SIEMENS

SIMATIC

Process Control System PCS 7 Connecting TM I/O to PCS 7

Manual

01/2007

C79000-G8076-C710-04

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This manual contains notices intended to ensure personal safety, as well as to protect the products and connected equipment against damage. These notices are highlighted by the symbols shown below and graded according to severity by the following texts:

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 can result if proper precautions are not taken.

Caution

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

Notice

draws your attention to particularly important information on the product, handling the product, or to a particular part of the documentation.

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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:

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Technical data subject to change.

Preface

Purpose of this manual

This manual provides information on hardware components you can use to interconnect an existing TELEPERM M I/O installation and the process control system SIMATIC PCS 7.
A combination of corresponding tools and programs enables communication (Configuration and Operation) with the C&O system WinCC.

The information in this manual enables you to:

- commission the TPM 478-2 interface module
- operate migration rack II with PCS7/TM.

Manual content

This documentation describes system-specific functions of the TPM 478-2 interface module and the use of migration rack II with PCS7/TM.

Topics included:

- Hardware assembly
- Software installation
- Commissioning
- Configuration
- TPM 478-2 interface module
- Migration rack II
- Technical data, abbreviations list, literatur listing, glossary.

Readers

The target group of readers is occupied in programming and process technology engineering.

Prerequisites

Prerequisite is basic knowledge on handling PCs and
working with *WinCC/TM*.
Also required is knowledge of the process control system TELEPERM M, PCS7 and SIMATIC S7.

A number of technical descriptions and manuals are available for consolidation of this information. Please refer to the literature index in Appendix C.

Further support

Siemens offers you a number of training courses for the SIMATIC PCS7 automation system. For details, please contact your regional training center or our central training center in:

1. D-90327 Nuremberg, Germany,
   Phone 0911 / 895 3202 , Fax: 0911 / 895 3252
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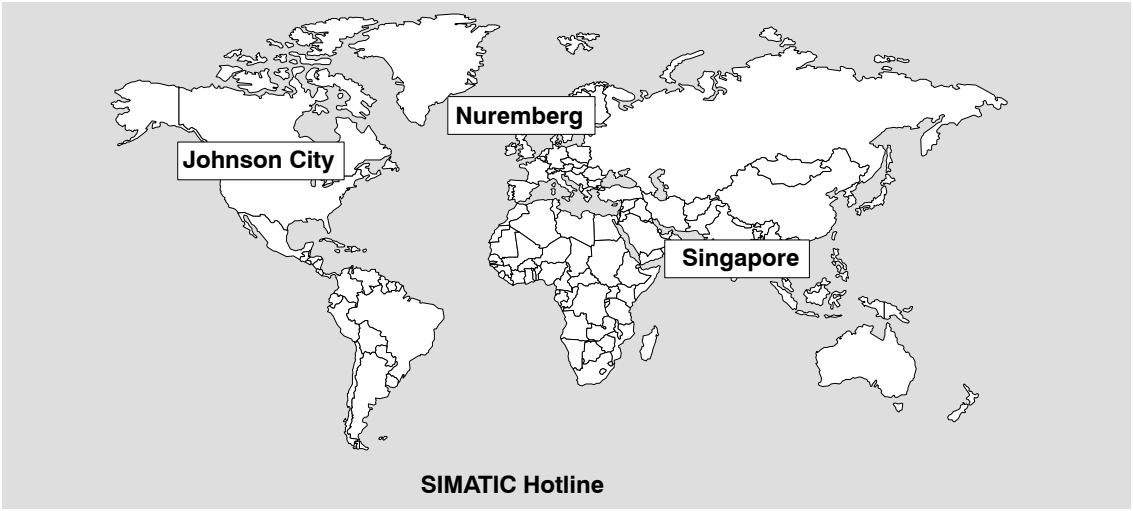

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- Users and specialists from all over the world share information in the forum.
- Your local customer service representative for Automation & Drives in our customer service representative data bank.
- Information on field service, repairs, spare parts and more under ”Services”.

Contents

Hardware structure

1

Contents

This chapter provides brief information which gives you a quick overview of the TPM 478-2 interface module and migration carrier II.

1.1 Interface module TPM 478-2

General functions

TPM 478-2 is an interface module with the M7-400 technological structure of the SIMATIC M7 product family. It represents an expansion unit for the central module FM 456-4, and it is used in the PCS7/TM PLC.
The following functions are integrated in the TPM 478-2 interface module:

- TELEPERM M I/O functionality.

  A highly efficient processor controls the access functions to TELEPERM M I/O modules via a periodically updated process image. This process image fetches input process data it writes them to the outputs of the hardware I/O.
  Process image data is transferred from the TPM 478-2 to the user program via driver blocks.

- two I/O bus interfaces for the TELEPERM M basic and expansion cabinet
- I/O bus logic supply with a +5 V bus.

Connecting TELEPERM M I/O

The TPM 478-2 interface module interconnects existing TELEPERM M I/O hardware of the basic and expansion cabinet of an AS 220/230/235 system. Here, the basic central unit is replaced with a preinstalled module rack - namely the migration rack - which contains a system PCS7/TM and the add-on components TPM 478-2 and FM456-4.
It provides the I/O bus connections A and B for existing expansion units. Data are exchanged with existing expansion unit via I/O bus A and B of TPM 478-2. See Figure 1-1.

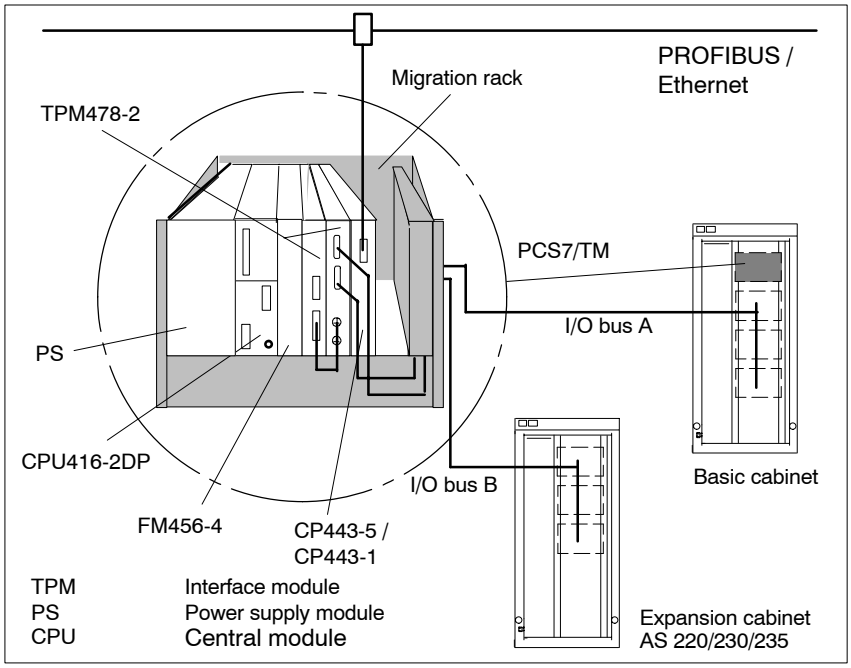

Figure 1-1 TPM 478-2 for the connection of TELEPERM M I/O modules

Elements of TPM 478-2

All connection and display elements of the TPM 478-2 interface module are mounted on the front panel of the module, see Figure 1-2.

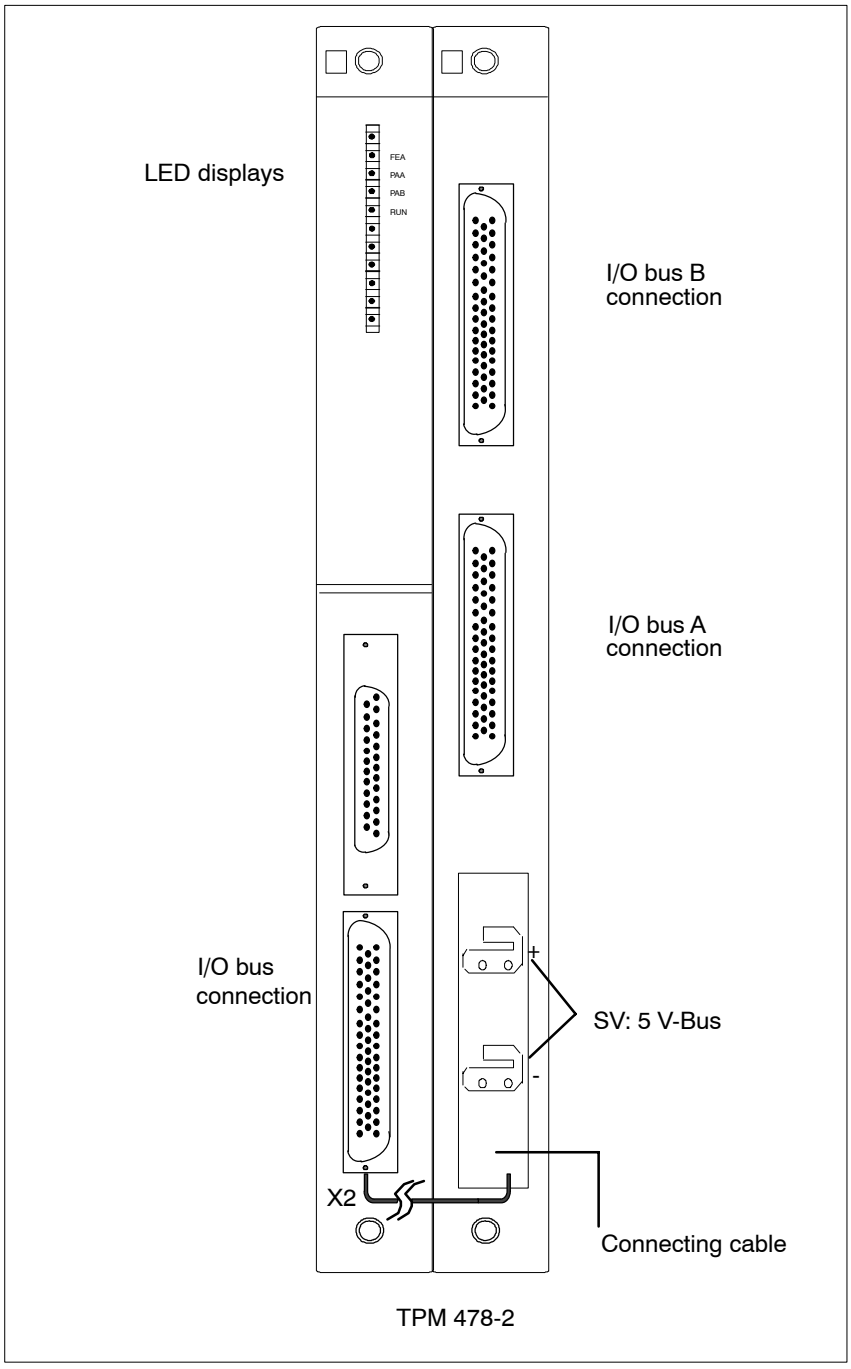

Figure 1-2 Arrangement of the connections and display modules of the TPM 478-2 interface module

Information

For additional information on the TPM 478-2 interface modules refer to Chapter 5 in this manual.

1.2 Migration rack II

General

The **migration rack II** is a preassembled module rack with the dimensions of the panel-mount system ES 902 which is required for operating a PCS7/TM system in a TELEPERM M cabinet.

All system components such as DC power supply, CPU, FM456-4 and I/O bus interface can be operated on the short backplane PCB.

The additional five I/O slots the migration rack II is equipped with can hold TELEPERM M I/O modules taken from an AS 220 S-/AS 235 basic unit and can be assigned freely to I/O bus A and B.

Features

For the PCS7/TM system, migration rack II provides **five TELEPERM M I/O slots** for the installation of TELEPERM M I/O modules taken from an AS 220 S-/AS 235 basic unit. All slots can be operated on I/O bus A or split up in a 3 : 2 ratio between I/O bus A and B.

Other features are the simplified wiring (supply and process control messages) and the possibility of replacing certain mechanical components (connectors) in case of error.

The wiring features no loose ends, that is, installation technique is adapted to AS 230/235.

The integrated backplane also provides distribution of specific signals and voltages. Process control monitoring signals are now terminated on the backplane terminal blocks - same as in the AS 235. The existing cabinet wiring can be used almost completely.

The front panel fuses for L+ (16A) and PM (4A) can be replaced from the front in case of error. Due to the fastening mechanism on the side, the I/O bus connectors can be replaced in case of error without having to remove the migration rack.

The migration rack is equipped with by-pass capacitors for the L+, PM, M24 and MZ voltages for the derivation of electrical disturbance to the shielding and, thus to the metal case.

All position addresses of the slots are equipped with filters.

Information

Further information on Migration Rack II is found in Chapter 6 of this manual.

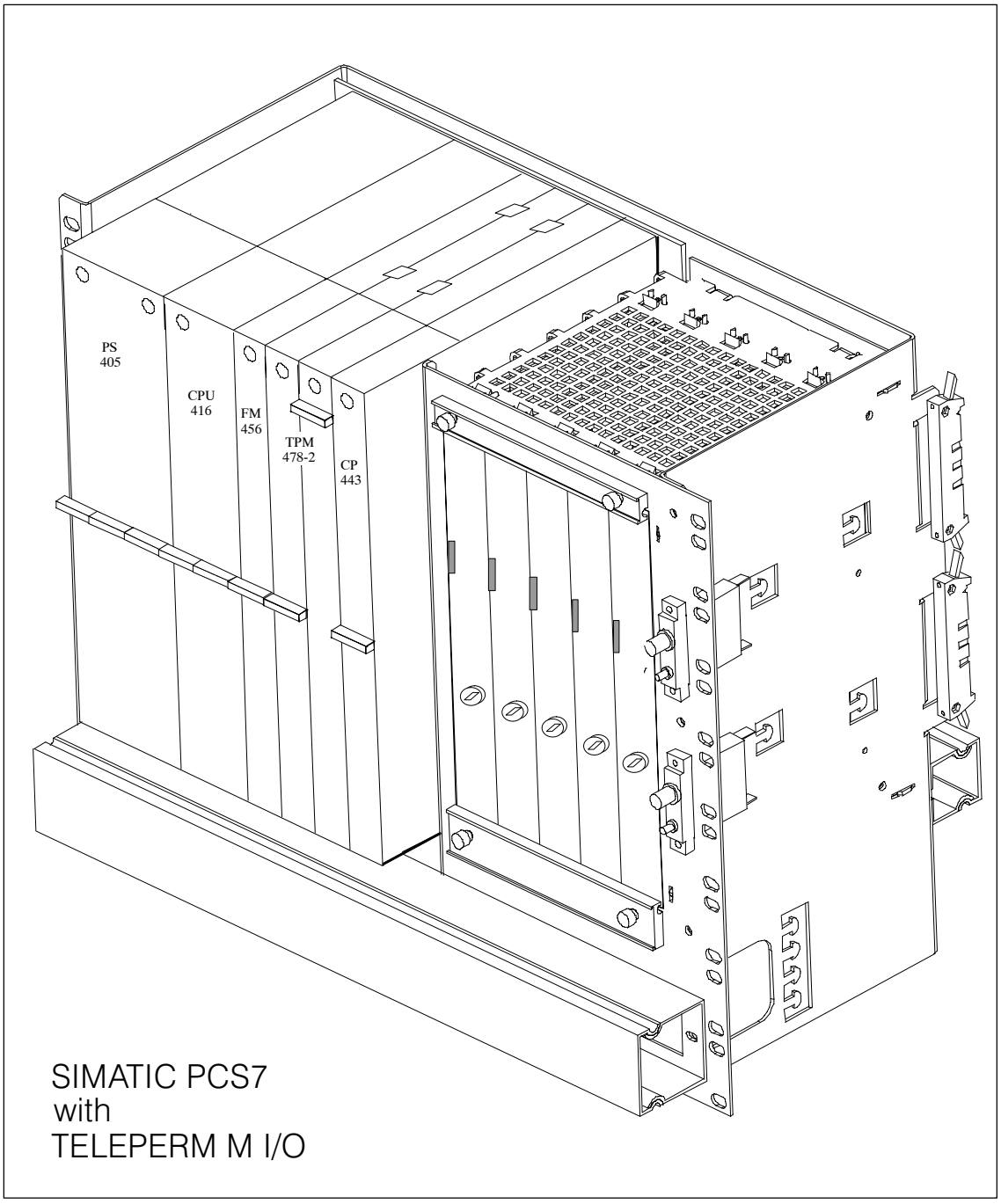

Figure 1-3 Front view of migration rack II

Installation of the software

2

Overview

In this Chapter you are shown how you can install the block library with the help of a setup routine.

