Controllers SIMATIC S7 / M7 / C7 – Components for Fully Integrated Automation, Catalog ST70".

You can obtain these catalogs and any other information you require from your local SIEMENS branch and national subsidiary

Some of the documents listed here are also on the Manual Collection CD supplied with every S7–CP.

Further recommended reading on the topics Internet/Web, HTML, Java

/23/   Web–Publishing with HTML 4
                           Deborah S.Ray / Eric J.Ray
                           Sybex Verlag 1998

/24/   Durchblick im Netz
                           Vom PC–LAN zum Internet
                           Kauffels, F–J.
                           Internat. Thomson Publ., 1998
                           ISBN 3–8266–0413–X

/25/   Campione/ Walrat
                           The JavaTM Tutorial
                           Second Edition
                           Object–Oriented Programming for the Internet
                           ADDISON–WESLEY, 1998
                           ISBN 0–201–31007–4

❏

D Glossary

D.1 General

Broadcast

A broadcast is like "calling all stations": Using **one** broadcast frame, you can reach all nodes that are prepared to accept broadcast frames.

Bus segment

Part of a –> subnet. Subnets can consists of bus segments and connectivity devices such as repeaters and bridges. Segments are transparent for addressing.

Client

A client is a device or, in general terms, an object that requests a service from a –> server.

Configuration data

Parameters that determine the modes and functions of a–> CP. They are set and downloaded using the NCM S7 configuration tool.

CP

Communications Processor. Module for communications tasks.

CSMA/CD

CSMA/CD (Carrier Sense Multiple Access with Collision Detection)

Frame

A message from one PROFIBUS/Ethernet station/node to another.

Frame header

A frame header consists of an identifier for the –> frame and the source and destination address.

Frame trailer

A frame trailer consists of a checksum and the end identifier of the –> frame.

Functions (FCs)

  STEP 7 code blocks of the type "function".

Gateway

  Intelligent connectivity device that connects local area –> networks of different types at the ISO Layer 7 level.

Industrial Ethernet

  A LAN system complying with IEEE 802.3 (ISO 8802–2)

Multicast

  A multicast is like "calling all group stations": Using **one** multicast frame, you can reach all the nodes that belong to the multicast group and that are prepared to receive frames.

NCM S7 for Industrial Ethernet

  Configuration software for configuration and diagnostic functions on an Ethernet CP.

NCM S7 for PROFIBUS

  Configuration software for configuration and diagnostic functions on a PROFIBUS CP.

Network

  A network consists of one or more interconnected –> subnets with any number of –> nodes. Several networks can exist one beside the other.

Process image

  The process image is a special memory area in the programmable logic controller. At the start of the cyclic program, the signal states of the input modules are transferred to the input process image. At the end of the cyclic program, the output process image is transferred to the output modules as a signal state.

PG operation

  A mode of the PROFIBUS/Ethernet CP in which the SIMATIC S7-CPU is programmed, configured or diagnosed over PROFIBUS/Ethernet. This mode is handled by the S7 functions.

PROFInet

Standard of the PROFIBUS Users organization defining a heterogeneous communications and engineering model.

Protocol

A set of rules for transferring data. Using these rules, both the formats of the messages and the data flow during transmission can be specified.

Segment

Synonym for –> Bus segment.

Server

A server is a device, or in general terms, an object that provides certain services. A service is started at the instigation of a –> client.

Services

Services provided by a communication protocol.

SIMATIC NET

Siemens SIMATIC Network and Communication. Product name for –> networks and network components from Siemens. (previously SINEC)

SIMATIC NET Ind. Ethernet

SIMATIC NET LAN system for industrial applications based on Ethernet. (previously SINEC H1)

SINEC

Previous product name for –> networks and network components from Siemens. Now: SIMATIC NET

Station

A stations is identified by the following:

- a MAC address on Ethernet
- a PROFIBUS address on PROFIBUS

Subnet

A subnet is part of a –> network whose parameters (for example on –> PROFIBUS) must be matched throughout the subnet. It includes the bus components and all attached stations. Subnets can, for example, be connected together by –> gateways to form a network.

