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SIMATIC NET
NCM S7 for PROFIBUS / FMS

Manual Volume 2/2

for NCM S7 V5.1 and higher

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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, severe personal injury or substantial property damage **will** result if proper precautions are not taken.

Warning

indicates that death, severe personal injury or substantial property damage **can** result if proper precautions are not taken.

Caution

indicates that minor personal injury or property damage can result if proper precautions are not taken.

Caution

indicates that property damage can result if proper precautions are not taken.

Notice

highlights important information on the product, using the product, or part of the documentation that is of particular importance and that may have detrimental effects if 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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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.

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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.

This product can only function correctly and safely if it is transported, stored, set up, and installed correctly, and operated and maintained as recommended.

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.

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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.

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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.

Siemens AG
Automation and Drives
Postfach 4848, D-90327 Nuernberg

Technical data subject to change.

Preface

Purpose

This manual supports you when you use the communication services provided by the SIMATIC NET communications processors (PROFIBUS CPs) for communication on SIMATIC NET PROFIBUS at the field level.

The manual deals with the following topics:

- The performance and applications of the communications services
- Configuring the CP with the NCM S7 configuration software
- Programming communications interfaces to the user program

Audience

This manual is intended for installation personnel, programmers of STEP 7 programs and service personnel.

Scope of the Manual

The manual is valid for version 5.1 and higher of the NCM S7 configuration software and for version 5.1 and higher of the STEP 7 software.

This version of the manual contains new information relating to service pack 3 of STEP 7 and NCM S7.

Please note the changes made in the safety–related notices. You will find explanations of the extended notices on page 2 of this manual.

Additional Information

This manual is also part of the NCM S7 for PROFIBUS documentation package. You will also find these documents on the Manual Collection CD supplied with every S7 CP. The following table provides you with an overview.

Title	Topic
NCM S7 for PROFIBUS, Primer	Based on simple examples, the primer introduces you to the methods of connecting and networking SIMATIC S7 stations with CPs on PROFIBUS. The primer shows you how the communications calls are entered in the user program to allow you to use the services via the SEND/RECEIVE interface and the services of the distributed peripheral I/Os. You will learn how simple it is to create a configuration for standard applications using STEP 7 and the NCM S7 optional package.
NCM S7 for PROFIBUS Volume 1	The manual is intended as a guide and reference work for configuring and programming a PROFIBUS CP. When working with the configuration software, you can also call up the online help in specific situations.
NCM S7 for PROFIBUS Volume 2	Volume 2 of the manual describes the additional FMS communications services.
Product Information CP xxxx	The product information bulletins accompanying the CPs contain information about the specific characteristics of the particular CP and instructions on installation and connections.

Additional Information on SIMATIC S7 and STEP 7

The following documentation contains additional information about the STEP 7 standard software of the SIMATIC programmable controllers and can be obtained from your local Siemens office.

Topic	Document	Order nos.
Basic information for technical personnel using the STEP 7 standard software for control tasks with S7–300/400 programmable controllers.	STEP 7 basics with • Configuring Hardware with STEP 7 • Programming with STEP 7 • Manual for converting from S5 to S7 • Primer for a fast start	6ES7810–4CA0x–8BA0
The reference works describing the programming languages LAD/FBD and STL as well as the standard and system functions in addition to the STEP 7 basic knowledge.	STEP 7 reference manuals with • Manuals for LAD/FBD/STL • Standard and system functions for S7–300/400	6ES7810–4CA0x–8BR0

Access to Online Help in 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.

  You can then 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.

Tip:

This symbol appears in the margin to draw your attention to useful tips.

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Contents

Open Communication with FMS Using the PROFIBUS CP

1

Topics in this Chapter

This chapter provides you with information about the areas of application and communications procedures of a SIMATIC S7 programmable controller with a PROFIBUS CP and FMS functionality.

Further Information

You will find further information in the following sources:

- For information about all the communication options available with a SIMATIC S7 programmable controller and a PROFIBUS CP, refer to Volume 1 of this manual.
- For information about installing the PROFIBUS CP, refer to the instructions in the product information supplied with the PROFIBUS CP /1/. The product information also contains further information about the performance of the PROFIBUS CP.
- For information about the functionality and application of STEP 7 configuration software, some of which is used to configure the CP (such as hardware configuration), refer to /4/ and /5/.

Configuration and Diagnostics

To connect and configure the PROFIBUS CP, you require the SIMATIC NET NCM S7 for PROFIBUS configuration software.

NCM S7 for PROFIBUS is installed as a STEP 7 optional package and is therefore integrated in STEP 7.

NCM S7 for PROFIBUS also provides comprehensive diagnostic options for different types of communication.

Working with NCM S7 for PROFIBUS as a configuration tool for FMS is described in the following chapters and in the help system of the configuration software.

1.1 Overcoming Language Barriers between Devices with FMS

Application and Uses: The Open Interface

Data transmission via a configured FMS connection is suitable for the transmission of structured data between two PROFIBUS nodes that support the FMS standard.

The great advantage of this FMS protocol is that data structures can be transferred in a neutral format and then converted to the format required by the end device.

This means that you can **communicate with all devices** that understand the FMS protocol.

In the user programs of the end devices, you can therefore use “Device Language”, for example Statement List for SIMATIC S7/SIMATIC M7 PLCs and C for the PC application.

FMS Nodes

FMS connections are possible between SIMATIC S7 controllers equipped with a PROFIBUS CP and the following communication partners:

- SIMATIC S7/SIMATIC M7 PLC with PROFIBUS CP
- SIMATIC S5 PLC with PROFIBUS CP (5431 FMS/DP)
- SIMATIC ET 200 U with PROFIBUS interface IM 318 C
- PC/PG with PROFIBUS CP (for example CP 5412 A1/A2)
- Devices that support the PROFIBUS standard for FMS with client or server functionality.

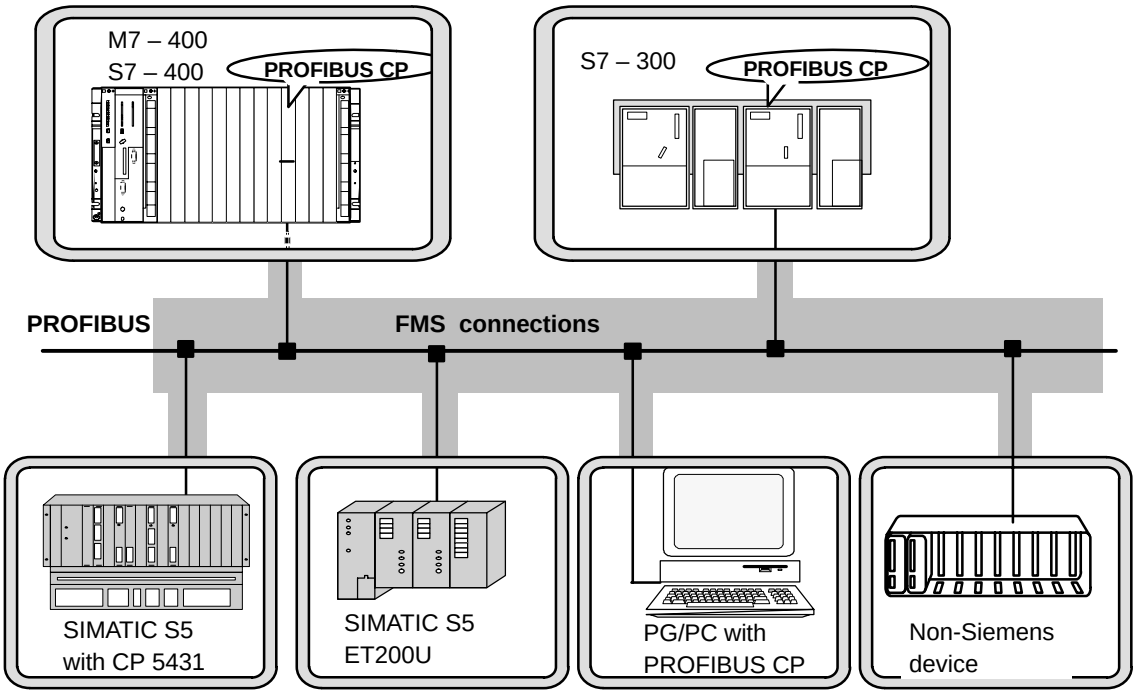

Figure 1-1 SIMATIC S7 PLC with Possible Communications Nodes via the Open FMS Interface

1.2 FMS Interface and FMS Master System

FMS Interface

Data is transmitted on an FMS connection when triggered by the user program. Special SIMATIC S7 function blocks (FBs) form the interface to the user program on the SIMATIC S7 programmable controller.

Function blocks are available for the following tasks:

Table 1-1

Task	Function Block (FB)
Read variable	READ
Write variable	WRITE
Report variable	REPORT
General VFD services	IDENTIFY STATUS

Nodes in the FMS Master System

On the PROFIBUS, devices are divided into masters and slaves. The right of access to the bus known as the token is passed on from master to master. The slaves can only react when requested to by a master.

In terms of the functionality of an FMS device, a further distinction is made between the following:

– FMS client

  The FMS client requests a service; assuming that it is a master on the PROFIBUS.

– FMS server

  The FMS server provides the requested service; both a master on the PROFIBUS as well as a slave on the PROFIBUS can act in the server role.

An FMS master system is formed by **all** the devices with FMS functionality on the PROFIBUS subnet. This means that several FMS masters can access the same slaves.

In contrast to this system, with distributed peripheral I/Os (DP) there are additional assignment criteria with which all or a subset of the DP slaves on the subnet can be assigned to a DP master. In other words, several DP master systems are possible.

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Configuring FMS Connections / Programming the FMS Interface

2

Topics in this Chapter

This chapter explains the following:

- The properties of an FMS connection
- How to send and receive data
- The data areas that can be used in the S7 CPU

Programming / Configuring

You will also find information about the following:

- Programming:

  Which functions are provided by the FMS interface in the user program.

- Configuring:

  How to configure an FMS connection and which connection and communication properties are set during configuration.

Where to Find Further Information

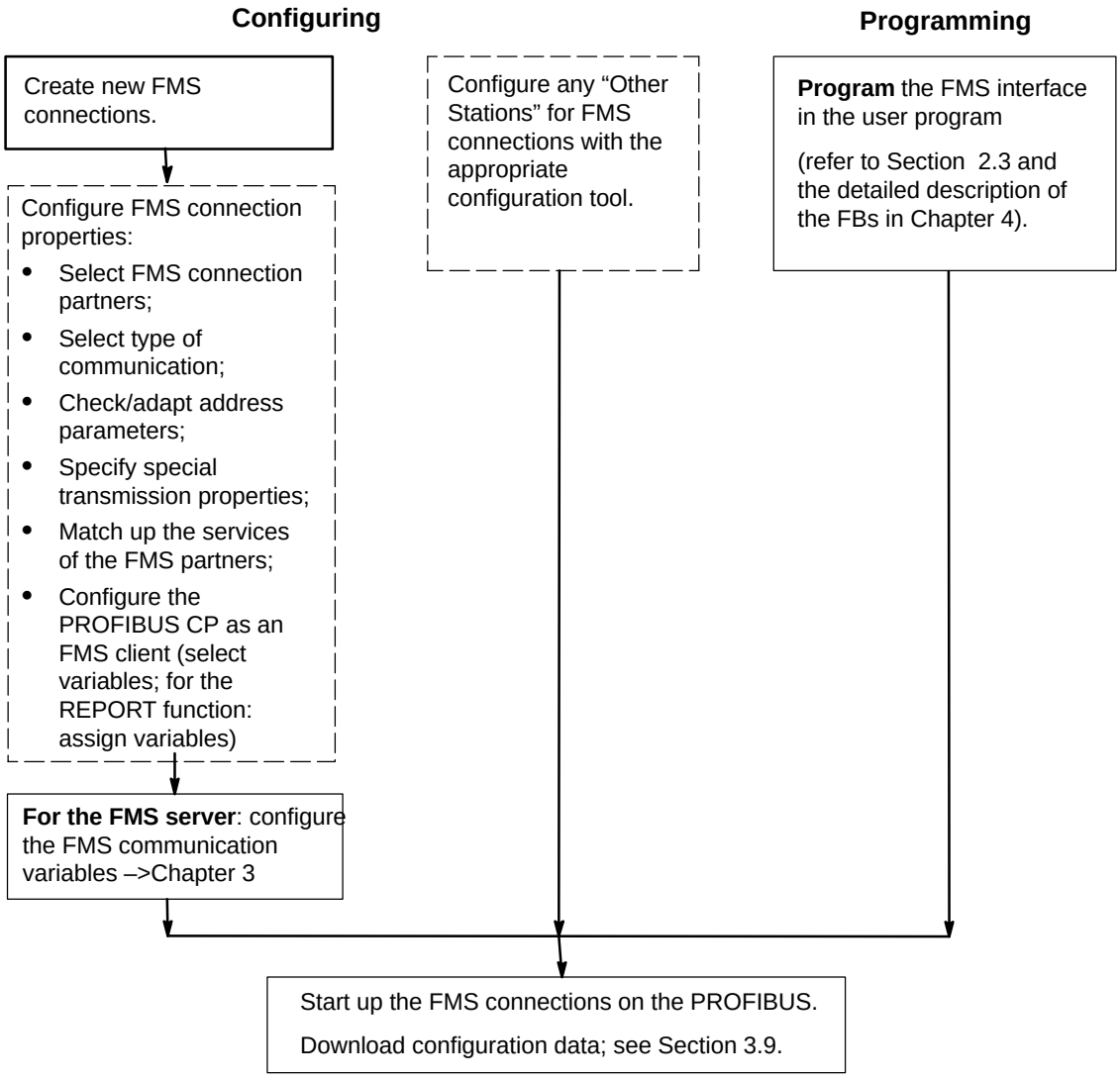
You will find further information in the following sources:

- For programming and configuring communication nodes for FMS connections (for example SIMATIC S5 programmable controller with CP 5431 FMS/DP, SIMATIC ET200 U with PROFIBUS interface (IM 318C), PC with CP 5412 A1/A2), refer to the manual for the specific device.
- The function blocks (FBs) for programming the FMS connections are described in Chapter 4. Here, you will find detailed information about programming techniques and communication procedures.
- The EN 50170 standard, Volume 2, PROFIBUS

2.1 Getting Started

Outline of the Steps

After configuring and networking S7 stations, the following steps are necessary to allow data exchange via FMS connections in the SIMATIC S7 PLC equipped with a PROFIBUS CP:



You will find the information you require for configuring in the following sections. Section 2.5 “Configuring FMS Connection Properties” contains a **checklist** in which you can see when the optional steps are useful.

2.2 SIMATIC S7 Programmable Controllers with FMS Connections

Virtual Field Device (VFD)

A device operating on PROFIBUS and complying with the FMS norm is generally known as a **V**irtual **F**ield **D**evice (a field device with an open communications interface).

S7-300/400 as VFD

The FMS interface described in this manual provides you with access to this open communication in the S7 user program.

The FMS services implemented on the PROFIBUS CP ensure that the data are converted from the S7 format to the neutral FMS data format and vice-versa.

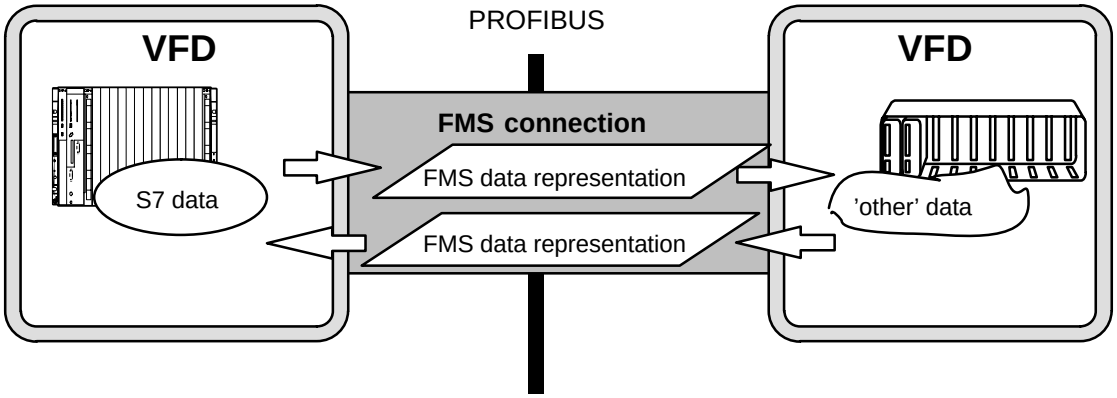


Figure 2-1 FMS Connection of an S7 VFD to any Device with an FMS Interface

Each CPU of a SIMATIC S7 with a PROFIBUS CP appears to the communication partner as **one** VFD. This means that you do not need to make any special assignments of devices or program sections to the VFD.

How the VFD is simulated on the partner device is described in the device documentation of your device. Depending on the type of device, one or more VFDs can be assigned within a physical device.

Properties of the FMS Connection

An FMS connection allows program-controlled communication between two nodes on the PROFIBUS with the following properties:

- Depending on the type of communication, for example master-master-cyclic (see Section 2.7.1), data transfer is bidirectional or monodirectional. Bidirectional means that it is possible to send and receive simultaneously on the FMS connection.
- Data is transferred using the FMS services complying with the EN 50170 standard. The services are negotiated between the communication partners automatically when the connection is established. You specify the services you require on the PROFIBUS CP during configuration.
- The data are transmitted on the FMS connection in the FMS format as specified in the EN 50170 standard.
- Depending on the services used on the FMS connection, a VFD functions as the FMS client, as the FMS server or performs both roles:
  - FMS client

    The FMS client requests a service; this assumes that the device is a master on the PROFIBUS.
  - FMS server

    The FMS server provides a requested service; both masters and slaves on the PROFIBUS can act as servers.

Amounts of Data and Numbers of Connections

The product information supplied with your PROFIBUS CP /1/ lists the maximum number of FMS connections supported by the particular PROFIBUS CP. The number of connections per station and the number of configurable server variables can be increased by adding further CPs.

On an FMS connection, the PROFIBUS CP can transmit an FMS protocol data unit (FMS PDU) with a maximum length of **241 bytes** per job. To obtain the user data length, you must take into account the protocol header and the way in which the data is converted from the S7 data presentation to the FMS data representation. For more detailed information, refer to Section 2.8.

For precise information about amounts of data and numbers of connections etc., refer to the product information /1/.

Tasks of the PROFIBUS CP

The PROFIBUS CP is responsible for the following tasks when handling the data transfer on an FMS connection:

- Receiving data from the PROFIBUS, converting the data from the FMS representation to the particular representation required by the device and passing on the data to the user data area on the CPU.
- Accepting data from the user data area of the CPU, converting the data to the FMS representation and sending the data on the PROFIBUS.

Requirements for Configuration

The PROFIBUS CP must first be entered in the hardware configuration of the S7 station and must be connected to the subnet.

Notice

All stations not in the current project must be entered and networked as “S5 Stations” or as “Other Stations” (S7 stations outside the project or non S7 stations).

Priority of the Frames

Please refer to the product information /1/.

2.3 The FMS Interface in the User Program

Principle

When you write the user program, you start with configured FMS connections. The FMS connections are established when the PROFIBUS CP starts up.

In the user program, you use function block (FB) calls for the communication jobs. The FMS connection is named in the FB call by the connection ID. Otherwise, the user program is not involved in handling connections.

The return values on the FMS interface (FBs) inform you of the status of the FMS connection. FMS diagnostics provides further information about the statuses of an FMS connection.

Writing, Reading and Reporting Data with Function Blocks (FBs)

The following function blocks (FBs) are available for handling communication on FMS connections:

Table 2-1

FB	Function/Method of Operation
WRITE	The user data referenced in the call are converted to the FMS representation and transmitted. The conversion is made). • according to the variable description stored on the partner and read during connection establishment (GetOD FMS service) • according to the configured variable description The data transfer is confirmed by the FMS server.
READ	The data area referenced by the FMS client in the job is converted to the FMS representation in the FMS server and transferred to the FMS client as the response. The data is reconverted on the FMS client • according to the variable description read during connection establishment on the FMS server (GetOD FMS service) • according to the configured variable description

Table 2-1 , continued

FB	Function/Method of Operation
REPORT	The user data referenced in the call are converted to the FMS representation on the FMS server according to the configured variable description and transferred. The sender does **not** receive confirmation (acknowledg,emt) from the remote application. The data are reconverted on the FMS client according to the **locally** configured variable description.

The following schematic illustrates how these function blocks work; the arrows indicate the direction of flow of the user data:

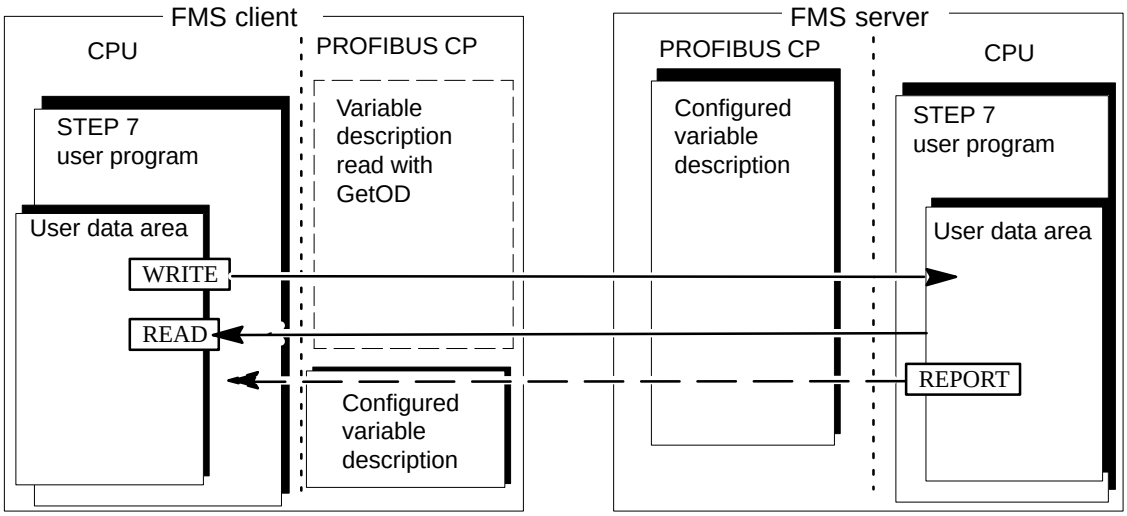


Figure 2-2 Service Request and Data Flow Between FMS Client and FMS Server

Other Services

Further function blocks (FBs) are available to coordinate data transfer between the FMS devices and for information, as follows:

Table 2-2

FB	Function/Method of Operation
IDENTIFY	Identification parameters such as the vendor name and the model of the partner device are read.
STATUS	With this job, standardized and device-specific status information can be requested from the partner device.

Programming the FMS Interface

Program the FMS interface in the user program as follows:

1. Use the FBs described above for data transfer.
2. Evaluate the values in the return parameters of the FB, as follows:
   - With WRITE and REPORT the parameters DONE, ERROR, STATUS;
   - With READ, IDENTIFY and STATUS the parameters NDR, ERROR, STATUS;

The flow charts for the function blocks in Chapter 4 illustrate how to supply and handle the FMS interface in the user program for problem-free data exchange. The primer /2/ contains examples.

Notice

The parameters for connection identification (local ID) must be identical in the program and configuration.

Accessing FMS Variables by Index or Name

There are two ways of accessing FMS variables with an FB WRITE or FC READ in the user program:

- Access using variable names

  In this type of access, the variable name stored on the FMS server is specified and transferred to the FMS server with the request frame.

Example of access to a variable with the name MOTOREN.MOTOR1

Store the name in a data block (symbolic name: Index102 WRITE parameter):

Write_VAR_name	STRING[14]	'MOTOREN.MOTOR1'

Reference the name of a variable symbolically in the FB call:

```
VAR_1 :="Index102 WRITE-Parameter".Write_VAR_name
```

   - Advantage

     Reliable access since the naming of the variable is not dependent on its actual address.

– Disadvantages

The variable name must be defined on the FMS server. On the S7 CP, the variable must be configured (see Section 3.6.1).

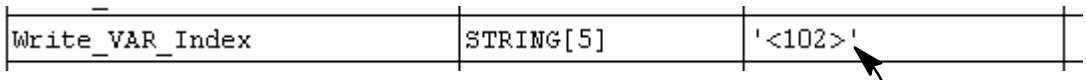
The variable name must be transferred in the frame and is therefore included in the PDU length (for information on calculating the PDU length, refer to Section 2.8).

- Access using the variable index (FMS index)

  In this type of access, an index is specified as the variable address and transferred with the request frame to the FMS server.

Example of accessing a variable with the index 102

Store the index in a data block (symbolic name: Index102 WRITE parameter):



Reference the index of a variable symbolically in the FB call:

```
VAR_1 :="Index102 WRITE-Parameter".Write_VAR_Index
```

– Advantages

Short name for the variable;

Generally, the index requires less space in the frame than a name (for information on calculating the PDU length, see Section 2.8);

Less effort required for configuring variables (see Section 3.6.1).

– Disadvantages

If changes are made to variable structures, the index specified in the user program may have to be adapted to the modified variable address.

2.4 Creating a New FMS Connection

Principle

When you create new FMS connections, you start from entered and networked stations. An FMS connection is then configured starting from a station in the current S7 project and then selecting a second station.

Due to the networking, the node addresses (PROFIBUS addresses) of the two stations are already decided. The local/remote LSAPs (Link Service Access Point) at both ends of the connection are automatically assigned default values.

How to Open the Table

You can open the connection table in a variety of ways:

Using the “Start” button in the Windows taskbar **Simatic ▸ STEP7 ▸ Configure Networks**, you open the NETPRO graphic representation.

In NETPRO, follow the steps below:

1. Select the station or the CPU in the station from which you want to establish the connection.
2. Select the menu command **Options ▸ Configure Connections** (also available with the right mouse key!)**.**

As an alternative, you can start in the SIMATIC Manager, as follows:

1. Open your CPU in the SIMATIC Manager.
2. Select the object **Connection**  .
3. Double-click the object or select
   Edit ▸ Open Object in the menu bar.

Result: The connection table appears on the screen with all the connections configured for the selected CPU (local node).

Endpoint is the CPU

The endpoint of the connection to a SIMATIC S7 station is always a CPU. A separate connection table is created for each CPU and contains the connection partner and type of connection.

By selecting a different CPU, you can also display its connection table.

Notice

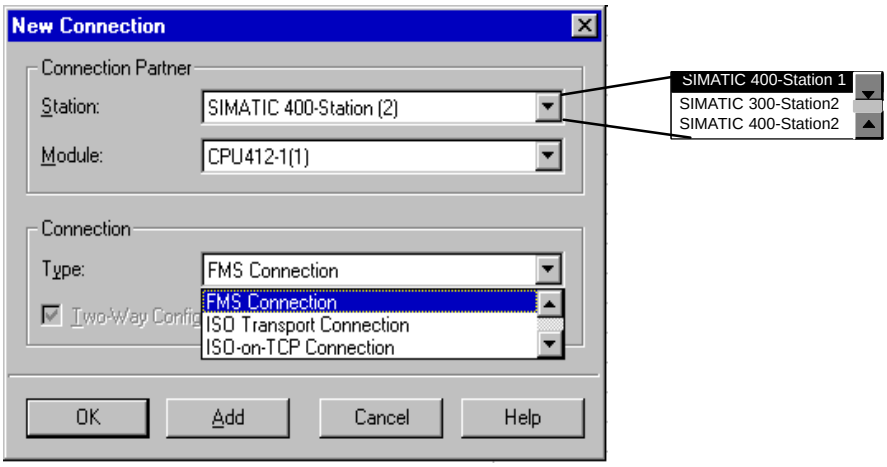
The parameters for connection identification (local ID) must be identical in the program and in the configuration.

Creating a New FMS Connection

To configure a new FMS connection, the stations and their CPs must be configured and networked in the S7 project. To create a new FMS connection, follow the steps below:

1. Select **Insert ▸ Connection...** in the menu bar.

Result: The “New Connection” dialog appears on the screen.



2. In the “Type” list box, select the connection type you want to use, in this case FMS connection.

All the remote partners of the selected local station in the S7 project and all the programmable modules (CPUs) they contain are displayed for selection.

3. Select the programmable module or the destination station to which you want to establish the connection.

The **Add** button enters the connection in the list. Instead of the **OK** button, the **Close** button then appears, you can enter further assignments.

With **OK**, the connection is entered in the list, the dialog is terminated and the display in the main dialog is updated.

With **Cancel**, the dialog is terminated and the connection is not entered in the list.

Note

Refer to the product information /1/ accompanying the CP to check how many connections are possible per PROFIBUS CP. If there is more than one CP installed in a station, the program automatically switches to the next CP if you exceed the limit for the number of connections. In the Properties dialog, you can reassign the connections to other CPs later.

Connections to “S5 Stations” or to “Other Stations” are created as “Incompletely Specified Connections”, in other words the remote LSAP is a proposed value. These connections must be checked and acknowledged with “OK” in the Properties dialog.

Connections to Stations External to the Project

If you configure connections to SIMATIC stations outside a project or to non-S7 devices, select a station of the type SIMATIC S5 or “Other Station”.

Due to the networking, the node addresses (PROFIBUS addresses) of the two stations are already decided. The local/remote LSAPs (Link Service Access Point) at both ends of the connection are automatically assigned default values. **The remote LSAP is a proposed value that must be checked and matched to the partner station.**

Note

If a station outside the project is made up physically of several nodes, you must create a separate “Other Station”, SIMATIC S5 or PC/PG object for every node of the station.

Unspecified Connection

If you select an unspecified station as the destination of an FMS connection, you can specify the addresses and parameters later in the Properties dialog. You can use this method of configuring instead of configuring an “other station” or “SIMATIC S5” station type. These stations are, however, not displayed in NETPRO.

Broadcast Connections

For an FMS broadcast connection, select “All Broadcast Nodes”.

2.5 Configuring FMS Connection Properties

Checking and Adapting Default Settings

In the simplest case, the settings you made when you created the FMS connection are adequate. The default settings are suitable in most situations for establishing and operating an FMS connection.

The default settings for various connection partners are listed in Appendix D.

You can add more detailed information and can check the default settings for the connection partner and the properties of an FMS connection in the dialogs and tab pages described below.

When are Settings Necessary?

The following checklist provides you with an overview of the reasons for checking or adapting the standard settings of a configured FMS connection. The “Default” column shows the connection properties that remain set if you do not change the configuration.

Table 2-3

Reason/Aim/Purpose	Possible Action/ Configuration	Default
ID Consistency To check/ensure consistency of the connection identification between the program and configuration	Select the “General” tab see Section 2.6	The connection ID is assigned in ascending order. The identical value must be used in the program and in the configuration.
Functionality To check the consistency of the configured FMS connections	Display the “Overview” tab page see Section 2.12	–
Reporting Variables Expect/allow reporting variables (REPORT).	Configure communication variables and assign data area for reported variables see Section 2.12	Reported variables cannot be assigned to the user data area.

Table 2-3 , continued

Reason/Aim/Purpose	Possible Action/ Configuration	Default
Partner External to the Project – S5 or Other The communication partner is not an S7 station (type “S5” or “Other Station”)	• Select station and connection profile see Section 2.6 • Specify type of communication and addresses (LSAP) see Section 2.7 • Match FMS services to those of the communication partner see Section 2.9	The FMS connection is only partly specified.
Partner External to the Project – S7 The communication partner is an S7 station but is managed in a different project (type “Other Station”)	• Select station and connection profile see Section 2.6 • Specify type of communication and addresses (LSAP) see Section 2.7 • Match FMS services to those of the communication partner see Section 2.9	
Memory Requirements/Run Time To optimize the resources required on the PROFIBUS CP and the time required for data transmission.	Specify special transmission properties see Section 2.8	See parameters or default settings as listed in Appendix D.
Load Distribution To optimize resources/distribute load on more than one PROFIBUS CP within a station.	Select a specific PROFIBUS CP in the station Select the “General” tab and the “Route” dialog box. see Sections 2.6 and 2.11	Automatic assignment of connections to the available CPs.

Table 2-3 , continued

Reason/Aim/Purpose	Possible Action/ Configuration	Default
Memory Requirements for Variables To optimize the resources required for variables that are read or written.	Filter communication variables see Section 2.10	**All** FMS variable definitions and all variable type definitions for the variables configured on the server and assigned to the FMS connection are read when the connection is established. Maximum resources required!
Access Rights Allow access to variables assigned access protection.	Prove that rights to access server variables exist. see Section 2.10.3	If variables have been assigned access protection on the server, access is prevented unless the correct password is specified.
Matching to the Partner The communication partner supports different FMS connection profiles	Specify the partner type see Section 2.6	Selection of the default connection profile. With S7: “user-defined” profile.

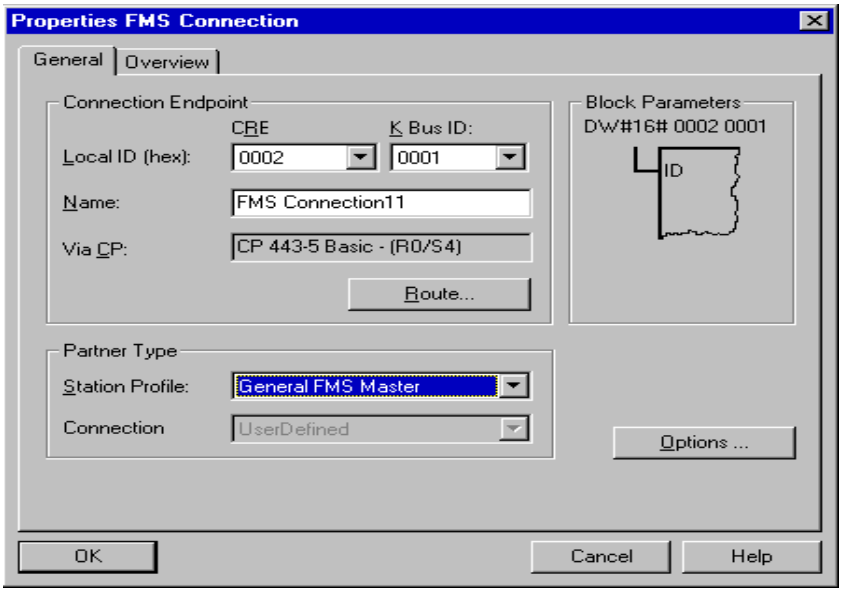
2.6 Specifying the FMS Partner

Procedure

To open the dialog for special connection properties, follow the steps outlined below:

1. Select the required connection in the connection table.
2. Select **Edit ▸ Object Properties** in the menu bar.

Result: The dialog “Properties FMS Connection” appears (here, showing an example of the “Other Station” partner type).



Tab Pages

The following tab pages are available for FMS connections:

- **General Tab Page**
  Global parameters for the connection are displayed in this tab page as well as the local name of the FMS connection.

  As a result of the type of CP and the partner type specified, certain connection properties are set as defaults. You can check and if necessary modify these settings in the dialog fields and tab pages described below.

  By clicking the “Route” button, you can always specify the local and remote endpoints in more detail if two or more subnet attachments exist to allow load distribution.

  By clicking the “Options” button, you can display all the available tab pages for setting FMS connection properties.

The checklist in Section 2.5 will help you to decide which tab page you should select.

- **Overview Tab Page**
  Overview of all configured FMS connections of the selected CPU in an S7 station with corresponding parameters (local and remote LSAPs). In this overview, you can check whether or not the configured connections are completely specified and check the status of the connections.