In this Chapter

This chapter treats the following topics:

Installation requirements

Software operating requirements are:

- Windows NT operating system
- Programming device or PC with
  - 80486 CPU (or higher) and
  - RAM memory
- Color monitor, keyboard and mouse, supported by Microsoft Windows NT
- STEP 7 Basic software
- Free space > 4 Mbytes on hard disk drive
- At least 1 MB space on drive C: for Setup (Setup files are deleted after installation).

2.1 Installing and uninstalling the block library

Overview

The setup program of the included software installs the block library automatically.

Installation is menu controlled. Call the setup program with the usual Windows 95 standard procedure for software installation.

Setup installs the basic blocks for the PLC in the PCS 7 Basis Blocks library of the SIMATIC S7 catalog.

If a Software version is already installed ...

If setup detects an existing installation on the system, a corresponding prompt pops up, offering you the following choices:

- Abort installation (in order to uninstall the old software version under Windows95 and the restart installation) or
- Continue installation and overwrite the old version with the new one.

Considering clean software maintenance, you should uninstall an existing old version before you install the new one. To simply overwrite an old version and then to uninstall it bears the risk that some components of the old installation might not be deleted.

Installing or uninstalling STEP 7-Software

Details on installing and uninstalling STEP 7 software is found in Chapter 2.3 of the STEP 7 documentation /31/.

Systems with WinCC

Setup also installs the screen software in systems operating with WinCC.

Use in CFC

Information on the use of blocks in CFC is found in the ”CFC for S7 and M7, Graphic connection of technological functions” User Manual.

Commissioning

3

In this Chapter

In this Chapter you are shown how to

- mount the modules on profile rails
- commission a PCS7/TM.

Contents

This is found on the following pages:

3.1 PCS7/TM in M7-400 installation technique

Introduction

A PCS7/TM PLC in M7-400 installation technique is mounted in the same way as a SIMATIC M7-400 PLC.

Note

Details on how to mount a SIMATIC M7-400 PLC are found in Manual /31/.

M7-400 mounting and installatio technology

Here a brief overview of the most important steps for mounting a PCS7/TM PLC in M7-400 installation technique:

Mounting modules

Mount the module rack in the cabinet.

Grounding modules

Ground the module rack.

Removing the cover hood

Remove the covers of the power supply and central module.

Installing interface modules

Remove the covers and insert the interface modules in the central module. See also Figure 3-1 showing the arrangement:

- IF 961-DIO for acquisition and output of process control signals, e.g. cabinet lamp
- IF 962-COM for diagnostics with remote terminal

Note when inserting an interface module:

- Hold the interface module on the longitudinal sides of the front panel
- Slide the ends of the interface module into the lower and upper guide rail of the slot
- Slide it in slowly until the front panel of the interface module is flush on the module slot frame
- Screw-tighten the interface module.

Warning

Always switch off power when you insert or remove an interface module.

The bottom of interface modules is not covered. This is why you must always conform with EGB rules when handling these modules.

Removing connector/socket covers

Remove the cover from the expansion connector on the TPM 478-2 interface and the cover of the expansion socket on the central module FM 456-4. See Figure 3-1.

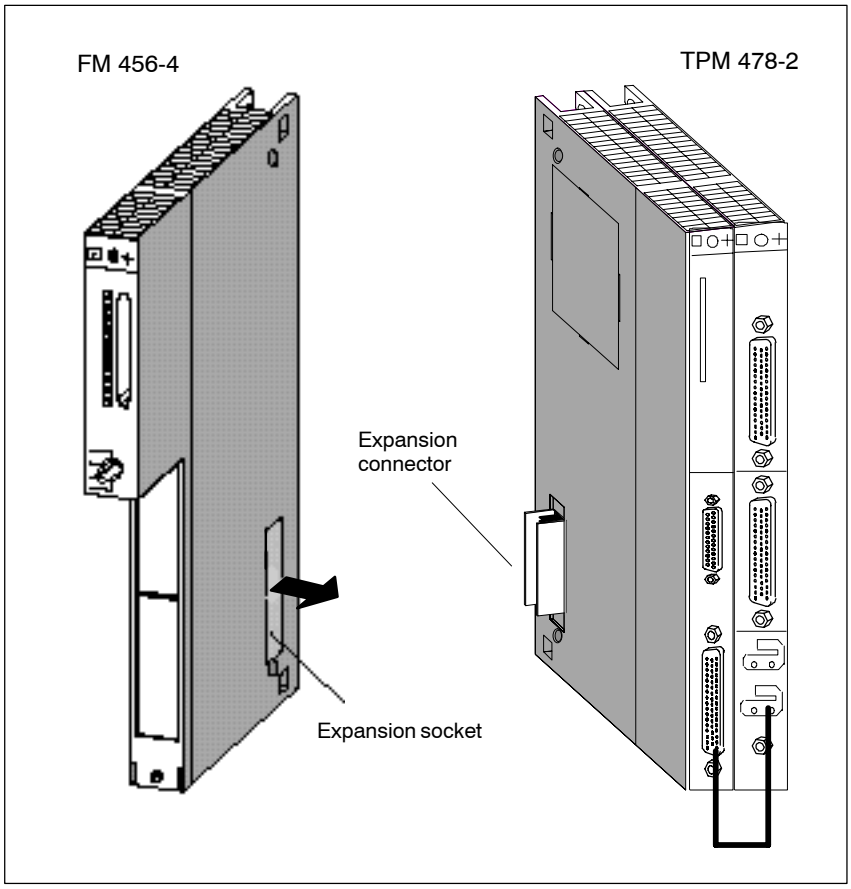

Figure 3-1 Positions of the expansion connector/socket with corresponding cover.

Interconnecting modules

Place the central module FM 456-4 and the TPM 478-2 interface module on a plane surface and carefully plug them together. Engage the included connection clamps on the upper and lower side of the modules.

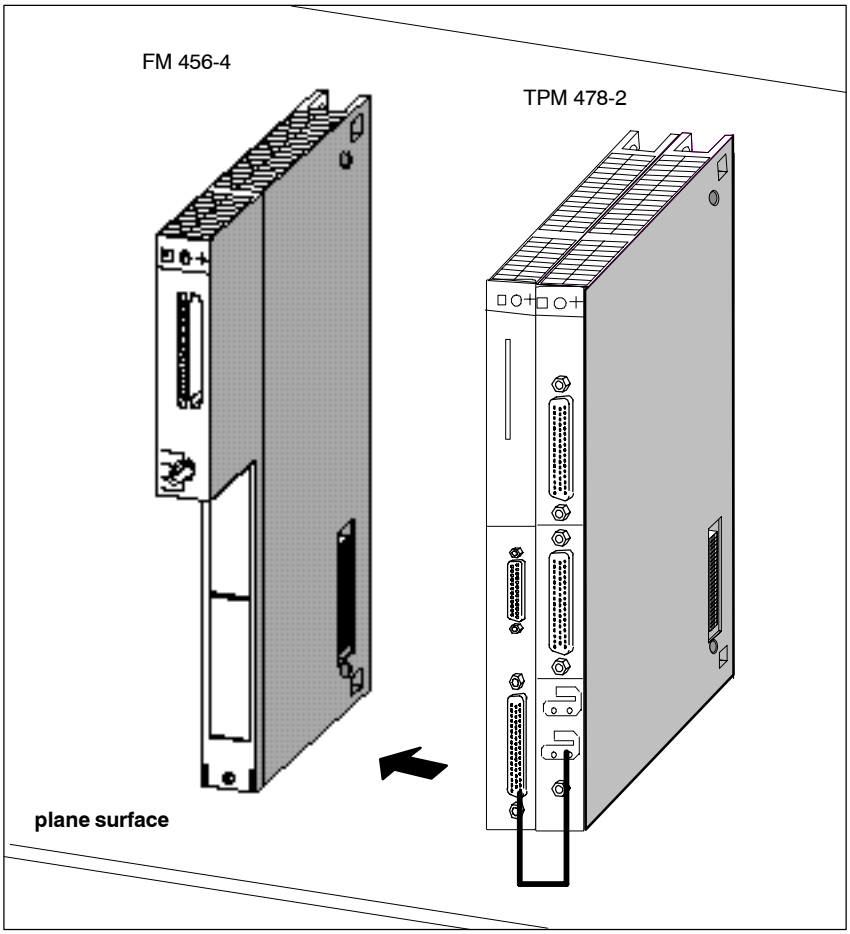

Figure 3-2 Interconnecting the central module and interface module

Blind covers

Remove the blind covers from the module rack slots required.

PS 405

Insert and screw-tighten the 24 VDC/24 VDC power supply module in the outer left slot (slot 1). Select your mains voltage with the selector switch on the power supply module.

Inserting modules

Insert the module group to the right side of the CPU (1) and swing it down (2). See Figure 3-3.

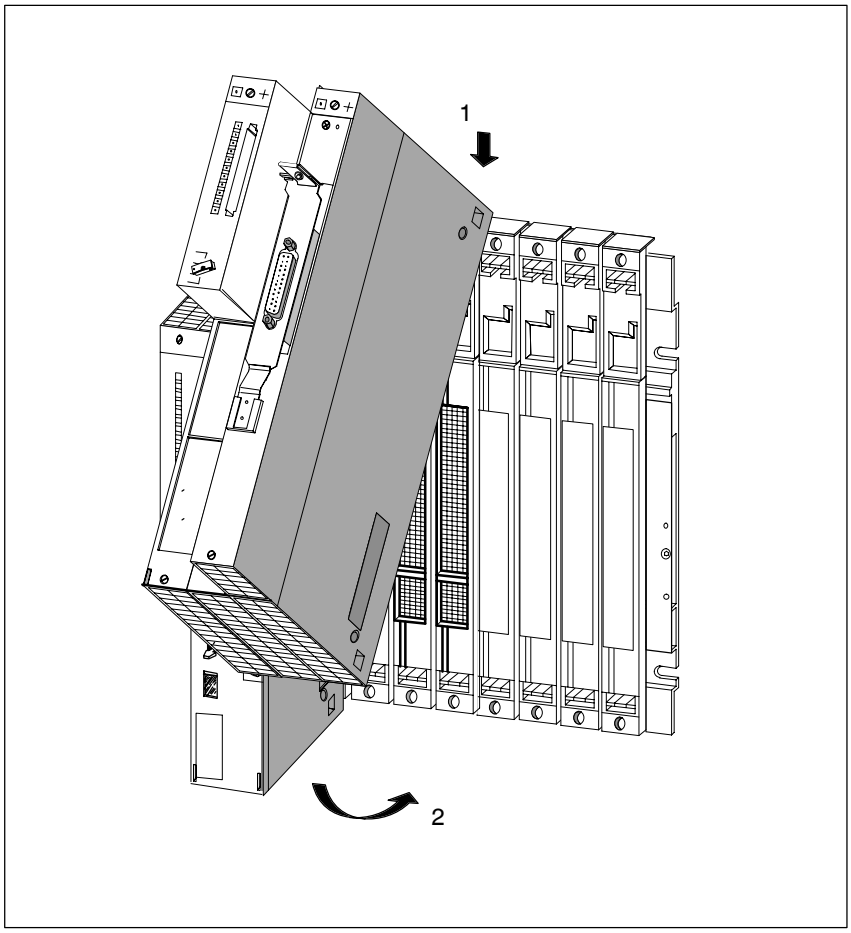

Figure 3-3 Inserting the modules

Screw-tightening the module unit

Screw-tighten central/expansion module unit.

Memory Card

Do not yet insert the Memory Card into the central module.

Inserting the key switch

Set the key switch on the central module to STOP position.

Backup battery

Insert the backup batteries (2 pieces) in the power supply (time-of-day).

Mains plug PS 405/407

Insert the wired mains plug into the power supply module.

Front connector IF 961-DIO

Wire and insert the preassembled front connector for the IF 961-DIO interface module according to your application.

PROFIBUS connection

Connect the PROFIBUS system. See Figure 3-4.

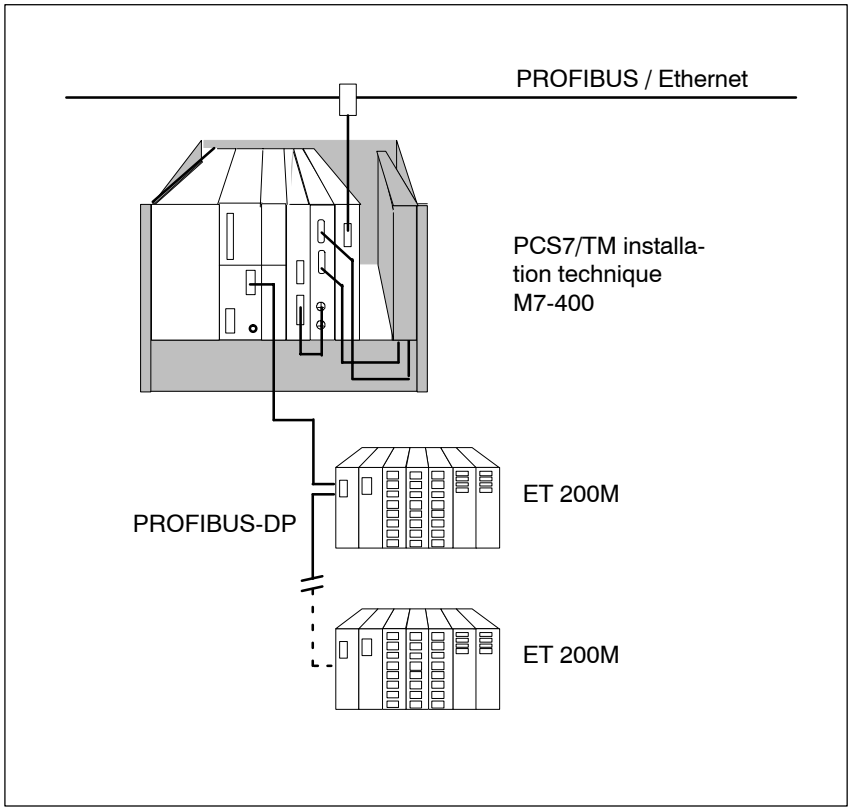

Figure 3-4 Connecting PROFIBUS-DP

Note

Further information on how to connect the PROFIBUS-DP system is found in manuals /17/ to /18/.