A –> system consists of several subnets with unique –> subnet numbers. A subnet consists of several –>nodes with unique –> PROFIBUS addresses or –> MAC addresses (with Industrial Ethernet).

System

This means all the electrical equipment within a system. A system includes, among other things, programmable logic controllers, devices for operation and monitoring, bus systems, field devices, actuators, supply lines.

Transport layer

The transport layer is layer 4 of the ISO/OSI reference model for open system interconnection. The transport layer is responsible for reliable transmission of data (raw information) from device to device. Transport connections are used for transmission.

Transport interface

The transport interface of a SIMATIC S5 PLC is the access to the connection-oriented services of the transport layer on the CP. The control program sees the transport interface in the form of handling blocks (HDBs).

TSAP

Transport Service Access Point

Transmission rate

According to DIN 44302, this is the number of binary decisions transmitted per time unit. The unit is bps. The transmission rate used depends on a number of conditions such as the end–to–end distance.

Watchdog

Mechanism for monitoring operability.

D.2 Industrial Ethernet

API

Application Programming Interface: programming library.

Applet

–> Java Applet

Base address

Logical address of a module in S7 systems.

- PROFIBUS

  The base PROFIBUS address is the address starting from which all automatically calculated address within a project are assigned.

- Industrial Ethernet

  The base MAC address is the address starting from which all automatically calculated address within a project are assigned.

Bean

–> JavaBean

E–mail connection

An E–mail connection is a logical connection between an S7 CPU and an IT–CP. It is essential for sending E–mails.

Firewall

Security mechanism suitable for interconnecting a private network to a public network, for example to the Internet, without anyone from the Internet obtaining access to the private information of the private network without authority.

FTP

File **T**ransfer **P**rotocol

HTML

      Hyper **T**ext **M**arkup **L**anguage is the name of an intermediate file format that is understood by all browsers and makes data communication easier.

HTML process monitoring

      Name of the technique allowing process information to be accessed using HTML pages.

HTML page

      A file created in HTML format that can be made available, for example on Web servers and can be called in the intranet/Internet.

HTTP

      Hyper **T**ext **T**ransfer **P**rotocol

HTML tag

      HTML tags identify structure elements of HTML documents; these documents include for example titles, paragraphs, tables, or applet calls.

IDE

      Integrated Development Environment, for example, IBM Visual Age, Borland JBuilder, ...

Information technology (IT)

      General: This term refers to all tasks involved in information processing and management. Specific: In SIMATIC NET, this term is used for products (generally communications processors) that allow or support communication between manufacturing/production facilities and other data processing systems via a company intranet or via the Internet.

Ind. Ethernet station

      A station is identified by a –> MAC address in –> Industrial Ethernet.

Internet protocol (IP)

Internet protocol, corresponds to layer 3 of the ISO 7–layer model.

IP address

IP: Internet Protocol. An IP address is used to address a node in a network. Example: 192.168.10.104

ISO–on–TCP

Communication connection of the transport layer (layer 4 communication complying with ISO) mapped to TCP.

Messages can be exchanged bidirectionally on an ISO–on–TCP connection. TCP provides data stream sequence communication without segmenting data in messages. ISO on the other hand is message–oriented. With ISO–on–TCP, this mechanism is mapped on TCP. This is described in RFC1006 (Request For Comment).

ISO–on–TCP connections all program/event–controlled communication on Ethernet from SIMATIC S7 to

- SIMATIC S7 with an Ethernet CP
- SIMATIC S5 with an Ethernet CP
- PC/PG with an Ethernet CP
- any other suitable system

Java

Object–oriented programming language developed by the Sun computer company.