Settings in the “General” Tab

The following table explains the displayed and selectable parameters:

Table 2-4

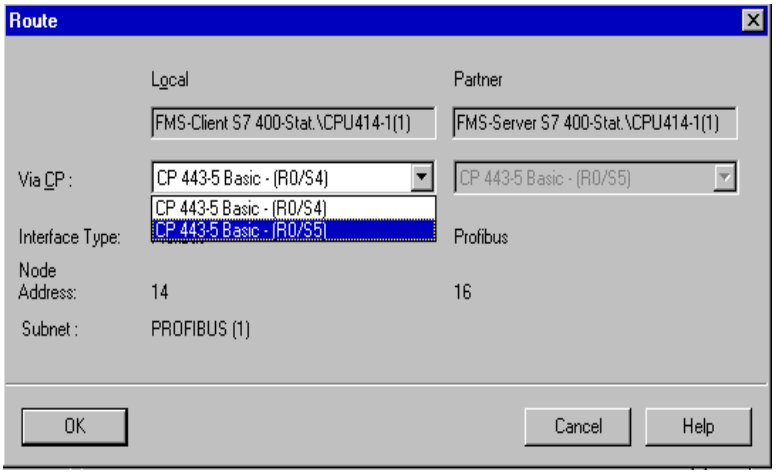
Parameter		Description	Access
Connection Endpoint	Local ID	When the FB is called in the user program, the local connection ID is specified to identify the FMS connection. This is made up of the CREF and the K bus ID and is always unique within the local device. The local ID is identical to the ID in the connection table and is simply displayed here as information.	
	• CREF	The communication reference (CREF) is part of the local ID of the FMS connection.	selectable
	• with the S7-400 K Bus ID	The K bus ID is the second part of the local ID of the FMS connection. This identifies the path via the CP in the rack uniquely.	selectable
	• with the S7-300 LADDR	The LADDR is the module start address. It is specified and displayed in Hardware Configuration. It is the second part of the local ID of the FMS connection. **Note:** Changing the K bus ID or the LADDR always means a change in the IDs of **all** connections assigned to this K bus ID or LADDR. The user program must be matched to the changes.	display only
	Name	Here, you can enter a suitable name for the FMS connection.	can be edited as required
	via CP	This field displays the local CP via which the FMS connection is maintained. If more than one CP exists locally or on the partner, you can make a selection with “Route”. If no CP is assigned on the partner (for example because the CP has been deleted) “none” is displayed here.	display only

Table 2-4 , continued

Parameter		Description	Access
Block Parameters	ID	The connection ID is displayed once again here. This value must be entered as the block call parameter ID on the FB interface in the user program to identify the connection. Remember that modification to the ID also affect the user program!	display only
Partner Type	Station Profile	The station profile identifies a device description complying with the FMS standard, here that of the partner device. The station profile addresses a type file containing a description of device-specific properties. These include the possible connection profiles (see below). With non-S7 systems, all installed partner profiles are displayed. **Importing GSD files:** You can define your own station profile. The FMS description file (FMS GSD file) supplied by the vendor of the FMS device must be stored in the following path or folder: \STEP7\S7data\S7wnx\FMS. As soon as STEP 7 NETPRO is started again, newly added FMS description files (FMS GSD files) are detected and compiled. The station profile defined by this file can be selected providing the connection partner is entered as unspecified.	With S7 and S5: fixed With other systems: selectable
	Connection Profile only displayed when • partner = other station or SIMATIC S5 • broad–cast con–nection	The connection profiles permitted in the FMS description file of the partner station (specified by the station profile) are displayed here. Depending on the station profile, a particular connection profile or the connection profile “User Defined” is displayed. Depending on the partner the connection profile is as follow: • S7 Station –> ”User Defined” • S5/Other Station –> First connection profile in the profile file In all situations, the default values are set so that communication is possible. For more information about the connection profile, refer to the explanation on the type of communication in the “Communication” tab page in Section 2.7.	selectable

Route when Distributing Load

The “Route” button calls the dialog box with the same name:



If you have configured a load distribution at the local or remote end on two or more PROFIBUS CPs, you can assign the FMS connection to the required route via the CPs.

For more information about load distribution, refer to Sections 2.11 und 3.7.

Table 2-5

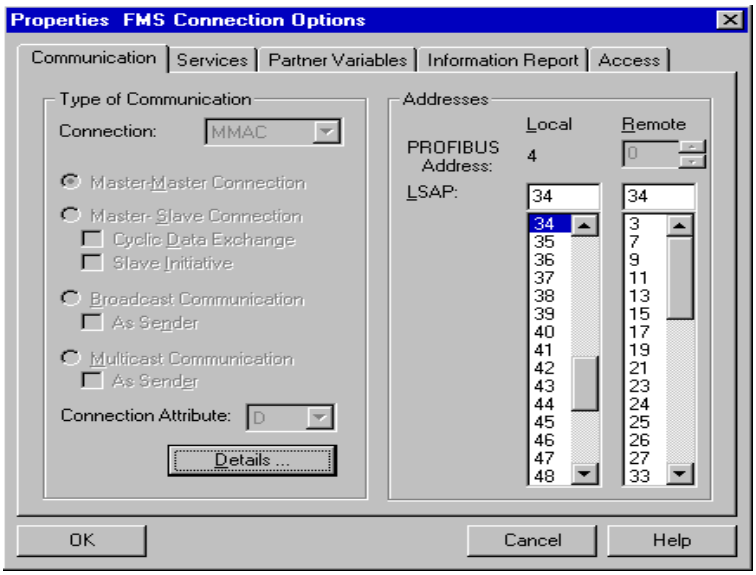
Parameter	Description	Access
Via CP / Local	If there is more than one PROFIBUS CP via which FMS connections can be operated in the station, you can select the route here. The CPs can only be selected if they are networked and have free resources!	selectable
	If no CP is assigned (for example the CP was deleted earlier) “(none)” is displayed here. If there is only one CP in the station, you cannot make any selection.	display only
Via CP / Partner (remote)	Depending on the local selection, the possible remote CPs are displayed for selection. You can select all CPs connected to the same subnet (networked) as the local CP. **Alternatives** are only available when a connection is established to a remote station configured in the same project that has two or more CPs.	selectable
	If no CP is assigned on the partner, (for example the CP was deleted earlier) “(none)” is displayed here.. If there is only one CP in the remote station, you cannot make any selection.	display only

2.7 Specifying the Type of Communication and Addresses

Communication Tab Page

The settings for the type of communication and the addresses are displayed in the “Communication” tab page. You can display the “Communication” tab page by clicking the “Options...” button in the “Properties – FMS Connection” dialog.

Which fields you can modify, partly depends on the previous settings in the connection configuration and on the type of partner selected. This is explained in more detail in the following sections and in the online help.



2.7.1 Specifying the Type of Communication

Type of Communication for an FMS Connection

Depending on the particular task, different types of communication can be used under FMS. The type of communication is decided by several parameters that, taken together effectively define the connection type.

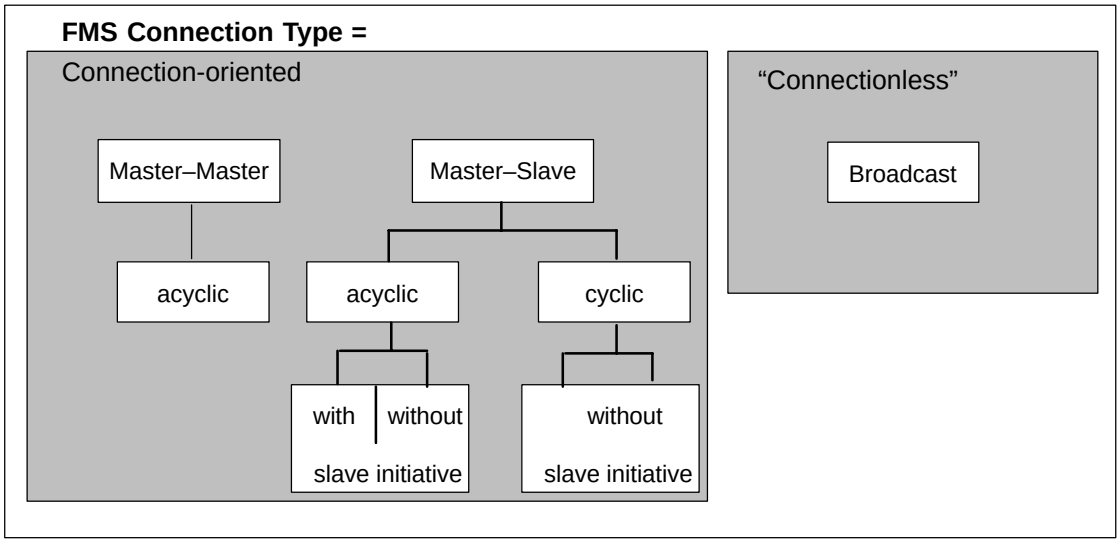


Figure 2-3 Available FMS Connections

Conditions

The connection type you **can** select, depends on the capabilities of the PROFIBUS CP you are using and the capabilities of the communication partner. The capabilities of the communication partner can be selected using the station or connection profile. If no suitable station or connection profile can be selected, individual settings are possible. For more detailed information about the capabilities of the selected PROFIBUS CP, refer to the product information /1/.

Selecting the Connection Type

The connection type you select depends on the distribution of tasks you assign to the stations. The table on the following page indicates which FMS services can be used with which type of connection.

Table 2-6 Connection Type and Job Type

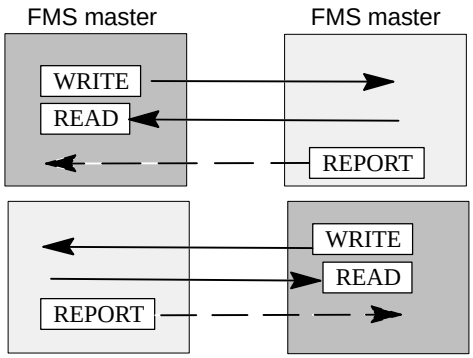
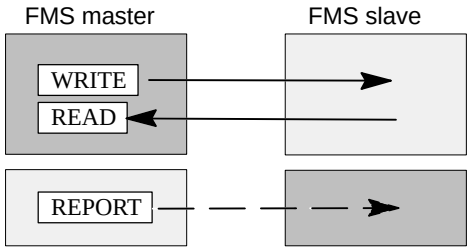
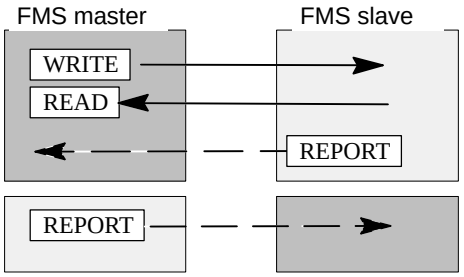
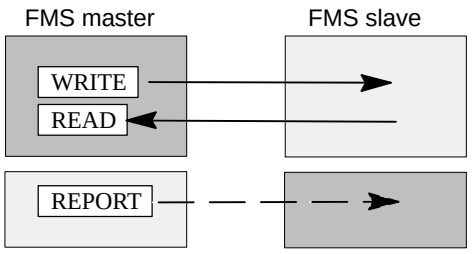
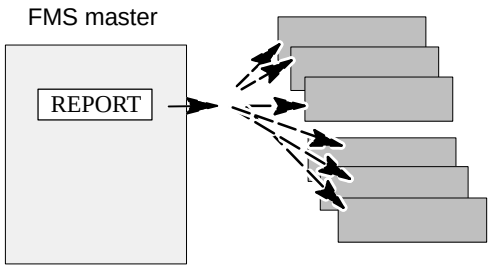
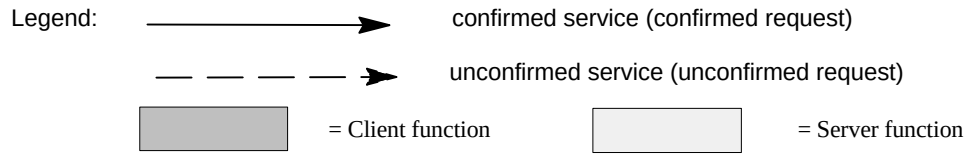
Connection Type	Type of Communication and Possible Job Types	
MMAC	**Master-master on acyclic connection** Write, read and report possible in both directions.	
MSAC	**Master-slave on acyclic connection without slave initiative** Write, read and report possible for the FMS master.	
MSAC_SI	**Master-slave on acyclic connection with slave initiative** Write, read and report possible for the FMS master. The FMS slave can also report once the master has assigned appropriate rights.	
MSCY	**Master-slave on cyclic connection without slave initiative** Write, read and report possible for the FMS master.	

Table 2-6 Connection Type and Job Type1, continued

Connection Type	Type of Communication and Possible Job Types	
BRCT	**Broadcast** Send to all.	



Specifying the Type of Communication

In the “Type of Communication” section of the dialog, you can select the connection type by selecting individual option buttons and check boxes or making a selection in the connection list box.

Setting Further Transmission Properties

You can set further transmission properties by clicking the “Details...” button in the “Communication” tab page. The options available after clicking this button are explained in Section 2.8.

Connection Attribute

The connection attribute parameter specifies the type of addressing of the two endpoints of the FMS connection.

The standard setting for the parameter is “D” (defined connection). The parameter cannot be selected.

2.7.2 Checking and Adapting Address Parameters

Address Parameters of an FMS Connection

An FMS connection is assigned a local and a remote connection end point. These end points are identified by the user program when the FB is called using the local connection ID (simply ID). This involves the following address parameters.

- PROFIBUS address of the local station.
- PROFIBUS address of the remote node to be obtained.
- Local LSAP (Link Service Access Point):
  The local LSAP controls the ready-to-receive status of the PROFIBUS CP. The receive resources for receiving data on the FMS connection are made available in the PROFIBUS CP for the LSAP.
- Remote LSAP (Link Service Access Point):
  The remote LSAP controls the transmission on the PROFIBUS CP. Using the LSAP, the PROFIBUS CP transmits to the node on the FMS connection. The destination node must be ready to receive for this LSAP.

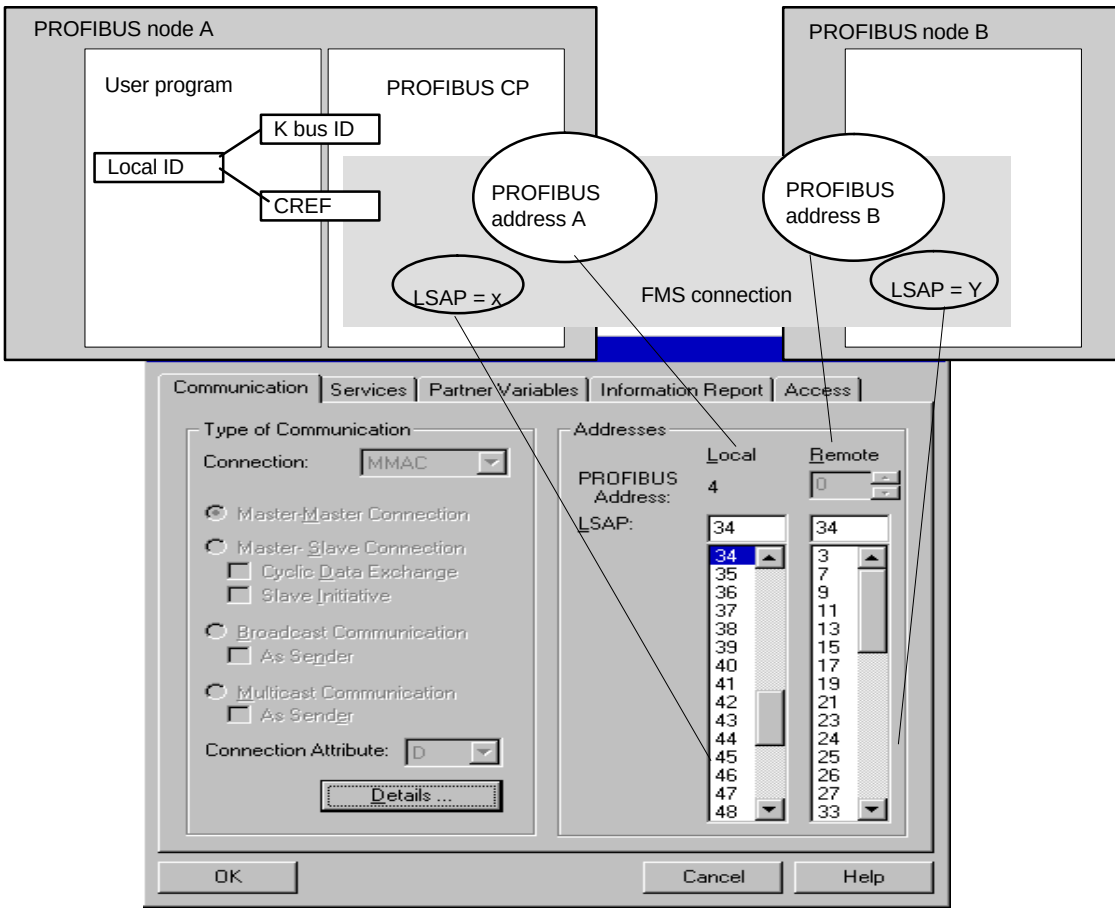


Figure 2-4 Assignment of Addresses to the End Points of the FMS Connection in the “Communication” Tab Page

Specifying Address Parameters

The PROFIBUS addresses and the local LSAP are always specified when the tab page is displayed.

The local and the remote LSAP can be modified. The remote LSAP must be checked and if necessary adapted if the station is configured in a different project (type “Other Station”).

The following table contains information about special LSAPs.

Table 2-7

LSAP Name	Value	Description
NIL	128	Only for “remote” LSAP
Broadcast	63	LSAP for BRCT connection type
Default	see product information /1/	Corresponding SAP to NIL, only “local”
Poll	see product information /1/	Special LSAP on the FMS master for the connection type MSCY via which the slaves are addressed cyclically (uniform for all connections)

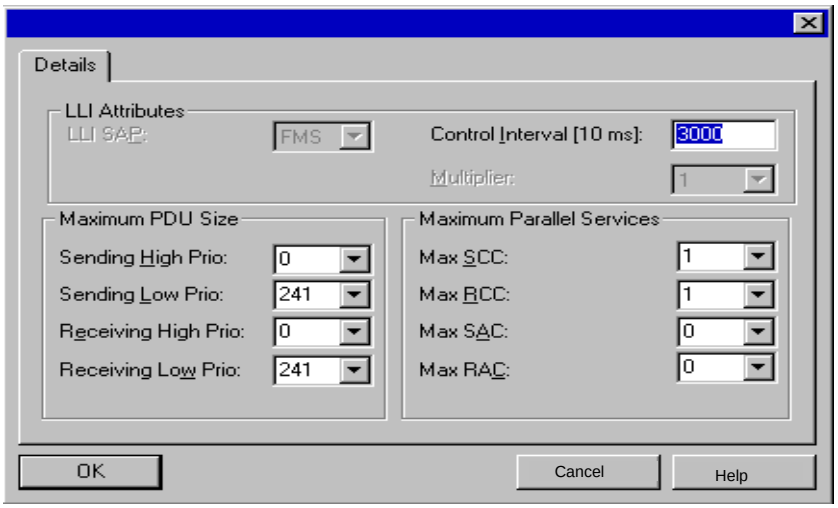
Unspecified Connection

If you selected “unspecified” for the destination station of an FMS connection, you specify the addresses for the remote partner here. You can use this method of configuring instead of configuring an “other station” or “SIMATIC S5” station type. These stations are, however, not displayed in NETPRO.

2.8 Specifying Further Transmission Characteristics

Meaning

To set other transmission properties, select the “Details...” button in the “Communication” tabpage.



- LLI Attributes

  LLI stands for lower layer interface. This interface provides the connection between the FMS user interface and the underlying FDL services. On the one hand, the LLI attributes specify the interface to the application layer (for example FMS), and on the other hand properties of the LLI are specified.

- Maximum PDU Size

  This parameter specifies limit values for the maximum length of the protocol data units (PDUs). Since there is no segmentation of the jobs, the setting must be made to suit the largest variables to be transferred.

Recommendation: only reduce this value when this is necessary to match the partner. If you use GetOD, the value must not be set below 50 bytes. Remember also to include GetOD in the calculation.

Notice

Settings made here must match those on the partner device to allow an FMS connection to be established. If the partner station is an S7 programmable controller and it was configured in the same S7 project, the maximum PDU size and parallel services are adapted automatically.

- Maximum Parallel Services

  These parameters specify whether and how many jobs can exist at the same time on an FMS connection in the PROFIBUS CP.

  If you increase the value, you also increase the possible data throughput but at the same time you also increase the memory requirements. For more detailed information about the selected PROFIBUS CP, refer to the product information /1/.

Parameters

The following table explains the parameters. The default settings depend on the PROFIBUS CP being used and therefore also on the FMS description file.

Table 2-8

Parameter		Description	Access
LLI Attributes	LLI SAP	SAP (Service Access Point) for LLI; various services can be supported above the LLI. • FMS • FMA This parameter therefore specifies whether the LLI user is of the type FMS (value = 0) or FMA (value = 1). Here, set to FMS.	Display only
	Control Interval	With connections with **acyclic** data exchange, this parameter specifies the interval of the connection monitoring (ACI) With connections with **cyclic** data exchange it specifies time interval of the connection monitoring (CCI). If either of the two nodes does not receive an IDLE or user data frame during this time, the connection is terminated.	Can be modified (depending on the station and connection profile)

Table 2-8 , continued

Parameter		Description	Access
	Multiplier	For connections with cyclic data exchange (MSCY) on the master side, this parameter specifies how often the PROFIBUS addresss and the corresponding LSAP of this FMS connection will be entered in the polling list. This can reduce the polling interval. With this parameter you can achieve a higher priority for this connection compared with other connections. With all other connection types, this parameter is irrelevant. Upper limit: 255	Can be modified (depending on the station profile)
Maximum PDU Size	Sending High Prio	At the sender end, this is the maximum permitted length of the FMS PDU for data to be transferred with a higher priority. Condition: <= Receiving High Prio of the partner Note the information about the maximum user data length in the product information of the PROFIBUS CP you are using /1/. Upper limit: 241 bytes	Can be modified[1)] (depends on the station/ connection profile)
	Sending Low Prio	At the sender end, this is the maximum permitted length of the FMS PDU for data transferred with low priority. Condition: <= Receiving Low Prio of the partner	Modifiable (depending on station/ connection profile)
	Receiving High Prio	At the receiver end, this is the maximum permitted length of the FMS PDU for data transferred with a high priority. Condition: >= Sending High Prio of the partner Note the information about the maximum user data length in the product information of the PROFIBUS CP you are using /1/. Upper limit: 241 bytes	Modifiable (depending on station/ connection profile)
	Receiving Low Prio	At the receiver end, this is the maximum permitted length of the FMS PDU for data transferred with low priority. Condition: >= Sending Low Prio of the partner Upper limit: 241 bytes	Modifiable (depending on station/ connection profile)
Maximum Parallel Services (see PICS Part 4 in Appendix C)	max SCC	Maximum number of existing parallel send jobs of the confirmed type; applies to a connection that permits acyclic data exchange. Condition: <= RCC of the communication partner	Modifiable (depending on station/ connection profile)
	max RCC	Maximum number of existing parallel receive buffers for jobs of the confirmed type; applies to a connection that permits acyclic data exchange. Condition: >= SCC of the communication partner	Modifiable (depending on station/ connection profile)

Table 2-8 , continued

Parameter		Description	Access
	max SAC	Maximum number of existing parallel send jobs of the unconfirmed type; applies to a connection that permits all transmission types (cyclic/acyclic data exchange). Condition: <= RAC of the communication partner	Modifiable (depending on station/ connection profile)
	max RAC	Maximum number of existing parallel receive jobs for jobs of the unconfirmed type; applies to a connection that permits all transmission types (cyclic/acyclic data exchange). Condition: >= SAC of the communication partner	Modifiable (depending on station/ connection profile)

1) Please refer to the information in the product information! If the PROFIBUS CP does not support transmission of high priority PDUs and you nevertheless configure a value greater than 0, the partner is forced to be able to react to a high priority message although it never receives such a message from this CP!

User Data Length and Maximum PDU Size

The maximum PDU size must be selected so that as much data as possible can be transferred in one FMS PDU. If you use GetOD, the value must not be set below 50 bytes. Remember also to include GetOD in the calculation.

You can find out the required PDU size taking into account the data length resulting from the conversion of the variables

Based on the conversion information in Section 3.6.3 (column “Number of Bytes in the FMS PDU) in Tables 3-7 and 3-8), find out which value you should use for the converted data structure. This value is shown below as $\mathbf{D_{conv}}$ (user data length).

max. PDU size (in bytes) = $\mathbf{D_{conv}}$ + variable address

The variable address is the value in the table below dependent on the job type.

Table 2-9 Length to be Included for the Variable Address

Access via	Job Type		
	WRITE	READ[1])	REPORT
Index	8	4	8
Name (length <=14	name length + 6	4	name length + 6
Name (length >14)	name length + 7	4	name length + 7
Index or name with subindex	Value specified for index or name + 2	4	Value specified for index or name + 2

1) The value does not depend on the type of addressing since there is no address information contained in the response PDU in which the $\mathbf{D_{conv}}$ data are transferred.

User Data Length

The section “Data for FMS” of the product information of the PROFIBUS CP you are using contains a value for the maximum user data length for the job types WRITE, READ and REPORT. The values specified there assume a maximum PDU size of 241 byes and access using the index.

If access is via name or index, use the values from Table 2-9 with or without subindex.

Example of determining the user data length with access via name:

With the default setting for “Sending Low Prio” and a variable with the name “Engines” (name length = 7 characters), the following results for an access with name:

For WRITE and REPORT:
$\mathbf{D_{conv}}$ = 241 –13 = 228 bytes of user data

For READ
$\mathbf{D_{conv}}$ = 241 –4 = 237 bytes of user data

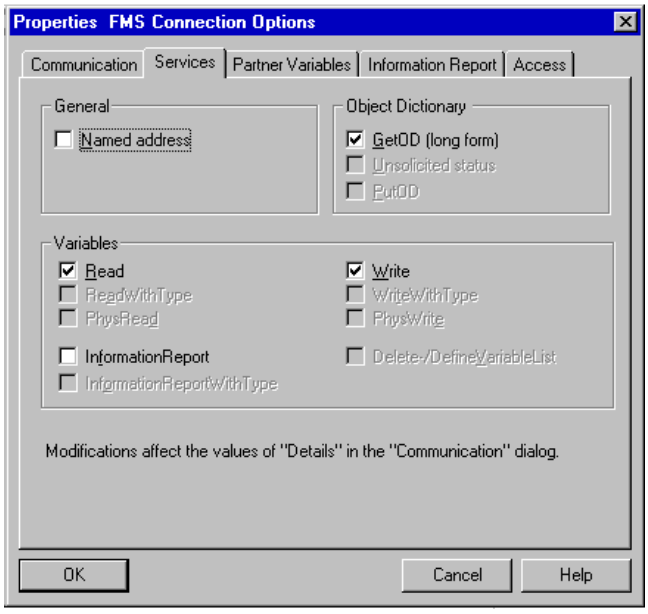
2.9 Matching the Services of the FMS Partners

Meaning

To allow successful connection establishment, the services of the communication partners must be matched.

Select the “Services” tab to check the settings and, if necessary, to adapt them. Here, you will see the services that the local PROFIBUS CP acting as requester expects from the partner device based on the local station and connection profile (see Section 2.6) .

You can only change settings that are supported based on the selected partner connection profile.



The meaning of the check boxes is as follows:

Display	Meaning for the Service Involved
	Not supported by the partner
	Supported by the partner and selected based on the selected profile
	Supported by the partner and can be selected if required.

The dialog box above shows the default services of the “User-Defined” profile. Generally, the following settings are made:

Table 2-10

Service	Setting	Selected as Default
Read	Can be modified	no
Write	Can be modified	no
InformationReport	Can be modified	no
GetOD (long form)	Can be modified	no
Others	Cannot be modified	

Description of the Services

Table 2-11

Service	Used on the FMS Interface for Job Type	Description
NamedAddress		Objects (for example variables) that can be addressed using names.
GetOD (long form)		Reading out the variable description with index and name. Access using variable names is only possible when this service is selected and supported. Otherwise only access via the index is supported. Please refer to the information in Section 2.10.1
UnsolicitedStatus		This service is used by the application for spontaneous transmission of a device status. It can also be used as an unconfirmed service by FMS slaves with initiative. Broadcast and multicast transmission is also possible here.
PutOD		With this service, one or more object descriptions is written to the object dictionary (OD).
Read	READ	With this service, the value of a variable object is read on the FMS server.
ReadWithType		With this type, the value and the data type description of a variable object is read on the FMS server.
PhysRead		With this service, the value of a physical access object is read.
InformationReport	REPORT	With this service the value of a variable object is transferred to another communication partner.

Table 2-11 continued

Service	Used on the FMS Interface for Job Type	Description
InformationReport WithType		With this service, the value and the type description of a variable object are transferred to another communication partner. No confirmation is expected.
Write	WRITE	With this service, the value of a variable object is transferred to another communication partner.
WriteWithType		With this service, the value and the type description of a variable object are transferred to another communication partner.
PhysWrite		With this service, a value is assigned to a physical access object.
Delete/Define VariableList		With this service, an object “Variable List” is deleted (delete) or created (define) on the communication partner. Delete: This is only possible when suitable access rights exist for the object. Define: The application of the requester must make sure that the data of the object can be transferred within one message (PDU).

Standard Services

Status, Identify and GetOD (short form) are supported as standard services and cannot be selected.

2.10 Configuring the PROFIBUS CP as an FMS Client

Meaning

The PROFIBUS CP can support both FMS client and FMS server functions. Please refer to the characteristics of the CPU you are using as described in the product information /1/.

In terms of configuration, this means that structure information for the data conversion and access negotiations must be made for the data transfer.

Configuring the FMS Client

The main task of the FMS interface is the neutral transmission of **structured** data. If you call the WRITE or READ FMS jobs in the user program, you use the PROFIBUS CP in the role of client. You then write or read variables defined on the partner device.

Configuring the FMS client involves the following:

- Specifying which communication variables will be read or written
- Specifying the data areas in which the reported variables are entered
- Assigning the device access rights for protected variables

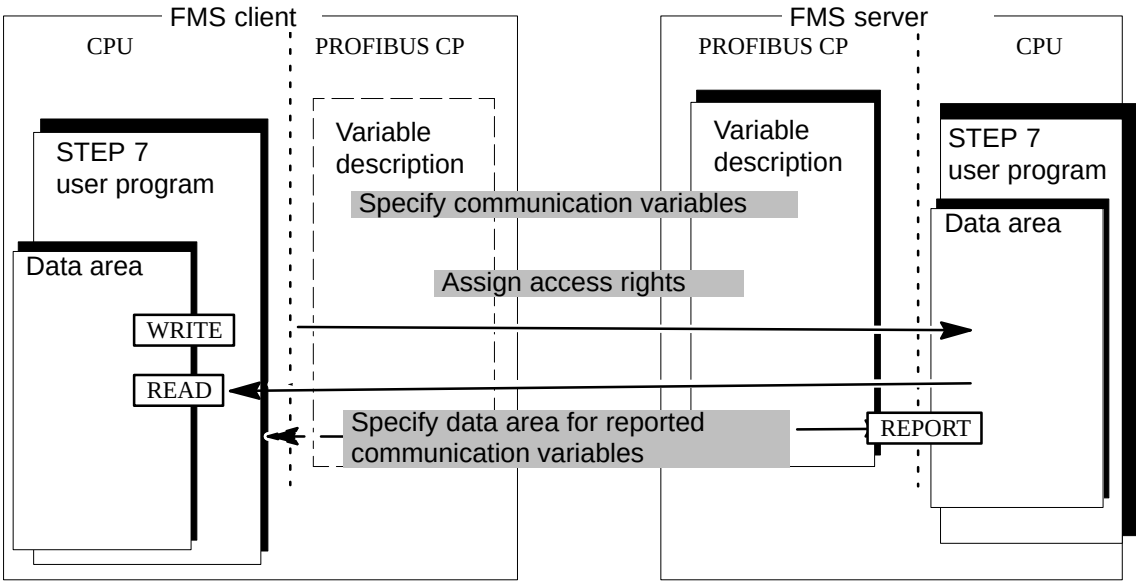


Figure 2-5 Configuring the FMS Client

Configuring the FMS Server

To be able to transfer variables due to a write or read request in the neutral FMS format, format information must be created and stored on the PROFIBUS CP.

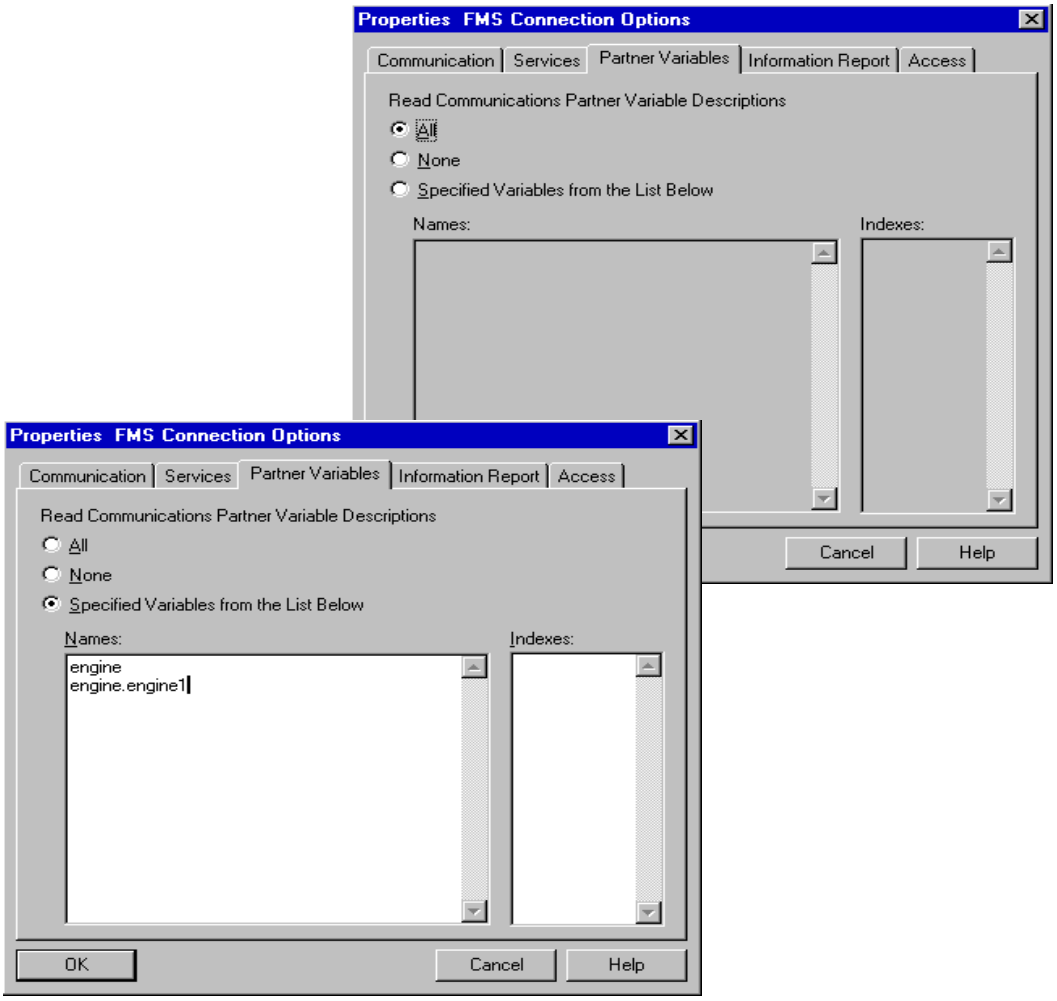
For a description of configuring variables, refer to Chapter 3.