3.2 Supply conception

Overview

The PLC system draws its power from a 24 VDC or 230 VAC power supply. On startup (after power is returned or after a reset) the application is always loaded from buffered CPU memory module.
The FM456-4 configuration is backed up on a Flash ROM Memory Card.
The lithium cell in the PS buffers the date and time-of-day as well as data on the CPU's memory module.

In order to resume with the last states and selected steps free of surge after a voltage drop and when power is returned, we recommend a redundant supply in the central PLC area. Even after load power loss, including the supply of DP stations and/or TM I/O units, the buffered PLC can communicate with the OS, generate process control failure messages and specifically apply configured failure and resume strategies.

We differentiate:

a) Redundant 24 VDC power supply by means of two diodes
wired in parallelism, switched in series to the PLC module rack of the 24 VDC version;
The redundant power supply busbar is arranged centrally on this system.

b) Uninterruptible power supply with distributed buffered operation;
A low-cost **SITOP power DC-UPS 40 A** is available.
Refer to Catalog *KT 10, Power supply SITOP power, System wiring SITOP connection.*

This UPS system allows an uninterrupted supply/buffer operation transition. The buffer units can be switched in parallel in order to adapt power to system requirements. When the UPS is designed to operate on the basic unit, for example, you can use the smallest 7 Ah backup battery module to buffer power loss times of approx. 4.5 h (with PCS7/TM) and approx. 1,6 h (with migration and TM I/O busses).

Buffer conception

On power loss the lithium cell buffers the programs in the PS. After power is returned, restart is always executed with system and user data stored on the system's Memory Card.

In order to avoid a restart after voltage drops on supply side, the PLC can be supplied redundant from two supply circuits with the help of two diodes, e.g. once from a battery.
This buffers all power drops, independent of the supply for I/O peripherals, and saves the respectively last system/operating states, thus allowing to resume operation.

Configuration

4

In this Chapter

This chapter provides information on how to configure TELEPERM M I/O peripherals.

Contents

This is found on the following pages:

4.1 General

For information on configuration refer to the SIMATIC Manuals /8/, /31/, /106/, /230/, /231/, /232/, /233/, /234/, /235/, /280/, /282/, /350/, /701/, /702/ and /703/. See Appendix C.

With a PCS7/TM PLC, the exchange of process values between the PLC and process I/O modules generally takes place via process image.

With an AS 2xx PLC data are exchanged via direct access to I/O modules during runtime of the driver block.

The disadvantage of direct access is, for example, extremely long acknowledgement and response times on a “long” I/O bus or with I/O modules distributed from AS 235 over larger distances. This is improved with PCS7/TM and an I/O communication module TPM 478, as a result of autarkic and processor controlled mapping of I/O values on the TPM 478.

Standard driver blocks, e.g. system version G of the AS 235, address TELEPERM M I/O modules with the help of the hierarchical addresses “Module number” and “Channel number”. These are entered in the block parameter lists when driver blocks are being configured. Here, implicit condition is a module-conform assignment of TELEPERM M I/O modules and drivers in the configuration.

This implicit module assignment in TPM 478 is no longer available in the application image in, or it is rudimentary and inconsistent. Therefore, supplementary configuration is required.

4.2 Configuration input

Data blocks from the library

To begin with, data blocks DB1 and DB2 as well as data types UDT1 and UDT2 must be copied from the library to the current project:

- call SIMATIC Manager
- open the current project and library Pcs7_tm
- select FM456 task\blocks
- select DB1, DB2, UDT1 and UDT2 and copy them to the block container of the FM456-4 in the current project

I/O configuration

DB1 and DB2 of the FM456-4 are configured in the block editor (View → Data view). Configuration of the interface to the TELEPERM M I/O bus only requires:

- assignment of module names (MLFB) to the module numbers (slot number) in the TELEPERM M I/O module rack and
- the processing cycle for cyclic repetition of the process image.

Information generated during the configuration of I/O peripherals are stored in DB1 and DB2 of the FM456-4. In the editor, this can be entered and modified for every block number. Entries are not activated at the time of input.

These declarations in the configuration lists are activated on restart of the FM456-4, after power is returned.

4.2.1 Configuring the Memory Card of the FM456

Required Software components

The Memory Card of the FM456-4 must contain the following SW components:

- the operating system M7-SYS Realtime V4.0
- the HW configuration
- the configured connections to the S7 CPU (refer to the Reference Manual Driver block library for TM I/O, Chapter 4.5)
- the task TM_EA_S7 for operation of the interface module TPM478-2 and communication with the S7 CPU
- I/O configuration data (DB1 and DB2)

The user must configure these software components on the Memory Card of the FM456-4, including the operations described in the following sections.

How to configure the Memory Card of FM456-4:

M7-SYS

- call SIMATIC Manager
- open the current project
- select the M7 program of the FM456-4
- PLC → Manage M7 target system ...
- select the medium ”Memory Card”
- select the ”Install OS” tab
- select → install ”M7 RMOS32”(confirm all prompts)
  ⇒ the Memory Card is formatted, M7-SYS will be installed.

Blocks

- PLC → Manage M7 target system ...
- select the medium ”Memory Card”
- select the ”Programs” tab
- select → install ”Blocks” (when prompted to write batch files to \etc\inittab, confirm with ”Yes”)
  ⇒ the HW configuration, configured connections and configuration DBs are now copied.

System SW

Since the system software is not visible in SIMATIC Manager when the optional package M7-ProC/C++ has not been installed, the system SW and all its components must be copied to Memory Card, using Windows Explorer:

- select the catalog \Siemens\Step7\S7libs\Pcs7_tm\hrs\P0000002\
- copy the file TM_EA_S7.EXE to mc:\romdir
- create a new catalog mc:\S7auto on Memory Card
- copy the file TM_EA_S7.BAT to mc:\S7auto
- copy the file BGRLISTE.TYP to mc:\romdir
- edit the file mc:\etc\inittab:
  At the end of the file in block ”Init 2 - not synchronized user ...”
  enter the line:

```
2 \s7auto\tm_ea_s7.bat
```

4.3 Example of how to use the block editor to configure I/O

The sample below shows the basic steps for configuration.
The entries are verified on startup of the FM456-4.
Possible inconsistencies are displayed and stored in the diagnostics buffer of FM456-4.
To configure TELEPERM I/O modules, open SIMATIC-Manager, then open the DB 1 you have generated during installation per double-click in the block container of FM456-4. Next, select ”Data view” from the ”View” menu. This opens, for example, the following view:

Table 4-1

Address	Name	Type	Start value	Actual value	Comment
0 . 0	BGNR000.BG_Typ	STRING [16]	’ ’	’6DS1601-8BA’	Module type (6DS1...)
18 . 0	BGNR000.Zyklus	INT	0	8	TPM478 processing cycle
20 . 0	BGNR001.BG_Typ	STRING [16]	’ ’	’6DS1603-8RR’	Module type (6DS1...)
38 . 0	BGNR001.Zyklus	INT	0	8	TPM478 processing cycle
40 . 0	BGNR002.BG_Typ	STRING [16]	’ ’	’6DS1701-8AA’	Module type (6DS1...)
58 . 0	BGNR002.Zyklus	INT	0	8	TPM478 processing cycle
60 . 0	BGNR003.BG_Typ	STRING [16]	’ ’	’6DS1702-8RR’	Module type (6DS1...)
78 . 0	BGNR003.Zyklus	INT	0	8	TPM478 processing cycle
80 . 0	BGNR004.BG_Typ	STRING [16]	’ ’	’6DS1607-8AB’	Module type (6DS1...)
98 . 0	BGNR004.Zyklus	INT	0	8	TPM478 processing cycle
100 . 0	BGNR005.BG_Typ	STRING [16]	’ ’	’6DS1401-8CA’	Module type (6DS1...)
118 . 0	BGNR005.Zyklus	INT	0	8	TPM478 processing cycle
120 . 0	BGNR006.BG_Typ	STRING [16]	’ ’	’6DS1603-8RR’	Module type (6DS1...)
138 . 0	BGNR006.Zyklus	INT	0	8	TPM478 processing cycle
140 . 0	BGNR007.BG_Typ	STRING [16]	’ ’	’ ’	Module type (6DS1...)
158 . 0	BGNR007.Zyklus	INT	0	8	TPM478 processing cycle
:	:	:	:	:	:
:	:	:	:	:	:
:	:	:	:	:	:
1238 . 0	BGNR061.Zyklus	INT	0	0	TPM478 processing cycle
1240 . 0	BGNR100.BG_Typ	STRING [16]	’ ’	’6DS1603-8RR’	Module type (6DS1...)
1258 . 0	BGNR100.Zyklus	INT	0	8	TPM478 processing cycle
1260 . 0	BGNR101.BG_Typ	STRING [16]	’ ’	’6DS1605-8BA	Module type (6DS1...)
1278 . 0	BGNR101.Zyklus	INT	0	8	TPM478 processing cycle
:	:	:	:	:	:
:	:	:	:	:	:
:	:	:	:	:	:
1558 . 0	BGNR113.Zyklus	INT	0	0	TPM478 processing cycle
1520 . 0	BGNR114.BG_Typ	STRING [16]	’ ’	’6DS1310-8AA’	Module type (6DS1...)
1538 . 0	BGNR114.Zyklus	INT	0	8	TPM478 processing cycle
1540 . 0	BGNR115.BG_Typ	STRING [16]	’ ’	’ ’	Module type (6DS1...)
:	:	:	:	:	:
:	:	:	:	:	:
:	:	:	:	:	:

In the “Name“ column you can see the slot number of the module to be configured. In the actual value column, enter the corresponding MLFB in the ”Module type” row and specify the processing cycle in the ”TPM478-processing cycle” row. See Table 4-3 in >Chapter. 4.7.

Caution

You can configure only one interrupt acquisition module 6DS1601-8AC or ...-8BA with BGNR061. Although other module types a re not rejected, they do not function on BGNR061.

This processing cycle configures process image updates on TPM 478. The following cycles can be set:

TPM478 processing cycle =	2	10 ms
	4	50 ms
	8	100 ms
	16	500 ms
	32	1 s
	64	Free cycle (= residual time

Set .Zyklus = 1 for the interrupt generating module “SF61”. For additional periodical monitoring of this module (e.g. for S 305), you must select the above Zyklus+1 for the module. Then, it makes sense to enter .Zyklus = 33 for interrupt + monitoring cycle 1 sec. If the module is also to be read in the PLC cycle, ensure that interrupt triggering on this module is enabled at both edges - positive and negatice (bridge socket X3 with 6DS1601-8BA).

Furthermore, configure the following FM456-4 parameters in SIMATIC-Manager → HW Config:

- Properties FM456-4 → Basic parameters:
  Interrupt Selection: Default is ”none”. Set it to ”Process” in order to enable throughput of the process interrupt from the interrupt triggering module.
- Properties FM456-4 → Addresses:
  The parameters process image (OB PI) and in/output addresses (512) within this mask must not be changed.

The reaction to the process interrupt has to be programmed by the user in the OB selected within the addresses mask (e.g. OB40).
The 48 bits read from the group interrupt module by the system, are written to the FM456-4 process image, and can be read from PIW 512 to PIW 516 by the user application.

It normally makes sense, and for some modules it is also mandatory (see Table 4-3 in Chapter 4.7), to select a process image update cycle time which is smaller than the time configured for the driver block on PLC processing level (e. g. approx. by half). To limit load on the TPM 478, however, you should not use faster cycles than actually required, and you should remove modules not required anymore. With an improper configuration of TPM 478 (overload), take into account that faster cycles are processed with higher priority than slower ones.

If you specifically assign all modules to the 100-ms cycle, cycle conflict is switched off, but the respective cycle might be overloaded in this operation. When you choose such an ”Overload configuration” (e.g. to obtain swift and conflict-free processing as far as possible), you must nevertheless take into account that the processing time for this cycle is increased accordingly.

4.4 Extended module configuration

In addition to transparent SIMATIC interface modules (see Table 4-3 in Chapter 4.7), you must also configure the subordinate I/O modules. Do so by opening DB2 in the block container of FM456-4, using the block editor. After you select ”Data view” iin the ”View” menu, you can see the following figure, for example:

Table 4-2

Address	Name	Type	Start value	Actual value	Comment
0 . 0	NR0001.BGNR	INT	-1	114	Module no. of the TM module
2 . 0	NR0001.Kanal	INT	0	8	Channel number (Offset)
4 . 0	NR0001.S5_Typ	STRING [4]	’ ’	’DE2’	S5 Module type
10 . 0	NR0002.BGNR	INT	-1	114	Module no. of the TM module
12 . 0	NR0002.Kanal	INT	0	0	Channel number (Offset)
14 . 0	NR0002.S5_Typ	STRING [4]	’ ’	’DA1’	S5 Module type
20 . 0	NR0003.BGNR	INT	-1	114	Module no. of the TM module
22 . 0	NR0003.Kanal	INT	0	1	Channel number (Offset)
24 . 0	NR0003.S5_Typ	STRING [4]	’ ’	’DA1’	S5 Module type
30 . 0	NR0004.BGNR	INT	-1	114	Module no. of the TM module
32 . 0	NR0004.Kanal	INT	0	2	Channel number (Offset)
34 . 0	NR0004.S5_Typ	STRING [4]	’ ’	’DA1’	S5 Module type
40 . 0	NR0005.BGNR	INT	-1	114	Module no. of the TM module
42 . 0	NR0005.Kanal	INT	0	3	Channel number (Offset)
44 . 0	NR0005.S5_Typ	STRING [4]	’ ’	’DA1’	S5 Module type
50 . 0	NR0006.BGNR	INT	-1	-1	Module no. of the TM module
52 . 0	NR0006.Kanal	INT	0	0	Channel number (Offset)
54 . 0	NR0006.S5_Typ	STRING [4]	’ ’	’ ’	S5 Module type
60 . 0	:	:	:	:	:
62 . 0	:	:	:	:	:
64 . 0	:	:	:	:	:

The ”Name” column shows you the consecutive number of the configured S5 module.
Select the ”Actual value” column. Enter the slot number of the TELEPERM module configured in DB1 in the ”Module no. of the TM module” (refer to Table 4-1 in Chapter 4.3) row.
In the ”Channel number” row, enter the byte address. Configure the S5 module ID in the ”S5 module type” row.

Configuring input modules

Channel number NR0xxx.Kanal	This entry specifies the byte address for the input area of the S5 module.
S5-Module type NR0xxx.S5_Typ='xy'	Specifies the S5 module ID. . The entry x and y can be defined with the following values:
x = DI	Digital input modules
x = AI	Analog value input module
y = 1 ... 16	Entry for 1 to 16 byte for digital input or 1 to 16 channels for analog input (corresponds with 2 to 32 bytes)

Configuring output modules

NR0xxx.Kanal	This entry specifies the byte address for the output area of the S5 module.
NR0xxx.S5_Typ='xy'	Specifies the S5 module ID. The entry x and y can be defined with the following values:
x = DQ	Digital output module
x = AQ	Analog value output module
y = 1 ... 16	Entry for 1 to 16 byte for digital output or 1 to 16 channels for analog output (corresponds with 2 to 32 bytes)

Deleting modules in extended configurations

To delete the TELEPERM M slot (that is, the connection module), you must delete the entry of the TM module in DB1 of FM456-4 and possible entries of subordinate S5 modules in DB2 of FM456-4.