Java applets

These are small Java applications that are transferred from Web servers to clients where they are run (in a Web browser with Java capability).

JavaBean

A JavaBean (or simply "bean") is a reusable software object with a standardized interface that can be linked with other JavaBeans in Builder tools to create an application (for example a Java applet). Ready–to–use S7 beans are available for IT–CP.

JavaScript

A script language developed by Netscape. JavaScript allows Web documents to be designed interactively and dynamically. JavaScript is a programming language that is easy to learn.

Java Virtual Machine (JVM)

–> SUN Java Virtual Machine (JVM)

MAC address

Address to distinguish between different stations connected to a common transmission medium (Industrial Ethernet).

Media Access Control (MAC)

Mechanisms for controlling access by a station to a common transmission medium shared with other stations.

MIME

Multipurpose Internet Mail Extension

PING

Packet Internet Groper. This is a synonym for ICMP echo (Internet Control Message Protocol).

Plugin component

A plugin is a program that extends the capability of the browser. It allows, for example, the display of different file formats, in particular the representation of multimedia elements.

Proxy server

A proxy server can increase the security in a network. Among other things, the software can be used to check access or to deny access to particular pages or documents as is also the case with the firewall. A proxy server can also serve as a type of buffer so that web pages that have been called once do not always have to be addressed again via the host. Waiting times can sometimes be greatly reduced.

RFC1006
> see ISO–on–TCP

S7 applet
> An S7 applet is a special Java applet written for the IT–CP.

S7 beans
> S7 beans are special JavaBeans supplied for the IT–CP in a class library. They allow access to process data via IT–CP and display of the data in a Web browser.

S7BeansAPI
> The S7BeansAPI is a software component library. It contains the S7 beans of the IT–CP.

Sandbox
> In the Web browser, Java applets run in the sandbox. This means that for security reasons the Java applets cannot, for example, access the local file system and cannot establish links to third parties (this is why the IT–CP from which the applies were loaded can always be addressed but no other).

Subnet mask
> The subnet mask specifies which parts of an IP address are assigned to the network number (see ISO-on-TCP). The bits in the IP address whose corresponding bits in the subnet mask are set to 1 are assigned to the network number.

Subnet number
> A –> system consists of several –> subnets with unique subnet numbers.

SUN Java Virtual Machine (JVM)

>The Java Virtual Machine is the central element in SUN's Java programming environment. This component makes Java programs independent of a particular platform.

TCP

>**T**ransport **C**ontrol **P**rotocol, corresponds to layer 4 of the ISO 7–layer model.

TCP/IP

>TCP = Transmission Control Protocol; IP = Internet Protocol

UDP

>User Datagram Protocol. Datagram service for simple, internetwork data transfer with no confirmation.

URL (Uniform Resource Locator)

>Identifies the address of a document in an intranet or on the Internet.

Web browser

>Basic software for displaying multimedia offers of the World Wide Web (normally simply : Web or WWW) on a PC, Unix workstation, Apple Macintosh, etc.

Web server

>Term for a computer in the network that provides services to other computers in the Web at the request of a client (–> Web Browser).

Workbench

>This is the name of the main application of Visual Age that manages all the projects.

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E Document History

This section provides an overview of the **previous** releases of this manual and the functional expansions in STEP 7 and NCM S7.

New in Release 04 / STEP 7 V5.2

This release of the Instructions describes the new IT-CPs, CP 343-1 IT for the SIMATIC S7-300 and CP 443-1 IT for the SIMATIC S7-400 with their new functions.

New features include:

- The standard HTML pages stored on the IT-CP have been extended.

- The FTP functionality has been greatly simplified. The information you require is now in a separate chapter.

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The languages of the SIMATIC Hotlines and the authorization hotline are generally German and English.		

Service & Support on the Internet

In addition to our documentation, we offer our Know-how online on the internet at:

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

where you will find the following:

- The newsletter, which constantly provides you with up-to-date information on your products.

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