2.10.1 Filtering Communication Variables

Reading Out the Type of the Communication Partner

To specify which communication variables can be read or written on the FMS server, select the “Remote Variables” tab page.

Since the structured descriptions of the data are read when the connection is established and stored on the PROFIBUS CP, you can “optimize” the memory requirements by only specifying the variables that are actually transferred on the FMS connection.



Parameters

The following table shows how to specify the type descriptions to be read out from the partner (FMS server) during connection establishment:

Table 2-12

Parameters/Option Fields		Description
Read out variable description of the communication partner	All (default setting)	All variable descriptions of the partner are read. The service GetOD(All) is used for all connections with acyclic data exchange. When the partner is an S7 station, this involves all the communication variables assigned to the CP belonging to the FMS connection.
	None	No variable descriptions are read out from the communication partner (FMS server). This means that variables can only be reported or the partner can read, write or report.
	Specified variables from the list below	The variable description of each name and index in the list is read out for all connections with acyclic data transfer when the connections are established (GetOD is sent for every variable).
Name		Here, you specify the name for each variable whose structure information will be read when the connection is established. You can only read this instruction information when you have selected “Specified Variables From the List Below”: Examples • Engines • Engines. Engine1 • Engines. rpmM1 Requirement for GetOD: GetOD must be configured in the “long form”, see see Section 2.9. To allow plausibility, the variable name must be configured on the FMS server. Plausibility check: Please note that your entries are **not** checked for plausibility. You will only receive a signal on the FB interface to indicate that the variable could not be identified on this FMS connection when you attempt to access the variable. Check by FMS diagnostics (see Chapter 5). The variables that could be read in the object dictionary are displayed in the “Remote Variables” tab page. The diagnostic buffer contains information about problems.

Table 2-12 , continued

Parameters/Option Fields	Description
Indexes	Here you specify the index for each variable whose structure information will be read out when the connection is established. This is only possible when you have selected the option button “Specify Variables from the List Below”. For example: • 100 (corresponds to access to Engines • 103 (corresponds to access to Engines.Engine1 If the index ranges are contiguous, you can specify the index range as follows: • 110–200 (access to all variables with indices from 110 to 200) For further examples and information, refer to Section 3.6. To ensure plausibility, the index or variable name must be configured on the FMS server. Plausibility check: Please note that your entries are not checked for plausibility. You will only receive a signal on the FB interface to indicate that the variable could not be identified on this FMS connection when you attempt to access the variable.

Note on Master-Slave Cyclic (MSCY)

If you have connections of the type MSCY (master-slave on cyclic connection), the variables read or written on the FMS server must also be specified here.

Since no GetOD service can be exectuted with MSCY connections, the variable descriptions are taken from the station profile of the partner station. The station profile is included in the type file.

The type file is stored in the following folder:

Siemens\STEP7\S7wnx\...\FMS\...

2.10.2 Configuring Reported Variables on the Receiver (FMS Client)

Assigning Received Reported Variables to the FMS Connection

To be able to receive reported variables, no jobs need to be started in the user program at the receiver end. During configuration, you specify which reported variables will be received and where they will be written.

The following steps are necessary to assign reported variables to a data area in the user program:

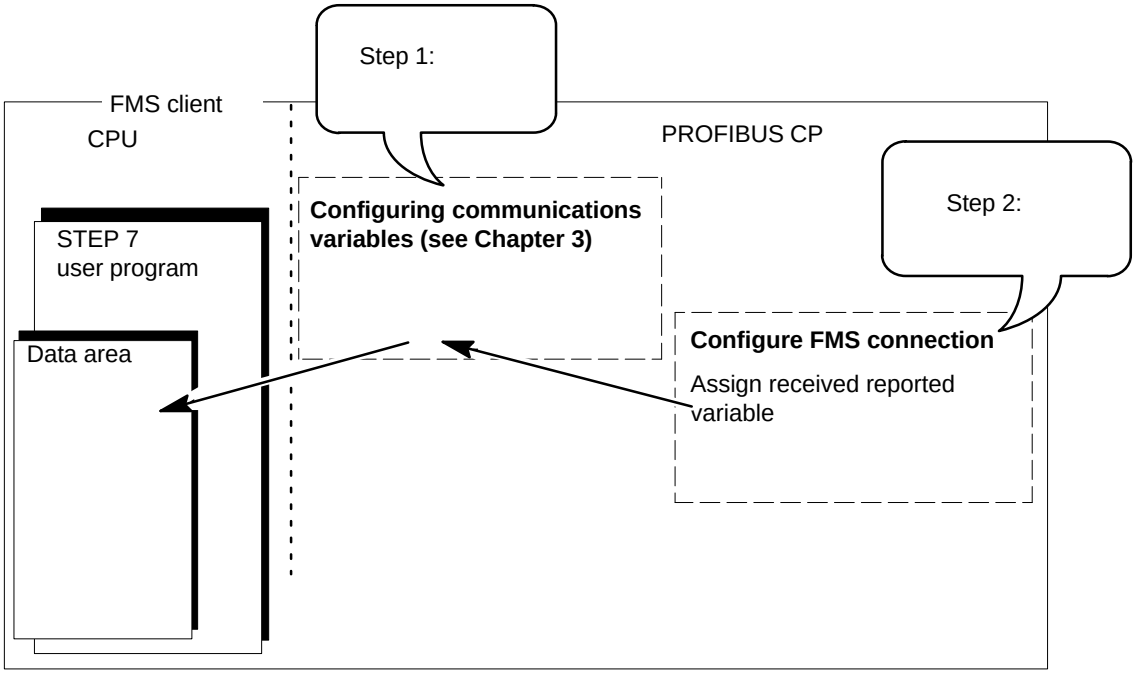


Figure 2-6 Configuring the FMS Client

Step 1: Configuring Reported Variables as Communications Variables

Reported variables must be configured on the client as communication variables (for the procedure, see Chapter 3). The associated automatic querying of variable formats, makes it unnecessary to query the variable formats with GetOD.

Advantages:

- You do not have to worry about incorrect communication due to inconsistent data area sizes on the client!
- Specifying the data destination is much easier.

Note

Variables configured for the FMS REPORT service should not be further accessed using the FMS WRITE or READ services. With these services, access is then limited to one of the alternatives “access by name” or “access by index”.

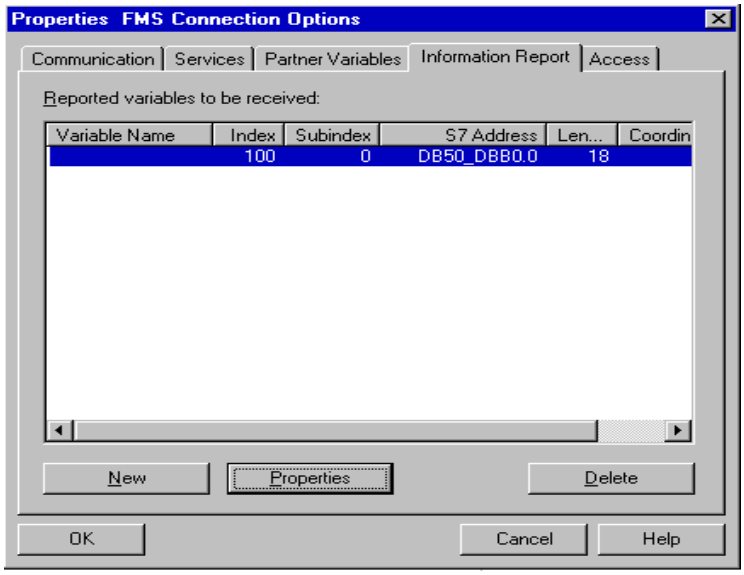
It is, however, always possible to access variables with WRITE or READ if they were configured as reporting variables on the server and on the client.

Step 2: Assigning the Received Reported Variable to the FMS Connection

To link local variables with reported communication variables:

1. Select the “Information Report” tab.

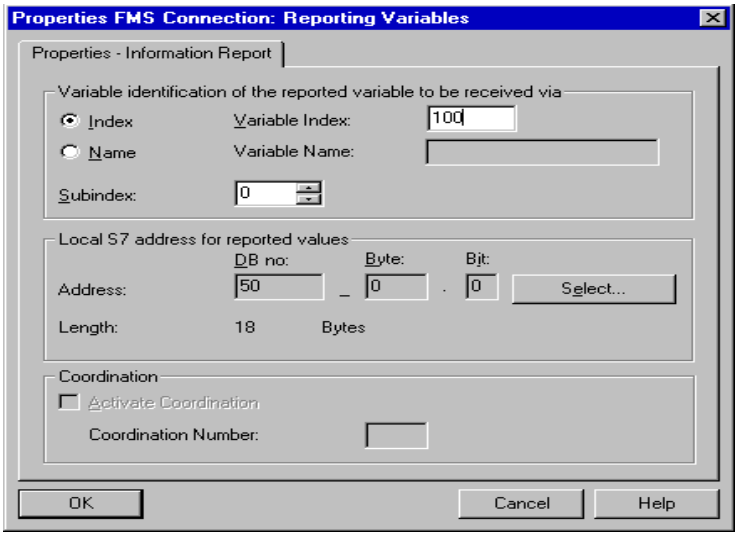
Result: You will see an overview of the reported variables to be received that have already been configured.



2. Click the “New” button to specify a new reporting variable to be received in the “Properties – Information Report” tab page

   or

   Select an existing entry and click the **“Properties” button** to display or modify a definition in the “Properties – Variable” tab page.



Parameters in the "Properties FMS Connection: Reporting Variables Tab

The following table shows the following:

How to specify the type descriptions to be read out when establishing the connection on the partner (FMS slave);

How to display the destination address you selected to store the variable.

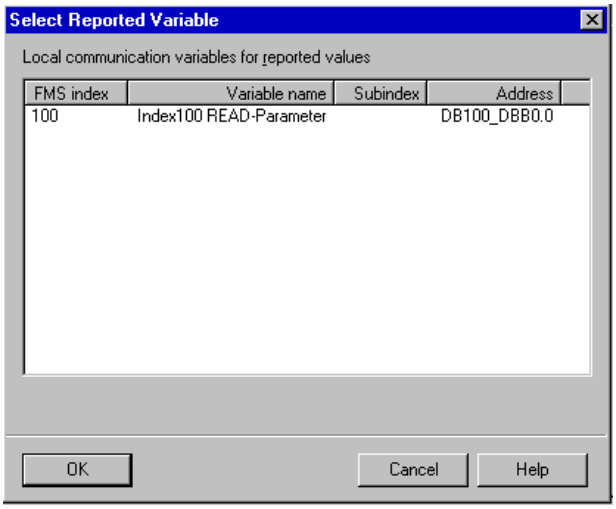
Table 2-13

Parameter		Description
Identify variable by	Name	Select the name as an alternative to the index of the remote variable.
	Variable name	Here, you specify the variable name. Plausibility is only ensured when the variable name is configured on the FMS server. Plausibility check: Please note that your entries are not checked for plausibility. You can only check whether or not reported variable values could be assigned using diagnostics.
	Index	Select the index of the remote variables as an alternative to the name.
	Variable index	Here, you specify the remote variable index. To ensure plausibility, the index or subindex variable name must be configured on the FMS server. Plausibility check: Please note that your entries are not checked for plausibility. You can only check whether or not reported variable values could be assigned using diagnostics.
	Subindex	In addition to the name or index, a subindex can be specified. Value >0: access using subindex according to the set value Value =0: no access using subindex
Local S7 address for reported values	DB	• Block number (display only)
	Byte	• Byte offset in the specified data block (display only)
	Bit	• Bit address if the variable is of the Boolean type (display only)
	Length	• Length of the variable in bytes The S7 length is displayed and not the FMS length

Entering the Data Destination

The PROFIBUS CP enters the reported variables in the data block (DB) specified under S7 address.

You can then use the “Select” button to open the ”Select Local S7 Addresses” dialog box where you can select the variable as a symbol.



Select one of the entries. Click OK to confirm the assignment. You will see the corresponding entries in the ”Properties – Information Report” tab in the “S7 Address” column.

Table 2-14

Parameter	Meaning
FMS Index	Identifies the FMS index under which you stored the configured local communication variable. Communication variables can be accessed using the FMS index or the variable name. Remember the effects on the user data length! For more detailed information, refer to Section 2.8.
Variable Name	Identifies the symbolic name you selected during configuration of the local communication variables. Communication variables can be accessed using the FMS index or the variable name. Remember the effects on the user data length! For more detailed information, refer to Section 2.8.
Address	Identifies the local data area in which the reported variables will be entered. The DB address and the DB offset (byte and bit) are displayed.

Note

Remember that the selections available in the ”Select Local S7 Addresses” dialog box represent a user-friendly input tool. If you change the configuration of the communication variables (reported variables in this case) later, the data destination for reported variables configured here is **not** automatically corrected.

Checking the Assignment of Reported Variables to Communication Variables

If you change the names of communications variables or remove communications variables from the symbols table, the assignment of the reported variables is lost. To avoid problems, you can use the test function in which you can recognize unassigned reported variables. To activate this test function, click the “Check...” button in the “Properties FMS Connection: Reporting Variables“ tab. You can then delete or reassign unassigned reported variables.

Reporting variables that no longer have an assignment can be reassigned in the ”Select Local S7 Addresses” dialog.

1. Open the ”Reported Variables” tab.
2. Select the reported variable and click the ”Properties” button.”
3. Using the ”Browse...” button, you display the ”Select Local S7 Addresses” dialog.

”Delete”/”Delete All”

You can also delete the displayed reporting variables that are no longer assigned (selected or all).

Changing the Content or Data Types within a DB

If you want to change the content of a data block you declared as a communications variable or whose components you declared as communications variables, you must update the address information for the reported variables.

1. Change to the ”Select Local S7 Addresses” dialog box.
2. Double-click **every** variable with a new address in the data block. This updates the address information which is displayed immediately.

2.10.3 Establishing Rights to Access Server Variables

Meaning

Variables can be assigned access protection in the object dictionary (OD) so that only authorized access is possible.

In the client configuration described here, you must enter the access rights according to the information in the object dictionary read from the partner (FMS server). If the partner is an S7 station, all group numbers are set.

For more information about the topic “Authorized Access”, refer to the description of the variable configuration on the FMS server in Section 3.8.

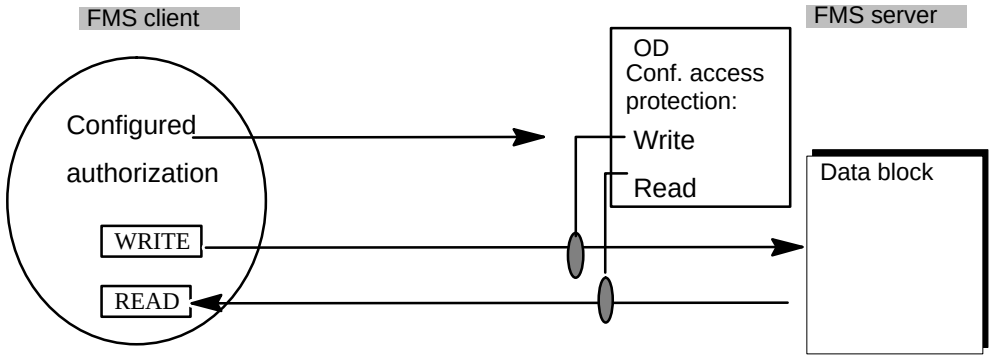
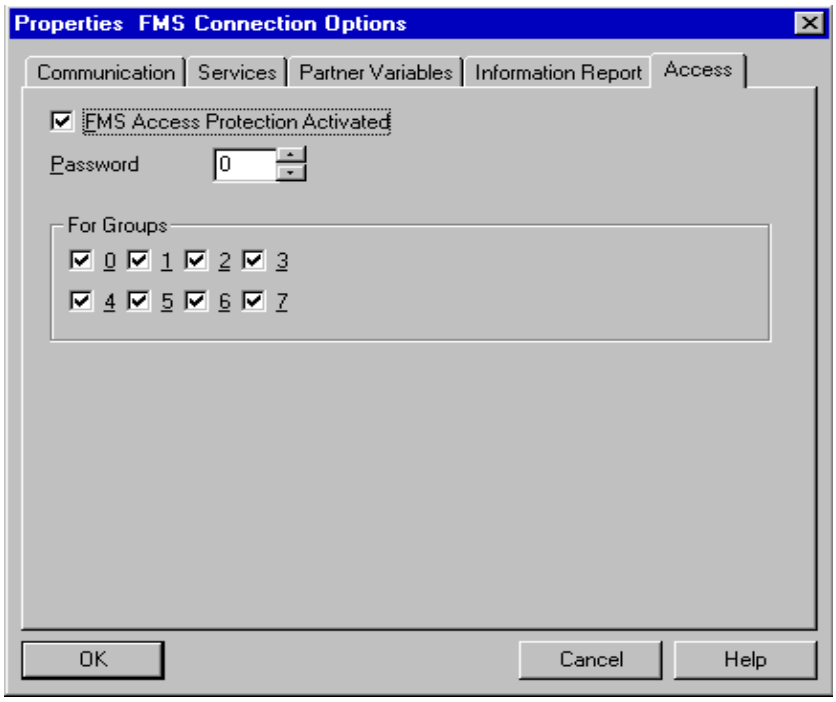


Figure 2-7 Effects of Controlling Access to Variables



Parameters

The following table shows the interdependencies of the displayed parameters and the parameters of the partner.

Table 2-15

Parameter	Meaning	Range of values
FMS Access Protection Activated	Access to a variable is only possible if the setting is identical on the partner. If access rights are set, additional write/read rights must be taken into account.	Yes/no
Password	Access to a variable is only possible with the identical setting on the partner.	**0**: The FMS client must specify the password “0” for authorization when the connection is established. Access is possible for **all** FMS clients that specify the password. **>0**: The FMS client must specify this password for authorization during connection establishment. Access is restricted to **one** FMS client/one FMS connection.
For Groups	Access to a variable is only possible when at least one group number is selected to match the setting on the partner (for a further explanation see below).	Groups 0 to 7 can be selected

Selecting Groups

Group numbers are a further method for selectively restricting access rights. Please note the following distinction:

- The partner is an S7 station:

  Individual activation or deactivation of groups is **not** possible on the partner station. Access is therefore possible using any group number (0 to 7). In the default setting, all groups are activated.

- The partner is not an S7 station

  Select a group number to which the variables on the partner are assigned.

2.11 Load Distribution with Two or More CPs in an S7 Station

Advantages

By distributing the load, you can eliminate bottlenecks when the communication resources are under heavy load. A distinction is made between the following:

- Bottlenecks caused by lack of time
- Bottlenecks caused by lack of memory

Lack of Time

Processing communication jobs on the PROFIBUS CP takes time. By adding further CPs and distributing the connections, processing of communication jobs by the CP can be spread over more than one CP and the processing speeded up.

By assigning the PROFIBUS CPs of an S7 station to different PROFIBUS subnets, the data throughput can be increased further.

Lack of Memory

Connections and FMS variables occupy resources on the PROFIBUS CP. You can avoid bottlenecks by operating more than one PROFIBUS CP in an S7 station.

Note

Check the information about the maximum number of CPs in the product information /1/ or in the manuals for the S7–300 /10/ and S7–400 /11/.

Detecting Memory Bottlenecks

You can predict resource shortages by calculating the amount of communication traffic when you configure your system. This calculation involves the connections and the variables:

- Connections
  - Calculation

    Note the information in the product information bulletins about the maximum number of connections per PROFIBUS CP.
  - Configuration

    When you configure the connections, NCM S7 informs you when the maximum number of connections is exceeded.
- FMS Variables
  - Calculation

    Note the information in the product information bulletin of the PROFIBUS CP you are using about the maximum number of configurable variables.

    Section 3.7 in this manual contains more information on how to make the required calculations.
  - Configuration

    The FMS variables (communication variables , see Chapter 3) are configured initially without any assignment to a particular CP. A lack of resources can therefore only be recognized when the configuration data are loaded. You should therefore decide about the need for load distribution based on the calculation of the number and size of the FMS variables.

    If you use more than one PROFIBUS CP to distribute the load, you can assign the FMS variables to specific PROFIBUS CPs during configuration (and implicitly also to the FMS connections).

2.12 Checking FMS Connections

Overview Tab

The overview displays all the previously configured FMS connections and their parameters in this station (this information is display only and cannot be modified). You can adjust the column width of the table.

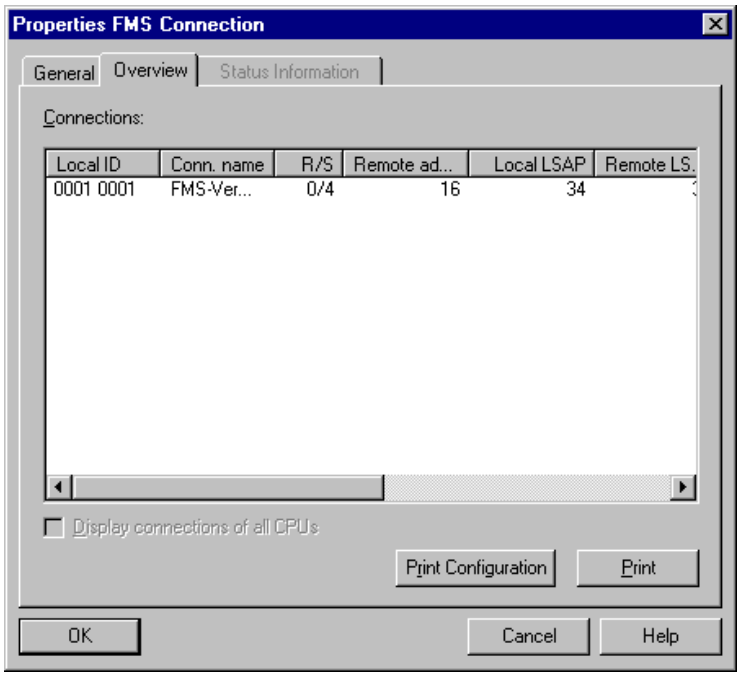


Table 2-16

Parameter	Description
Local ID	This is the connection ID of the FMS connection.
Conn. Name	Connection name. This identifies the FMS connection.
R/S	Rack/slot of the local CP via which the connection is established.
Remote address	Specifies the remote PROFIBUS address of the partner.
Local LSAP	Local link service access point.
Remote LSAP	Remote link service access point.
Status	This displays the current configuration status of the connection. “Connections without assignment” are displayed as “**no local CP**” or “**no remote CP**” in the status column and a “!” character at the end of the “local ID” (for example: 0002 AFFF!). The status display is not updated. The status that was valid when the dialog box was called is displayed.

2.13 Change Partners

Introduction

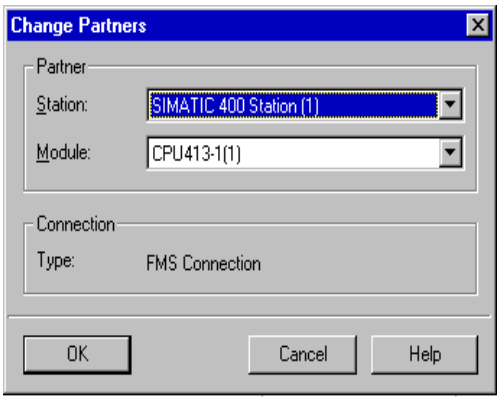
Apart from creating new connections, you can also change the partner for each configured connection. Before you can assign a new connection partner, the stations and CPs must be configured and networked in the S7 project.

Calling the Dialog

To display the “Change Partners” dialog box, follow the steps below:

1. Select the required connection in the connection table.
2. Select **Edit ▸ Change Partner** in the menu bar or double-click “Partner” in the connection table.

Result:



Connection Partners

All the stations in the S7 project are displayed and can be selected. Select the programmable module to which you want to establish the connection.

When you click **OK**, the connection is entered in the list, the dialog is terminated and the display in the main dialog is updated.
If you click **Cancel**, the dialog is terminated without changes being entered.

2.14 Further Functions

Toolbar

The toolbar of the connection configuration includes further functions:

Table 2-17 Further Important Functions for Connection Configuration

Save 	To save the configured connection, select the save function or click the save button (diskette icon).
Print 	You can print the entire connection table or individual areas of the connection table. Select the function print or click the print button (printer icon). The following print options are available: • Overview of all connections (complete connection table) • Overview of selected connections (selected area) • Details of all connections • Details of the selected connections
Download 	You download the connection table to the destination system. The integrated help system provides more detailed information about this function.
Help 	If you require help or further information, select the help function or click the help button (? icon). With the help button, you obtain context-sensitive help, using the help menu option, you obtain the help dialog familiar from other Windows applications.

Print Function in the “Overview” Tab

An additional function for printing the configured connections and configuration status is available in the “Overview” tab.

2.15 Connections Without Assignment

Background

This section explains the actions that can cause configured connections to lose their assignment to the CP or to be deleted.

Notice

Please note that in contrast to homogeneous S7 connections, a CP-dependent ID is assigned to the connections of the FMS interface. In the actions described below, the ID can be changed so that the interface references in the user program must also be adapted.

Table 2-18 Actions That Can Lead to Modifications in Configured Connections

Action	Consequences for the Connections	How to Reconfigure the Connection
Changing the CP (module) in the hardware configuration (drag and drop)	The connections are retained. The connection IDs are updated automatically	1. The IDs in the user program must be adapted. 2. Download the connection configura tion to the CP again.
Deleting the CP (module) in the hardware configuration. The following messages displayed: “CP has n connections; the assignment will be lost in the connection table”.	The connections are retained **without assignment to a CP** in the connection table. In the “Overview” page of the properties dialog of the connections, the connections are marked with “!”.	After you have inserted a CP in the hardware configuration and have networked it: 1. Reassign the connection using the **Edit ▶ Connection Partner...** or se lect the new CP in the “Connection Properties” dialog. 2. Adapt the connection ID in the user program. 3. Download the connection configura tion to the CP again.
Deleting the SIMATIC S7 station.	All connections to this station are deleted within the project.	Reconfigure the station and connections.
Deleting the CPU	All connections to this CPU are deleted.	Reconfigure the connections.
Replacing the CPU with another (**not** deleting, but replacing by dragging and dropping from the module catalog)	Connections are retained.	–

Table 2-18 Actions That Can Lead to Modifications in Configured Connections, continued

Action	Consequences for the Connections	How to Reconfigure the Connection
Deleting a remote station (other station, SIMATIC S5, PC/PG).	The connections from the stations in the project to the remote station are retained **without assignment** in the connection table. In the "Overview" page of the properties of the connections dialog, the connections are marked with "!".	Assign a new remote station (or a local station) to the connection using the **Edit** ▸ **Connection Partner...**function.
Modifying the subnet assignment of the CP	The connections that were assigned to the CP are retained with the status "different subnets" in the connection table. In the "Overview" page of the properties of the connections dialog, the connections are marked with "!".	Reassign the connections using the **Edit** ▸ **Connection Partner..** function or using the properties dialog for the connection in the "Address" tabpage.

Display

The "Properties – FMS Connections" dialog displays the status of the connection. As an example, refer to the dialog in Section 2.12 "Checking FMS Connections".

The display ...AFFF under Local ID indicates an unassigned FMS connection.

Notice

1. If a CP is replaced by another it must provide at least the same services and be at least the same version higher.
2. If you replace a CPU by **deleting** it, all connections are lost.

❑

Configuring Communication Variables

3

Topics in this Chapter

The process and processed data in a SIMATIC S7 station that are read or written by another device using FMS services must be specified as **communication variables**. This variable configuration for a SIMATIC S7 station functioning as an **FMS server** is described in this chapter.

One special feature is the configuration of the **REPORT** FMS service. For this service, you must also configure the variables on the client. This means that you can be sure that data areas available on the client can accommodate the variables reported by the FMS server.

3.1 Overview

FMS Server

An S7 station functions as an FMS server when it is accessed (read or write) or when it uses the REPORT FMS service as the requester.

Why Configure Communication Variables?

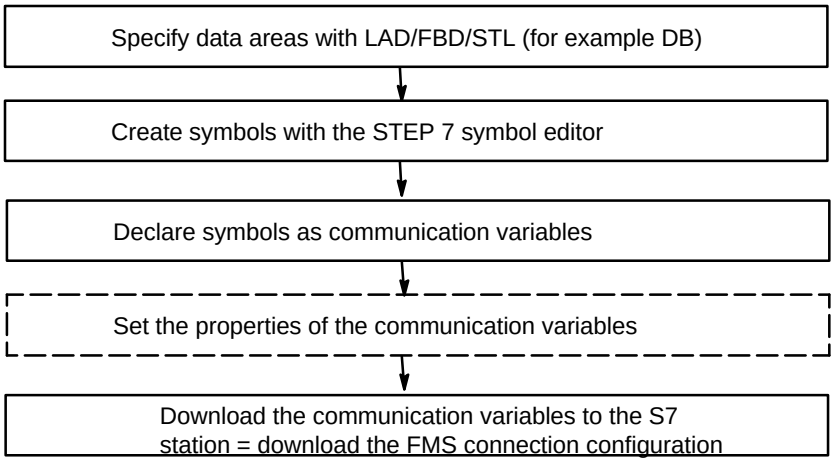
You configure communication variables for the following reasons:

- Neutral data types:
  You provide a neutral description of the structure of the data on the FMS server. This allows the data to be transferred to any other device. The other device is capable of converting the FMS data representation to its own, device-specific representation.
- Restriction in the number of variables:
  You select only those variables specified in the STEP 7 symbol table that can be transferred via the PROFIBUS subnet.

3.2 Where to Find More Information

You will find further information in the following sources:

- On programming symbols in STEP 7: read the corresponding STEP 7 manual or start the online help of the STEP 7 symbols editor.
- On the FBs for programming the FMS connections: see Chapter 4.



3.3 How Variable Descriptions Work

Downloading Variable Descriptions to the PROFIBUS CPs

The descriptions of the structure of the communication variables are stored first along with the configuration data of the corresponding FMS connection on the PROFIBUS CP of the FMS server.

The structure descriptions are first downloaded to the PROFIBUS CP of the FMS server along with the configuration data of the corresponding FMS connection.

One special feature is the configuration of the **REPORT** FMS service. For this service, you must also configure the variables on the client. The structure descriptions are also downloaded to the PROFIBUS CP aong with the configuration data of the corresponding FMS connection.

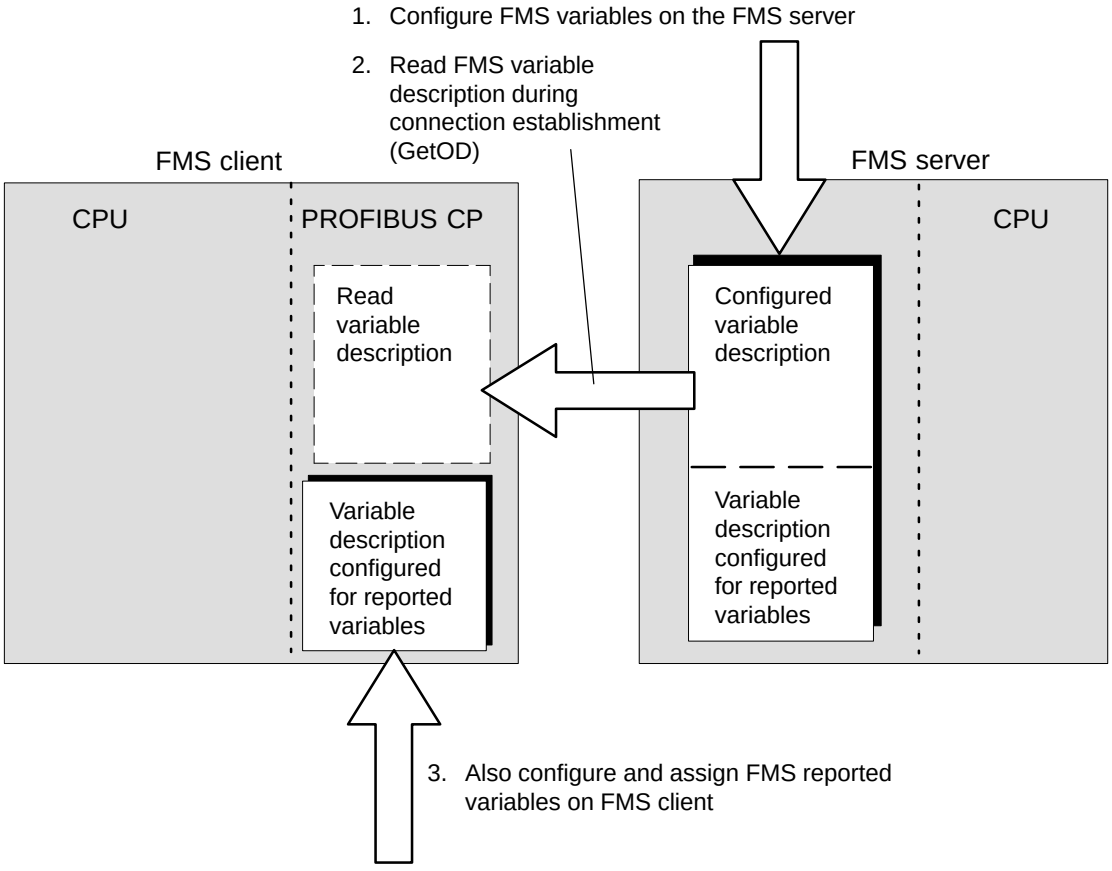


Figure 3-1 Configuring the FMS Variable Description / Transferring to the Client

The structure description read during connection establishment is used on the FMS client to convert the data to the device-specific format. With the FMS job type

- WRITE

  the user data referenced in the job are converted from the local representation of the FMS client to the neutral FMS format and then sent.

- READ

  The received data are converted from the neutral FMS representation to the local representation of the FMS client and then entered in the user data area specified in the job.

- REPORT

  The received data are converted from the neutral FMS representation to the local representation of the FMS client and then entered in the data block specified in the configuration.

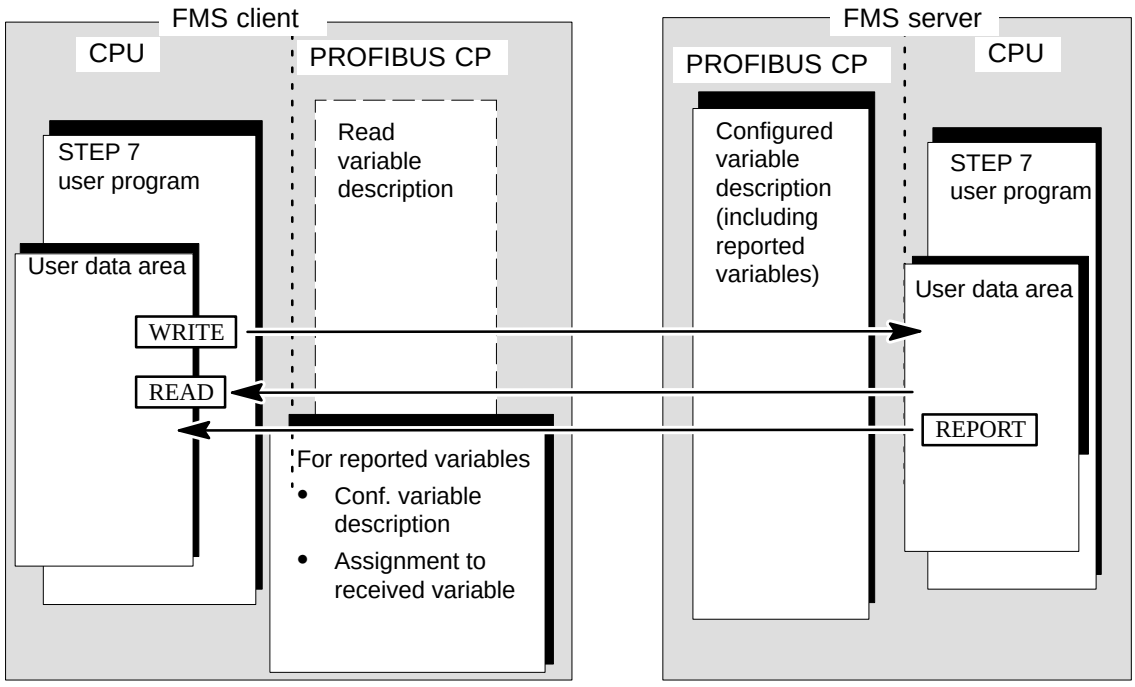


Figure 3-2 Using the FMS Variable Description

Note

Variables configured for the FMS REPORT service should not be further accessed using the FMS WRITE or READ services. With these services, access is then limited to one of the alternatives “access by name” or “access by index”.