4.5 Special features for the configuration of transparent connection modules

Take these special features into account when you configure transparent SIMATIC connection modules (6DS1310, 6DS1321 and 6DS1327):

- Modules 6DS1321-8AA and 6DS1327-8AA programmed directly with this MLFB use respectively 8 or 16 successive module numbers (MNO). Here you must configure a start MNO = n x 8 or n x 16 (or for the I/O bus these numbers + 100). The counting method in the manuals is here “n” = 0, 1, 2, ... 7 or 15 = module number of the connection groups.
- Further TELEPERM modules entries in this used area of 8 or 16 module numbers are permitted. However, they do not have any effect, that is, these modules will not be addressed.
- When you configure BGNR = 32 for a connection module, for example, enter a byte address Nrxxxx.Kanal = 3 x 64 = 192 to reach the start of BGNR = 35, and with = 194 you reach a module with the byte address channel = 2 within BGNR = 35.
  Caution: ”Nrxxxx.Kanal” is always a byte address (applies to analog modules as well).
- Not allowed are start BGNR 56 and 156 for 6DS1321-8AA and 48 und 148 for 6DS1327-8AA, because otherwise the prohibited areas (BGNR = 61 ff or 161 ff) would be covered. In this case you must use the substitute configuration to configure the required MNOs explicitly, that is, for *every* MNO used by the connection module you must configure one separate 6DS1310-8AA.
- A granular MON mix of TELEPERM and SIMATIC modules with 6DS1327-8AA also requires a substitute configuration.
  Such overlaps are currently not possible with 6DS1321-8AA, they must be cleared.
- With 6DS1321-8AA, coding switch 6 must be set to OFF (EANK active), otherwise the process control message S 313 is output.
- Special care must be exercised when entering data, since the configuration tool does not safely prevent an overlap of process images with the modules mentioned above, or only shows the assignment without output of an explicit error message; for example, the author must take the limitation of channels (maximum = 63) into account when he creates his configuration with 6DS1310.
  - With confguration errors, e.g. if a driver block accesses a subordinate I/O module which has not been configured and is therefore not existing because of a wrong configured channel number, possibly no acknowledgement error S305 will be signaled.
  - In principle the corresponding module width has to be configured for each S5 module with S5_Typ as far as possible. Especially combining several modules has to be avoided.
    Example: 2 byte binary input S5_Typ = DE2;
    4 byte binary output S5_Typ = DA4;

4.5.1 Configuration Notes for the Coupling Modules 6DS1333, 6DS1318

Among the module operating manuals and the driver documentation for TM_S5KS/TM_S5KE, the notes described below are relevant for confi-guring the coupling modules.

A migration from AS230 / AS235 / AS488/TM to PCS 7/TM-EA is possible, if the links within the system configuration and its structure meets the following standard configuration:

Standard configuration, quantified project scope:

– Settings relating to the number of coupling modules:

Number of coupling mod.	Number of transm. channels / mod	Number receive channels / mod.	TM_S5KS/ S5KE driver cycles	DB1cycle
2	2	1	1 s	16 (500 ms)
4	2	0	1 s	16 (500 ms)
4	2	1	2 s	32 (1 s)

– Up to 6 TM_S5KS driver per channel KNR can send to a single module. The partner device transmits no more than 12 telegrams per TM_S5KE cycle.

– With acyclic stress by process alarms, and by transmission times of I/O modules behind coupling modules 6DS1322-8AA, the number of coupling modules which can be used in the same cycle, may be reduced (recommendation: slot for the coupling module immediately in the migration rack).

If a system departs from this standard scope (e.g. a larger number of coupling modules or more driver blocks), such couplings often can be replaceble nevertheless. But sometimes changing the configuration may be necessary (e.g. parameter adjustment, extension of TM_S5KE cycle).

Common settings:

– All TM_S5KS of a module have to be installed in the same cycle.

– The DB1 cycle for these coupling modules has always to be set faster than the assigned TM_S5KE block.

Operating mode, settings for 6DS1333-8AB:

– The 6DS1333-8AB interface module works with high priority, on the partner side 'low priority' has to be set; 1 stop bit, even parity, same baudrate. ED telegrams can be initiated only by the AS.

– For reading data from a partner device (with FETCH), and for monitoring a TM_S5KE has to be configured in the AS coupled with SIMATIC S5/S7. Only one TM_S5KE is used for each module, which has been installed in the cycle list only once.

- Protocol 3964(R) and RK512 procedure.
  The RK512 procedure is essential required. The 3964 or 3964R protocol is open selectable. The X5/11-12 jumper has to be set like configured on the partner side [optional parameter for (R)].
  S7 protocol parameter = 'Standard settings'.
  When coupling to SIMATIC S7, the setting 'RK512' includes the '3964' protocol. Using 3964R is recommended because of the improved communication in disturbed environment.
- Coupling to SIMATIC S7: On 6DS1333-8AB the X5/13-14 jumper has to be set for disabling the function 'check telegram'. This is also necessary for other devices without check function.
- Coupling to SIMATIC S7-300: If the X5/13-14 jumper has been installed, the 6DS1333-8AB sends the data type DAAR=n (TM_S5KS block) for the coordination flag within the telegram array. The P_RCV_RK S7 block then sets the flag with this number (e.g. M 0.1 for DAAR=1) after each receiving. The next telegram can be received only, after the S7 software has reset this flag. This enabling has to be done quickly.

Operating mode, settings for 6DS1318-8AB:

- The 6DS1318-8AB module has to be treated in the same manner as the 6DS1333-8AB.

4.6 Configuring the connection modules 6DS1310-8AA/-8AB

With 6DS1310, a separate module number must be configured for every input/output, that is, one MNO is configured only for input modules, the other only for output modules.

For subordinate S5 modules on a 6DS1310 you should only configure DB2 for word access with DI2 or DQ2, in order to insure that all accesses to module 1310 end at an odd address. This means that either one or two modules are recognized per access. Every configured access (DI2, DQ2) must start with an even address number, irrespective of the module assembly.
In this case, overlap of I/O addresses is permitted.

Possibly existing cycle cells must be disabled, that is, jumper J7/5-12 must be removed from the module and the TM_A110 drivers must be assigned the parameter BQ2 ≠ 3.

All running interfaces configured otherwise do not have to be changed. Existing configurations can be migrated without changes.

Caution

The preferred configuration above (word operation) may not be operated on S5 peripherals of 6DS1321 and 6DS1327 modules (this also applies to the so-called substitute configuration of a ‘6DS1310’ for a 6DS1321 or 6DS1327)!
In this case the configuration rules as mentioned earlier in the chapter apply.

4.7 Substitute configuration for 6DS1504-8AA / 6DS1505-8AA

4.7.1 Rules for PCS7/TM

The signals ”Enable Manual” (EM) and ”Enable Automatic” (EA) only exist once in 6DS1504-8AA and 6DS1505-8AA. It is therefore required to switch over in the **same** way in **all** drivers defined for a module. Otherwise, the function is not ensured. In any case, full SW control can only be reached if the status is not established by hardware forcing of the ”Enable Manual” signal (connector X2) (refer to the operating instructions on the 6DS1504-8AA or 6DS1505-8AA module).

4.7.2 Substitute configuration for PCS7/TM

For PCS7/TM the result is the following configuration of 6DS1504-8AA / 6DS1505-8AA :

Configuration rules

DB1

MNO=21;	Example of MNO
BG_Typ=6DS1310-8AA;	Substitute configuration-always enter 1310-8AA!
.Cycle=....;	The cycle must always be faster than the fastest cycle of the EG driver blocks assigned to this module.

DB2

.Kanal=8
.S5_Typ=DE2

Kanal=0;	Only enter if operating EG driver type 0, 1 or 2 with CNO=0.
.S5_Typ=DA1;	Only enter if operating EG driver type 0, 1 or 2 with CNO=0..
.Kanal=1;	Only enter if operating EG driver type 0, 1/KNR=1 or type 2/KNR=0.
.S5_Typ=DA1;	Only enter if operating EG driver type 0, 1/KNR=1 or type 2/KNR=0.
Kanal=2;	Only enter if operating EG driver type 0, 1 or 2 with CNO=2.
.S5_Typ=DA1;	Only enter if operating EG driver type 0, 1 or 2 with CNO=2.
.Kanal=3;	Only enter if operating EG driver type 0, 1/KNR=3 or type 2/CNO=2.
.S5_Typ=DA1;	Only enter if operating EG driver type 0, 1/KNR=3 or type 2/CNO=2.

The remaining entries are only for 6DS1505-8AA:

.Kanal=4;	Only enter if operating EG driver type 0, 1 or 2 with CNO=4.

.S5_Typ=DA1;	Only enter if operating EG driver type 0, 1 or 2 with CNO=4.
.Kanal=5;	Only enter if operating EG driver type 0, 1/KNR=5 or type 2/KNR=4.
.S5_Typ=DA1;	Only enter if operating EG driver type 0, 1/CNO=5 or type 2/CNO=4.
Kanal=6;	Only enter if operating EG driver type 0, 1 or 2 with CNO=6.
.S5_Typ=DA1;	Only enter if operating EG driver type 0, 1 or 2 with CNO=6.
.Kanal=7;	Only enter if operating EG driver type 0, 1/KNR=7 or type 2/CNO=6.
.S5_Typ=DA1;	Only enter if operating EG driver type 0, 1/KNR=7 or type 2/CNO=6.

The configuration must be adapted every time a driver is installed or uninstalled. However, alternatively it is possible to initially configure all channels and drivers and next link the unused drivers to a source in order to switch over their manual/auto mode in synchronism to the other drivers.
Also, all TM_EG blocks assigned to one module must follow each other immediately in the same block. They must be switch on or off all at once.

4.8 Table of TELEPERM M modules for input at "Module type"

Table 4-3

Input text for module type (i.a. = MLFB no.)	Module function	Comment
6DS1310-8AA	Interface module AG110, serial	1)
6DS1310-8AB	Interface module AG110, serial	1)
6DS1318-8AB	S5 interface, EG, serial	4) 5)
6DS1321-8AA	Interface FBG S5-EG, parallel	1) 2)
6DS1322-8AA	Interface for ES100K	
6DS1327-8AA	Interface to S5 E/A, ET100	1) 2)
6DS1333-8AB	Interface module S5 ZG, serial	4) 5)
6DS1400-8AA	S-controller 1K	5)
6DS1400-8BA	S-controller 1K	5)
6DS1401-8AA	K-controller 1K	5)
6DS1401-8BA	K-controller 1K	5)
6DS1402-8AA	S-controller 2K	5)
6DS1402-8BA	S-controller 2K	5)
6DS1403-8AA	K-controller 2K	5)
6DS1403-8BA	K-controller 2K	5)
6DS1403-8CA	K-controller 2K	5)
6DS1403-8CB	K-controller 2K	5)
6DS1500-8AA	Control module Motor 1K	5)
6DS1500-8BA	Control module Motor 1K	5)
6DS1501-8AA	Control module ESG 1K	5)
6DS1501-8AB	Control module ESG 1K	5)
6DS1501-8BA	Control module ESG 1K	5)
6DS1501-8BB	Control module ESG 1K	5)
6DS1502-8AA	Control module Motor 3K	5)
6DS1502-8BA	Control module Motor 3K	5)
6DS1503-8AA	Control module ESG 3K	5)
6DS1503-8BA	Control module ESG 3K	5)
6DS1504-8AA	Control module Valve 4K	5) 6)
6DS1505-8AA	Control module Valve 8K	5) 6)
6DS1600-8AA	Binary input 16 NO contact	
6DS1601-8AA	Binary input 48	
6DS1601-8AC	Binary input 48 + INT (version $\geq$ 4)	
6DS1601-8BA	Binary input 48 + INT (version $\geq$ 2)	
6DS1602-8AA	Binary input 32	
6DS1602-8BA	Binary input 32	
6DS1603-8AA	Binary output 32 (100 mA)	
6DS1603-8AB	Binary input 32 (100 mA)	
6DS1603-8BA	Binary output 32 (100 mA)	
6DS1603-8RR	Binary output 32 (100 mA)	
6DS1604-8AA	Binary output 16 (400 mA)	
6DS1605-8AA	Binary output 16 Relays	

6DS1605-8BA	Binary output 16 Relays	
6DS1607-8AB	Count pulse input 8 PT	5)
6DS1613-8AB-2	Dosing meter 2-channel operation	3) 5)
6DS1613-8AB-4	Dosing meter 4-channel operation	3) 5)
6DS1613-8BB-2	Dosing meter 2-channel operation	3) 5)
6DS1613-8BB-4	Dosing meter 4-channel operation	3) 5)
6DS1615-8AA	Binary input 48 24 V/48 V (INT); (version ≥ 4)	
6DS1620-8AA	Binary input 8 NO contacts	
6DS1621-8AA	Binary input 8 BERO	
6DS1700-8AA	Analog input 8 SV T	
6DS1700-8AB	Analog input 8 SV T	
6DS1700-8BA	Analog input 8 SV T	
6DS1701-8AA	Analog input 8 HART	
6DS1701-8AB	Analog input 8 HART	
6DS1702-8AA	Analog output 4 PT	
6DS1702-8RR	Analog output 4 PT	
6DS1703-8AB	Measurement point expansion for ”1731”	
6DS1703-8RR	Measurement point expansion for ”1731”	
6DS1713-8AB	Analog input 4	
6DS1717-8AA	Binary calculator module, can be structured	4) 5)
6DS1717-8RR	Binary calculator module, can be structured	4) 5)
6DS1719-8AA	Expansion to ”1717”	
6DS1719-8RR	Expansion to ”1717”	
6DS1720-8AA	Expansion to ”1717”	
6DS1730-8AA	Analog input 8	
6DS1731-8AA	Analog input 4	
6DS1731-8BA	Analog input 4 Thermo	
6DS1731-8EA	Analog input 4 Thermo	
6DS1731-8FA	Analog input 4 Thermo	
6DS1731-8RR	Analog input 4 Thermo	

1) Transparent SIMATIC communication module - extended configuration.
2) These modules can also be configured in windows, by entering a “6DS1310-8AA” for every MNO (”Replacement configuration). In this way you can cover the complete address area (512 or 1024 channels).
3) The text to be entered differs from MLFB (“6DS1613-8BB”).
4) TPM 478 processing time is higher than that of the driver (with 1717= 10/ 18 ms without/with analog values; with 1318/1333 even higher, depending on the load). Therefore, use a slow cycle (e.g. 1 s). Alternative: ”Overload configuration” (refer to the section on processing cycles).
5) With these modules it is imperative that the processing cycle configured in DB 1 is faster than the PLC cycle of the corresponding driver blocks.
6) In most cases the substitute configuration described in Chapter 4.7 must be used for these modules.

The table applies to PCS7/TM as of V1.00. Other modules compatible to the ones mentioned above can be configured by entering the corresponding text from the table.