Saving Resources

The variable descriptions occupy memory on the PROFIBUS CP of an FMS and FMS server. It is therefore advisable to store descriptions only of the variables that will be transfered.

Note the following possibilies:

- S7 station as FMS server
  - Specify the data areas (for example DBs), whenever possible, so that they contain only variables that are involved in communication. Declare only these data areas as communication variables as described in Section 3.4. This prevents unused structure descriptions putting extra load on the CP memory.
  - Using the function “Assign Communication Variables to Modules” (see Section 3.7), you can further restrict the variable descriptions stored on the PROFIBUS CP. You should use this function in particular when you need to distribute the load on two or more PROFIBUS CPs.

    For more information about load distribution, refer to Section 2.11.
- S7 station as FMS client
  - During connection configuration, select only the variables that will actually be used on the configured connection (refer to Section 3.7) .

3.4 Selecting Communication Variables

Meaning

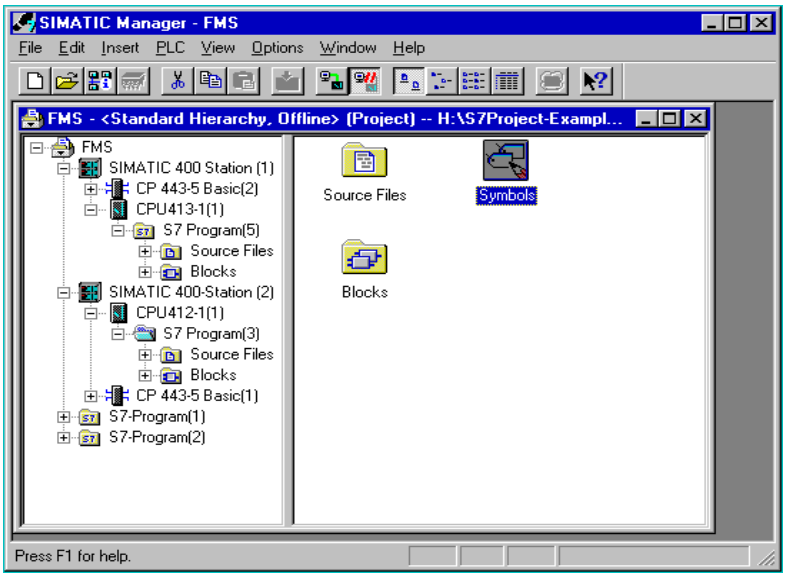
You configure communication variables based on the names that you specify for the data on your programmable controller using the symbols editor. You decide which data will be accessible as communication variables.

You specify the variables that will actually be used on an FMS connection during connection configuration on the partner station (FMS client).

Procedure

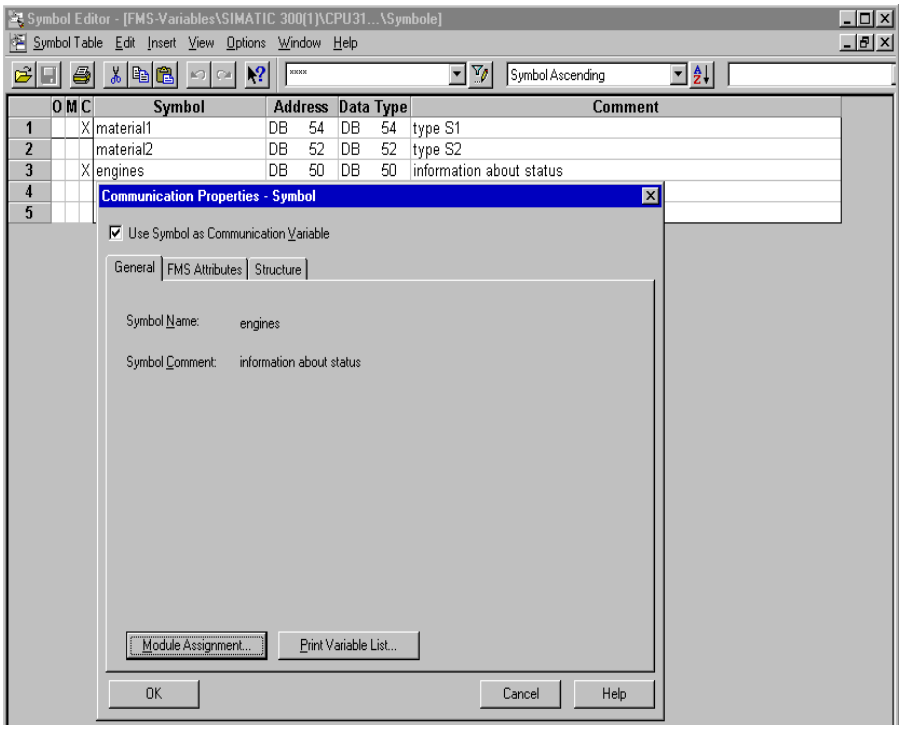
To configure variables for a PROFIBUS CP being used as an FMS server, follow the steps below:

4. In the SIMATIC Manager, select the symbol table (“Symbols” object) for the CPU you wish to use in the FMS server role.



5. Start the symbols editor by opening “Symbol”.
6. Create a new symbolic name for a defined data area or select an existing entry from the table. Make sure that the corresponding data area is permitted as the data area for communication variables. The table in the following section shows which data areas are possible.

7. Use the function **Edit▸Special Object Properties▸Communication...**.
   Result: You change to the “Communications Properties – Symbol” tab page. The General tab page is displayed and the symbolic name you have selected is already entered.



8. In the “General” tab page, you now decide whether you actually want to use the selected variable as a communication variable. If it is required, activate the check box.
9. Specify the other variable properties as described below. This includes the following:
   – Protecting variables from access
   – Specifying the variable definition

Other Buttons

Button	Meaning
Module Assignment	Click this button when: • you only want to assign selected variables from the configured variables to the PROFIBUS CP • you want to operate more than one CP in the S7 station and want to assign the variables specifically. For more detailed information refer to Section 3.7.
Print...	Click this button to print a list of all configured communication variables.

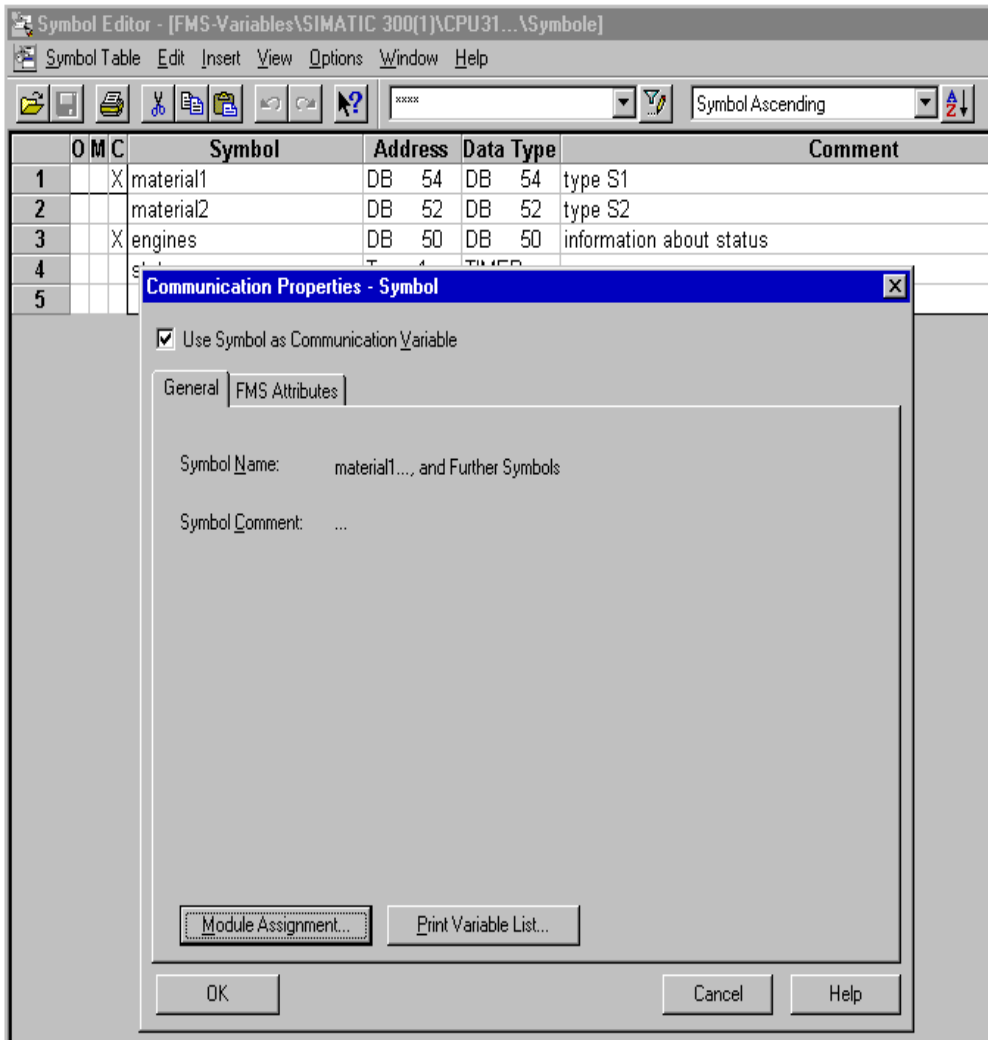
Selecting and Editing More Than One Symbol

In the symbols editor, you can also select more than one variable at the same time and use the function **Edit ▸Special Object Properties▸Communication...**. When you select a variable, make sure that you select the entire row and not just fields within a row! To select an entire row, click the buttons to the left of the symbols while holding down CTRL.

If you select more than one variable at the same time, you can set the variable properties for all the selected variables at the same time.

Using this method, you cannot, however, display and edit the structure definitions of more than one variable at the same time.

The dialog box below appears when more than one variable is selected:



Copying Communications Variables

You can copy symbols and their communication variables in the symbols table (**Function Edit ▸ Copy**). This can, for example, be useful when you want to copy communications variables from one station to another or into a different project.

To copy the descriptions of the communications variables along with the symbol, select the option “Copy with special object properties” in **Options ▸ Customize...**

3.5 Declarations for Communication Variables

Plausibility

To be able to use variables as communication variables, you must make the following declarations:

Table 3-1

Declaration	Explanation	Rules
Select a permitted data area.	The **Edit▸Special Object Object Properties▸Communication...** function cannot be used with invalid types, for example FCs.	Select permitted data areas based on the next table.
Highest structure level with structured data types = 2 or 3	The standard setting for the communication variables allows a maximum of 3 structure levels With DBs, this means, for example, a maximum of 2 nested data elements of the type STRUCT can be defined for the standard setting. The DB itself represents structure level 0. **Structure level 3 is possible:** A further structure level in the DB is possible if you select **only** the variable representation “First Structure Level of a DB”. This effectively eliminates structure level 0.	The system informs you of illegal nesting levels as soon as you exit the “Communications Properties – Symbol” dialog box with “OK”. If you do not change the DB, an error message is displayed as soon as you download the DB to the S7 station! There are two ways in which you can correct this situation: 1. You modify the structure in the DB so that the maximum structure level of 3 is kept to. 2. You reduce the number of structure levels in the “Struc–ture” tab page by selecting the variable representation “First Structure Level of a DB”.
Variable length (user data length) For FMS, 237 bytes are specified as the maximum value. This value can be reduced to suit your system.	Communication variables are transferred without segmentation. In the variable definition, you must therefore make sure that the maximum **total length** is not exceeded.	Refer to the information about the maximum user data length in the product information of the local PROFIBUS CP and the partner /1/. Refer to Section 2.8 for information about configuring the maximum PDU size.
Data blocks Assign variables not involved in communication to a different DB.	Only an entire DB can be defined as a communication variable. One or more communication variables can be defined in it.	Group communication variables whenever possible in a DB.

Permitted Data Areas

The following table specifies which data areas of the S7 CPU can be assigned to a communication variable.

Table 3-2

Can be Selected as Communication Variable	International	SIMATIC	Explanation:	Data Type:
x	I	E	Input bit	BOOL
x	IB	EB	Input byte	BYTE, CHAR
x	IW	EW	Input word	WORD, INT, S5TIME
x	ID	ED	Input double word	DWORD, DINT, REAL, TOD, TIME
x	Q	A	Output bit	BOOL
x	QB	AB	Output byte	BYTE, CHAR
x	QW	AW	Output word	WORD, INT, S5TIME
x	QD	AD	Output double word	DWORD, DINT, REAL, TOD, TIME
x	M	M	Memory bit	BOOL
x	MB	MB	Memory byte	BYTE, CHAR
x	MW	MW	Memory word	WORD, INT, S5TIME
x	MD	MD	Memory double word	DWORD, DINT, REAL, TOD, TIME
	PIB	PEB	Peripheral input byte	BYTE, CHAR
	PQB	PAB	Peripheral output byte	BYTE, CHAR
	PIW	PEW	Peripheral input word	WORD, INT, S5TIME
	PQW	PAW	Peripheral output word	WORD, INT, S5TIME
	PID	PED	Peripheral input double word	DWORD, DINT, REAL, TOD, TIME
	PQD	PAD	Peripheral output double word	DWORD, DINT, REAL, TOD, TIME
x	T	T	Timer	TIMER
x	C	Z	Counter	COUNTER
	FB	FB	Function block	FB
	OB	OB	Organization block	OB
x	DB	DB	Data block	DB, UDT
				FB, SFB
	FC	FC	Function	FC
	SFB	SFB	System function block	SFB
	SFC	SFC	System function	SFC

Can be Selected as Communication Variable	International	SIMATIC	Explanation:	Data Type:
	VAT	VAT	Variable table	
	UDT	UDT	User-defined data type	UDT

Notice

With the Report service, only the data area DB (data block) can be used.

3.6 Specifying the Variable Definition

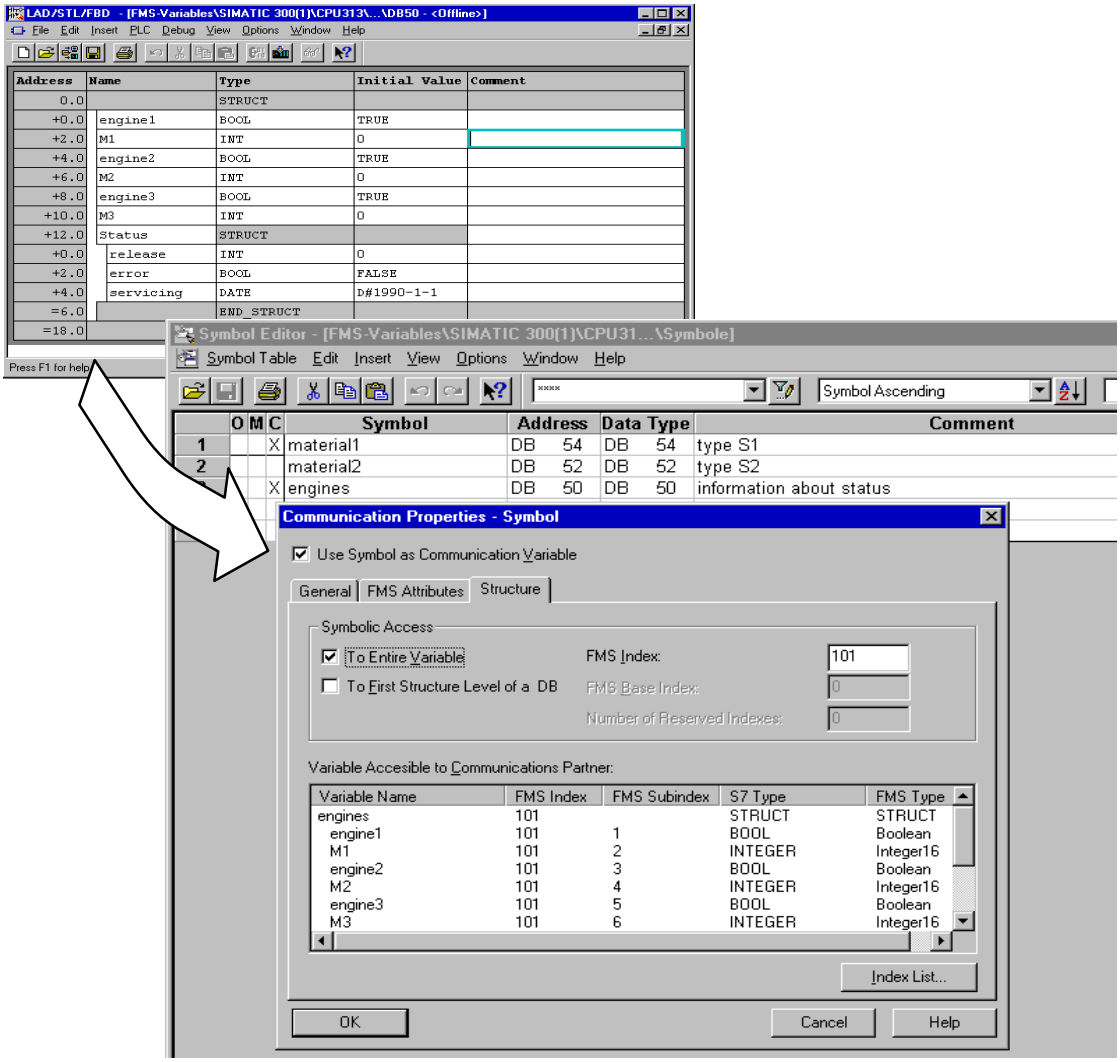
Meaning of the Structure Description

With the variable structure in your data block or other data areas, you initially specify an internal S7 description format.

Principle of Conversion

When you select a symbol in the symbols editor as a communication variable, the corresponding structure description created, for example for a data block with LAD/STL/FBD, is converted to the neutral FMS structure.

The following figure shows the representation of data block DB50 that was stored in the symbols editor with the name “Engines”.



3.6.1 Specifying Access

Selecting Structure Levels

In the “Structure” tab page, you can specify how the data in the selected data structure are accessed by write or read calls in the user program.

- Symbolic Access to Entire Variable
  Access is possible to the entire structure. (Default for all permitted data areas).
- Symbolic Access to First Structure Level of a DB
  Access is possible to components of the structure.

Configurable Variables: Note Limits

Communication variables use resources on the PROFIBUS CP. You should therefore select your settings carefully. The “First Structure Level of a DB” can use up more resources than intended since a communication variable is created for each structure component.

For information about calculating the memory requirements refer to Section “Assigning Communication Variables to Modules”.

For information about calculating the memory requirements refer to Section “Assigning Communication Variables to Modules”.

Access to the Entire Variable

Here, select the “To Entire Variable” check box.

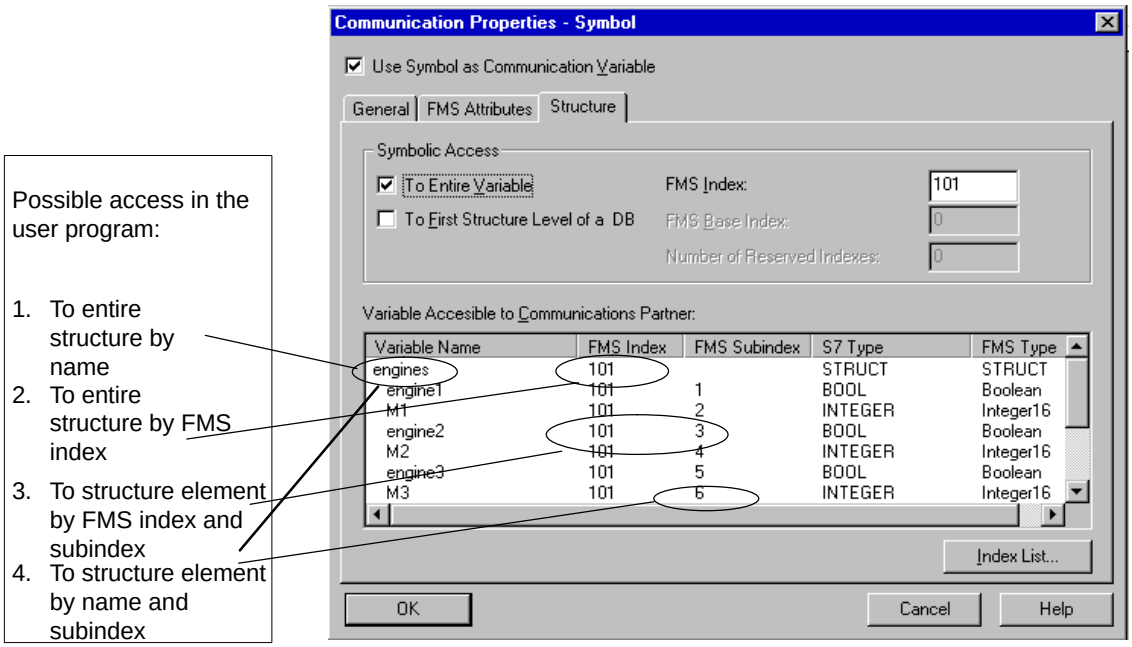


Figure 3-3 Access Using “Symbol”

Access to the First Structure Level of a DB

If you want to permit symbolic alternate access to individual structure elements or indexed access to their subcomponents, select the “First Structure Level of a DB” check box.

The following figure shows how the “Engines” structure is broken down into substructures.

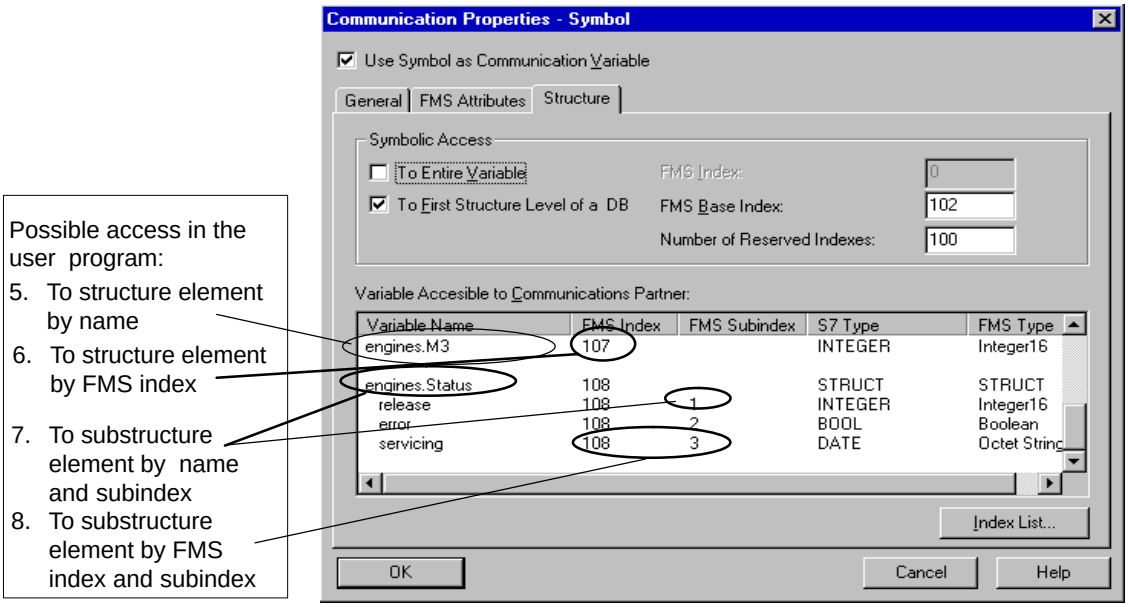


Figure 3-4 Access Using “First Structure Level of a DB”

Use “Symbolic Access to First Structure Level of a DB” in the following situations:

- When you want to access the first structure level of a data block symbolically.
- When you want to access a structure element at structure level 2 of the variable using the index.
- When you want to define a communication variable (DB), structures as far as structure level 3 (last level for elementary data types)
- When you want to define and access arrays at the first structure level of a DB.
- When you want to be able to access elements of an array using the subindex.

  Example of the maximum permitted structure definition (access only possible with symbolic alternate access).

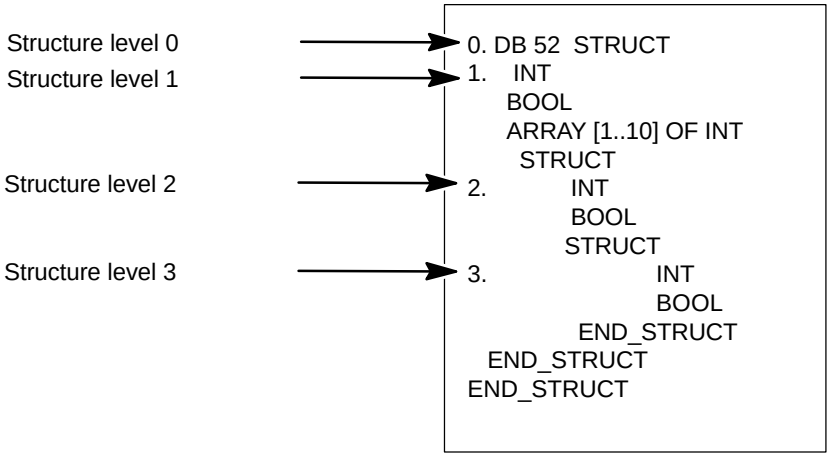


Table 3-3 Parameters for the Input Area “Symbolic Access...”

Parameter/ Check Box	Description	Range of Values
To Entire variable	The check box is used to select the entire structure This selection is possible in conjunction with the option “to first structure level of a DB”.	Only with structured data areas (DB): “on” or “off” With elementary data types always “on”
To First Structure Level of a DB	The check box allows symbolic access to the elements of the structure level of a DB. This selection is possible in conjunction with the option “to entire variable” **Note with Arrays:** With one exception, arrays always require the declaration “to first structure level of a DB“. The exception is Arrays of Char; These are mapped on the elementary data type octet string during the data type conversion.	Only with structure data areas (DB): “on” or “off” With elementary data types always “off”

Table 3-3 Parameters for the Input Area “Symbolic Access...”, continued

Parameter/ Check Box	Description	Range of Values
FMS index	The FMS index is specified in the FB call in the user program to identify the variable. The FMS index is unique within the CPU. It is initially proposed by the system. The default value of 100 initially leaves a space from 0 to 99 for internally used type indexes. You **must** modify the default value 100 when more than 85 structures are defined, otherwise there are index overlaps. Note the following: Indexes 0 to 14 have a standard assignment for elementary types. Each structure occupies a further type index These internal indexes are assigned in ascending order starting at index 15.	Default setting: 100 Can be entered/permitted: 15 to 65535
FMS base index	The FMS base index is the index of the first structure element of the variable at structure level 1.	Can be entered/permitted: 15 to 65535
Number of reserved indexes	Range of indexes reserved for the currently displayed variable. Reserving indexes leaves space for subsequent structure extensions.	Default: 100 Maximum selectable: 512

Notice

Remember that the total length of a name must not exceed 32 characters.

Access using a subindex reduces the maximum total length of a name to 30 characters because the subindex itself takes up 2 characters.

General Requirements for Access Using a Name

Access using a name in the user program is only possible when the FMS services GetOD (long form) was declared for the FMS connections (see Section 2.9: matching the services of the FMS partner).

Summary of Access Methods

The following table summarizes the possible ways of accessing communication variables in the user program.

Remember that the configuration settings can also be important when variables are accessed using an index rather than a name. If, for example, you want to access a structure element using its index (case 5 in the table), this is only possible when the check box “To First Structure Level of a DB” is selected.

Access Option	Example (Name or index referenced via FB parameter VAR_1)	Configuration Symbols	
		to entire variable	to first level
1. To entire structure with name	’Engines’	X	–
2. To entire structure with FMS index	’<100>’	X	–
3. To structure element or array element with FMS subindex	’<100:1>’	X	–
4. To structure element or array element with name and subindex	’Engines:6’	X	–
5. To structure element with name	’Engines.EngineM3’	–	X
6. To substructure element with FMS index	’<103>’	–	X
7. To a substructure element with name and subindex	’Engines.Totalstatus:1’	–	X
8. To a substructure element with FMS index and subindex	’<103:1>’	–	X

Key: X mandatory, – irrelevant

The Data Area is Not a DB

Data areas such as bit memory, timers or counters (for further memory areas refer to Section 3.5) are always assigned elementary data types. It is therefore not possible to divide the variable into structure elements.

This means that it is not possible to select access to the first structure level in the “Structure” tab page. The variable is displayed with its corresponding data type. The “To Entire Variable” is selected as default and cannot be changed. The only selection or entry possible is the FMS index for access using an index.

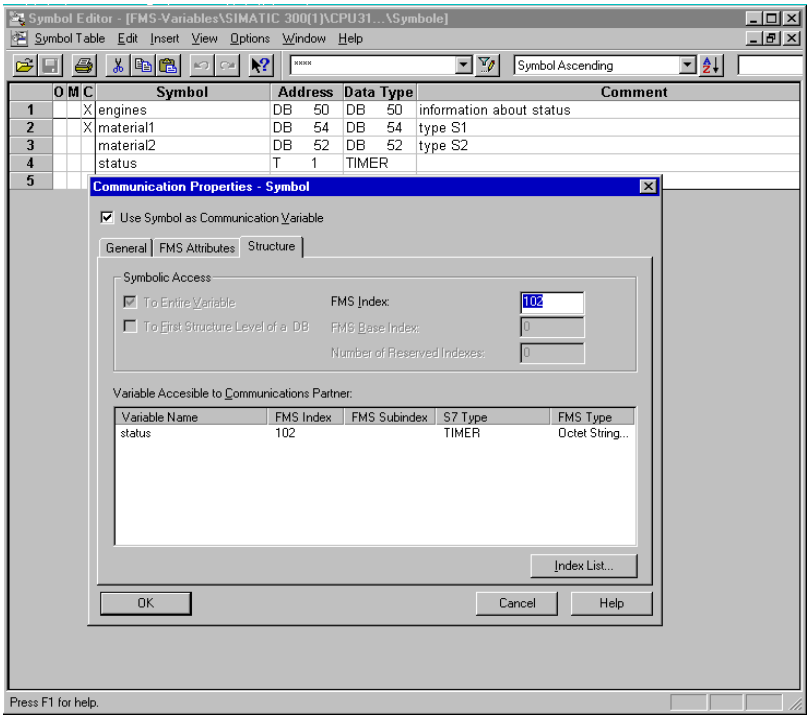


Figure 3-5 Example of an Elementary Data Type “Timer”

3.6.2 Outputting the Index List

Index List Button

To obtain an overview of all the indexes assigned for FMS variables in the S7 CPU you can display an index list by clicking the “Index List...” button in the “Structure” tab page.

Managing Indexes

The index list helps you when assigning indexes. The indexes are initially assigned without gaps in ascending order when you create communication variables. By removing or extending variables, gaps can however occur that are then free for new definitions.

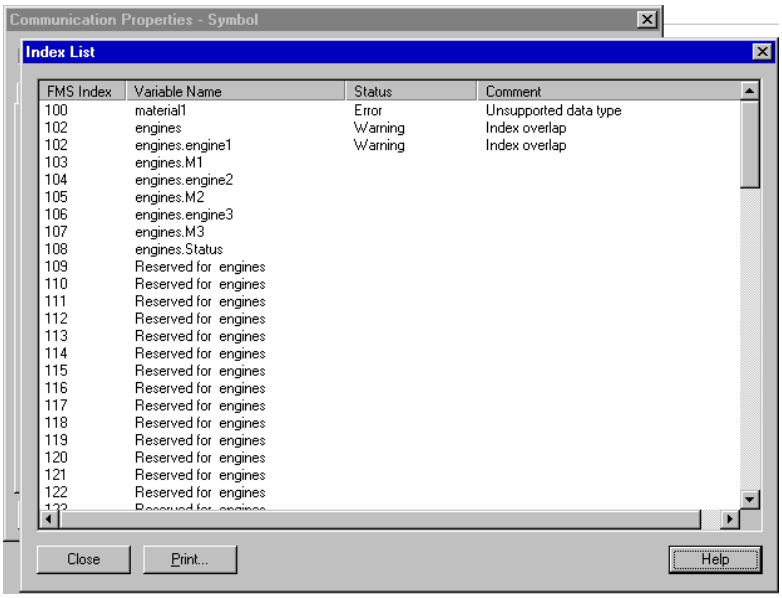


Figure 3-6 Example of an Index List

The following table shows how to interpret the information in the index list and how to deal with the problems.

Table 3-4

Status	Comment/Problem Detected	Further Information/Procedure
Warning	Overlapping of variable indexes	Based on the list, select the FMS index or FMS base index for the individual communication variables so that no overlaps can occur. Check the reserved, unused indexes. Reducing the number of reserved indexes can also help to eliminate overlaps.
Error	Nesting level exceeded	Only displayed as an error when no alternate access is possible. Change the variable structure or the access in the “Structure” tab page.
Warning	Nesting level exceeded	Only displayed as a warning when alternate access is possible. Check the structure definition.
Error	Array in first structure level	Change the access in the “Structure” tab page to “Access to First Structure Level”. Arrays deeper in the structure must be eliminated.
Error	Unknown data type	Check the data type being used based on the list in Section 3.5.
Error	Data type not supported	Check the data type being used based on the list in Section 3.5.

3.6.3 Simulating S7 Data Types With FMS Data Types

Representing S7 and FMS Data Structures

The “Structure” tabbed page displays the simulation of the selected variable in the FMS structure. Apart from the name and index assignments explained in Section 3.6.1, you also see the conversion of S7 types to the FMS PDU data type. Based on the tables in this section, you can clarify which FMS data types occur on your partner system.

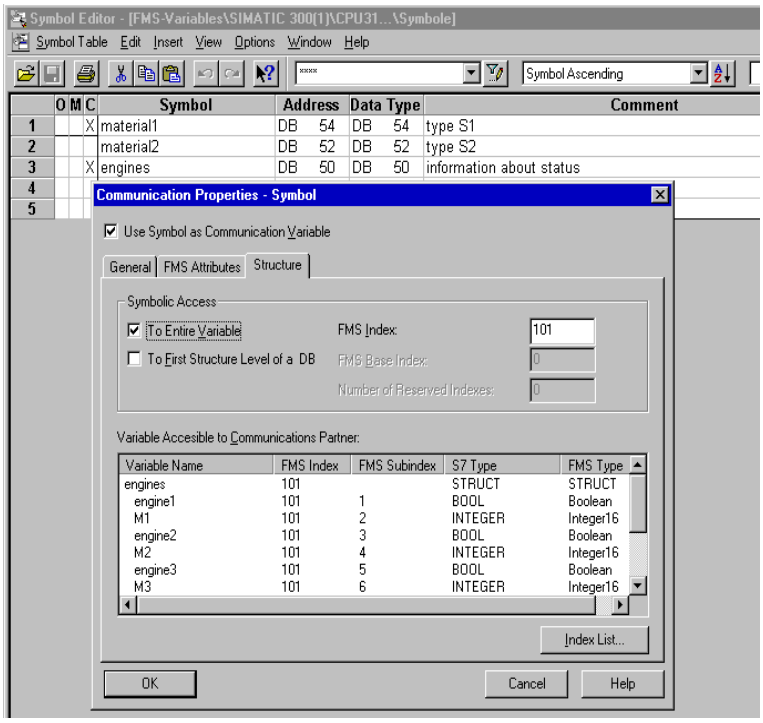


Table 3-5 Parameters for the Display Area “Variable Accessible to Communications Partner”

Parameter	Description
Variable Name	Variable name taken from the symbol table and the structure description of the variable.
FMS Index	Display of the current FMS index. For the significance of the FMS index, refer to Section 3.6.1.
FMS Subindex	Display of the calculated subindex of a structure element according to its data type. For the significance of the FMS subindex, refer to Section 3.6.1.
S7 Type	Display of the SIMATIC S7 internal data type.