4.9 FM456-4 configuration

4.9.1 Display elements of FM456-4

Table 4-4

LED's				
RUN	**STOP**	**USR1**	**USR2**	**Meaning**
off	on	x	x	FM456 has stopped (flashing SD LED: Boot sequence)
2 Hz	off	x	x	Restart / Startup
on	off	x	x	FM has booted and system SW is running
on	off	2 Hz	x	Startup sequence has started
on	off	2 Hz	2 Hz	TPM478-2 not found or disrupted
on	off	0.5 Hz	x	TPM478 is initialized, configuration DBs are interpreted
on	off	0.5 Hz	2 Hz	Could not find or load module list BGRLISTE.TYP TPM478-2: Startup error
on	off	off	0.5 Hz	Error in configuration DB1/2
on	off	off	2 Hz	Start of cyclic processing
on	off	off	off	Startup successful without error

4.9.2 Diagnostics

The precise cause of error can be read from the diagnostic buffer of FM456-4. It contains messages showing the event ID 16#A100 in the field ”Additional info 1” and an error number:

Table 4-5

Additio-nal info 1	Meaning of the error messages	Additional info 2	Additional info 3
16#A001	No TPM478 module found	-	-
16#A002	TPM478 reset error	-	-
16#A003	TPM478 startup error	-	-
16#A004	No file BGRLISTE.TYP found	-	-
16#A005	No memory for module list	-	-
16#A006	Module list write error	-	-
16#A011	8 ms task configuration error	-	-
16#A012	8 ms task startup error	-	
16#A013	Basic task commissioning error	-	-
16#A014	Basic task startup error	-	-
16#A015	Connection task commissioning error	-	-
16#A016	Connection task startup error	-	-
16#A017	Error 1 connection task startup	-	-
16#A018	Error 2 connection task startup	-	-
16#A019	Error 3 connection task startup	-	-
16#A01A	Error 4 connection task startup	-	-
16#A01B	Connection initialization error	-	-
16#A01C	Interrupt generating error	-	-
16#A01D	Error on direct write access to I/O	-	-
16#A01E	Basic task startup error	-	-
16#A01F	Semaphore commissioning error	-	-
16#A021	Missing configuration DB1	-	-
16#A022	Configuration DB1 too short	-	-
16#A023	Missing DB for S5 submodules	Module no.	-
16#A024	Unknown module type	Module no.	-
16#A025	No access method	Module no.	-
16#A026	Module number in use by other module	Module no.	-
16#A027	Wrong I/O method	Module no.	Channel no.
16#A028	Wrong module type for S5 submodules	Module no.	Channel no.
16#A029	Wrong channel number for S5 submodules	Module no.	Channel no.

The additional info in the ”Additional info 2” or ”Additional info 3” fields describes the module no. or channel number at which the error was recognized (hexadecimal format).

4.9.3 Reaction of the Output Modules in STOP or HALT State

With transition from RUN state to STOP or HALT state of the CPU41x the values at the TELEPERM M output modules normally remain unchanged. This reaction can be changed by configuration.

For that the following pseudo module has to be defined within DB1 of the FM456-4:

Module type: **STOP:NULL_TO_OUT**

Cycle: n = 0 or 0 < n < 21, with:

n = 0 (default value): The last output values survive if the CPU goes to STOP or HALT.

0 < n < 21: If the CPU goes to STOP or HALT, the outputs are set to zero if a corres ponding setting has been done on the module. On this (n-1) * 250 msec will be waited between occurrence of the STOP/HALT state and the zero output.
If the CPU changes from the STOP/ HALT state to the RUN state during this waiting period, the last output state survives.

4.9.4 Diagnosis Function: Time Measurement at FM456-4

This function gives information about the FM456-4 load, and about the communication running times between CPU41x and FM456-4.
But the interpretation of this data can only be done by the TELEPERM M support.

With the following configuration of a pseudo module within the DB1 data block of the FM456-4 this diagnosis function can be switched on/off:

Module type: **DIAG_FM456*****

Cycle: n = 0 or n > 0, with:

n = 0 (default value): Diagnosis / time measurement deactivated on the FM456-4.

n > 0: Diagnosis / time measurement activated on the FM456-4.

4.9.5 Mutual Monitoring between CPU and TPM 478-2

With the following configuration of a pseudo module within the DB1 data block of the FM456-4 the mutual monitoring between CPU and TPM 478-2 can be switched on/off:

Module type: **TPM478:NO_WATCHD**

Cycle: n = 0 or n > 0, with:

n = 0 (default value): Monitoring is deactivated.

n > 0: Monitoring is activated.

Interface module TPM 478-2

5

What does this Chapter describe?

This chapter describes system-specific functions of the interface module TPM 478-2.

This description includes the following topics:

- Product overview
- Areas of application
- Structure
- Operating method
- Configuration
- I/O modules
- Ordering note

Contents

In these sections you find on the following pages:

5.1 Product overview

Contents

This chapter provides a brief overview of the interface module TPM 478-2.

What is a TPM 478-2?

TPM 478-2 is an interface module which is designed in M7-400 technology of the SIMATIC M7 product family. It is an expansion unit for the central module FM 456-4, for use with PCS7/TM PLCs.

The following functions are integrated in the TPM 478-2 interface module:

- TELEPERM M I/O functionality.

  A highly efficient processor controls the access functions to TELEPERM M I/O modules via a periodically updated process image.This process image fetches input process data and it writes them to the outputs of the hardware I/O.
  Process image data is transferred from the TPM 478-2 to the user program via driver blocks.

- two I/O bus interfaces for the TELEPERM M basic and expansion cabinet
- I/O bus logic supply with a +5 V bus.

Application options

The example below explains how you can use the interface module:

Connecting TELEPERM M I/O

The TPM 478-2 interface module connects existing TELEPERM M I/O hardware of the basic and expansion cabinet of an AS 220/230/235 system.
Here, the basic central unit is replaced by a preinstalled module rack - namely the migration rack - equipped with a PCS7/TM (supplemented by TPM 478-2 and FM456-4 components).
Data are exchanged with existing expansion units via I/O bus A and B of TPM 478-2 (connection via TPM 478-2 and migration rack. See Figure 5-1).

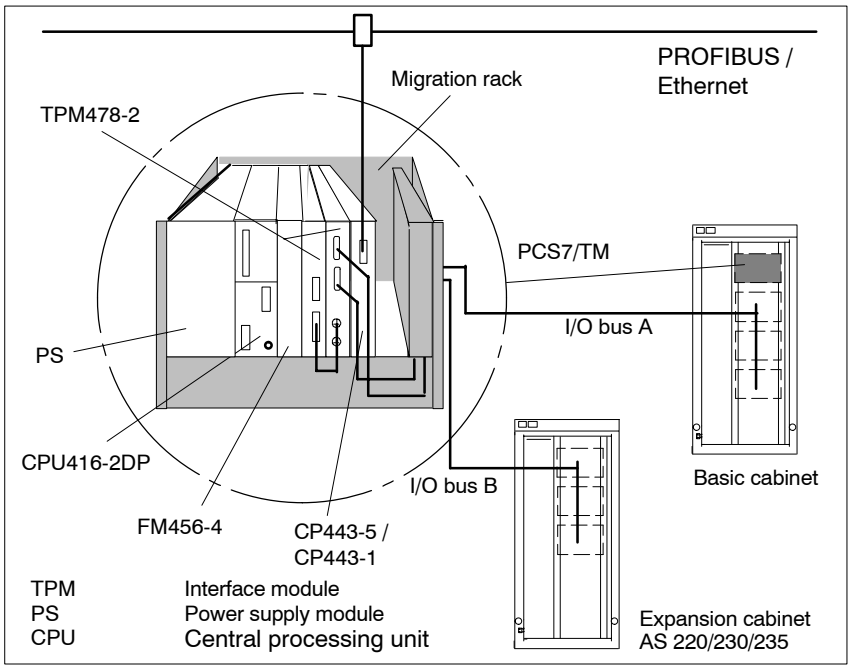

Figure 5-1 TPM 478-2 for the connection of TELEPERM M I/O modules

Elements of TPM 478-2

All connecting and display elements of the TPM 478-2 interface module are mounted on its front panel, see Figure 5-2.

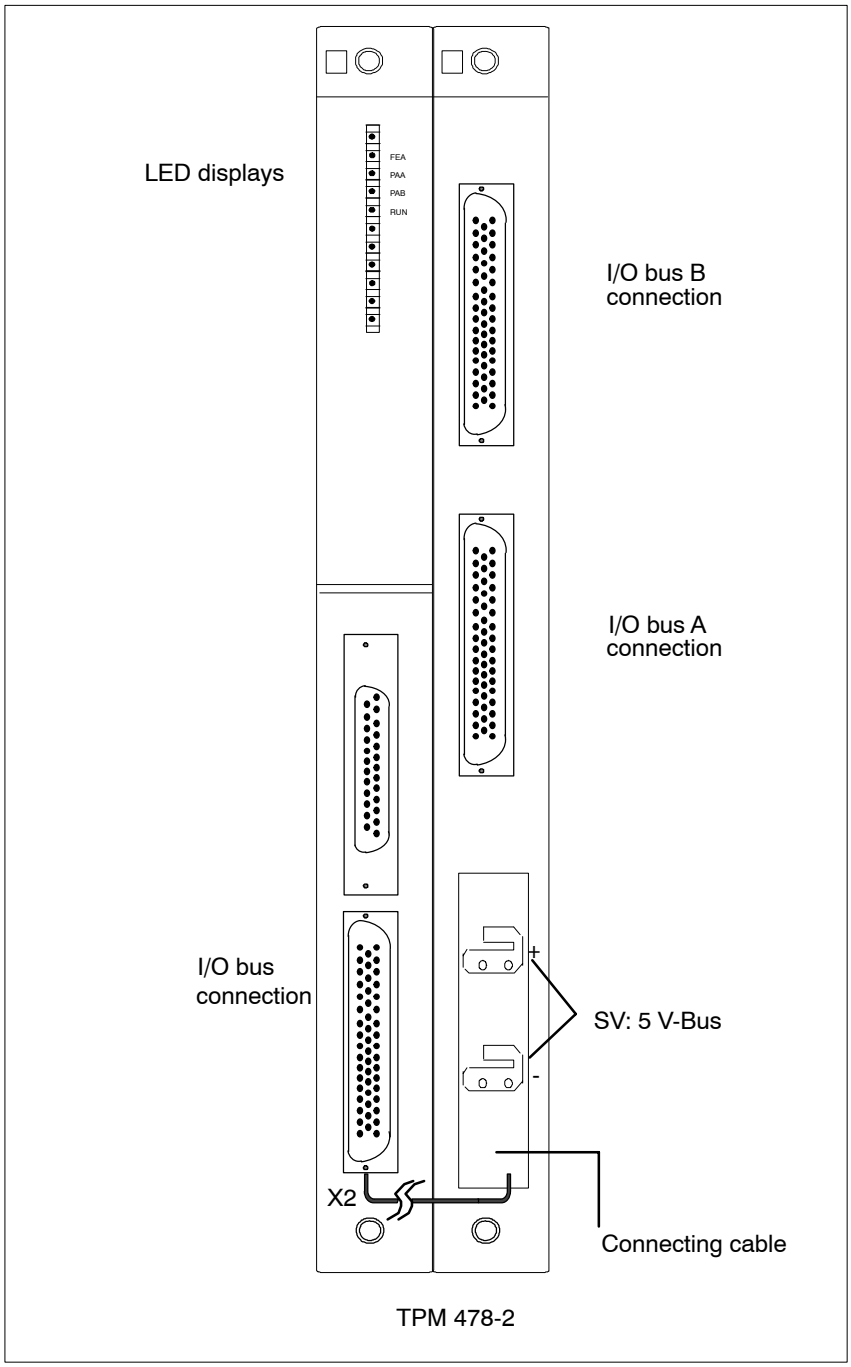

Figure 5-2 Arrangement of the connections and display modules of the TPM 478-2 interface module

Configuration, general

Various parameters are required to operata a TPM 478-2 module. For standard TELEPERM-M I/O, these parameters describe the current hardware configuration for the automation task.
I/O configuration parameters are declared in data blocks **DB1** and **DB2** of the FM456-4, using the data block editor. You can load modified project data to the System Memory Card with the help of SIMATIC Manager.
All updated project data are loaded on system restart.

Configuration of TPM 478

The TPM 478-2 parameters are automatically configured by the PLC software on system startup.

Note

Data blocks DB1 and DB2 are configured in the data block editor of SIMATIC Manager.
This software is included in the PCS7 system software package.

I/O bus topology

Note:
I/O bus A and B correspond with the two I/O bus systems of the basic/expansion cabinet or with those of a K-system for two lines with ES 100K.
Here, I/O bus B is physically branched off bus A via bus amplifier. Blocking disturbances as a result of an error on bus A therefore also affect bus B.

Functions of the interface modules

The TPM 478-2 interface module provides the following functions:

- Interfaces:
  - I/O bus interface to TELEPERM M I/O
- TPM 478-2 I/O functions compatible to the TELEPERM M bus interface
- future-oriented hardware and software on the basis of the SIMATIC M7 product family:
  - integrated design technology M7-400
  - integrated interface specification of the FM 456-4 (ISA bus/backplane bus)
  - SMD technology
- low power loss as a result of energy-saving technologies
- operation without fan cooling

Standards

The modules conform with following guidelines, amongst others:

- CE
- UL/CSA
- FM

5.2 Fields of application

Automation task

The brief overview below describes the solutions required of the TPM 478-2 module. The module is optional to the PCS7/TM PLC and offers the following solutions:

- Connection of TELEPERM M I/O hardware (via TPM 478-2 and migration rack).

TELEPERM M I/O process peripherals

To operate your PLC with TELEPERM M I/O, you require the TPM 478-2 module. The PLC and the TPM 478-2 are installed in a so-called migration rack.
TPM 478-2 delivers the process image of your configured I/O modules to the TELEPERM M I/O bus. The module is equipped with two I/O bus interfaces for interconnecting TELEPERM M basic/expansion cabinets, as well as with a +5 V bus.
The migration rack is designed for optimal arrangement of the module interfaces in the cabinet, according to TELEPERM M regulations. The rack directly replaces the previous PLC basic unit in the cabinet.
Special advantage is the complete mechanical preassembly for installation in the cabinet.

Caution

A PCS7/TM in the migration rack cannot be used to replace redundant AS 220H or AS 235H systems.
Compact systems AS 220K, AS 230K, AS 235K cannot be replaced by a PCS7/TM in their existing cubicles. In this case the assembly is carried out as in a migration from AS 220/230.
Details on the migration rack are found in the description /32/.

Properties of TPM 478-2

The TPM 478-2 interface module offers:

- an interface to the TELEPERM M I/O bus
- I/O functions compatible to the TELEPERM M I/O interface
- ISA bus interface of FM456-4
- Diagnostic display for TELEPERM M I/O modules
- process image controlling
- implementation of two TELEPERM M I/O busses A and B
- interface connection via bus connector to TELEPERM M I/O bus systems of the basic/expansion cabinet
- ”+5 V bus” interface for the supply of TELEPERM M expansion modules (cabinet connections)

- backplane bus interface for the supply of the +5 V bus from the PLC's power supply module
- future-oriented hardware and software basis with the SIMATIC M7 and S7 product family
  - integrated installation technology S7-400
  - integrated interface specifications of the ISA bus systems on the FM456-4 and backplane bus
  - modern SMD technology
- low power losses as a result of energy-saving technologies
- Conformity with the standards:
  - CE
  - UL/CSA
  - FM

5.3 Configuration

Configuration, general

The TPM 478-2 module represents an FM 456-4 interface module which provides options for connecting TELEPERM M I/O (see Figure 5-3).
TPM 478-2 is interconnected to FM 456-4 via ISA bus connector, mounted on the side of the module. PCS7/TM system software uses this ISA bus to exchange data with the TPM 478-2.
The two TELEPERM M I/O bus systems (A and B) are interconnected using the two connectors of the TPM 478-2; the power supply for the logic is connected separately (+5 V). The latter is connected to the backplane bus and supplied by the master power supply of the PCS7 system.