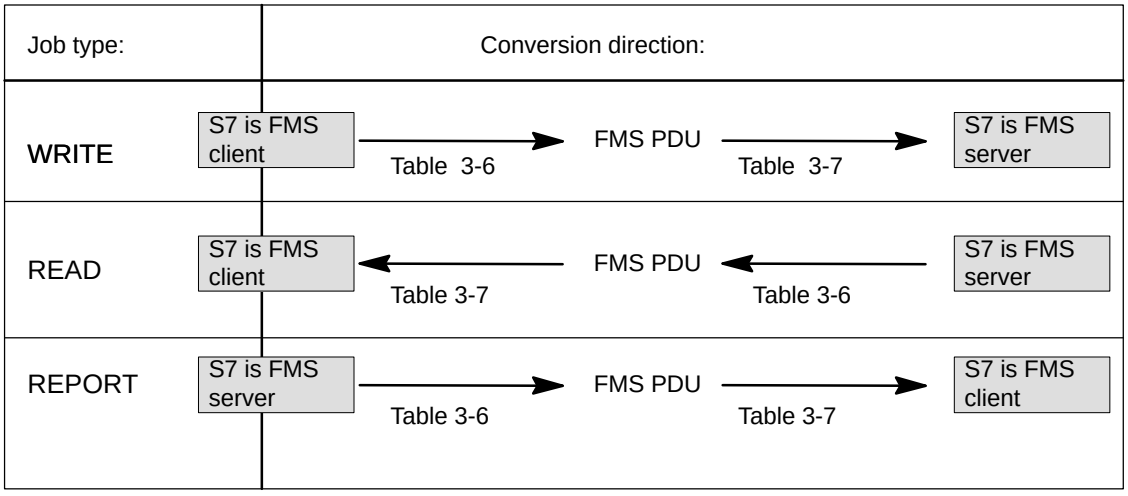
Parameter	Description
FMS Type	Display of the FMS type. The FMS type decides the data format transferred in the FMS PDU.

Conversion Rules

The following tables show how S7 data types are converted to FMS data types.

Depending on the transmission or conversion direction, select the table “Data Conversion From S7 Format to FMS PDU” or “Data Conversion From FMS PDU to S7 format”.

The following table showing the assignment of job type and conversion direction will help you to make your selection.



Data Conversion From S7 Type to FMS Type

The column “Number of Bytes in FMS PDU” provides you with the value D_{conv} that you require for the PDU length calculation (see Section 2.8).

Table 3-6 Data Conversion From S7 Format to FMS PDU

Convert Data Type ——————> S7 Type	FMS PDU	Description	Bit Length S7	Number of Bytes in FMS PDU	Range of Values S7	FMS
STRUCT	(only structure elements relevant)	Data structure	–	–	see range of values of structure elements	
BOOL	Boolean	Boolean value	1	1	0,1	0x00, 0xff
BYTE	Unsigned8 2)	Bit string 8	8	1	every 8-bit string	
WORD	Unsigned16 2)	Bit string 16	16	2	every 16-bit string	
DWORD	Unsigned32 2)	Bit string 32	32	4	every 32-bit string	
CHAR	Octet string[1]	ASCII chars.	8	1	see ISO 646 and ISO 2375: Defining registration number 2 + SPACE	
ARRAY [x..x+n] OF CHAR	Octet string[n+1] 0<=n<=236	ASCII character string	[n+1]*8	n+1	see ISO 646 and ISO 2375: Defining registration number 2 + SPACE	
ARRAY [x..x+n] OF “elementary type”	ARRAY [n+1] of “elementary type”]	ARRAY of any elementary data type (except ARRAY)	[n+1] * Bit length of “elementary type”	[n+1] * number of bytes in FMS PDU of “elementary type”		
ARRAY [x..x+n] OF STRUCT	ARRAY [n+1] of Struct	Array of any structured data type (except ARRAY)	[n+1] * Bit length of “structure”	[n+1] * number of bytes in FMS PDU of “structure”		
ARRAY [x..x+n] OF ARRAY	–	–	–	–	not permitted	
INT	Integer8	Integer	8	1	$-2^7..2^7-1$ Note: Integer8 only when configured on partner, otherwise Integer16.	
INT	Integer16	Integer	16	2	$-2^{15}..2^{15}-1$	
DINT	Integer32	Double integer	32	4	$-2^{31}..2^{31}-1$	
REAL	Floating-point	Real number	32	4	see IEEE Stand. 754 Short Real Number	
TIME	Time difference	Time duration	32	4	see IEC 1131 IS	$0..2^{32}-1$ ms and $0..2^{16}-1$ days
DATE	Octet string[2]	Date (only)	16	2	see IEC 1131 IS	see EN 50132

Table 3-6 Data Conversion From S7 Format to FMS PDU, continued

Convert Data Type ——————> S7 Type	FMS PDU	Description	Bit Length S7	Number of Bytes in FMS PDU	Range of Values S7	FMS
TIME_OF_ DAY or TOD	Time-of-day	Time (only)	32	4 or 6	see IEC 1131 IS	0..2^{28}–1ms
S5TIME	Octet string[2]	S5 time duration	16	2	see IEC 1131 IS	
DATE_AND _TIME or DT	Date	Date and time	64	7	see IEC 1131 IS	0..2^{28}–1 ms or 0..2^{16}–1 days
STRING[n] (where 0<n<=237)	Visible string[n]	ASCII string with a length n	8n	n	see IEC 1131 IS	
Timer	Octet string[2]	Timer function	16	2	0 to 65535	
Counter	Octet string[2]	Counter function	16	2	0 to 65535	

Note

Note the following when converting data type ARRAY:

During data type conversion, the ARRAY length is always aligned with word lengths. With array elements of the type CHAR or BYTE, an odd number of elements (for example 13) is rounded up to an even number of elements (for example 14).

Data Type Conversion from FMS to S7 Type

The column “Number of Bytes in FMS PDU” provides the value D_{conv} that you require for the PDU length calculation (see Section 2.8).

Table 3-7 Data Conversion From FMS PDU to S7 Format

Convert Data Type ——————> FMS PDU	S7 Type	Description	Bit Length S7	Number of Bytes in FMS PDU	Range of Values S7	FMS
Boolean	BOOL	Boolean value	1	1	0,1	0x00, 0xff
Bit string[8]	BYTE	Bit string 8	8	1	every 8-bit string	
Unsigned8	BYTE	Bit string 8	8	1	every 8-bit string	

Table 3-7 Data Conversion From FMS PDU to S7 Format, continued

Convert Data Type ——————> FMS PDU	S7 Type	Description	Bit Length S7	Number of Bytes in FMS PDU	Range of Values S7	FMS
Bit string[16]	WORD	Bit string 16	16	2	every 16-bit string	
Unsigned16	WORD	Bit string 16	16	2	every 16-bit string	
Bit string[32]	DWORD	Bit string 32	32	4	every 32-bit string	
Unsigned32	DWORD	Bit string 32	32	4	every 32-bit string	
Bit string[8n] where n>4	ARRAY [x..x+n–1] OF BYTE	Bit string with 8*n bits	8*n	n	every bit string with length n	
Octet string[n] 1<=n<=237	ARRAY [x..x+n–1] OF BYTE	Octet string	8*n	1n	see ISO 646 and ISO 2375: Defining registration number 2 + SPACE	
Visible string[n] 1<=n<=237	ARRAY [x..x+n–1] OF CHAR or S7 string	ASCII character string	8*n	1n	see ISO 646 and ISO 2375: Defining registration number 2 + SPACE S7 string, if defined	
ARRAY [n] of ”elementary type”]	ARRAY [x..x+n–1] OF ”elementary type”	ARRAY of any elementary data type **(except ARRAY**)	[n * Bit length of ”elementary type”]	[n * Number of bytes in FMS PDU of ”elementary type”]	Note: each element is extended to word size.	
Integer8	INT	Integer	8	1	$-2^7..2^7-1$ (FMS range) Note: Integer8 only when configured on partner, otherwise Integer16.	
Integer16	INT	Integer	16	2	$-2^{15}..2^{15}-1$	
Integer32	DINT	Double integer	32	4	$-2^{31}..2^{31}-1$	
Floating-point	REAL	Real number	32	4	see IEEE Stand. 754 Short Real Number	
Time difference	TIME	Time duration	32	4 or 6 (if days specified)	see IEC 1131 IS Note: the day is ignored	$0..2^{32}-1$ ms and $0..2^{16}-1$ days
Time-of-day	TIME_OF_ DAY or TOD	Time (only)	32	4	see IEC 1131 IS	$0..2^{28}-1$ms
Date	DATE_AND_ TIME or DT	Date and time	64	7	see IEC 1131 IS	see EN 50132

3.7 Assigning Communication Variables to the Modules (Load Distribution)

Meaning

The configured communication variables occupy memory on the PROFIBUS CP after they are downloaded to the S7 station.

If you have selected communication variables from the symbol table, you have already made a selection and restricted the required resources to the communication variables.

If you make no further selection, the variable descriptions for all communication variables will be downloaded to all the PROFIBUS CPs assigned to the CPU.

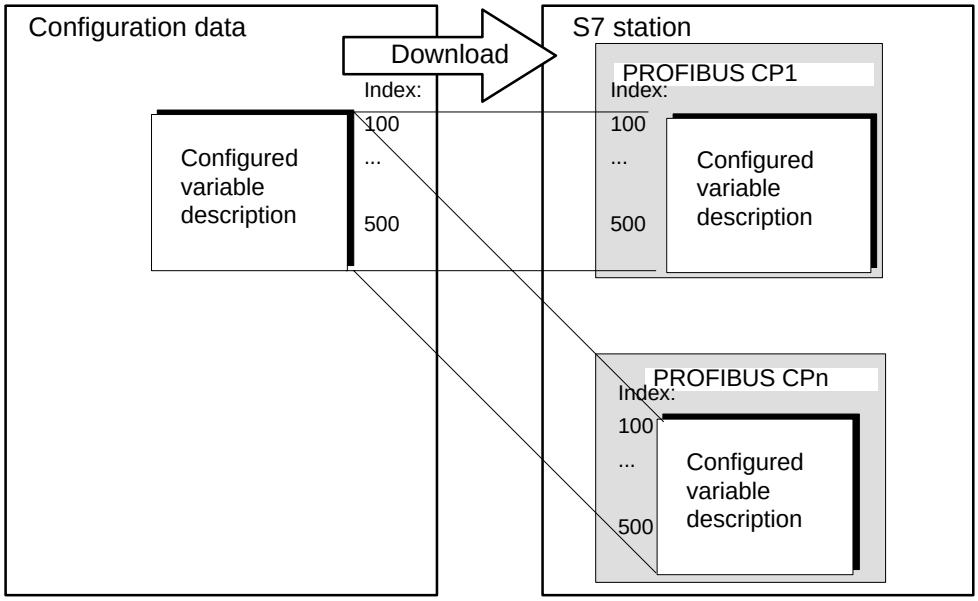


Figure 3-7 Standard Setting: All Variable Descriptions will be Downloaded to all CPs

Concept of Load Distribution

By adding further PROFIBUS CPs, you gain more resoureces for storing variables and increase the possible number of FMS connections.

The function “assign communication variables to modules” allows you to distribute variables on specific CPs.

Remember that you must also make an appropriate assignment of the FMS connections. How to configure FMS connections and to assign them to PROFIBUS CPs to distribute the load is described in Sections 2.11 and 2.6.

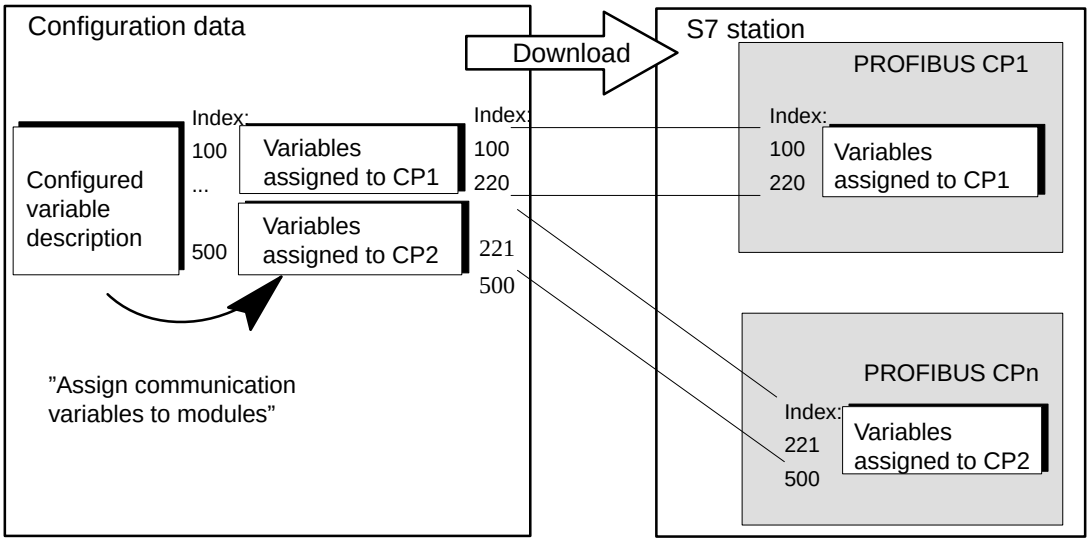


Figure 3-8 Load Distribution

Note Limits for Configurable Variables

You can calculate the resources required for configured communication variables according to the following information.

You will find information about the maximum number of configurable variables (for elementary data types) in the product information of the PROFIBUS CP /1/ in the section "Characteristic Data FMS Connections" (or similar).

Remember, however, that a communication variable of the type structure requires more memory on the PROFIBUS CP than a variable of an elementary type. For the calculation, assume that number of variables specified in the product information is reduced as follows when structures are defined:

Number of structure elements	The maximum number of objects is reduced by approximately
1 .. 10	1
11 .. 20	2
21 ... 30	3
...	...
71 ... 76	7

Example: A structure with 17 elements reduces the maximum number of variables that can be configured by two, in other words a total of three variables.

These values take into account the number of structures on the one hand and approximate the complexity of structures on the other.

Specifying "First structure level of a DB" means that a separate communication

variable is created for each structure component. Each component must then be included in the calculation.

Note

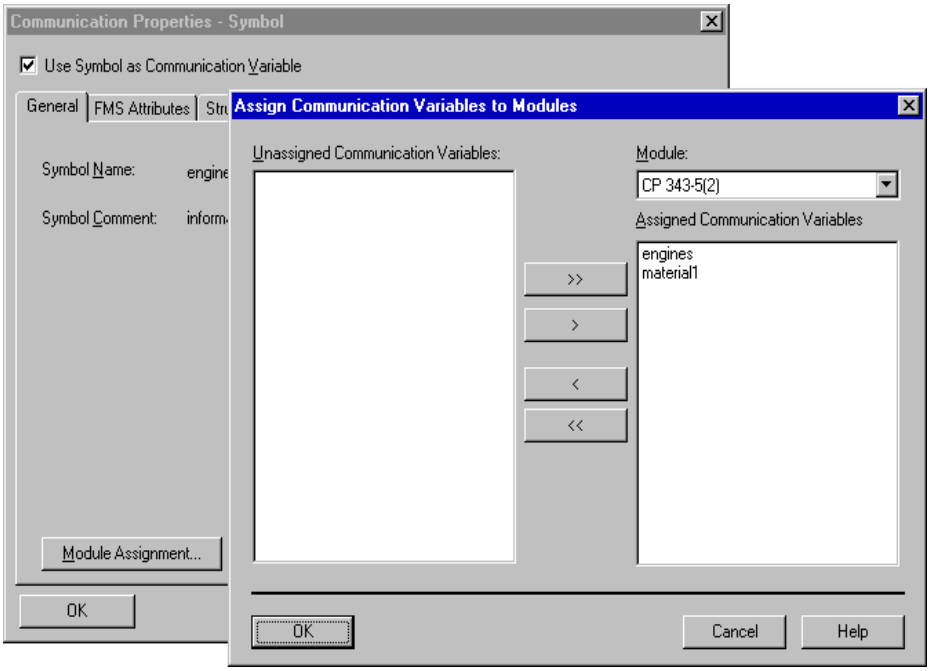
If the communications partner uses the function GetOD (long form), a maximum of 47 structure elements can be configured due to the resulting length of the FMS PDU.

Making the Assignment

By clicking the “Module Assignment” button in the “General” tab page, you display the “Assign Communication Variables to Modules” dialog box.

The following rules apply to the representation and selection of the variables:

- All the variables configured for the CPU are displayed.
- As default, all variables are initially assigned to all CPs and are displayed on the left.
- The display and selection of the variables uses the symbols declared in the symbol table. The substructures assigned to a symbol are always included in the symbol.



Dialog Box	Meaning
Module	Here, you select the PROFIBUS CP for which the following selection applies.
Unassigned Communication Variables	Here, the communication variables are displayed that are **not** assigned to the current module (PROFIBUS CP). If you select one or more variables, and click the button (arrow), you can include variables in the assignment.
Assigned Communication Variables	Here, the communication variables are displayed that are assigned to the current module (PROFIBUS CP). If you select one or more variables, and click the button (arrow), you can include variables in the assignment.

3.8 Protecting Variables From Access

Configuring FMS Attributes for Access Protection

You can disable and enable read or write access to a variable in the configuration. Using password protection, you can restrict access to disabled variables to authorized connections.

As an alternative to using passwords, you can control access to variable **groups**.

Principle

Password protection is checked when the connection is established using a password number. Connections are only established to a station when the partner has a unique password. No two partners have the same password.

Password “0” is an exception and can be used to establish several connections at once.

Whether or not write or read rights are set, is checked when the communications jobs are processed.

Setting FMS Attributes

To set FMS attributes, follow the steps below:

1. Select the “FMS Attributes” tab page.
2. Click the “FMS Access Protection Activated” check box.
3. Select the required options for reading and writing. You can assign unrestricted access or assign access restricted to a group or only with a password (or a combination of both).

   If you specify a password (number), the following rules apply:

   0:
   The FMS client must specify the password “0” to verify authorization during connection establishment. Access is possible for **all** FMS clients that specify the password.

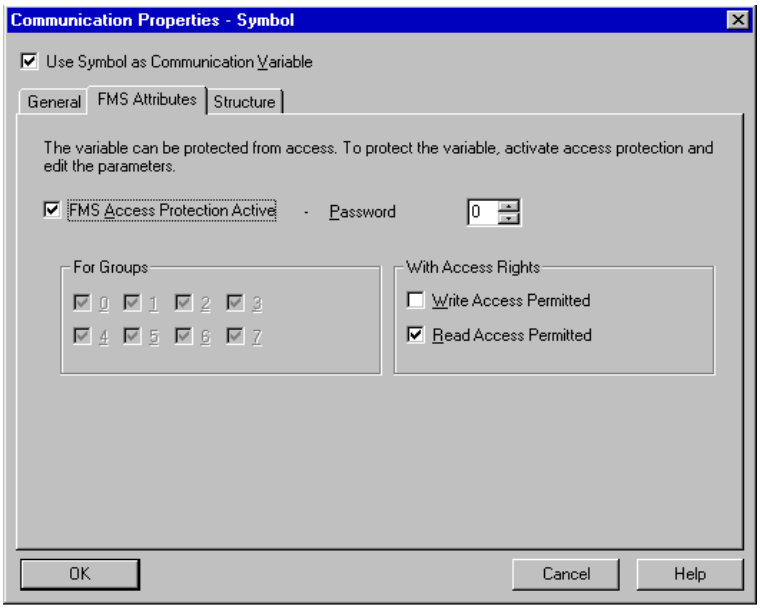
   >0:
   The FMS client must specify this password to verify authorization during connection establishment. Access is restricted to **one** FMS client/one FMS connection.

   If you specify groups, the following applies:

   If you activate FMS access protection, this is activated initially for all groups that can be assigned according to the FMS standard. It is also possble to activate or deactivate specific groups by selecting or deselecting them.

Note

Remember that only the check marks on a white background indicate the effective settings. Check boxes with a gray background indicate previous settings that are no longer effective.



Processing More Than One Variable

If you have selected more than one symbol when you call the function **Edit▸Special Object Properties▸Communication...** the display of the “Access Protection” tab page depends on the status of the variable settings as follows:

Display “FMS Access Protection Activated”	“FMS Access Protection Activated” is activated for
	None of the selected variables
	All selected variables
	Some of the selected variables

Notice

Note that the configured settings made here cannot be canceled or modified by statements in the user program.

3.9 Downloading the Variable Configuration

Principle

The variable configuration is downloaded with the connection configuration to the S7 station or to the CPU and the PROFIBUS CP.

The data areas themselves, DBs, bit memory etc., are downloaded with the user program.

If the declarations for structured communication variables (DBs) exceed the maximum nesting level, you will receive an error message when you download the connection configuration.

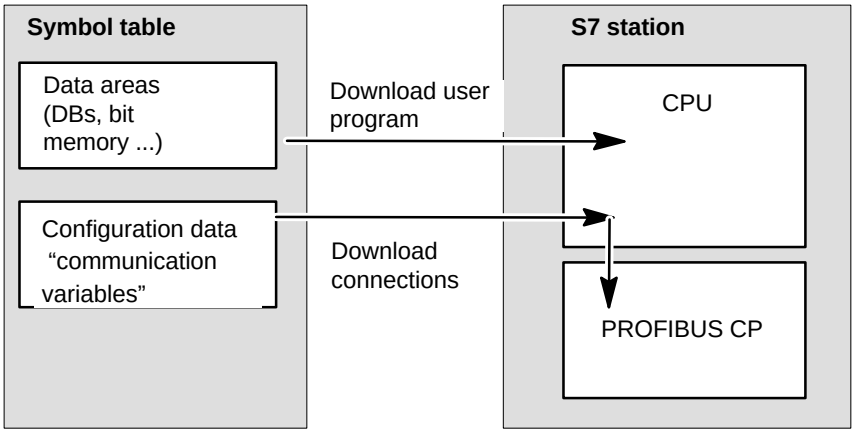


Figure 3-9 Principle of Downloading

Requirements

Before you can download the configuration data of the communication variables to the PROFIBUS CP, at least one FMS connection must be configured that is operated via this PROFIBUS CP.

Operating More Than One CP

If you operate more than one PROFIBUS CP in the S7 station, remember that by default the configuration data of the communication variables are downloaded completely to each CP via which at least one FMS connection to the corresponding CPU is operated.

Use the function “Assign Communication Variables to Modules” to achieve a genuine distribution of load on the resources for communication variables (see Section 3.7).

Downloading the Variable Configuration

The variable configuration is downloaded to the CP using the connection configuration. Follow the steps below:

1. Select the CPU containing the relevant communication variables in the SIMATIC Manager.
2. Select the “Connections” object and open it (**Edit...** function or double click).
3. Select the **PLC Download** function in the open connection table.

Downloading System Data

The data of the variable configuration are in the system data of the CP. It is therefore possible to download the variable configuration using the system data of the CP. Remember, however, that this is only possible after you have saved the variable configuration and have called up the connection configuration of the station at least once (see note below).

Follow the steps below:

1. Select the CP in the SIMATIC Manager.
2. Branch to the “Blocks” subdirectory.
3. Select the “System Data” object.
4. Start the **PLC Download** function.

Note:
The data of the variable configuration are created initially using the symbol editor and saved under the CPU of a station. The data are, however, assigned to the CPs with the module assignment and the corresponding FMS connections. To achieve this assignment of the data in the system data intended for the CP, the connection configuration must be called up.

❑

Programming Function Blocks for FMS

4

"Off-the-peg" function blocks (FBs) form the interface to the FMS services.

The description of each FB in this chapter includes the following sections that may be extended by specific information:

- Meaning
- Call Interface
- How the Block Works
- Explanation of the Formal Parameters
- Return Codes

This chapter provides you with information over and above the general information available in the online help for the FBs when programming in STEP 7.

You will find further information in the following sources:

- In the PROJECT_PROFIBUS sample project that you can start after installing NCM S7, you will find **sample programs**. There are descriptions of these in the primer "Getting Started" /2/.

The Quick Start CD that can be ordered separately is a treasure-trove of **sample programs** and configurations.

You can order this directly on the Internet at:
http://www.ad.siemens.de/csi/net Entry ID: 574211

4.1 Function Blocks for FMS

Supplied in a block library

The function blocks are supplied with the STEP 7 option NCM S7 for PROFIBUS. These FBs are available in the SIMATIC_NET_CP block library after installing the NCM S7 for PROFIBUS option.

Overview

The following function blocks are available for an S7 station involved in FMS communication.

The list also shows the block numbers that are assigned when the blocks are supplied. You can change these numbers.

Function Block		Function Block can be used in the function of the PROFIBUS CP as:		Meaning/Function
Type	**Block Number**	**FMS Client**	**FMS Server**	
IDENTIFY	FB2	X	X	For checking device properties
READ	FB3	X	–	For reading data
REPORT	FB4	–	X	For transferring data unconfirmed
STATUS	FB5	X	X	For a status check
WRITE	FB6	X	–	For writing data

Examples

Apart from the call examples in this chapter, the CD supplied contains examples that you can use and that are described in the primer.

Difference between S7-300 and S7-400

Different FBs are supplied for the S7-300 and S7-400. Make sure you access the appropriate block library (SIMATIC_NET_CP) depending on whether you are creating a user program for an S7-300 or an S7-400.

FBs and Module Replacement (Spares)

Module replacement in this sense means the replacement of a module with another module that may be a more recent version.

Notice

Please remember that if you replace a module, you must only use the blocks permitted for the configured CP type in the user program.

This means:

- If you replace the module without adapting the configuration data to the possibly newer module type, you do not need to make any changes to the blocks used.
- If you replace the module and you do adapt the configuration data to the newer module type, you must use the block versions approved for this module type.

We recommend that you always use the latest block versions for all module types. With the older module types, this recommendation assumes that you are using the latest firmware for the particular block type.

You will find more detailed information on replacing modules in our Customer Support (see also Section E) under the following entry ID: 7806643

The manuals /2/ contain information on the compatibility of the S7 CPs and the corresponding blocks (FCs / FBs).

Calling Communication Blocks for an S7-300

Notice

The communication blocks for S7-300 (SIMATIC NET block libraries for S7-300 in STEP 7) must not be called in more than one priority class! If, for example, you call a communication block in OB1 and in OB35, block execution could be interrupted by the higher-priority OB.

If you call blocks in more than one OB, you must write your program so that a communication block that is currently executing cannot be interrupted by another communication block (for example by disabling/enabling SFC interrupts).

Setting Block Parameters Automatically [1)]

To ensure correct parameter settings for the block calls, The LAD/STL/FBD editor in STEP 7 provides you with the option of accepting all the relevant parameters from the hardware configuration (HW Config) and from the connection configuration.

When assigning the parameters for the block in the user program, follow the steps outlined below:

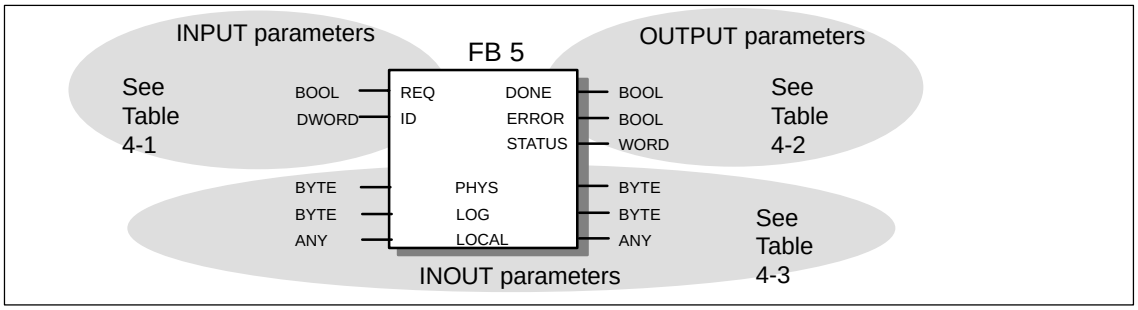
1. Select the block call and its block parameters;
2. Right-click and select the menu command **“Connections...”**.
3. Depending on the block type, you can now select the connection intended for the block or module from a list.
4. Confirm your selection; as far as possible, the available parameter values are entered in the block call.

1). This function is possible only with the block library ..V50 SP3 or later.

4.2 FMS Block Parameters

FB Call Interfaces

The following sections describe the call interface for each FB as shown below:



Depending on the FB type, the FB has different parameters of the type INPUT, OUTPUT or INOUT. The following tables explain the meaning, data type, range of values and memory area of **all** block parameters.

Table 4-1 INPUT Parameters

INPUT Parameter	Meaning	Data Type	Range of Values/ Memory Area	Used in FB				
REQ	Edge signal for executing the block	BOOL	0=FALSE; 1=TRUE: 0–>1: “start”/ I,Q,M,D,L	2	3	4	5	6
ID	This identifier identifies the FMS connection. S7-300: The ID specifies both the LAN connection and the P bus connection. S7-400: The ID specifies both the LAN connection and the K bus connection. You must use the ID from connection configuration or match it to this ID.	DWORD (with FB 1: WORD)	0001 0001 .. FFFF FFFF / I,Q,M,D,L	2	3	4	5	6
VAR_1	The parameter addresses the remote communications variable to be read or written. Depending on the configuration on the FMS server, you can specify a name or an index (for further information refer to Chapter 3)	ANY	String: Max. length = 254 Bytes e.g.. ’<102>’ (index access) ”SLAVE2” (named access) D	2	3	4	–	6

INPUT Parameter	Meaning	Data Type	Range of Values/ Memory Area	Used in FB				
SD_1	Address of a local data area from which the variables will be transferred.	ANY	This type corresponds to a reference to a DB, I/O process image or bit memory area. Example: SD_1 := P#DB17.DBX0.0 BYTE 16 In this example, the first 16 bytes of DB17 are transferred. I,Q,M,D,L,C,T,DBx	–	–	4	–	6
RD_1	Address of a local data area to which the variables will be transferred.	ANY	This type corresponds to a reference to a DB, I/O process image or bit memory area. Example: RD_1 := P#DB17.DBX0.0 BYTE 16 In this example, the first 16 bytes of DB17 are transferred. I,Q,M,D,L,DBx • Note on array of bytes for S7-300: If you have an odd number of bytes to read, the length of the receive area must be set to the next higher even number of bytes. Example: for an array[1..13] of bytes, you must reserve a receive buffer size of 14 bytes.	–	3	–	–	–

Table 4-2 OUTPUT Parameters

OUTPUT Parameter	Meaning	Data Type	Range of Values/ Memory Area	Used in FB				
DONE	Indicates that the job is completed.	BOOL	0=FALSE 1=TRUE: job completed; I,Q,M,D,L	–	–	4	–	6
NDR	Indicates reception of data.	BOOL	0=FALSE 1=TRUE: new data were accepted; I,Q,M,D,L	2	3	–	5	–

Table 4-2 OUTPUT Parameters, Fortsetzung

OUTPUT Parameter	Meaning	Data Type	Range of Values/ Memory Area	Used in FB				
ERROR	Indicates that an error occurred.	BOOL	0=FALSE 1=TRUE: error occurred; I,Q,M,D,L	2	3	4	5	6
STATUS	Provides detailed information about warnings or errors after the job has been completed.	WORD	Refer to the detailed description of the codes in the table in Section 4.9 I,Q,M,D,L	2	3	4	5	6

Table 4-3 INPUT/OUTPUT Parameters

INOUT Parameter	Meaning	Data Type	Range of Values/ Memory Area	Used in FB				
PHYS	Indicates the physical status of the partner device (VFD).	BYTE	0...3 I,Q,M,D,L	–	–	–	5	–
LOG	Indicates the logical status of the partner (VFD).	BYTE	0...3 I,Q,M,D,L	–	–	–	5	–
LOCAL	“local detail” parameter of the partner.	ANY	This detail can be up to 16 bytes long. I,Q,M,D,L	–	–	–	5	–
VENDOR	Name of the device vendor.	STRING	Length<255 D	2	–	–	–	–
MODEL	Name of the device model.	STRING	Length<255 D	2	–	–	–	–
REVISION	Version (revision) of the device.	STRING	Length<255 D	2	–	–	–	–

Memory Area

The abbreviated forms for the memory areas in the table correspond to the following:

Abbreviation	Type
I	Input
Q	Output
M	Bit memory
L	Temporary local data
D	Data block area
C	Counter

Abbreviation	Type
T	Timer
DBX	data block.

FB Output Parameters During the CP Startup (S7-400)

When the FB is called (REQ:0–>1, EN_R=1) while the PROFIBUS CP is starting up (for example due to turning the power off and on again or due to a power outage) the following output parameters are possible:

- DONE = 0
- NDR = 0
- ERROR = 1
- STATUS = 0001 (K bus connection is not yet established) or
  STATUS = 0601 (GetOD still active)

Setting Block Parameters Automatically

To ensure correct parameter settings for the block calls, The LAD/STL/FBD editor in STEP 7 provides you with the option of accepting all the relevant parameters from the hardware configuration (HW Config) and from the connection configuration.

When assigning the parameters for the block in the user program, follow the steps outlined below:

1. Select the block call and its block parameters.
2. Right-click and select the menu command **“Connections...”**.
3. Depending on the block type, you can now select the connection intended for the block or module from a list.
4. Confirm your selection; as far as possible, the available parameter values are entered in the block call.

4.3 IDENTIFY Function Block

Meaning of the Block

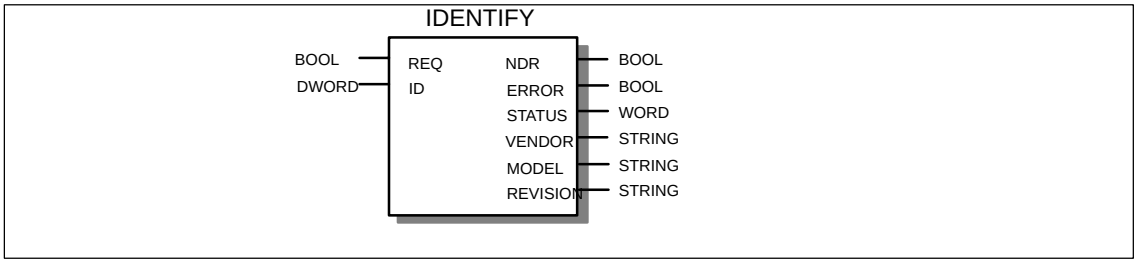
With the IDENTIFY function block you can fetch the following information about the partner device (with S7 stations about the CPU):

- Name of the device vendor.
- Name of the device model.
- Version (revision) of the device.