TPM 478-2 periodically transfers I/O values sent to and received from then I/O bus systems and controls them in a process image.

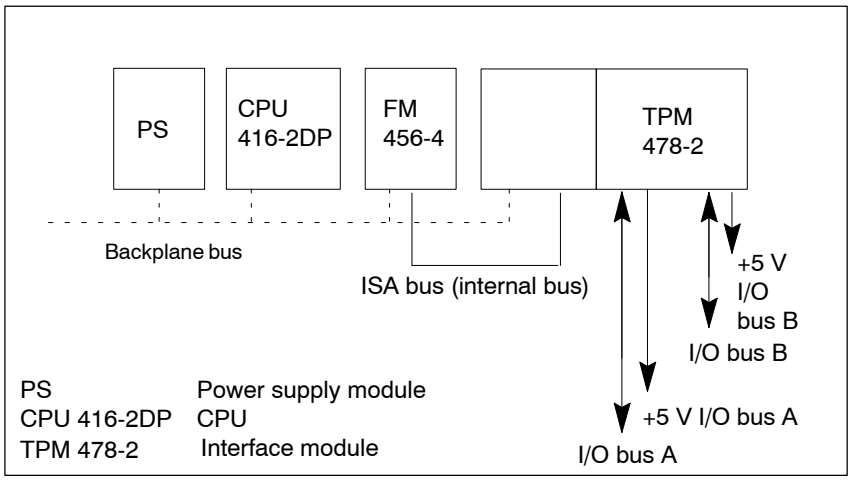

Figure 5-3 Configuration, general

5.3.1 Configuration of the PCS7/TM with TELEPERM M I/O

TPM 478-2 in PCS7/TM

Figure 5-4 below shows you the configuration of the TPM 478-2 interface module in the PCS7/TM:

Special measures are required when routing cables from the TPM 478-2 to I/O bus A and B. These measures are already taken care of in the design of the migration rack (see Figure 5-5). You can allocate all five I/O modules in migration rack II to I/O bus A, or you can distribute them on bus A and B (e.g three on I/O bus A and two on I/O bus B). In addition, you can interconnect up to three expansion units (EU) of the basic cabinet or four ES 100 K expansion systems to I/O bus A. To I/O bus B you can connect up to four expansion units of an expansion cabinet or up to four ES 100 K (all fully assembled). Mixed system configurations per I/O bus are permitted with up to 4 EU/ES 100 K (e.g. 3 EU + 1 ES 100 K).

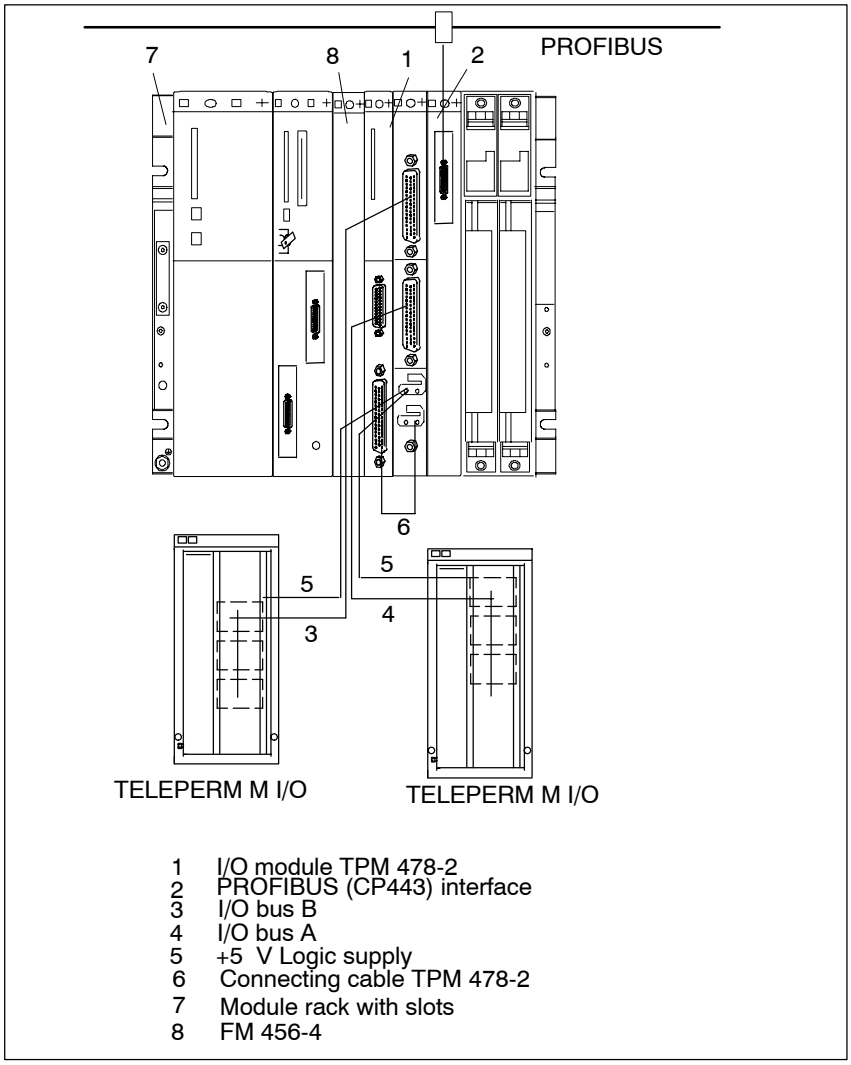

Figure 5-4 TPM 478-2 in PCS7/TM on PROFIBUS

Note

You install, wire and fuse the PCS7/TM by yourself. We provide the migration rack (refer to the section below) for easy installation and use of the modules. Details on PCS7/TM and migration racks, as well as connectable hardware I/O modules are found in descriptions /2/ and /4/.

Migration rack

The migration rack is a preassembled module rack equipped with an integrated SIMATIC S7/M7-400 backplane bus, and with dimensions according to the installation system ES 902 used in TELEPERM M cabinet systems. It holds the configuration described in Figure 5-5 and is equipped with ready-to-use cables and integrated fusing for L+ 24 V/16 A. I/O bus A and B can be connected at the rear of the migration rack with the help of the two ribbon cable connectors.
TPM 478-2 in the migration rack processes I/O bus A and B on which you can operate up to seven TELEPERM M expansion units EU (3 on A; 4 on B) or up to eight ES 100 K expansion systems (4 on A, 4 on B). Expansion units and ES 100 K systems can also be operated on both I/O bus systems in mixed mode, with max. 4 EU/ES per I/O bus).
Typical configurations are:

- 3 EU and 1 ES 100 K per I/O bus A and B
- at least 1 EE, and thus up to 3 ES 100 K on bus A and B
- 3 EUs of an AS 230-/AS 235 basic cabinet on bus A and 3 EU of an AS 230-/AS 235 expansion cabinet on bus B (se Figure 5-5).

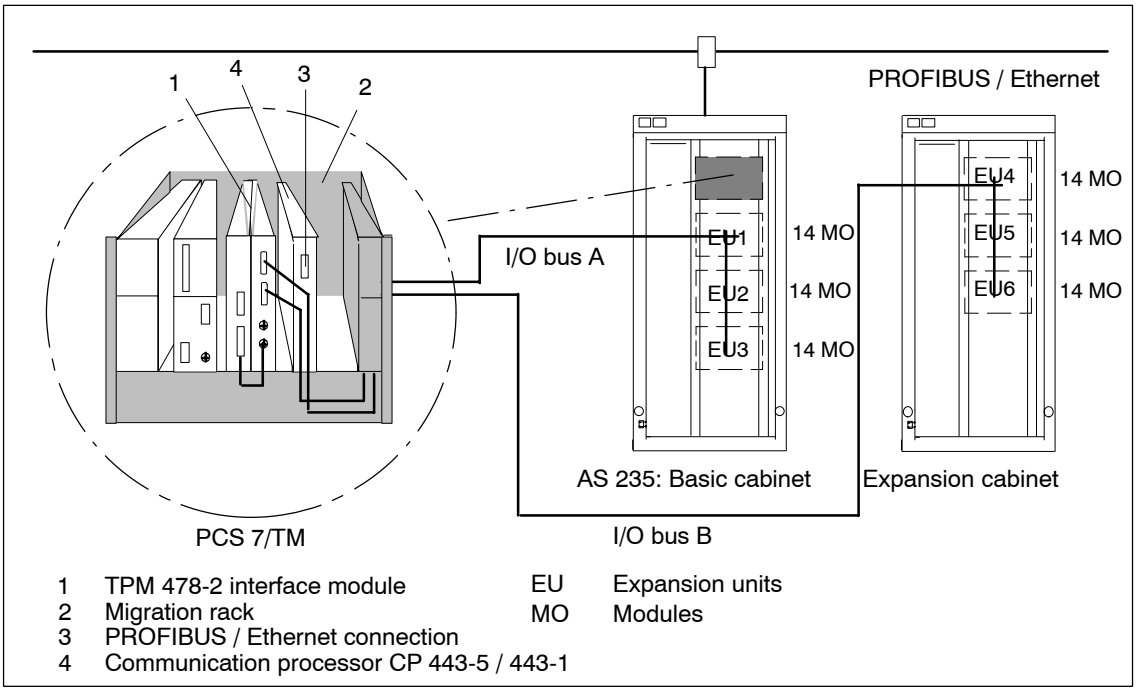

Figure 5-5 Migration rack

5.4 Operating method

Function, general

The task of a TPM 478-2 interface module is to integrate the functions of existing TELEPERM M I/O into a PCS7/TM.

Below we shall explain the general functions of the interface module.

Function of TPM 478-2

Figure 5-6 shows a reduced block diagram of the TPM 478-2 interface module function. The function blocks are explained below.

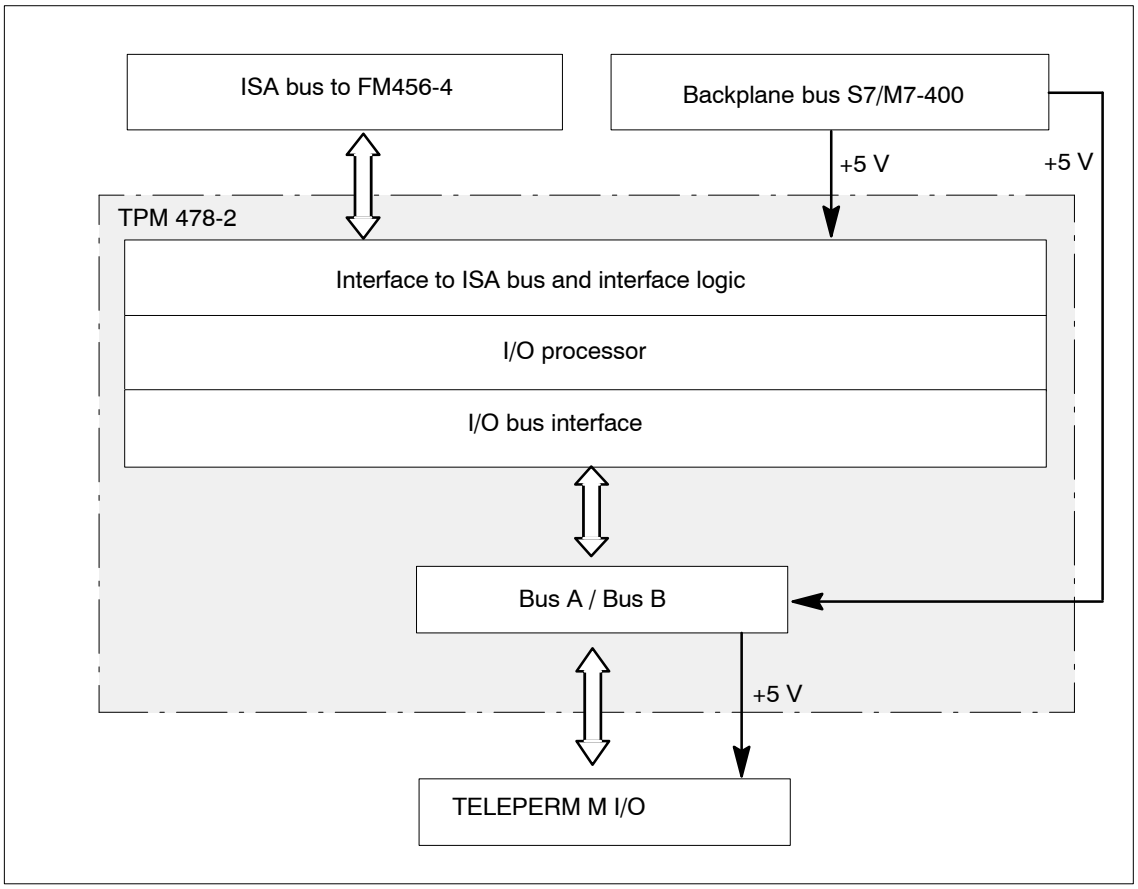

Figure 5-6 TPM 478-2 function

Interface to the ISA bus/backplane bus

The interface establishes the interconnection between the ISA bus and FM 456-4, independent of the backplane bus. It contains the interface for data transfer.
The interface logic controls access to the RAM address area of FM 456-4. This interface handles all data accesses as well as the TPM 478-2 parameters.

I/O processor

The KI/O processor consists of an 80C186 CPU, the I/O bus logic as well as RAM and FEPROM chips. It interconnects the ISA and I/O bus interfaces.

The TPM 478-2 interface module establishes the connection to the I/O bus system and controls the process image which is updated at every cycle. The module also splits the I/O bus system into I/O bus A and B.

Function of TPM 478-2

Figure 5-7 shows the functions of the interface module in a simplified form. The various function blocks are described at a later point.

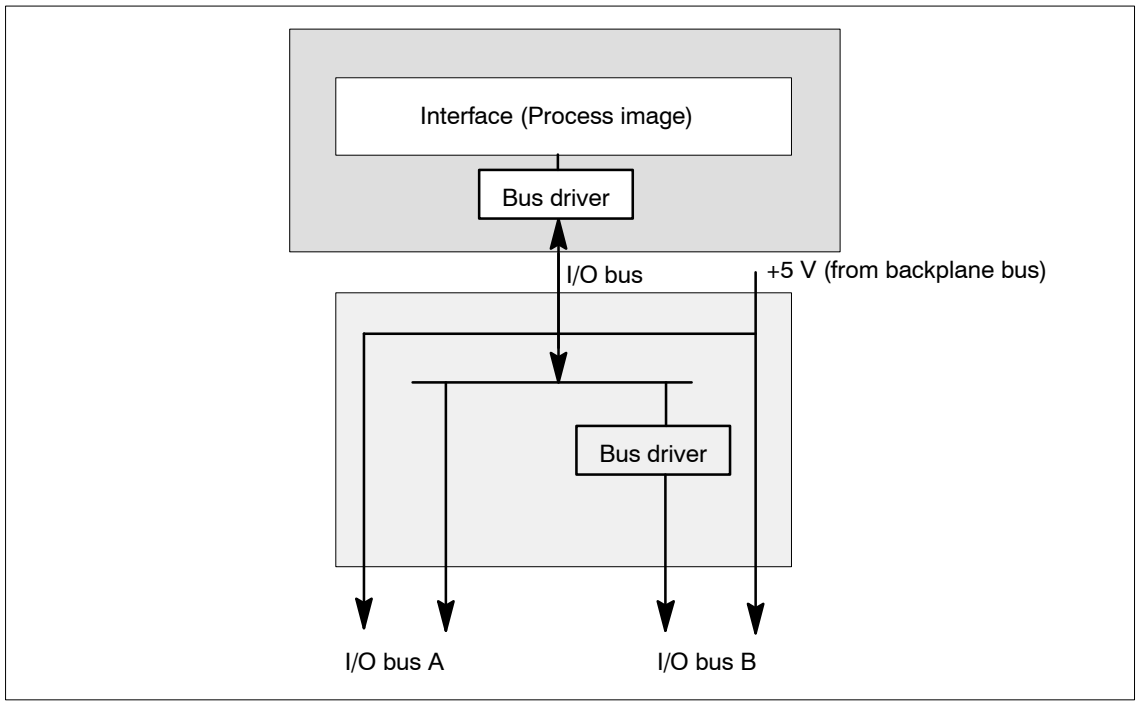

Figure 5-7 Function of TPM 478-2

Interface to the I/O bus

The I/O bus interface is located on the TPM 478-2. The TPM 478-2 interface module manages the process image and executes specific I/O instructions required for generating the process image for TELEPERM M I/O modules. These I/O instructions are decoupled and transferred to the I/O modules via I/O bus A and B.

Bus drivers

The bus driver amplifies the signal for I/O bus B.

Power supply to I/O bus A and B

The interface module draws a 5-V power supply from the system's backplane bus and distributes it at two points to the expansion units of the respective TELEPERM M I/O bus A and B.

Parameter assignment

TPM 478-2 is addressed and assigned its parameters automatically on system startup by the configuration parameters for TELEPERM I/O (in the PCS7/ TM).

Configuration parameters

Enter configuration parameters as follows:

Configuration parameters for	Tool
TELEPERM M I/O	Data block editor in SIMATIC-Manager

Normal mode

During operation SIMATIC Manager controls TPM 478-2 operations for the configuration of TELEPERM M I/O.

Operator actions are not required. The jobs are processed by TPM 478-2 periodically. Changes can be effected in SIMATIC Manager. See Figure 5-8.

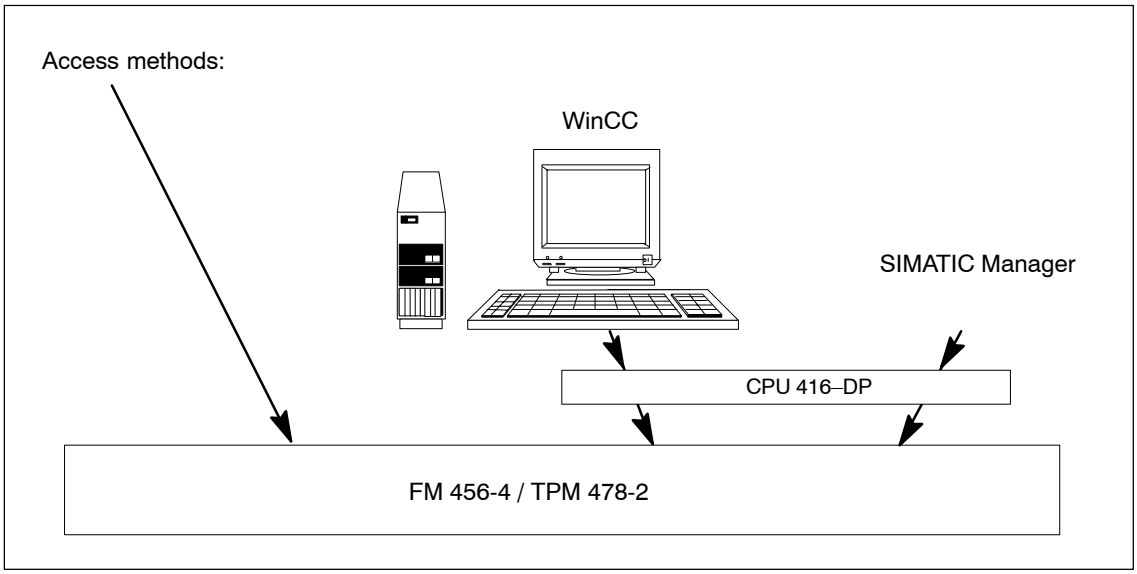

Figure 5-8 Access methods of TPM 478-2

5.4.1 Implementation of TELEPERM M I/O in PCS7/TM

Function of TPM 478-2

The TPM 478-2 interface module allows you to connect TELEPERM M I/O to a PCS7/TM.

The general function is shown in Figure 5-9.

Startup behavior of TELEPERM M I/O peripherals

The TPM478-2 module periodically generates a process image of its connected TELEPERM M I/O. Here, the configuration parameters are fetched from PCS7/TM system memory (System Memory Card) and then processed periodically by TPM 478-2.
You have declared these configuration parameters with the help of SIMATIC-Manager. For additional notes refer to Technical Data /2/. On successful startup the LED "RUN" on TPM 478-2 lights up.
If problems arise, refer to Table 5-1 and 5-2.

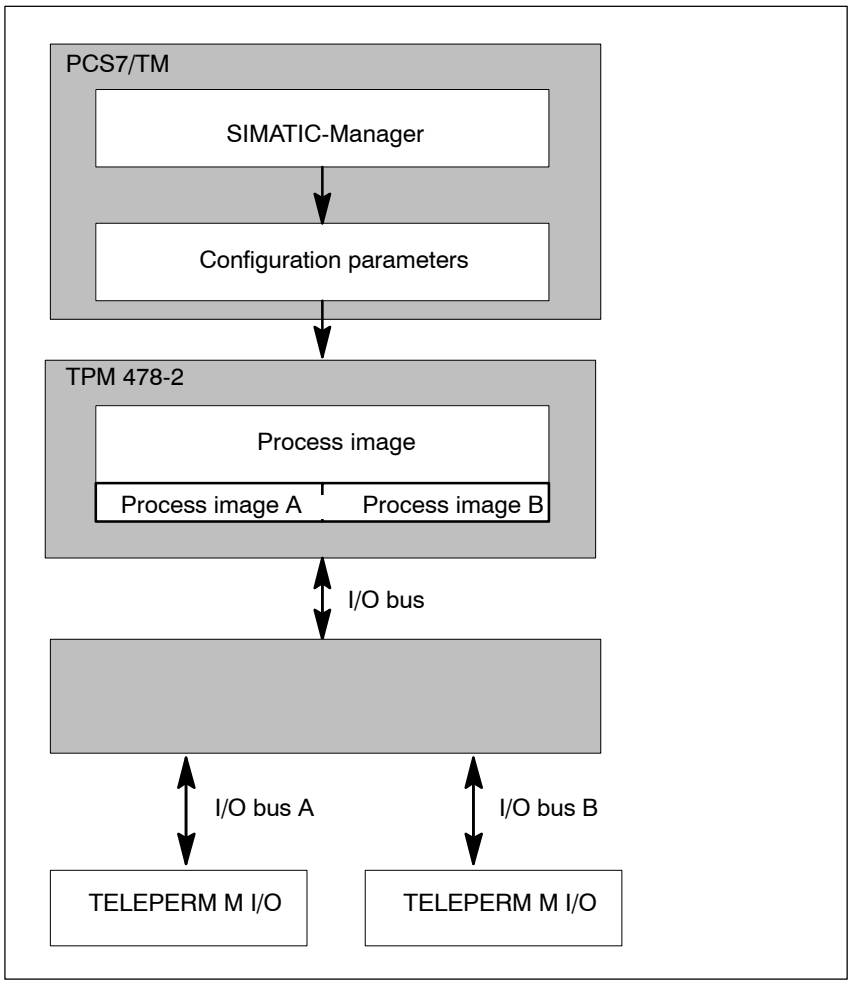

Figure 5-9 Startup behavior of TELEPERM M I/O

TPM 478-2: Diagnostics of I/O communication

At every startup of PCS7/TM, the TPM 478-2 software performs an initialization and self-test routine.
LEDs 6-10 on the TPM 478-2 front panel provide information on operation and startup behavior of I/O communication, thus enabling quick diagnostics if an error occurs. The I/O startup behavior of TPM 478-2 is shown in Table 4-1 (sequence from left to right).
The table shows only some of the important phases. Depending on the PLC software version and user structure, there are additional dark phases. In every situation only the RUN LED is lit after startup of the I/O bus system (cyclic operation).

Table 5-1

Meaning / Display	Coordination		Initialization/Self-test	I/O bus system startup		
EIO (red)	0	0	0	0	0	0
PQA (yellow)	0	x	x	0	x	0
PQB (yellow)	0	0	x	x	x	0
RUN (green)	0	0	0	0	x	x

0 ≙ LED is OFF
x ≙ LED is ON

Coordination

The fast coordination phase is hardly perceptible.

Initialization/ Selftest

After a successful init/self-test phase, TPM 478-2 performs the startup of the I/O bus system.
If an error is detected, TPM 478-2 interrupts startup and goes into STOP (red LED EIO is lit). TPM 478-2 is defective if it stays in STOP state even after several reset operations. When you return a defective module to the Electronics Plant in Karlsruhe (EWK), Germany, specify which error displays have occurred. See Table 5-2.

Table 5-2 Error displays on startup

Meaning / Display	Error in local RAM	DPRAM error	Address bus error	Program memory error	Watchdog error
EIO (red)	x	x	x	x	x
PQA (yellow)	x	0	x	0	x
PQB (yellow)	0	x	x	0	x
RUN (green)	0	0	0	0	x

0 ≙ LED is ON
x ≙ LED is OFF

Startup of the I/O bus system

The RUN LED indicates successful startup. The I/O bus system operates in cyclic mode, that is, the process image is updated periodically.

Meaning of status and error displays/ diagnostics: I/O communication

Table 5-3 describes the status and error displays relevant to I/O response. They are listed in the order of their arrangement on the TPM 478-2 interface module. TPM 478-2 is equipped with the following status and error displays:

Table 5-3 Status and error displays for cyclic operation

Display	Meaning	Description
EIO (red)	Reserve	
PQA (yellow)	Reserve	
PQB (yellow)	Reserve	
RUN (green)	active	cyclic mode, the process image is updated at every cycle

5.5 Configuration

As TPM 478-2 is configured by the PCS7/TM system, a special configuration of this module is not required.
TPM 478-2 is configured automatically at system startup.

The Object Manager (OM) included in the TPM 478-2 module package must be installed on the PCS7 system prior to initial commissioning.
Insert the installation disk in your floppy drive and run Setup. Follow the on-screen instructions. After installation, the module is available in HW Config in SIMATIC-Manager, under SIMATIC 400, M7 Extensions.

Further notes on configuration is found in the Technical Data: Basic Software for S7 and M7-STEP7 /231/, Order No. C79000-G7000-C502.

5.6 I/O modules

Table 5-4 lists all TELEPERM M I/O modules you can operate in a TELEPERM M expansion unit or in an ES 100 K expansion system on PCS7/TM.

Table 5-4 Available TELEPERM M I/O modules

Designation	MLFB	Compatible, approved versions
Controller modules		
S-controller, single-channel	6DS1400-8BA	...-8AA
K-controller, single-channel	6DS1401-8BA	...-8AA
S-controller, dual-channel	6DS1402-8BA	...-8AA
K-controller, dual-channel	6DS1403-8CA	...-8AA;...-8BA;...-8CB
Single control modules		
1 motor or 1 solenoid valve	6DS1500-8BA	...-8AA
1 positioning drive without RM	6DS1501-8BA	...-8AA
1 positioning drive with RM	6DS1501-8BB	...-8AB
Motors/solenoid valve, 3-channel	6DS1502-8BA	...-8AA
Positioning drives, 3-channel	6DS1503-8BA	...-8AA
4 control devices + 1 idle position	6DS1504-8AA	
8/4 control devices + 2 idle positions	6DS1505-8AA	
Calculator modules		
Binary calculator module	6DS1717-8AA	...-8RR
Binary expansion module	6DS1719-8AA	...-8RR
Analog expansion module	6DS1720-8AA	
Signal modules/BE		
16 BE	6DS1600-8AA	
48 BE	6DS1601-8BA	...-8AA;...-8AC
32 BE	6DS1602-8BA	...-8AA
48 BE, 24 VDC/48 VDC	6DS1615-8AA	
8 changeover contacts	6DS1620-8AA	
8 proximity switches	6DS1621-8AA	
Signal modules/BA		
32 BA	6DS1603-8BA	...-8AA;...-8AB;...-8RR
16 BA	6DS1604-8AA	
16 Relays	6DS1605-8BA	...-8AA

Table 5-4 Available TELEPERM M I/O modules

Designation	MLFB	Compatible, approved versions
Signal modules/AE		
8 AE, galvanically separated	6DS1700-8BA	...-8AA;...-8AB;...-8BB; 6DS1701-8AA;...-8AB
8 AE, not galvanically separated	6DS1730-8AA	
4 AE	6DS1731-8AA	...-8RR
4 AE, +	6DS1731-8BA	...-8RR
4 EEPROM	6DS1731-8EA	...-8RR
4 + EEPROM	6DS1731-8FA	...-8RR; 6DS1713-8AB
14 Thermal elements	6DS1703-8AB	...-8RR
4 AE	6DS1731-8RR	
Signal modules/AA		
4 AA	6DS1702-8AA	...-8RR
Counter modules		
8 channels	6DS1607-8AB	
Dosing meter modules		
2 or 4 channels	6DS1613-8BB	-8AB
Communication modules		
S5-110A, 4-channel	6DS1310-8AA	
S5-110A, single-channel	6DS1310-8AB	
S5-115/135/150, dual-channel	6DS1321-8AA	
S5 central cabinet, dual-channel	6DS1318-8AB	
	6DS1333-8AB	
S5 transparent, dual-channel	6DS1327-8AA	
ES 100K on TM IO BUS	6DS1322-8AA	
CP 581 TM	6DS1318-8AB	6DS1341-1AD; 6DS1337-1AD

Not available:

- Field multiplexer, FM driver
- Testable BI/BQ; DR; SIPART.

5.7 Note on orders

Order number

The order number for the TPM 478-2 module is found in table 5-5, e.g. for ordering spare parts.

Table 5-5 Order number

Product	Description	Order No.
TPM 478-2	Interface module TPM 478-2	6ES7478-2DA10-0AC0

Migration rack II

6

What dows this Chapter describe?

This chapter provides information on migration rack II and its use on PCS7/TM.

Contents

This is found on the following pages:

6.1 Product overview

6.1.1 Use of the migration rack on PCS7/TM

What is migration rack II?

Migration rack II is a preassembled module rack equipped with an integrated SIMATIC S7/M7-400 backplane bus, with the dimensions of the panel-mount system ES 902. It is absolutely required for operation of a PCS7/TM system in a TELEPERM M cabinet.

All system components can be operated on the slots of the short backplane PCB, e.g the DC power supply, CPU, FM456-4 and I/O bus interface.