Depending on the information you receive, you could, for example:

- Set the local program function to match the performance and response of the partner
- Set communication parameters

FB Call Interface



Example of a Call in STL

STL	Explanation
call FB 2, DB 22	//IDENTIFY block call with instance DB
REQ := M 1.0	//Signal edge change to execute the FB
ID := DW#16#10001	//compared with configuration of FMS connection
NDR := M 1.1	//indicates when new data are accepted
ERROR := M 1.2	//indicates incorrect execution
STATUS := MW 20	//detailed error decoding
VENDOR := “SLAVE2”.VENDOR_IMAGE	//data area for vendor name
MODEL := “SLAVE2”.MODEL_IMAGE	//data area for device type
REVISION := “SLAVE2”.REV_IMAGE	//data area for revision

Further information

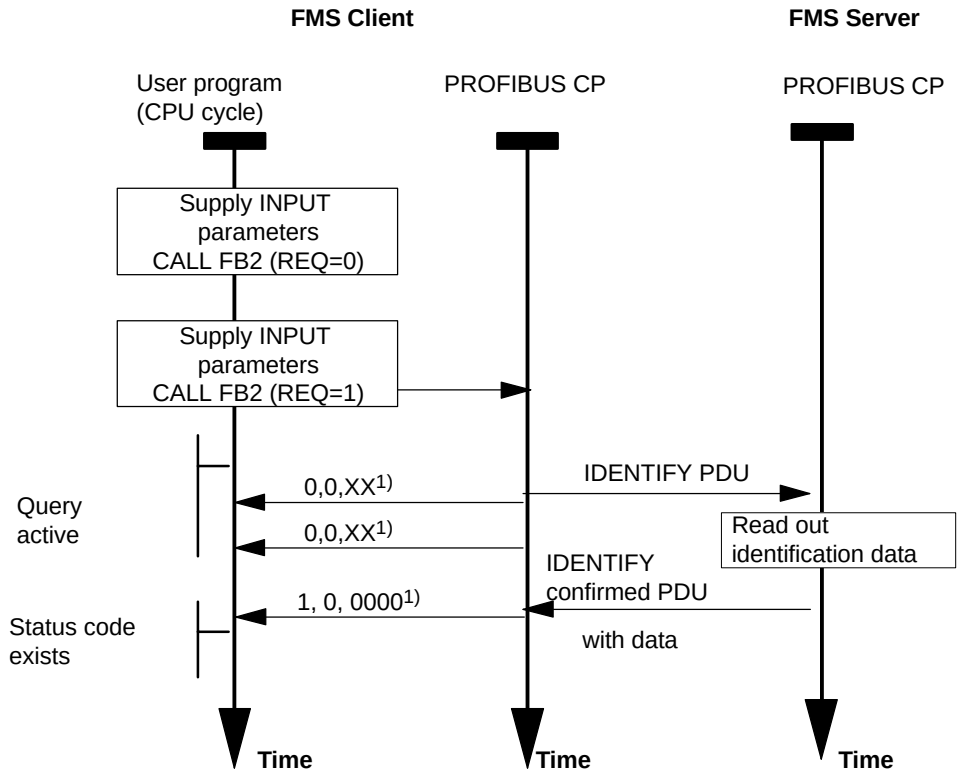
“SLAVE2”
is the symbolic name of a data block. This name is defined in the corresponding symbol table.
VENDOR_IMAGE, MODEL_IMAGE and REVISION_IMAGE
are variables of the data type STRING. These are defined in the “SLAVE2” data block.

How the Block Works

The following flow chart illustrates the normal sequence of an IDENTIFY job.

The job is activated by a (positive) edge change at the parameter REQ.

Each IDENTIFY job of the user program is acknowledged by the PROFIBUS CP with a value in the output parameters NDR, ERROR and STATUS.



Legend:
1) Parameter transfer NDR, ERROR, STATUS

4.4 READ Function Block

Meaning

The READ function block reads data from a data area of the communication partner specified by a name or index depending on the assignment of parameters for the job. The data that are read are saved locally in a data block, an area in the process image of the inputs/outputs or in a bit memory area (compare parameter RD_1, Section 4.2).

Requirement: Configuration of Communications Variables

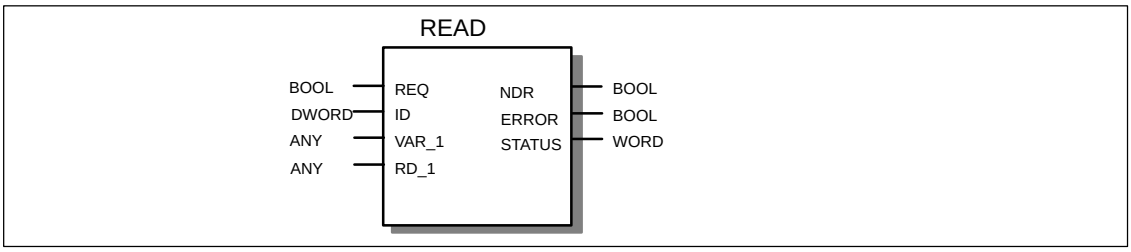
The structure of the variables on the communications partner (FMS server) is fixed. When the FMS connection is established, the structure description is read out from the communications partner. This is then available on the PROFIBUS CP to convert the data to the FMS representation (for conversion rules see Section 3.6.3).

The structure description is only read when the connection is established if the communications variable was selected during configuration of the FMS connection (see also Section 2.10.1).

Access Rights

Remember that access rights can be set for the data transmission. Data transmission is then only possible if the FMS client has been assigned suitable rights.

FB Call Interface



Example of a Call in STL

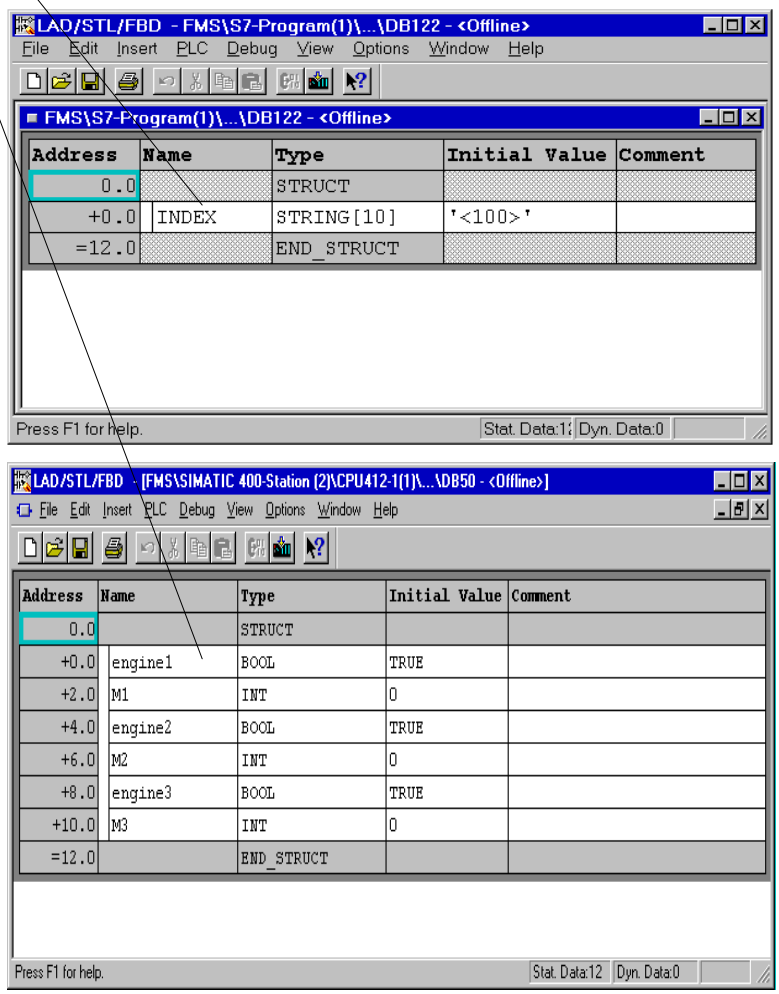
STL	Explanation
call FB 3, DB 29	//READ block call with instance DB
REQ := M 1.0	//Signal edge change to execute the FB
ID := DW#16#10001	//compared with configuration of FMS connection
	//addresses K variable that will be read
VAR_1 := "SLAVE2".INDEX	//addresses data area as destination
RD_1 := "PROCESS".IMAGE	//confirmation of execution
NDR := M 1.1	//indicates incorrect execution
ERROR := M 1.2	//detailed error decoding
STATUS := MW 20	

Further information

"SLAVE2".INDEX
Is the reference to a symbolic name or index in a DB "Slave2" (DB122). The name or index names the communication variable on the communication partner.

"PROCESS".ENGINE1
Is a locally declared variable in the "PROCESS" DB that as the destination data area contains the read value.

Definition of the data blocks referenced in the FB call in LAD / FBD / STL

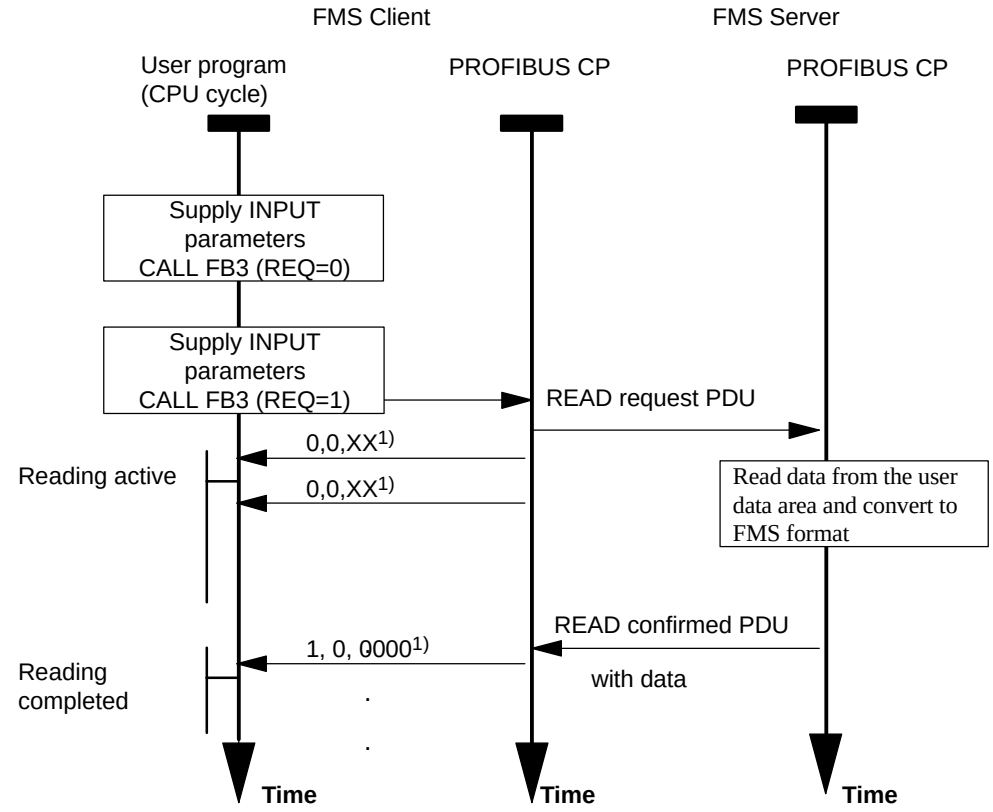


How the Block Works

The following sequence chart shows the normal sequence of data reception triggered with READ in the user program.

The job is activated by a (positive) edge change at the parameter REQ.

Every READ job in the user program is acknowledged by the PROFIBUS CP with values in the output parameters NDR, ERROR and STATUS.



Legend:
1) Parameter transfer NDR, ERROR, STATUS

Guarantee of Data Transfer

The diagram shows that successful reading is confirmed if the return parameters have the following values: NDR=1, ERROR=0 and STATUS=0000.

Positive confirmation of the read job does not, however, necessarily mean that the read job was received by the partner application.

4.5 REPORT Function Block

Meaning of the Block

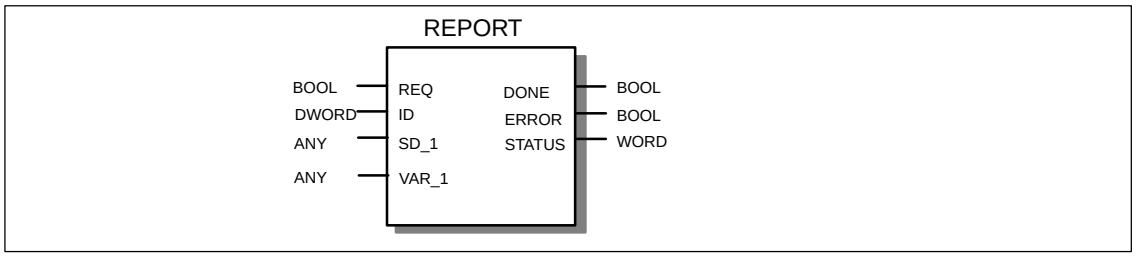
The REPORT function block allows unconfirmed transmission of variables by an FMS server. This job type is used particularly for transmission on broadcast/multicast FMS connections.

The structure of the variables to be reported must be configured locally on the FMS server (see Section 3.6).

S7 Station as Communications Partner

To allow the reported variables to be accepted by the communications partner, the variables must be entered during configuration of the communications partner (FMS client) (see Section 2.10.2).

FB Call Interface



Example of a Call in STL

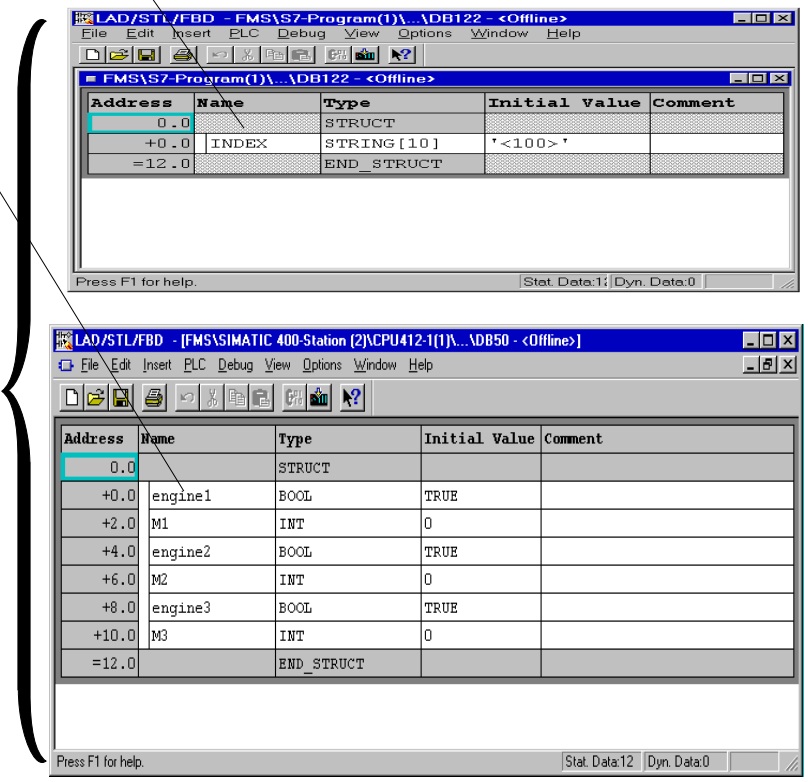
STL			Explanation
call FB 4, DB 28			//REPORT block call with instance DB
REQ	:=	M 1.0	//Signal edge change to execute the FB
ID	:=	DW#16#10001	//compared with configuration of FMS connection
VAR_1	:=	“SLAVE2”.INDEX	//names the C variable to be reported
SD_1	:=	“PROCESS”.ENGINE1	//addresses the source data area
DONE	:=	M 1.1	//confirmation of execution
ERROR	:=	M 1.2	//indicates incorrect execution
STATUS	:=	MW 20	//detailed error decoding

Further information

“SLAVE2”.INDEX
Is the reference to a symbolic name or index in a DB “Slave2” (DB122). The name or index names the communication variable according to the variable configuration.

Engine1
Is a variable declared locally in the DB “PROCESS” (DB50) that contains the reporting variable in the source data area.

Definition of the data blocks referenced in the FB call in LAD / FBD / STL



Notice

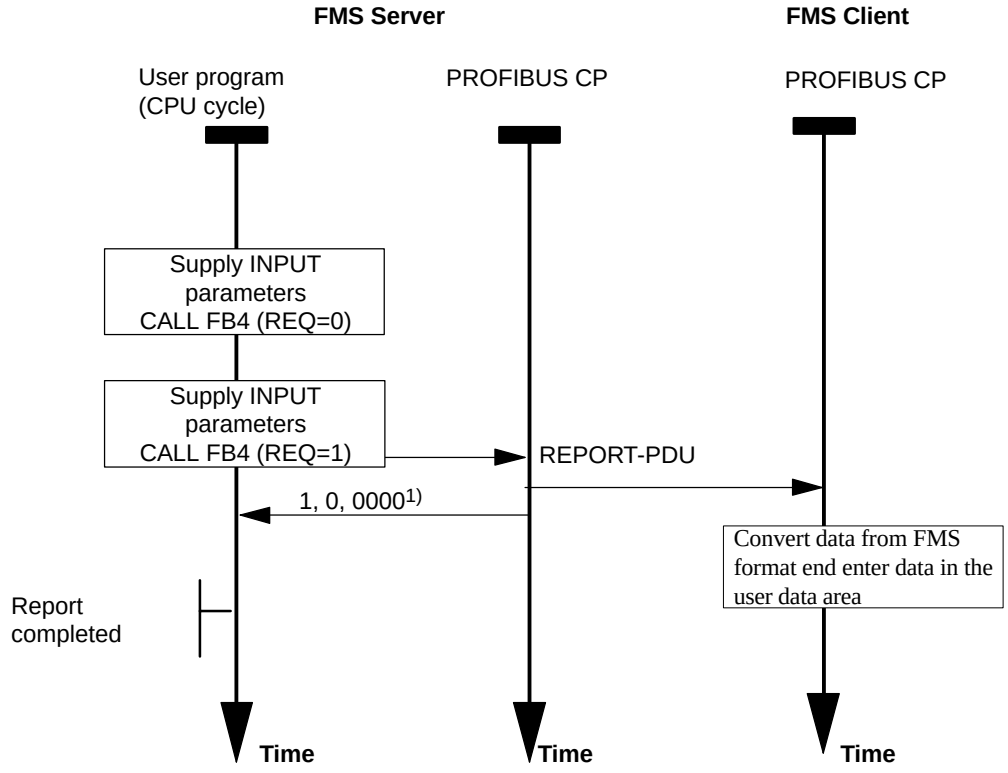
The parameter SD_1 is used to address the data area from which the variable values are read and reported. According to the FMS convention, you must also specify the variable index on the FC interface. The consistency of this information is not, however, checked when the call is executed.

How the Block Works

The following flow chart shows the normal sequence of a data transfer transferred by REPORT in the user program.

The job is activated by a (positive) edge change at the parameter REQ.

Every REPORT job in the user program is acknowledged by the PROFIBUS CP with values in the output parameters DONE, ERROR and STATUS.



Legend:
1) Parameter transfer DONE, ERROR, STATUS

4.6 STATUS Function Block

Meaning of the Block

The STATUS function block allows status information to be requested from the communications partner on the specified FMS connection.

The following information is available:

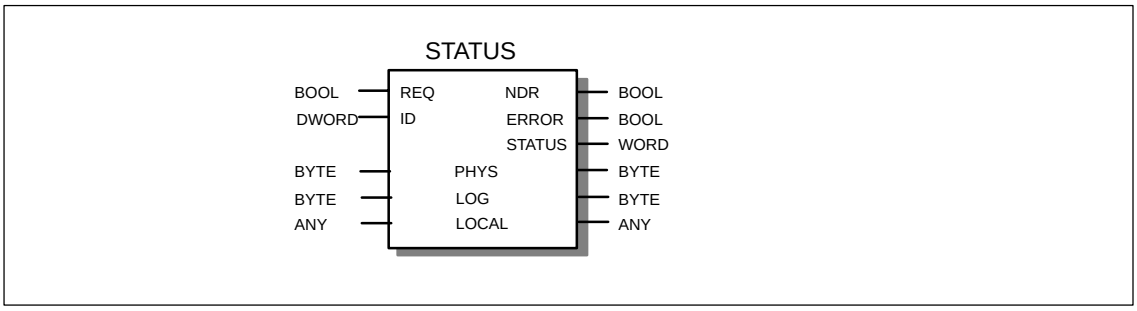
- The logical status of the VFD
  for example information whether communication is possible
- The physical status of the VFD
  information about the status of the device
- Device-specific information
  normally provides vendor-specific information

The following table provides information about the codes that a device can supply as a result of the status request.

Table 4-4

Device	Message Version	Log	Phys	Local Detail
S7 with PROFIBUS-CP	1	00H: Ready for communication, CP in RUN, CPU in RUN	10H: Operational, CPU in RUN	No entry
	2	02H: Limited services, CP in RUN, CPU in STOP	13H: Maintenance required, CPU in STOP	No entry
Non-SIMATIC	The following are possible::	00H: Ready for communication 02H: Limited services	10H: Operational 11H Partly operational 12H Not operational 13H Maintenance required	– vendor specific–

FB Call Interface



Example of a Call in STL

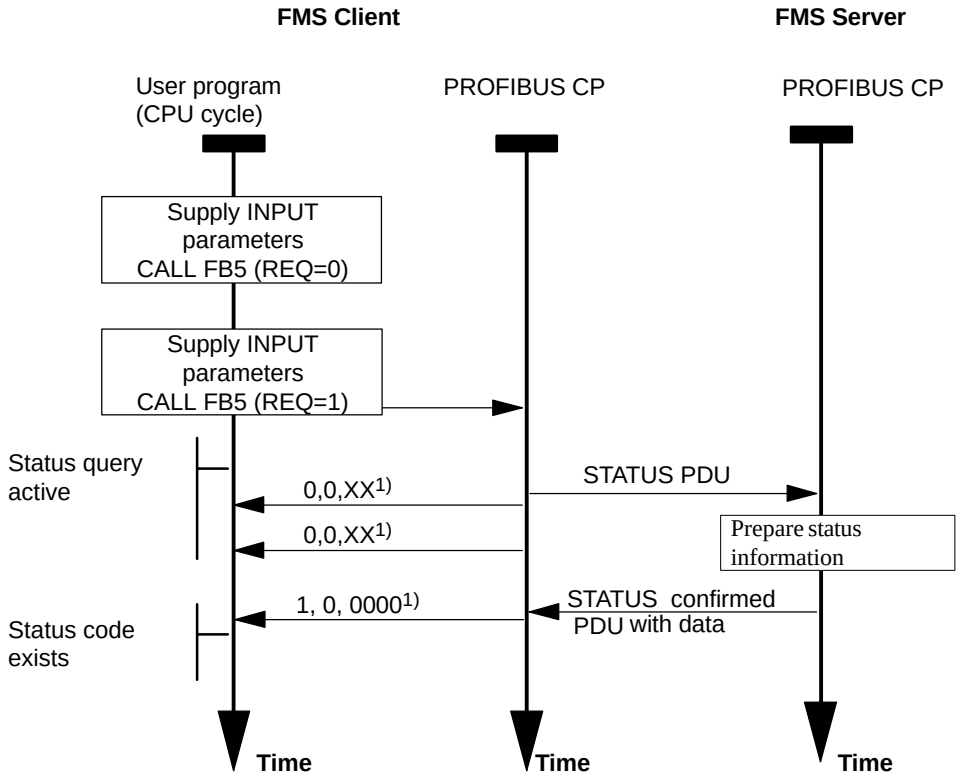
```
STL                                  Explanation
call FB 5, DB 21                     //STATUS block call with instance DB

REQ    :=  M 1.0                     //Signal edge change to execute the FB
ID     :=  DW#16#10001               //compared with configuration of FMS connection

NDR    :=  M 1.1                     //indicates when new data are accepted
ERROR  :=  M 1.2                     //indicates incorrect execution
STATUS :=  MW 20                     //detailed error decoding
PHYS   :=  MB 22                     //data area for physical status
LOG    :=  MB 23                     //data area for logical Status
LOCAL  :=  P#DB18.DBX0.0 WORD8       //data area for ”local detail”
```

How the Block Works

The following flow chart shows the normal sequence of a STATUS job.

The job is activated by a (positive) edge change at the parameter REQ.

Every STATUS job in the user program is confirmed by the PROFIBUS CP with values in the output parameters NDR, ERROR and STATUS.



Legend:
1) Parameter transfer NDR, ERROR, STATUS

4.7 WRITE Function Block

Meaning

The WRITE FB transfers data from a specified local data area to a data area on the communication partner. The local data area can be a data block, an area in the process input or output image or a bit memory area. (compare parameter SD_1, Section 4.2).

The data area of the communication partner is specified using a variable name or a variable index (see also Section 3.6.1).

Requirement: Configuration of Communications Variables

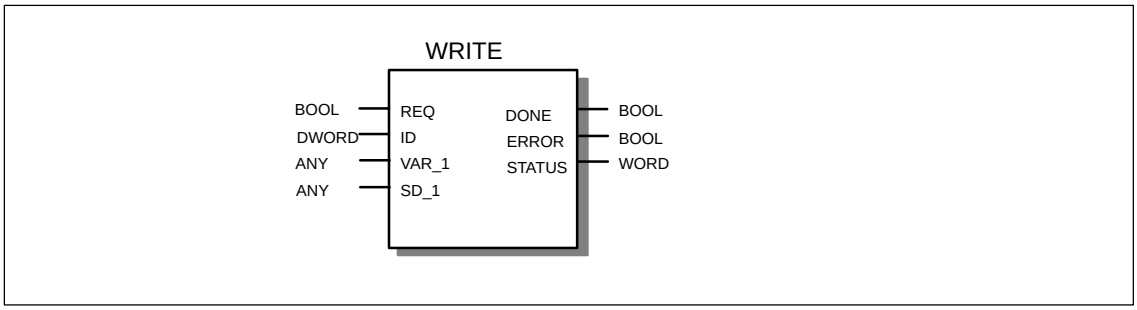
The structure of the variables on the communications partner (FMS server) is fixed. When the FMS connection is established, the structure description is read out from the communications partner. This is then available on the PROFIBUS CP to convert the data to the FMS representation (for conversion rules see Section 3.6.3).

The structure description is only read when the connection is established if the communications variable was selected during configuration of the FMS connection. (see also Section 2.10.1).

Access Rights

Remember that access rights can be set for the data transmission. Data transmission is then only possible if the FMS client has been assigned suitable rights.

FB Call Interface



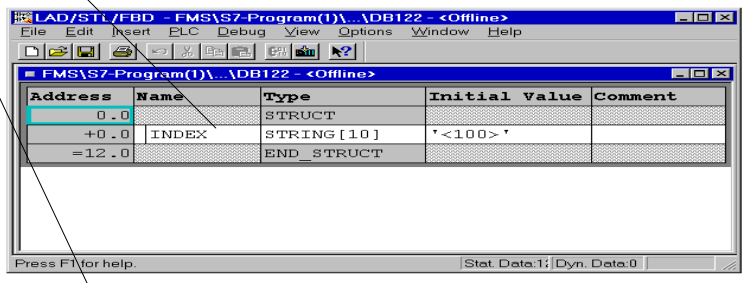
Example of a Call in STL

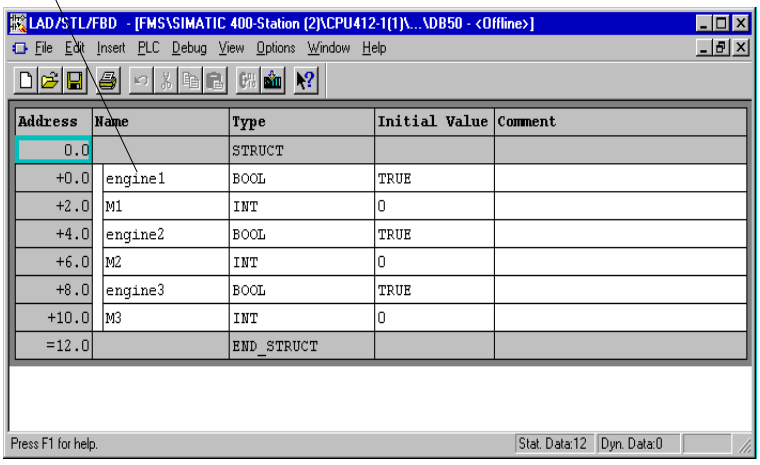
STL			Explanation
call FB 6, DB 28			//WRITE block call with instance DB
REQ	:=	M 1.0	//Signal edge change to execute the FB
ID	:=	DW#16#10001	//compared with configuration of FMS connection
			//addresses C variable to be written
VAR_1	:=	“SLAVE2”.INDEX	
			//addresses source data area
SD_1	:=	“PROCESS”.ENGINE1	
			//confirmation of execution
DONE	:=	M 1.1	//indicates incorrect execution
ERROR	:=	M 1.2	//detailed error decoding
STATUS	:=	MW 20	

Further information

“SLAVE2”.INDEX
Is the reference to a symbolic name or index in a DB “Slave2” (DB122). The name or index names the communication variable on the communications partner (FMS slave).
”PROCESS”.ENGINE1
Is a locally declared variable in the “PROCESS” DB (DB50) that as the source data area contains the value to be written.

Definition of the data blocks referenced in the FB call in LAD / FBD / STL



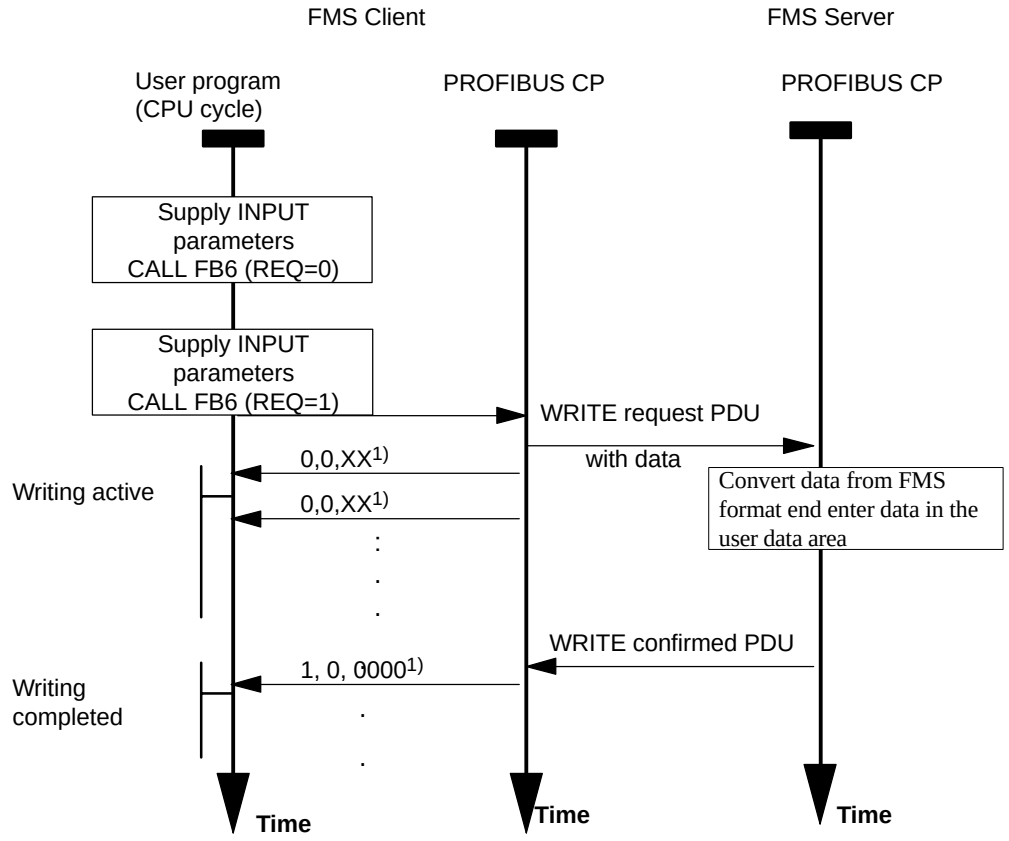


How the Block Works

The following flow chart shows the normal sequence of a data transfer triggered with WRITE in the user program.

The job is activated by a (positive) edge change at the parameter REQ.

Every WRITE job in the user program is confirmed by the PROFIBUS CP with values in the output parameters DONE, ERROR and STATUS.



Legend:
1) Parameter transfer DONE, ERROR, STATUS

Guarantee of Data Transfer

The diagram shows that with the confirmation DONE=1, ERROR=0 and STATUS=0000, the transfer of the data to the communications partner and the entry in the remote data area took place.

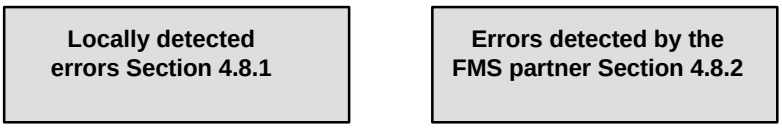
This confirmation does not necessarily mean that the data have already been accepted or processed by the partner application.

4.8 Returned Values and Error Messages

Structure of the Tables

The following tables explain the return values and error codes that must be handled in your user program. For the meaning of the parameters DONE/NDR, ERROR and STATUS, refer to Section 4.2, Table 4-2.

To provide a better overview, the error codes are listed as follows:



Decoded according to:

- Error class (explained in Table 4-6 below)
- Error code/meaning (see tables 4-7 to 4-23)

Error-Free Job Execution

If the job was executed free of errors, the parameters on the FB interface have the following values:

Table 4-5

DONE/NDR	ERROR	STATUS	Meaning
1	0	0x0000	Job completed without errors
0	0	0x000B	Job active

Error Classes

The possible error codes are grouped into the following error classes:

Table 4-6

Error Class	Meaning
Block	Indicates errors or problems involving the following: • FB parameter assignment • Block execution in the CPU and CP
Application	Indicates errors or problems on the interface between the user program and FB.
Definition	Indicates errors that usually involve inconsistencies between the user program and FMS configuration
Resources	Indicates resource problems on the PROFIBUS CP.

Table 4-6 , continued

Error Class	Meaning
Service	Indicates errors or problems in conjunction with the requested FMS service.
Access	Indicates denied access to objects due to the following: • Absence of access rights • Hardware problems • Other inconsistencies
OD (object dictionary)	Indicates problems accessing the object dictionary of the VFD.
VFD status	Unspecified error on the VFD
Other	Other errors

4.8.1 Locally Detected Errors

Table 4-7 “Block” Error Class

DONE/NDR	ERROR	STATUS	Meaning
0	1	0x0001	Communications problem: For example K bus connection not established.
0	1	0x0002	Function cannot be executed: either negative acknowledgment by the CP or error in the sequence, for example K bus protocol error.
0	1	0x0003	The connection is not configured (invalid ID specified). If the connection is configured, the error message indicates that the permitted parallel job processing limit has been exceeded. Example SAC=0 is configured and a REPORT job is sent.
0	1	0x0004	The receive data area is too short or the data types do not match.
0	1	0x0005	A reset request has been received from the CP (BRCV).
0	1	0x0006	The corresponding job execution on the CP is in the DISABLED state or a reset request has been received from the CP; the transfer is therefore incomplete.
0	1	0x0007	Corresponding job execution on the CP is in the wrong state. With REPORT: the error is specified in greater detail in the diagnostic buffer.
0	1	0x0008	Job execution on the CP signals an error accessing the user memory.

Table 4-7 “Block” Error Class, continued

DONE/NDR	ERROR	STATUS	Meaning
0	1	0x000A	Access to the local user memory is not possible (for example the DB has been deleted).
0	1	0x000C	When the underlying BSEND or BRCV SFBs were called, an instance DB that does not belong to SFB12/SFB13 was specified or no instance DB was used, but rather a global DB.
0	1	0x0014	Not enough work or load memory available.

Table 4-8 Application Error Class

DONE/NDR	ERROR	STATUS	Meaning
0	1	0x0200	Unspecified application reference error.
0	1	0x0201	The configured connection cannot be established at present; for example LAN connection not established.

Table 4-9 “Definition” Error Class

DONE/NDR	ERROR	STATUS	Meaning
0	1	0x0300	Unspecified definition error.
0	1	0x0301	Object with requested index/name is not defined.
0	1	0x0302	Object attributes are inconsistent.
0	1	0x0303	Name exists already.

Table 4-10 “Resources” Error Class

DONE/NDR	ERROR	STATUS	Meaning
0	1	0x0400	Unspecified resource error.
0	1	0x0401	No memory available.

Table 4-11 “Service” Error Class

DONE/NDR	ERROR	STATUS	Meaning
0	1	0x0500	Unspecified service error.
0	1	0x0501	Conflict due to object status.
0	1	0x0502	Configured PDU size exceeded.
0	1	0x0503	Conflict due to object restrictions.
0	1	0x0504	Inconsistent parameters.
0	1	0x0505	Illegal parameters.

Table 4-12 “Access” Error Class

DONE/NDR	ERROR	STATUS	Meaning
0	1	0x0600	Unspecified access error.
0	1	0x0601	Invalid object.
0	1	0x0602	Hardware error.
0	1	0x0603	Object access was denied.
0	1	0x0604	Invalid address.
0	1	0x0605	Inconsistent object attributes.
0	1	0x0606	Object access not supported.
0	1	0x0607	Object does not exist in OD or GetOD still active
0	1	0x0608	Type conflict or variable content outside permitted range of values
0	1	0x0609	Access using names not supported.

Table 4-13 “Object Dictionary” (OD) Error Class

DONE/NDR	ERROR	STATUS	Meaning
0	1	0x0700	Unspecified OD error.
0	1	0x0701	Permitted name length exceeded.
0	1	0x0702	Overflow of the object dictionary.
0	1	0x0703	Object dictionary is write protected.

Table 4-13 “Object Dictionary” (OD) Error Class, continued

DONE/NDR	ERROR	STATUS	Meaning
0	1	0x0704	Overflow of the extension length.
0	1	0x0705	Overflow of the object description length.
0	1	0x0706	Processing problem.

Table 4-14 VFD–Status/Reject Error Class, continued

DONE/NDR	ERROR	STATUS	Meaning
0	1	0x0100	Unspecified VFD status error.
0	1	0x0108	RCC/SAC/RAC error
0	1	0x0106	Service not supported.
0	1	0x0105	PDU length error
0	1	0x0102	Bad FMS-PDU

Table 4-15 “Other” Error Class

DONE/NDR	ERROR	STATUS	Meaning
0	1	0x0800	Unspecified error.

4.8.2 Errors Signaled by the FMS Partner

Table 4-16 Application Error Class

DONE/NDR	ERROR	STATUS	Meaning
0	1	0x8200	Unspecified application reference error.
0	1	0x8201	Application (for example user program) not obtainable.

Table 4-17 Definition Error Class

DONE/NDR	ERROR	STATUS	Meaning
0	1	0x8300	Unspecified definition error.
0	1	0x8301	Object with requested index/name is not defined.
0	1	0x8302	Object attributes are inconsistent.
0	1	0x8303	Name exists already.

Table 4-18 Resources Error Class

DONE/NDR	ERROR	STATUS	Meaning
0	1	0x8400	Unspecified resource error.
0	1	0x8401	No memory available.

Table 4-19 Service Error Class

DONE/NDR	ERROR	STATUS	Meaning
0	1	0x8500	Unspecified service error.
0	1	0x8501	Conflict due to object status.
0	1	0x8502	Configured PDU size exceeded.
0	1	0x8503	Conflict due to object restrictions.
0	1	0x8504	Inconsistent parameters.
0	1	0x8505	Illegal parameters.

Table 4-20 Access Error Class

DONE/NDR	ERROR	STATUS	Meaning
0	1	0x8600	Unspecified access error.
0	1	0x8601	Invalid object.
0	1	0x8602	Hardware error.
0	1	0x8603	Object access was denied.

Table 4-20 Access Error Class, continued

DONE/NDR	ERROR	STATUS	Meaning
0	1	0x8604	Invalid address.
0	1	0x8605	Inconsistent object attributes.
0	1	0x8606	Object access is not supported.
0	1	0x8607	Object does not exist.
0	1	0x8608	Type conflict or variable content outside permitted range of values
0	1	0x8609	Access using names is not supported.

Table 4-21 OD (Object Dictionary) Error Class

DONE/NDR	ERROR	STATUS	Meaning
0	1	0x8700	Unspecified OD error.
0	1	0x8701	Permitted name length exceeded.
0	1	0x8702	Overflow of the object dictionary.
0	1	0x8703	Object dictionary is write protected.
0	1	0x8704	Overflow of the extension length.
0	1	0x8705	Overflow of the object description length.
0	1	0x8706	Processing problem.

Table 4-22 VFD Status Error Class

DONE/NDR	ERROR	STATUS	Meaning
0	1	0x8100	Unspecified VFD status error.

Table 4-23 “Other” Error Class

DONE/NDR	ERROR	STATUS	Meaning
0	1	0x8000	Unspecified error detected by partner.

4.9 Resources Required for FBs

Notice

Please note the version information of the blocks. Blocks with other versions have different resource requirements.

Table 4-24 For FBs with an S7-400

NAME	Version	FB No.	Load memory bytes	Work memory bytes	MC7 Bytes	Local data Bytes	Instance DB Block Bytes	Instance DB MC7 Bytes
IDENT	1.3	2	1658	1364	1328	136	464	196
READ	1.5	3	2474	2086	2050	130	606	338
REPORT	1.5	4	2184	1818	1782	156	588	332
STATUS	1.3	5	1656	1390	1354	112	438	190
WRITE	1.5	6	2486	2094	2058	142	632	358

Table 4-25 For FBs with an S7-300

NAME	Version	FB No.	Block Bytes	Work memory bytes	MC7 Bytes	Local data Bytes	Instance DB Block Bytes	Instance DB MC7 Bytes
IDENT	1.5	2	1462	1254	1218	86	306	158
READ	1.5	3	1998	1700	1664	64	218	70
REPORT	1.5	4	2024	1718	1682	76	230	72
STATUS	1.5	5	1430	1244	1208	60	182	46
WRITE	1.5	6	2016	1710	1674	76	230	72

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NCM S7 Diagnostics

5

The following sources provide you with further information:

- This chapter extends the explanations about the NCM diagnostic tool in Volume 1 of this manual.
- For information about the FMS communication services, refer to the other chapters in this manual.
- When you are working with diagnostics, the integrated help provides you with context-sensitive support.
- You will find detailed information on working with STEP 7 programs in the Help on STEP 7, which includes the topic “Diagnosing Hardware”.

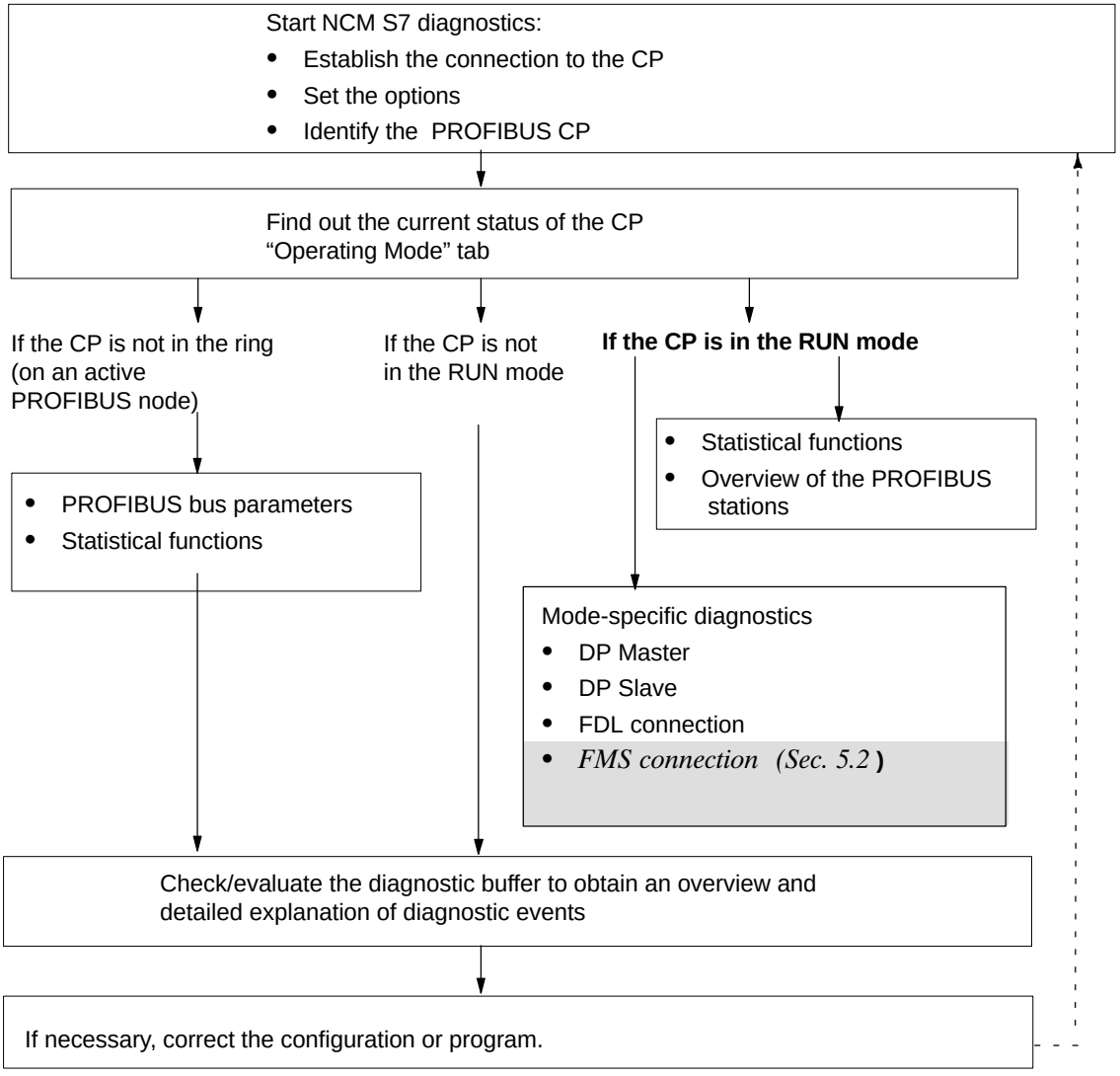
5.1 How to Use Diagnostics

Using Diagnostics

To use the diagnostic tool efficiently, particularly when working with it for the first time, the following procedure is advised:

1. The following flow chart outlines the general sequence of a diagnostic session.

   Note: The functions that are not highlighted are explained in detail in Volume 1 of this manual.



2. Clarify your problem, for example based on the checklist in Section 5.3 Select the appropriate diagnostic function based on the recommendation.

5.2 Diagnostics on FMS Connections

Diagnostic Aim

The purpose of diagnostics is to display and monitor the FMS connections configured on the selected PROFIBUS CP. Problems can be eliminated by making corrections in the configuration and programming.

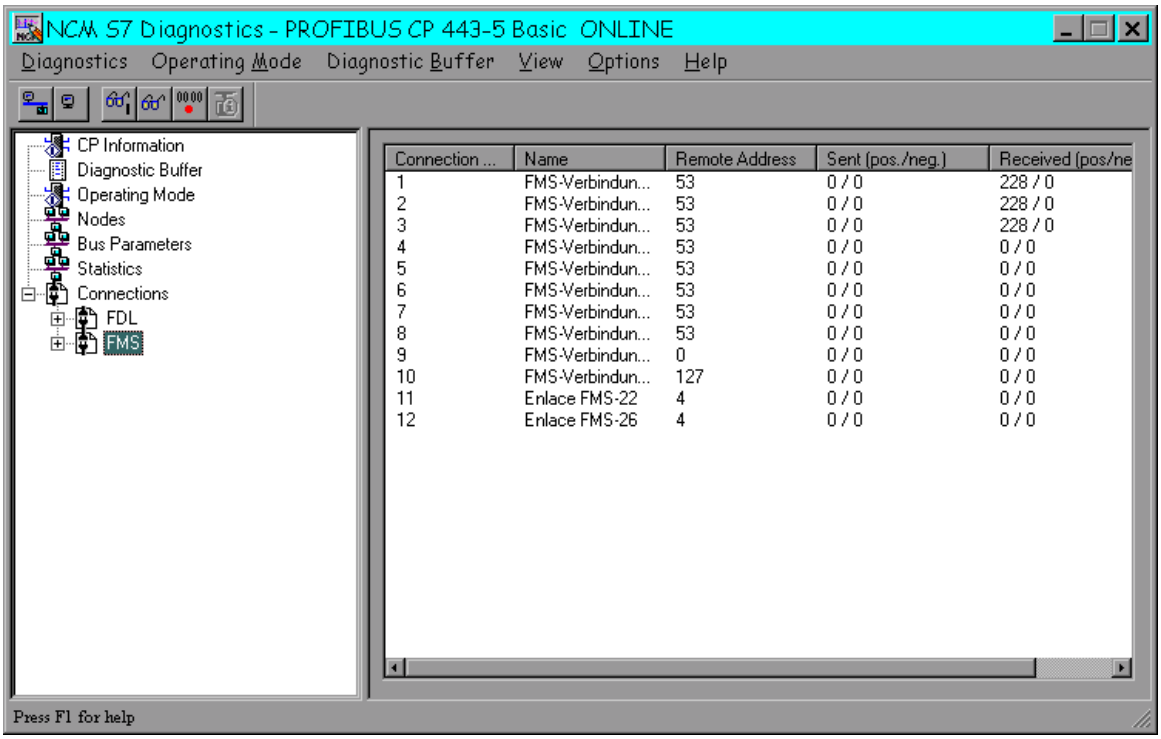
Functions

The available diagnostic functions allow specific analysis of problems and inconsistencies on the FMS connections of the CP.

The “FMS” diagnostic object provides you with an overview of all the configured FMS connections (the entries are purely examples):

Content Area with the Diagnostic Result

The following information is displayed:



Connections with a problem are marked (“!”).

Table 5-1 Notes on the Parameters in the Dialog Box

Parameter	Meaning
Connection number	The communication reference identifies the FMS connection uniquely.
Name	Name of the FMS connection specified in the connection configuration by the user.
Remote address	PROFIBUS address of the communication partner.
Sent	Counter for positively and negatively confirmed jobs (requests). The display includes jobs of the types: READ, WRITE, REPORT, IDENTIFY and STATUS.
Received	Counter for positively and negatively confirmed messages sent to the communications partner. The display includes jobs of the types: READ, WRITE, REPORT, IDENTIFY and STATUS.
Connection status/cause	Plain text display of the status of the selected connection.

5.2.1 FMS Connection – Detailed Information

Diagnostic Aim

You obtain information about the following for the selected FMS connection:

- Whether services between connection partners were successfully negotiated and whether the FMS connection could be established.
- Which parameters led to a conflict in negotiation.

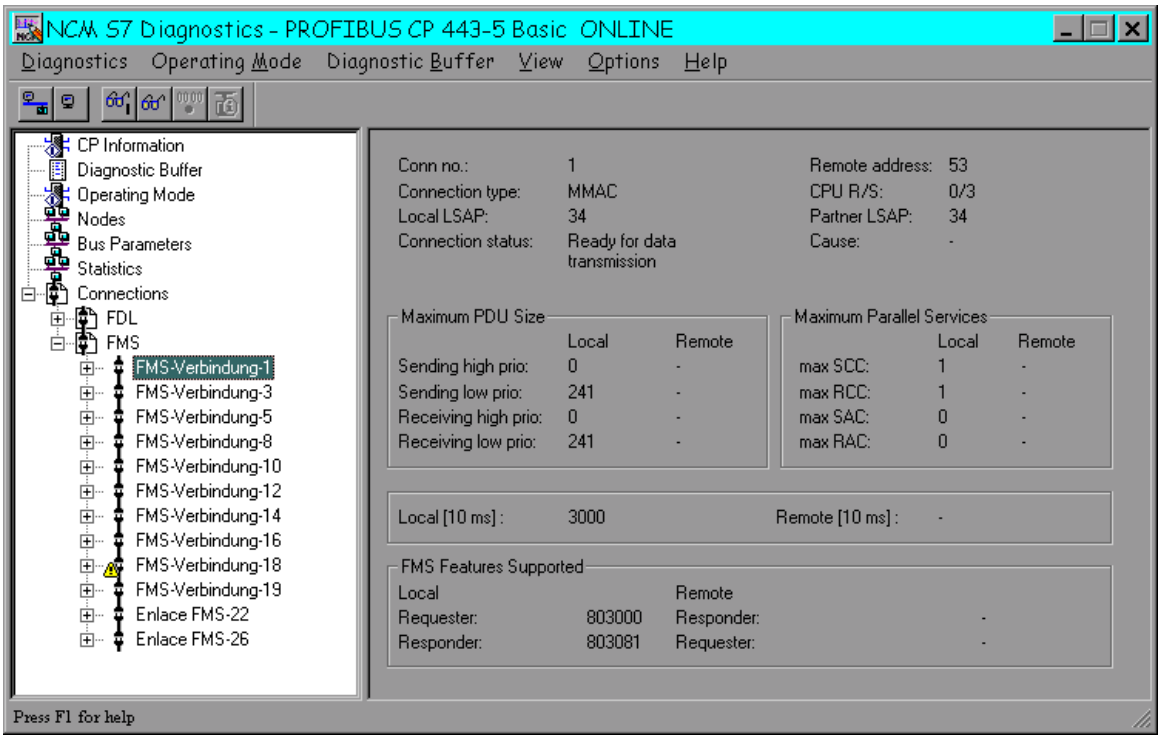
The codes are based on context checks complying with the standard EN 50170, Vol 2.

Calling the Function

You can display this function by selecting the diagnostic object “FMS Connection” in the navigation area.

Content Area with the Diagnostic Result

The following information is displayed (the entries are typical examples):



Note that the diagnostic information that can be displayed here is only available when the connection **cannot** be established. Certain parameter values providing information about the conflict situation can only be displayed in this situation.

Table 5-2 Notes on the Parameters

Parameter	Meaning
Maximum PDU size	The context check is negative if the following is **not** satisfied: • SendingHighPrio(local) <= ReceivingHighPrio (remote) • SendingLowPrio(local) <= ReceivingLowPrio (remote) • ReceivingHighPrio(local) >= SendingHighPrio (remote) • ReceivingLowPrio(local) >= SendingLowPrio (remote) For information about configuring the parameters, refer to Section 2.8.
Maximum Parallel Services	The context check is negative if the following is **not** satisfied: • max SCC (local) <= max RCC (remote) • max RCC (local) >= max SCC (remote) • max SAC (remote) <= max RAC (local) • max RAC (remote) >= max SAC (remote) For information about configuring the parameters, refer to Section 2.8.
FMS Features Supported	The context check is negative when one or more services of the FMS partners are not available on the one hand for the requester function and on the other hand the responder function. A mismatch (error or warning) exists when the displayed value is not “0”. The display corresponds to the bit coding complying with standard EN 50170, Vol 2 for the attribute “FMS Features Supported”.

Note

In addition to the information listed above, the context check is negative when the local and the remote control interval (CI/ACI) do not match.

5.2.2 ”Reported Variables” Diagnostic Object

Diagnostic Aim

Regardless of the acceptance and evaluation in the user program, you can find out the following for the selected FMS connection:

- Which reported variables to be received are configured locally;
- The data areas in the user program (on the CPU) in which received reported variables should be entered.

Content Area with the Diagnostic Result

The following information is displayed (the entries are typical examples):

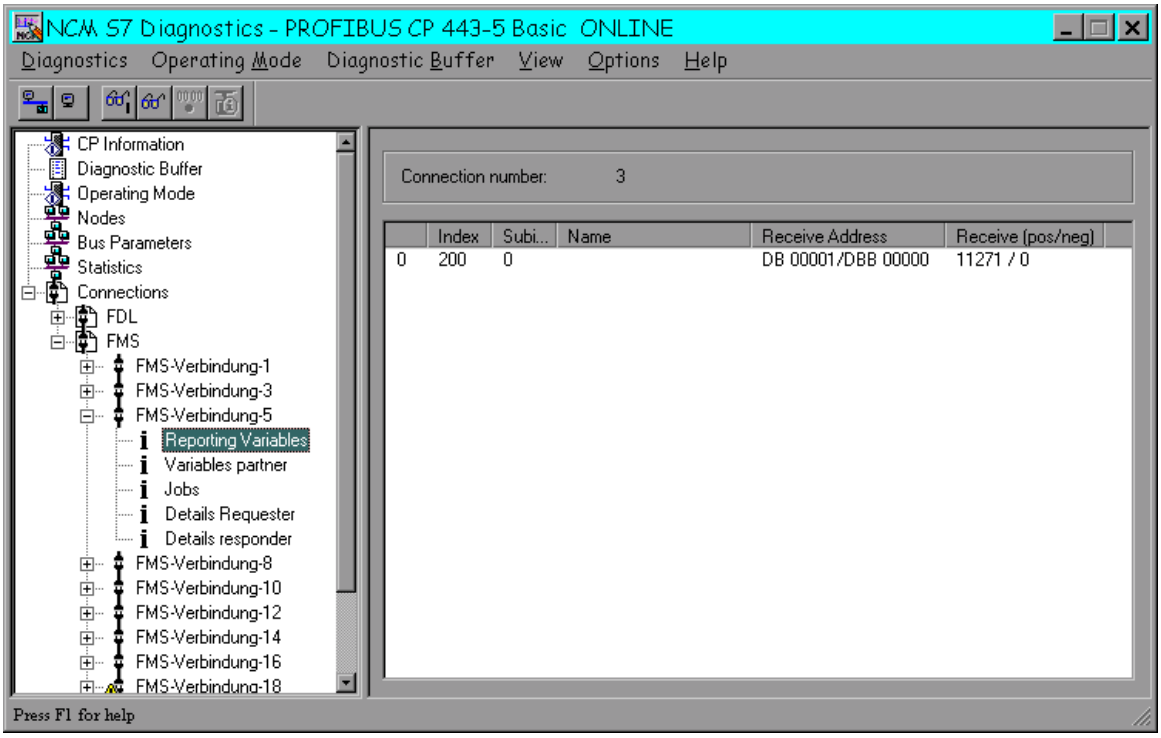


Table 5-3 Notes on the Parameters

Parameter	Meaning
Index	Displays the remote configured FMS index of the variable to be reported.
Name	Displays the remote configured variable name of the variable to be reported.
Subindex	Displays the remote configured FMS subindex of the variable to be reported.

Table 5-3 Notes on the Parameters

Parameter	Meaning
Receive address	Displays the configured destination address for the reported variable.
Receive (pos./neg.)	Shows the number of received messages. positive: the variable could be entered in the required destination area. negative: the variable could not be entered in the required destination area. The entries in the diagnostic buffer provide more detailed information.

5.2.3 “Jobs” Diagnostic Object

Diagnostic Aim

Recognizing incorrect processing.

Functions

On the selected FMS connection, you can follow the status of the jobs currently being processed. The jobs are displayed in the order in which the services were triggered. The number of jobs displayed and the maximum number that can be displayed depends on the maximum number of parallel services (see Table 2-8).

The GetOD service is always displayed in the first line and is **not** moved by the display of other services.

If errors occur, the last error is displayed in the last line.

Content Area with the Diagnostic Result

The following information is displayed (the entries are typical examples):

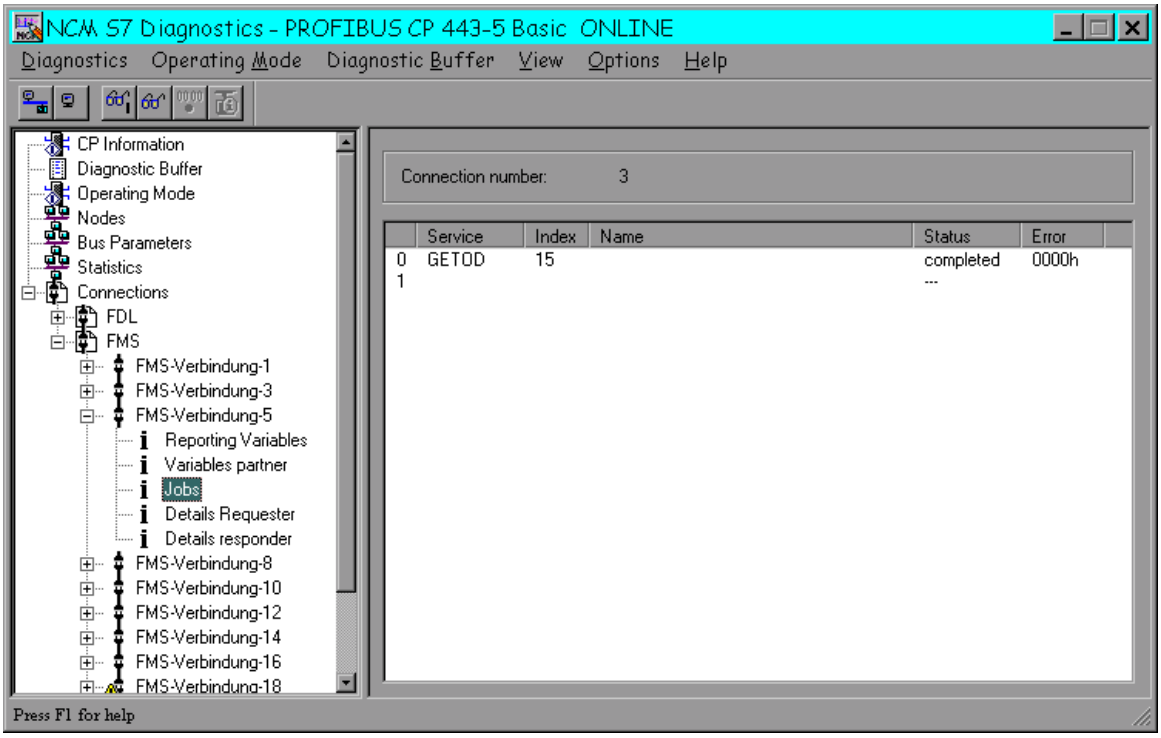


Table 5-4 Notes on the Parameters

Parameter	Meaning
Service	Line-by-line display of the jobs (services) depending on the FMS connection.
Index	Displays the configured FMS index with which the variable can be addressed on the call interface (FB).
Name	Displays the configured variable name with which the variable can be addressed on the call interface (FB) (only with GetOD(long form)).
Status	Shows the status of the job. Possible displays: job active; job complete
Errors	The error codes displayed here correspond to the displays that can be on the FB call interface in the STATUS parameter. Error codes see Sections 4.8.1 and 4.8.2 If an error occurred: • the text “Error” is displayed in an additional line, • you can obtain detailed information in the “Diagnostic Buffer” tab.

5.2.4 ”Variables Partner” Diagnostic Object

Diagnostic Aim

Displays which variable descriptions of the partner are available for the selected FMS connection.

Note how this depends on the configuration of the FMS connection in the “Remote Variables” tab page (see Section 2.10.1.).

Content Area with the Diagnostic Result

The following information is displayed (the entries are typical examples):

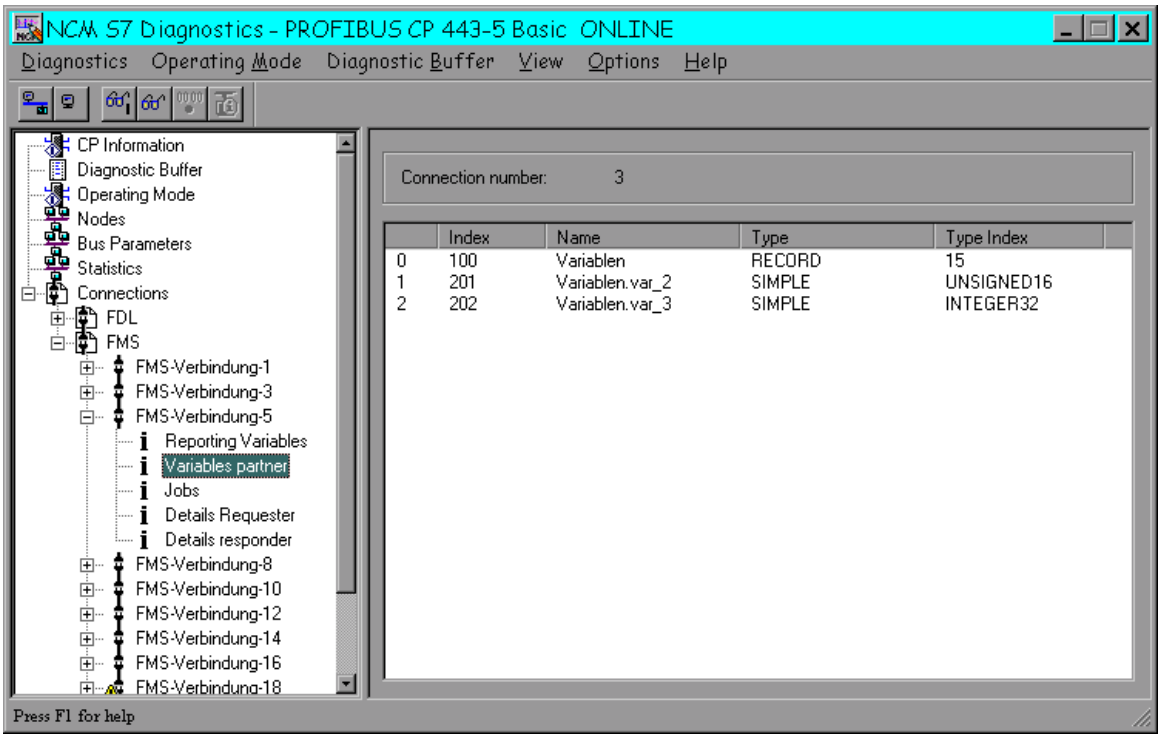


Table 5-5 Notes on the Parameters in the Dialog Box

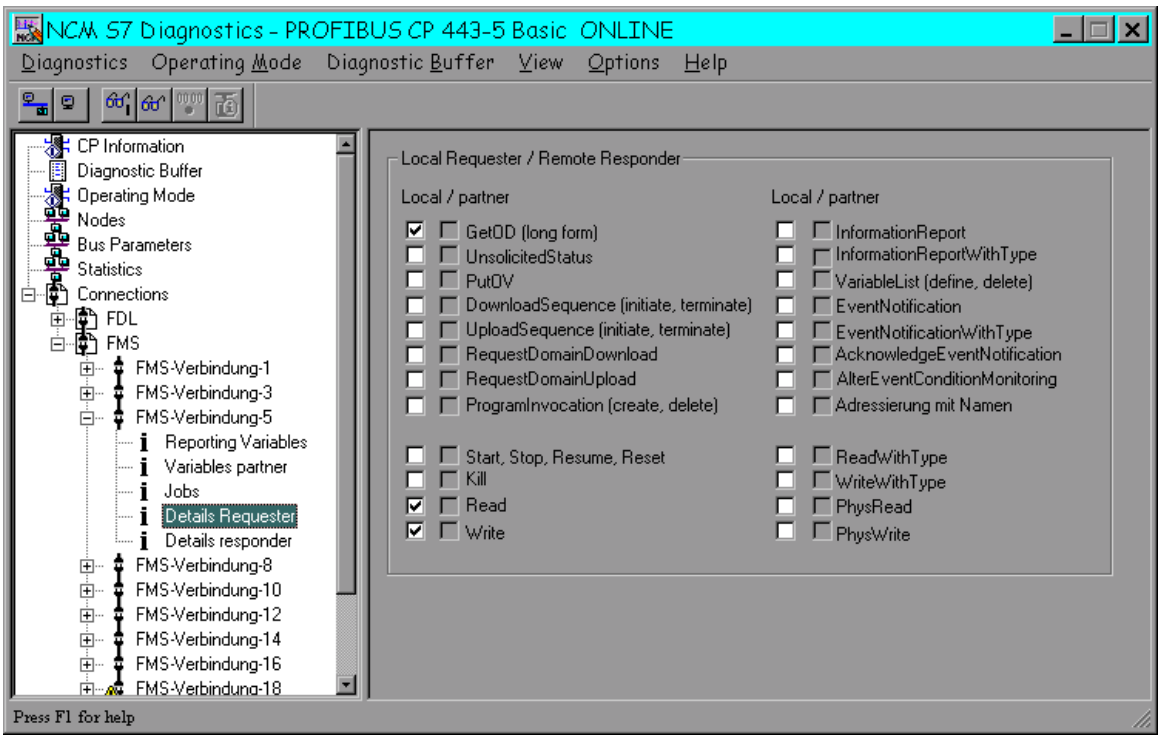
Parameter	Meaning
Index	Displays the configured FMS index with which the variable can be addressed on the call interface (FB).
Name	Displays the configured variable name with which the variable can be addressed on the call interface (FB) (only with GetOD(long form)).

Table 5-5 Notes on the Parameters in the Dialog Box, continued

Parameter	Meaning
Type	Displays the data type (S7 type) of the variable obtained from the read object dictionary (OD).
Type index	Shows the index under which the FMS type description is stored on the FMS partner. It can be used for test purposes depending on the device type. With a SIMATIC S7 as the FMS partner, the type index is an automatically assigned index.

5.2.5 Details of the Requester Function (local)

If you select the “Details for requester (local)” diagnostic object, the following information is displayed (entries examples):



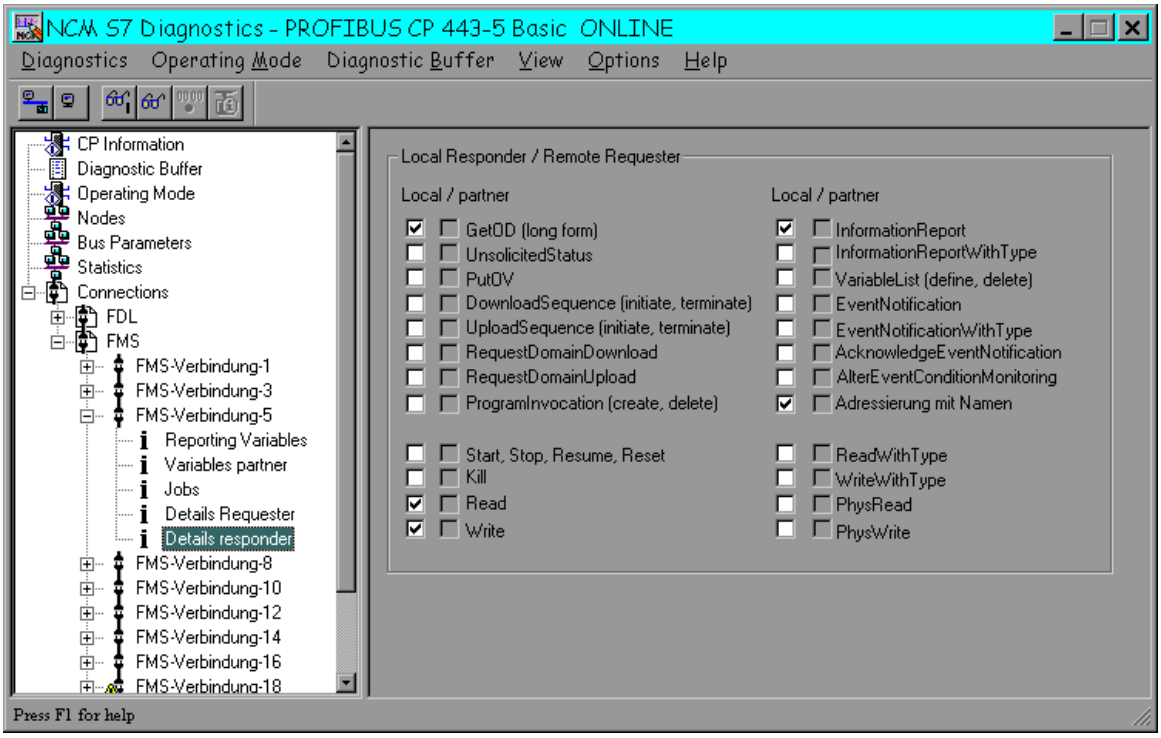
Certain combinations in the display are only possible if an error has occurred. The following table illustrates this as follows:

- Which combination can be interpreted as the cause of the unsuccessful connection establishment.
- Which display combinations are not the cause of an unsuccessful connection establishment and therefore be interpreted as warnings.

Display Requester (local)/Responder (remote)	Meaning
	*Error:* The FMS partner (Responder) cannot handle the service specified on the local station (Requester).
	Warning/error **possible (correct situation also possible)**: The FMS partner possibly cannot handle the service specified on the local station (Requester).
	Warning: The specified service will not be handled by the local station (Requester) if a connection is established.
	**Can** be interpreted as a warning **(correct situation also possible)**: The specified service would be expected by the FMS partner if a connection is established; the service cannot, however, be handled by the local station (Requester). Example: The FMS partner could expect a message in certain situations (in the user program).

5.2.6 Details of the Responder Function (local)

If you select the “Details for responder (local)” diagnostic object, the following information is displayed (entries examples):



Certain combinations in the display are only possible if an error has occurred. The following table illustrates this as follows:

- Which combination can be interpreted as the cause of the unsuccessful connection establishment.
- Which display combinations are not the cause of an unsuccessful connection establishment and therefore be interpreted as warnings.

Display Responder (local)/Requester(remote)	Meaning
	**Warning:** The FMS partner cannot handle the service specified on the local station (Responder).
	**Can** be interpreted as a warning **(correct situation also possible)**: The FMS partner (Requester) might not support the service handled by the local station (Responder).
	*Error:* The local station (Responder) cannot handle the service specified on the FMS partner (Requester).
	**Can** be interpreted as a warning/error **(correct situation also possible)**: The specified service might be used by the FMS partner (Requester) if a connection is established; the service cannot, however, be handled by the local station (Responder).

5.3 Checklist for “Typical Problems” in a System

Meaning

The following lists contain typical problems and possible causes with which the NCM S7 for PROFIBUS diagnostics tool can provide help.

The following topics are dealt with:

- In Volume 1 of this manual
  - Checklist of general CP functions
  - Checklist for DP master mode
  - Checklist for DP slave mode
  - Checklist for FDL connections
- In Volume 2 of this manual
  - Checklist for FMS connections

How to Read the Tables

The column “Identifying and Remedying the Cause” contains the diagnostic function recommended for the particular problem and steps you can take to eliminate the problem.

5.3.1 Checklist for FMS Connections

Table 5-6 Checklist of Typical Problems on FMS Connections in a System

Problem	Possible Cause	Identifying and Remedying the Cause
The FMS connection can be established.	The LSAP assignment is wrong.	Evaluate the diagnostic buffer. Remedy: Modify the SAPs according to the diagnostic buffer entries.
	The PROFIBUS destination address is not obtainable.	Select PROFIBUS station overview. Evaluate the diagnostic buffer and check the PROFIBUS addresses of the PROFIBUS nodes. Remedy: Configure the correct destination address. Increase bus parameter: Slot time (see Volume 1, Chapter 2).
	The bus parameters of the stations involved • do not match • are not adequate	PROFIBUS Selecting Statistics in Diagnostics Remedy: PROFIBUS Adapting Parameters. (see Volume 1, Chapter 2). Increase Slot time, Max TSDR and Min TSDR on all stations.
	FMS services do not match.	Context check
	There are negotiation conflicts in the FMS parameters.	Diagnostic Functions as in Section 5.2. Remedy: Correct parameters as in Section 1.
	Cable not plugged in, cable defective, bus terminator problem	
Data cannot be transferred via an FMS connection.	The FBs READ and WRITE are not called in the user program or there is no edge signal.	Check the user program. Remedies: • If nec. program blocks; • If necessary program an edge change (switch parameter from REQ =0 to REQ = 1).
	The FBs READ and WRITE have incorrect parameters (for example receive or send buffers are too small or incorrect).	Check the user program. Evaluate the status bytes in READ and WRITE. Remedies: • Check SD_1 or RD_1 • Correct ID • Correct VAR_1 • Use “Job Status” diagnostic function

Table 5-6 Checklist of Typical Problems on FMS Connections in a System, Fortsetzung

Problem	Possible Cause	Identifying and Remedying the Cause
	The variable does not exist.	Evaluate the diagnostic buffer. Check whether there is a lack of memory or whether the variable was configured. It is possible that the symbol table with the communication variables is not in the S7 program of the CPU containing the FMS connection. Remedies: • Lack of memory: access with single index • Configure communication variable • Use “Remote Variables” diagnostic function
Connections are constantly being established and terminated again.	The control interval is too low.	Remedy: Increase the control interval in the “Properties - FMS Connections: Details” dialog. (The value should correspond to at least the default setting)
	The bus parameters of the partner are inadequate.	Increase Slot time, Max TSDR and Min TSDR on all stations.
	Error response during GetOD.	Configure access to special variables from the list or “none”. See “Filtering Communication Variables” in Section 2.10.1

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References

A

/1/

Product Information SIMATIC NET CP
Supplied with each CP
Siemens AG

/2/

NCM S7 for PROFIBUS Primer
Part of the documentation package NCM S7 for PROFIBUS
Siemens AG

/3/

NCM S7 for Industrial Ethernet Manual
Siemens AG

/4/

SIMATIC STEP 7 Configuring Hardware with STEP 7
Part of the STEP 7 documentation package STEP 7
Siemens AG

/5/

SIMATIC STEP 7 Programming with STEP 7
Part of the STEP 7 documentation package STEP 7
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/8/

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Manuals for MS-DOS, Windows German
Siemens AG

/10/

SIMATIC S7
S7–300 Programmable Controller
Installation and Hardware
Manual

/11/

SIMATIC S7
S7-400 Programmable Controller
Installation and Hardware
Manual

Order Numbers

The order numbers for the SIEMENS documentation listed above can be found in the catalogs ”SIMATIC NET Industrial Communication, Catalog IK PI” and ”SIMATIC Programmable Controllers SIMATIC S7 / M7 / C7 – Catalog ST70” .

You can order these catalogs and additional information from your local SIEMENS representative.

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Glossary

B

B.1 General Section

Baud rate

–> transmission rate

Bus Segment

Part of a –> subnet. Subnets can consist 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)

FC

STEP 7 logic block of the type “function”.

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.

Gateway

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

Industrial Ethernet

A fieldbus complying with IEEE 802.3 (ISO 8802–2)

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 –> stations. Several networks can exist side by side.

PG Mode

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

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 process input image. At the end of the cyclic program, the process output image is transferred as a signal state to the output modules.

Protocol

A set of rules for transferring data. Using these rules, both the formats of the frames and the data flow are 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 for Ind. Ethernet

SIMATIC NET bus 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 station is identified by a

- MAC address in the Ethernet network.
- PROFIBUS address in the PROFIBUS network.

Subnet

A subnet is part of a –> network whose parameters (for example –> PROFIBUS) must be matched. 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 –> stations with unique –> PROFIBUS or MAC addresses (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.

Transmission Rate

According to DIN 44302, this is the number of binary decisions transmitted per time unit. The set or selected transmission rate depends on various conditions, for example the distance across the network. In Ethernet, there is a fixed transmission rate of 10 Mbps.

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 transport interface presents itself to the control program in the form of handling blocks (HDBs).

Transport Layer

The transport layer is layer 4 of the ISO/OSI reference model for open system interconnection. The purpose of the transport layer is to transfer data reliably from device to device. Transport connections can be used for the transmission.

TSAP

Transport Service Access Point

Watchdog

Mechanism for monitoring operability.

B.2 PROFIBUS

Base Address

Logical address of a module in S7 systems.

- For PROFIBUS

  The PROFIBUS base address is the address starting at which all addresses that are calculated automatically in the project are assigned.

- For Industrial Ethernet

  The base MAC address is the address starting at which all addresses that are calculated automatically in the project are assigned.

Bus Parameter

Bus parameters control the data transmission on the bus. Each –> station on the –> PROFIBUS network must use bus parameters that match those of other stations.

CLEAR Mode

Mode of the DP master. Inputs are read cyclically, outputs remain set to 0.

Communication

A communication variable is a variable of the programmable controller that is ready for communication using FMS services.
With S7, communication variables must be configured. After configuration, a neutral structure (in terms of devices) complying with EN 50170 is stored for the variable.

Control Job

Global control jobs are control commands for the DP mode such as CLEAR, SYNC, FREEZE, UNFREEZE.

Device Database

Device database files (DDB files) contain DP slave descriptions complying with EN 50170, Vol. 2. The use of device databases data makes it easier to configure –> DP masters and –> DP slaves.

Distributed I/Os (DP)

Input and output modules used at a distance (distributed) from the CPU (central processing unit of the controller). The connection between the programmable controller and the distributed I/Os is established on the –> PROFIBUS system. The programmable logic controllers do not recognize any difference between these I/Os and local process inputs and outputs.

DP I/O Module

DP slaves have a modular design. A –> DP slave has at least one DP I/O module.

DP I/O Type

The DP I/O type identifies a –> DP I/O module. The following modules are possible:

- Input module
- Output module
- Input/Output module
- Empty module

DP Master

A –> station with master functions in –> PROFIBUS DP. Masters come into the following categories:

- DP master (class 1) or DP master 1

  The DP master 1 handles the exchange of user data with the –> DP slaves assigned to it.

- DP master (class 2) or DP master 2

  The DP master 2 provides services such as the following:

  – Reading the input/output data

  – Diagnostics

  – Global control

DP Master System

A –> DP master and all –> DP slaves with which the DP master exchanges data.

DP Mode

The following operating modes are possible for the connection between the –> DP master and –> DP slaves:

- OFFLINE
- STOP
- CLEAR
- RUN[1]

Each of these modes is characterized by defined actions between the –> DP master and –> DP slave.

DP Module Name

Name of a –> DP I/O module entered in the DP module list.

DP Module Type

Type identifier of a –> DP I/O module in the device master data of a –> DP slave complying with EN 50170, Vol 2.

DP Slave

A –> station with slave functions on –> PROFIBUS DP.

DP Slave Name

A DP slave name is entered in the DP slave list to identify a –> DP slave in the DP configuration.

DP Subnet

PROFIBUS subnet on which only –> distributed I/Os are operated.

FDL

Fieldbus Data Link. Layer 2 on the –> PROFIBUS.

[1] corresponds to OPERATE according to the DP standard.

FDL Connection

FDL connections allows program/event-controlled communication between a SIMATIC S7 PLC on PROFIBUS and the following:

- SIMATIC S7 PLC with PROFIBUS CP
- SIMATIC S5 PLC with CP 5430/31
- SIMATIC S5-95U with PROFIBUS interface
- PC/PG with CP 5412A1/A2

The transfer of blocks of data on an FDL connection is bi-directional.

FMS

Field (bus) Message Specification complying with EN 50170, Vol. 2.

FMS Connection

FMS connections allow program/event-controlled communication between devices complying with the FMS standard. Characteristics of the data of a specific device are neutralized during transmission.

FMS Variable

–> Communication variable

FREEZE Mode

(a synchronization control frame).

Gap Update Factor

A free address area (gap) between two active stations/nodes is checked cyclically to find out whether or not another station/node is requesting to enter the logical ring.

GetOD

FMS service for reading the object dictionary (containing, for example, the variable descriptions) of a –> VFD.

Group Identifier

The DP slaves can be assigned to one or more groups using a group identifier. The global control frames can be addressed to specific groups of –> DP slaves using the group identifier.

Highest PROFIBUS Address

A –> bus parameter for –> PROFIBUS. This specifies the highest PROFIBUS address of an active –> station on PROFIBUS. Addresses higher than the highest station address (HSA) are possible for passive stations (possible values: HSA 1 to 126).

Master

Active station on –> PROFIBUS, that can send –> frames unsolicited when it is in possession of the token.

Maximum Station Delay

A bus parameter for –> PROFIBUS. The maximum station delay (max. TSDR) specifies the longest interval required by a –> station in the –> subnet between receiving the last bit of an acknowledged frame and sending the first bit of the next frame. After sending an unacknowledged frame, a sender must wait for the maximum TSDR to expire before sending a further frame.

Minimum Station Delay

A –> bus parameter for –> PROFIBUS. The minimum station delay (min. TSDR) specifies the minimum time that the receiver of a –> frame must wait before sending the acknowledgment or sending a new frame. The min. TSDR takes into account the longest interval required by a station in the subnet for receiving an acknowledgment after sending a frame.

Polling

Cyclic processing: In this case, for example, cyclic processing of the ”polling list” on the PROFIBUS CP.

PROFIBUS

A fieldbus system complying with EN 50170, Vol. 2 (previously SINEC L2).

PROFIBUS Address

The PROFIBUS address is a unique identifier for a station/node connected to –> PROFIBUS. The L2 address is transferred in the frame to identify a station/node.

PROFIBUS DP

A distributed I/O mode complying with EN 50170, Vol. 2.

PROFIBUS-FMS

PROFIBUS Fieldbus Message Specification. Upper sublayer of layer 7 of the ISO/OSI reference model on –> PROFIBUS.

PROFIBUS PA

PROFIBUS PA is a guideline of the PROFIBUS user organization extending the PROFIBUS EN 50170 by including an intrinsically safe area.

Reorganization Token Ring

All the –> masters on –> PROFIBUS form a logical token ring. Within this token ring, the token is passed on from node to node. If the transmission of the token is incorrect or if a master is removed from the ring, this leads to an error when the token is passed on (the token is not accepted by this node) and the node is excluded from the ring. The number of exclusions is counted in the internal token error counter. If this counter reaches an upper limit value, the logical token ring is then reorganized.

SCOPE L2

Diagnostic product for –> PROFIBUS, with which traffic on the –> network can be recorded and analyzed.

Setup Time

A –> bus parameter for –> PROFIBUS. The setup time specifies the minimum interval on the sender between receiving an acknowledgment and sending a new call frame.

SIMATIC NET for PROFIBUS

SIMATIC NET bus system for industrial applications based on PROFIBUS (previously SINEC L2)

Slave

A passive node on –> PROFIBUS.

Slot Time

A bus parameter for –> PROFIBUS. The slot time (TSL) is the time during which the sender of a –> frame waits for the acknowledgment from the receiver before detecting a timeout.

Station (PROFIBUS)

A station is identified by a –> PROFIBUS address in the –> PROFIBUS network.

SYNC Mode

The SYNC mode in which one, several (group) or all –> DP slaves transfer data to their process outputs at a certain time. The time at which the data is transferred is indicated in the SYNC command (a control command for synchronization).

Target Rotation Time

A –> bus parameter for –> PROFIBUS. The token represents the right to transmit for a –> station on PROFIBUS. A station compares the actual token rotation time it has measured with the target rotation time and, depending on the result, can then send high or low priority frames.

Token Bus

Network access technique used to assign bus access with several active stations (used on PROFIBUS). The token is passed on from active station to active station. A complete token rotation takes place between a station sending the token and receiving it again.

UNFREEZE

Job for resetting the –> FREEZE mode.

UNSYNC

Job for resetting the –> SYNC mode.

Virtual Field Device (VFD)

A virtual field device (VFD) is an image of a programmable controller in a neutral description. The data and the behavior of the device are described.

Watchdog Time

A monitoring time that can be set on a –> DP slave to detect the failure of the its –> DP master.

❑

Protocol Implementation Conformance Statements (PICS)

C

Meaning

The Protocol Implementation Conformance Statements (PICS) provide further information about the implementation of FMS (range and complexity) on the PROFIBUS CP.

This information is required for connections to systems of other manufacturers.

Note

Please read the information in the product information of the PROFIBUS CP you are using.

PICS Serial Number: 1 PICS Part 1 Implementation in the system	
System Parameters	Detail
Implementation vendor name	Siemens AG
Implementation model name	Order number of the CPU
Implementation revision identifier	Version number of the CPU
Vendor name of FMS	Siemens AG
Controller type of FMS	ASPC2 for a CP 443-5 SPC/2 for a CP 343-5
Hardware release of FMS	A_._ (can be found on type plate)
Software release of FMS	V_._
Profile number	0
Calling FMS user (enter YES or NO)	YES
Called FMS user (enter YES or NO)	YES

PICS Part 2 Supported Services	
Service	Primitive
Initiate	req, con, ind, rsp
Abort	req, ind
Reject	ind
Status	req, con
Unsolicited Status	ind
Identify	req, con
Read	req, con
Write	req, con
Information Report	ind
Get–OD (short form)	req, con
Get–OD (long form)	req, con
Read–CRL–Loc	req, con

PICS Part 3	
FMS Parameters and Options	Detail
Addressing by names	YES
Ma×imum length for names	32
Access–protection–supported	–
Ma×imum length for e×tension	32
Ma×imum length for e×tension arguments	0

PICS Part 4	
Local Implementation Values	Detail
Ma×imum length of FMS–PDU	241
Ma×imum number of services outstanding calling (for SAC or SCC)	4 with S7-400 1 with S7-300
Ma×imum number of Services Outstanding Called (for RAC or RCC)	4 with S7-400 1 with S7-300
Synta× and semantics of the e×ecution argument	–
Synta× and semantics of e×tension	–

❑

Default Settings for FMS Connections (Station Profile)

D

About this Chapter

This chapter lists the default settings for connection configuration (see Chapter 1) taken from the station profiles for SIMATIC NET CPs and for ET200 components.

D.1 CP 5431

ImplementationAndSystem	
PollListSap	= 58
TimeOutAssociate	= 3000
DefLsap	= 1

ConnectionProfile	StandardA	StandardB	UserDefined
ConnProfileBetriebsart	= MASTER	= MASTER	= MASTER
ConnectionAttributes (Configuration, see Section. 2.6)			
ConnectionType_Default	= MMAZ	= MMAZ	= MMAZ
ConnectionAttribute_Default	= D	= D	= D
ControlInterval_Default	= 500	= 500	= 500
LLIAttribute_Default	= FMS	= FMS	= FMS
Multiplier_Default	= 1	= 1	= 1
NumberOfParallelServices (Configuration, see Section. 2.8)			
DefMaxSCC	= 1	= 1	= 1
DefMaxRCC	= 1	= 1	= 1
DefMaxSAC	= 0	= 1	= 1
DefMaxRAC	= 0	= 1	= 1
SizeOfPracticalData (Configuration, see Section. 2.8)			
DefMaxPduSendingHighPrio	= 0	= 24	= 24
DefMaxPduSendingLowPrio	= 241	= 241	= 241
DefMaxPduReceivingHighPrio	= 0	= 24	= 24
DefMaxPduReceivingLowPrio	= 241	= 241	= 241
SupportedServices_R (**R**equester) (Configuration, see Section. 2.9)			
Read	= TRUE	= TRUE	= TRUE
Write	= TRUE	= TRUE	= TRUE
InformationReport	= FALSE	= TRUE	= TRUE
SupportedServices_O (Resp**o**nder) (Configuration, see Section. 2.9)			
Read	= TRUE	= TRUE	= TRUE
Write	= TRUE	= TRUE	= TRUE
InformationReport	= FALSE	= TRUE	= TRUE

D.2 CP 343–5

ImplementationAndSystem	
PollListSap	= 58
TimeOutAssociate	= 3000
DefLsap	= 1

ConnectionProfile	StandardA	StandardB	UserDefined
ConnProfileBetriebsart	= MASTER	= MASTER	= MASTER
ConnectionAttributes (Configuration, see Section. 2.6)			
ConnectionType_Default	= MMAZ	= MMAZ	= MMAZ
ConnectionAttribute_Default	= D	= D	= D
ControlInterval_Default	= 3000	= 3000	= 3000
LLIAttribute_Default	= FMS	= FMS	= FMS
Multiplier_Default	= 1	= 1	= 1
NumberOfParallelServices (Configuration, see Section. 2.8)			
DefMaxSCC	= 1	= 1	= 1
DefMaxRCC	= 1	= 1	= 1
DefMaxSAC	= 0	= 1	= 0
DefMaxRAC	= 0	= 1	= 0
SizeOfPracticalData (Configuration, see Section. 2.8)			
DefMaxPduSendingHighPrio	= 0	= 32	= 0
DefMaxPduSendingLowPrio	= 241	= 241	= 241
DefMaxPduReceivingHighPrio	= 0	= 32	= 0
DefMaxPduReceivingLowPrio	= 241	= 241	= 241
SupportedServices_R (**R**equester) (Configuration, see Section. 2.9)			
Read	= TRUE	= TRUE	= TRUE
Write	= TRUE	= TRUE	= TRUE
InformationReport	= FALSE	= TRUE	= FALSE
GetLongOD	–	–	=TRUE
AddressableWithName	–	–	=FALSE
SupportedServices_O (Resp**o**nder) (Configuration, see Section. 2.9)			
Read	= TRUE	= TRUE	= TRUE
Write	= TRUE	= TRUE	= TRUE
InformationReport	= FALSE	= TRUE	= FALSE

ConnectionProfile	StandardA	StandardB	UserDefined
GetLongOD	–	–	=TRUE
AddressableWithName	–	–	=FALSE

D.3 CP 443–5 Basic

ImplementationAndSystem	
PollListSap	= 58
TimeOutAssociate	= 3000
DefLsap	= 1

ConnectionProfile	StandardA	StandardB	UserDefined
ConnProfileBetriebsart	= MASTER	= MASTER	= MASTER
ConnectionAttributes (Configuration, see Section. 2.6)			
ConnectionType_Default	= MMAZ	= MMAZ	= MMAZ
ConnectionAttribute_Default	= D	= D	= D
ControlInterval_Default	= 3000	= 3000	= 3000
LLIAttribute_Default	= FMS	= FMS	= FMS
Multiplier_Default	= 1	= 1	= 1
NumberOfParallelServices (Configuration, see Section. 2.8)			
DefMaxSCC	= 1	= 1	= 1
DefMaxRCC	= 1	= 1	= 1
DefMaxSAC	= 0	= 1	= 0
DefMaxRAC	= 0	= 1	= 0
SizeOfPracticalData (Configuration, see Section. 2.8)			
DefMaxPduSendingHighPrio	= 0	= 32	= 0
DefMaxPduSendingLowPrio	= 241	= 241	= 241
DefMaxPduReceivingHighPrio	= 0	= 32	= 0
DefMaxPduReceivingLowPrio	= 241	= 241	= 241
SupportedServices_R (**R**equester) (Configuration, see Section. 2.9)			
Read	= TRUE	= TRUE	= TRUE
Write	= TRUE	= TRUE	= TRUE
InformationReport	= FALSE	= TRUE	= FALSE
GetLongOD	–	–	=TRUE

ConnectionProfile	StandardA	StandardB	UserDefined
AddressableWithName	–	–	=FALSE
SupportedServices_O (Responder) (Configuration, see Section. 2.9)			
Read	= TRUE	= TRUE	= TRUE
Write	= TRUE	= TRUE	= TRUE
InformationReport	= FALSE	= TRUE	= FALSE
GetLongOD	–	–	=TRUE
AddressableWithName	–	–	=FALSE

D.4 CP 5412

ImplementationAndSystem	
PollListSap	= 51
TimeOutAssociate	= 3000

	StandardA	StandardB	UserDefined
ConnProfileBetriebsart	= MASTER	= MASTER	= MASTER
ConnectionAttributes (Configuration, see Section. 2.6)			
ConnectionType_Default	= MMAZ	= MMAZ	= MMAZ
ConnectionAttribute_Default	= D	= D	= D
ControlInterval_Default	= 3000	= 3000	= 3000
LLIAttribute_Default	= FMS	= FMS	= FMS
Multiplier_Default	= 1	= 1	= 1
NumberOfParallelServices (Configuration, see Section. 2.8)			
DefMaxSCC	= 1	= 1	= 1
DefMaxRCC	= 1	= 1	= 1
DefMaxSAC	= 0	= 1	= 1
DefMaxRAC	= 0	= 1	= 1
SizeOfPracticalData (Configuration, see Section. 2.8)			
DefMaxPduSendingHighPrio	= 0	= 32	= 32
DefMaxPduSendingLowPrio	= 241	= 241	= 241
DefMaxPduReceivingHighPrio	= 0	= 32	= 32
DefMaxPduReceivingLowPrio	= 241	= 241	= 241

	StandardA	**StandardB**	**UserDefined**
SupportedServices_R (**R**equester) (Configuration, see Section. 2.9)			
Read	= TRUE	= TRUE	= TRUE
Write	= TRUE	= TRUE	= TRUE
InformationReport	= FALSE	= TRUE	= TRUE
GetLongOD	–	–	=FALSE
UnsolictedStatus	–	–	= FALSE
PutOD	–	–	= FALSE
DomainDownload	–	–	= FALSE
DomainUpload	–	–	= FALSE
RequestDomainDownLoad	–	–	= FALSE
RequestDomainUpLoad	–	–	= FALSE
CreateProgramInvocation	–	–	= FALSE
DeleteProgramInvocation	–	–	= FALSE
StartProgramInvocation	–	–	= FALSE
StopProgramInvocation	–	–	= FALSE
ResumeProgramInvocation	–	–	= FALSE
ResetProgramInvocation	–	–	= FALSE
KillProgramInvocation	–	–	= FALSE
ReadWithType	–	–	= FALSE
WriteWithType	–	–	= FALSE
PhysRead	–	–	= FALSE
PhysWrite	–	–	= FALSE
InformationReportWithType	–	–	= FALSE
DefineVariableList	–	–	= FALSE
DeleteVariableList	–	–	= FALSE
EventNotification	–	–	= FALSE
EventNotificationWithType	–	–	= FALSE
AcknowledgeEventNotification	–	–	= FALSE
AlterEventConditionMonitoring	–	–	= FALSE
AddressableWithName	–	–	= FALSE
SupportedServices_O (Resp**o**nder) (Configuration, see Section. 2.9)			
Read	= TRUE	= TRUE	= TRUE
Write	= TRUE	= TRUE	= TRUE
InformationReport	= FALSE	= TRUE	= TRUE
GetLongOD	–	–	= FALSE
UnsolictedStatus	–	–	= FALSE
PutOD	–	–	= FALSE

	StandardA	StandardB	UserDefined
DomainDownload	–	–	= FALSE
DomainUpload	–	–	= FALSE
RequestDomainDownLoad	–	–	= FALSE
RequestDomainUpLoad	–	–	= FALSE
CreateProgramInvocation	–	–	= FALSE
DeleteProgramInvocation	–	–	= FALSE
StartProgramInvocation	–	–	= FALSE
StopProgramInvocation	–	–	= FALSE
ResumeProgramInvocation	–	–	= FALSE
ResetProgramInvocation	–	–	= FALSE
KillProgramInvocation	–	–	= FALSE
ReadWithType	–	–	= FALSE
WriteWithType	–	–	= FALSE
PhysRead	–	–	= FALSE
PhysWrite	–	–	= FALSE
InformationReportWithType	–	–	= FALSE
DefineVariableList	–	–	= FALSE
DeleteVariableList	–	–	= FALSE
EventNotification	–	–	= FALSE
EventNotificationWithType	–	–	= FALSE
AcknowledgeEventNotification	–	–	= FALSE
AlterEventConditionMonitoring	–	–	= FALSE
AddressableWithName	–	–	= FALSE

D.5 SIMOCODE

ImplementationAndSystem	
PollListSap	= 0
TimeOutAssociate	= 0

ConnectionProfile	SIMOCODE_KR2
ConnProfileBetriebsart	= SLAVE
ConnectionAttributes (Configuration, see Section. 2.6)	
ConnectionType_Default	= MSAZ_SI
ConnectionAttribute_Default	= 0
ControlInterval_Default	= 1000
LLIAttribute_Default	= FMS
Multiplier_Default	= 0
NumberOfParallelServices (Configuration, see Section. 2.8)	
DefMaxSCC	= 0
DefMaxRCC	= 1
DefMaxSAC	= 1
DefMaxRAC	= 0
SizeOfPracticalData (Configuration, see Section. 2.8)	
DefMaxPduSendingHighPrio	= 11
DefMaxPduSendingLowPrio	= 102
DefMaxPduReceivingHighPrio	= 0
DefMaxPduReceivingLowPrio	= 55
SupportedServices_R (**R**equester) (Configuration, see Section. 2.9)	
UnsolicitedStatus	= TRUE
SupportedServices_O (Resp**o**nder) (Configuration, see Section. 2.9)	
Read	= TRUE
Write	= TRUE

D.6 ET200U

ImplementationAndSystem	
PollListSap	= 0
TimeOutAssociate	= 0

AdditionalCharacteristics	
MaxNameLen	= 0
AccessProtectSupport	= TRUE

AdditionalCharacteristics	
MaxLenExtension	= 0
MaxLenExecArgument	= 0

ConnectionProfile	**ET200U _KR2**	**ET200U _KR3**	**ET200U _KR4**	**ET200U _KR5**	**ET200U _KR6**	**ET200U _KR7**	**ET200U _KR2**
ConnProfileBetriebsart	= SLAVE	= SLAVE	= SLAVE	= SLAVE	= SLAVE	= SLAVE	= SLAVE
ConnectionAttributes (Configuration, see Section. 2.6)							
ConnectionType_Default	= MSZY	= MSZY	= MSZY_SI	= MSZY_SI	= MSAZ_SI	= MSAZ	= MSAZ
ConnectionAttribute_Default	= 0	= 0	= 0	= 0	= 0	= 0	= 0
ControlInterval_Default	= 3000	= 3000	= 3000	= 3000	= 3000	= 3000	= 3000
LLIAttribute_Default	= FMS	= FMS	= FMS	= FMS	= FMS	= FMS	= FMS
Multiplier_Default	= 0	= 0	= 0	= 0	= 0	= 0	= 0
NumberOfParallelServices (Configuration, see Section. 2.8)							
DefMaxSCC	= 0	= 0	= 0	= 0	= 0	= 0	= 0
DefMaxRCC	= 0	= 0	= 0	= 0	= 1	= 1	= 1
DefMaxSAC	= 0	= 0	= 1	= 1	= 1	= 0	= 0
DefMaxRAC	= 0	= 0	= 0	= 0	= 0	= 0	= 0
SizeOfPracticalData (Configuration, see Section. 2.8)							
DefMaxPduSendingHighPrio	= 0	= 0	= 241	= 241	= 241	= 0	= 0
DefMaxPduSendingLowPrio	= 241	= 241	= 241	= 241	= 241	= 241	= 241
DefMaxPduReceivingHighPrio	= 0	= 0	= 0	= 0	= 0	= 0	= 0
DefMaxPduReceivingLowPrio	= 241	= 241	= 241	= 241	= 241	= 241	= 241
SupportedServices_R (**R**equester) (Configuration, see Section. 2.9)							
EventNotification	–	–	= TRUE	= TRUE	= TRUE	–	–
SupportedServices_O (Resp**o**nder) (Configuration, see Section. 2.9)							
Read	= TRUE	–	= TRUE	–	= TRUE	= TRUE	= TRUE
Write	–	= TRUE	–	= TRUE	= TRUE	= TRUE	= TRUE
GetLongOD	–	–	–	–	= TRUE	= TRUE	= TRUE

ConnectionProfile	ET200U _KR2	ET200U _KR3	ET200U _KR4	ET200U _KR5	ET200U _KR6	ET200U _KR7	ET200U _KR2
AcknowledgeEventNotification	–	–	–	–	= TRUE	–	= TRUE
AlterEventConditionMonitoring	–	–	–	–	= TRUE	–	= TRUE

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SIMATIC NET – Support and Training

E

Customer Support, Technical Support

Open round the clock, worldwide:

SIMATIC Hotline

Technical Support	**Authorization Hotline**
Europe and Africa (Nuremberg) Mo. to Fr. 7:00 to 17:00 (local time, GMT +1) Tel: +49 – (0) 180 – 5050 – 222 Fax: +49 – (0) 180 – 5050 – 223 E-mail: techsupport@ad.siemens.de	**Europe and Africa** (Nuremberg) Mo. to Fr. 7:00 to 17:00 (local time, GMT +1) Tel: +49 – (0) 911 – 895 – 7200 Fax: +49 – (0) 911 – 895 – 7201 E-mail: authorization@nbgm.siemens.de
America (Johnson City) Mo. to Fr. 8:00 to 19:00 (local time, GMT –5) Tel: +1 – (0) 423 – 262 – 2522 Fax: +1 – (0) 423 – 262 – 2231 E-mail: simatic.hotline@sea.siemens.com	
Asia and Australia (Singapore) Mo. to Fr. 8:30 to 17:30 (local time, GMT +8) Tel: +65 – (0) 740 – 7000 Fax: +65 – (0) 740 – 7001 E-mail: simatic.hotline@sae.siemens.com.sg	
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Worldwide (Nuremberg) Workdays 0:00 to 24:00 (local time, GMT +1) Tel: +49 – (0) 911 – 895 – 7777 Fax: +49 – (0) 911 – 895 – 7001 E-mail: techsupport@ad.siemens.de	Fast callback guaranteed within a maximum of two hours (charged, only with the SIMATIC Card)

Technical Support Online Services

SIMATIC Customer Support provides you with a wide range of additional information on SIMATIC products in the online services:

- You can obtain general up-to-date information as follows:
  - on the Internet at http://www.siemens.de/simatic-net
  - at fax polling no. +49 (0) 8765-93 02 77 95 00
- Updated product information, FAQs, Tips and Tricks, and useful downloads are available from the following sources:
  - on the Internet at http://www.siemens.de/automation/service&support
  - From the bulletin board system (BBS) in Nuremberg (*SIMATIC Customer Support Mailbox)* at the number +49 (0) 911 895-7100.

    To dial the mailbox, use a modem with up to V.34 (28.8 Kbaud), with the following parameters: 8, N, 1, ANSI, or dial on ISDN (x.75, 64 Kbits).

Training Center

Courses are available to help you become familiar with the SIMATIC S7 automation system and programmable controllers. Please contact your regional training center or the central training center in D 90327 Nuremberg.

Tel. +49 (0) 911–895–3154

Infoline: Tel. +49 (0) 1805 23 56 11
Fax. +49 (0) 1805 23 56 12

Internet: http://www.sitrain.com

E-mail: AD–Training@nbgm.siemens.de

The H/F Competence Center in Nuremberg offers a special workshop on the topic of fault-tolerant SIMATIC S7 programmable controllers. The H/F Competence Center also supports you during configuration, when putting your system into operation and if you have problems on site.

Tel. +49 – (0) 911 – 895 – 4759
Fax. +49 – (0) 911 – 895 – 5193

E-mail: hf–cc@nbgm.siemens.de
CoC–SI@nbgm.siemens.de

Further Support

If you have further questions about SIMATIC NET products, contact your local Siemens representative.

You will find the addresses:

- In our catalog IK PI
- on the Internet at
  http://www.siemens.de/automation/partner
- in the interactive catalog CA01
  http://www.siemens.de/automation/ca01
- on the Quick Start CD

❑