Migration rack II also provides five slots for TELEPERM M I/O modules taken from an AS 220 S-/AS 235 basic unit. These five I/O slots can be freely assigned to I/O bus A and B.

Features

For the PCS7/TM system, migration carrier II provides **five TELEPERM M I/O slots** for TELEPERM M I/O modules taken from an AS 220 S-/AS 235 basic cabinet. All these slots can be operated on I/O bus A or in a 3 : 2 ratio on I/O bus A and B.

Another feature is the simplified wiring (supply and process control messages) and the possibility of replacing certain mechanical components (connectors) in case of error.

The wiring features no loose ends, that is, the installation technique is adapted to AS 230/235.

The integrated backplane also provides distribution of specific signals and voltages. Same as in AS 235, the 24-V supply lines are terminated on press-fit nuts with hex bolts. The 5-V supply of the I/O bus is integrated in the backplane, the wiring can be distributed from there. Process control monitoring signals are now terminated on the backplane terminal blocks - same as in the AS 235. The existing cabinet wiring can be used almost completely.

The front panel-mount fuses for L+ (16A) and PM (4A) can be replaced from the front in case of error. Due to the fastening mechanism on the side, the I/O bus connectors can be replaced in case of error without having to remove the migration rack.

The migration rack is equipped with by-pass capacitors for the L+, PM, M24 and MZ voltages for the derivation of electrical disturbance to the shielding and, thus to the metal case.

All position addresses of the slots are equipped with filters.

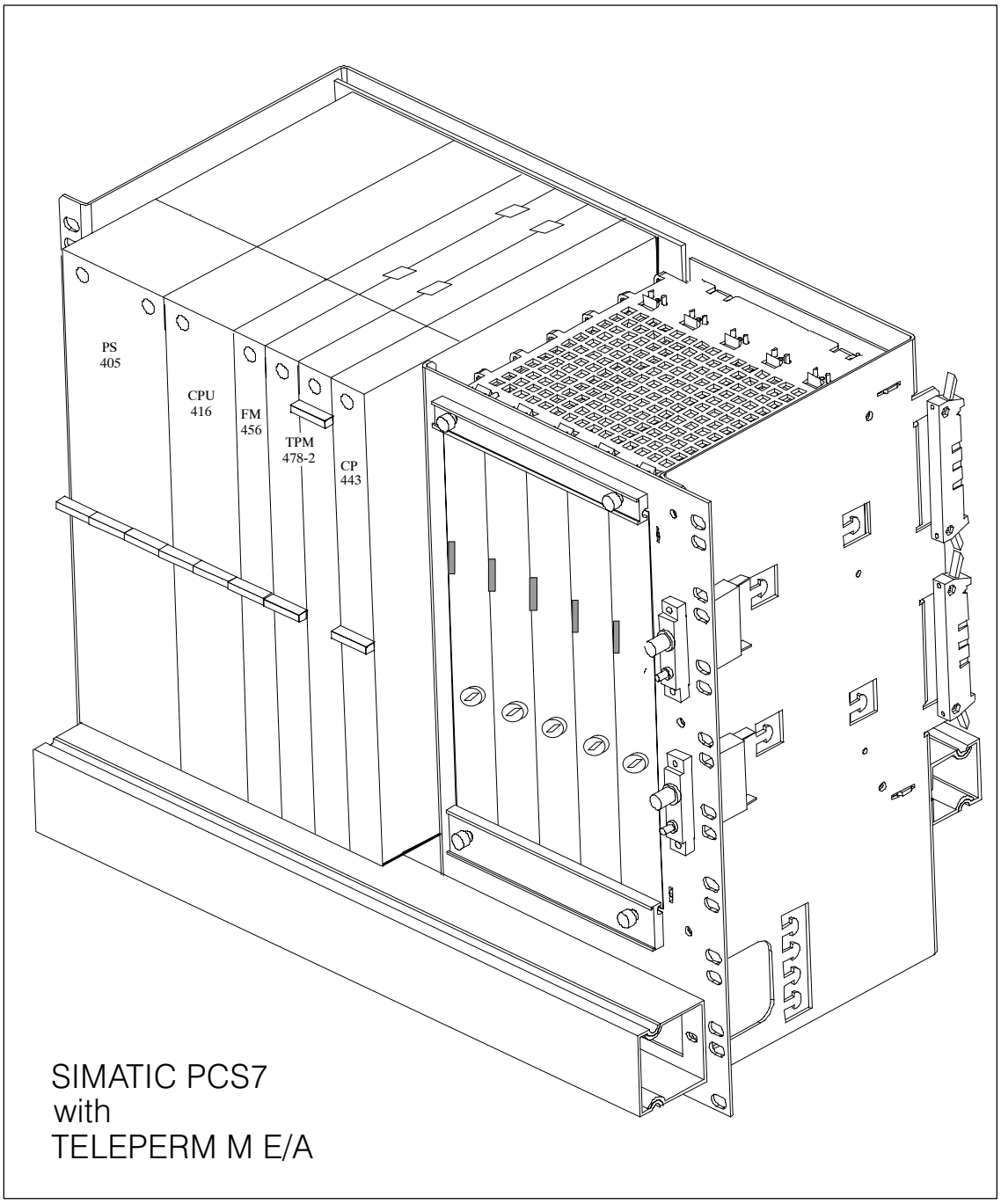

Figure 6-1 Front view of Migration Rack II (without wiring)

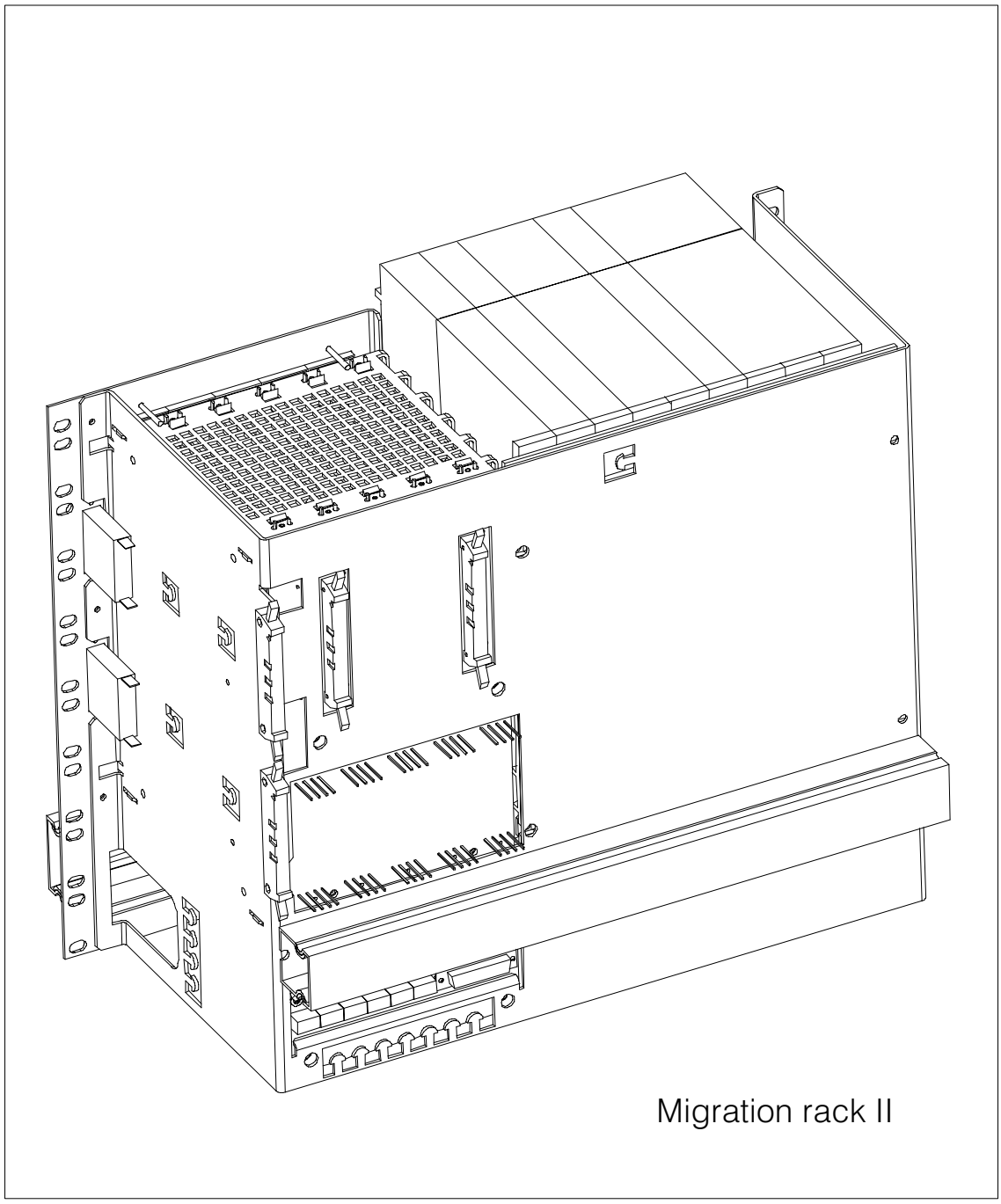

Figure 6-2 Rear view of migration rack II

6.2 Wiring

6.2.1 Supply and signals

Power supply, chassis ground

The **power supply** L+ and M24 from the W row is screw - terminated on the 1L+ and M24 screw terminals. The second 1L+ is wired to the two fuses (16 A and 4 A). The fused voltages PM (4 A) and L+ (16 A) are screw-fastened on the respective press-fit nuts. Here you also find the connector for the round cable which is wired to the M7 power supply.

The 5-V bus supply from TPM 478-2 is terminated on the 5 V and 0 V terminals.

Here you also **interconnect 0V and M24** if this connection does not exist at another location (0-V block). (Mandatory connection!)

Existing MZ or BS can be terminated on the respective press-fit nuts.

See also Figure 1-1 and “Grounding conception” in Chapter 2.2

PCM signals

A patch cord equipped with sub-D connectors on both ends is used to connect **P**rocess **C**ontrol **M**onitoring signals, inserted and secured on X30.

The load power supply L+ - of the DIO module is routed across a so-called “Multi-Fuse”, in order to separate the system from the DIO if an error occurs (e.g. short-circuit in the DIO connector).

Outputs are available on the screw terminals X31, X32 and X33, inputs on X35, X36 and X37.

Cable routing

All cables are routed through the front and rear cable duct and, as far as required, secured in appropriate places with cable ties.

6DS1000

The power supply modules 6DS1000-... inserted in the EUs serve two major purposes:
Supply of one or multiple EUs with fused L+ and PM,
as well as for the supply of modules via +5 V bus.
After installation of the PCS7/TM, you must switch off the front panel PS switches for the +5 V bus system of 6DS1000. The assigned error LED is irrelevant (can be covered up).

6.2.2 Grounding

Grounding conception, referencing

For the operation of a PCS7/TM in the migration rack with TELEPERM M I/O modules, the TELEPERM M Installation Guidelines in the Manual "TELEPERM M, Notes and Guidelines on Planning, Installation and Operation", Order No. C79000-G8076-C417 apply.
Information on grounding conception is found there in Chapter 7.2, as well as in the "AS 235 User Manual", Order No. C79000-G8076-C295, Operating instructions C79000-B8076-C295, Chapter 4.2, 4.3 and 4.3.1.

Protective earth

According to DIN VDE 0150, Section. 3.2.1, multiple grounding of plants with DC power supply is not allowed for reason of stray corrosion. For this reason, migration systems must have **only one** galvanic connection between local earth and M24. That is, although shielding and protective ground are respectively connected to local earth via shielding busbar and cabinet grounding bolt, chassis ground M24 is only connected to local earth at one point in the system. That is, at the "Central Grounding Point" - CGP - that applies to all TELEPERM M systems of this plant.
According to "S7-400, M7-400 PLCs, Order No. C79000-G7076-C410", Chapter 4.6 and 4.7, the preassembled galvanic connection between M24 and local earth related to the cabinet must be disconnected to establish a floating potential assembly.

Grounding plate

The grounding plate between M24 and local earth is located on the left side of module rack UR2.

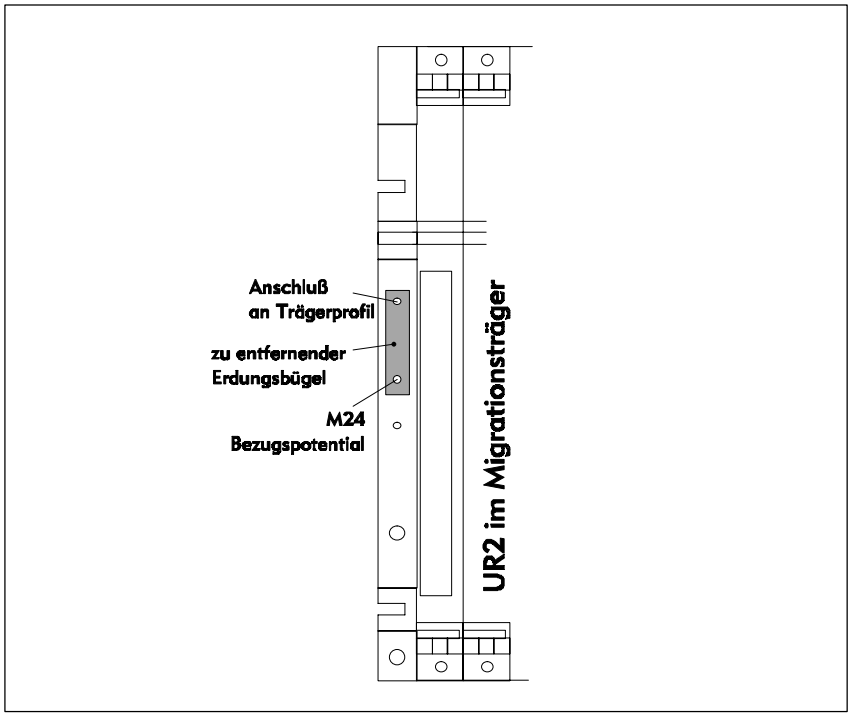

Figure 6-3 Grounding plate

6.3 I/O bus system

6.3.1 Configuration of the I/O bus system

I/O bus A and B

Connection and termination of the 50-pole ribbon cables can vary, depending on requirements.

Version 1: Bus A with 5 slots

Version 2: Bus A with 3 and bus B with 2 slots

Version 3: Bus A with 2 and Bus B with 3 slots

Version 4: Bus B with 5 slots

Of importance are only versions 1 and 2. These can be realized easily with suitable ribbon cable connectors.

to version 1:

- Mount the ribbon cable for bus A on the upper mounting point
- Connect the ribbon cable connector to X34 and X12 by using a C79451-A3496-D1 cable and 4 ribbon cable connectors (also for stand-alone use) or by crimping two additional ribbon connectors onto an existing cable (system substitution) (see Figure 4-2)

to version 2:

- Mount the ribbon cable for bus B on the upper mounting point
- Connect the bus B ribbon cable connector to X34 by using the first one of two C79451-A3496-D2 cables with three ribbon cable connectors (also for stand-alone use) or crimping an additional ribbon cable connector onto an existing cable (system substitute to expansion cabinet)
- Mount the ribbon cable for bus A on the upper mounting point
- Connect the bus B ribbon cable connector to X12 by using the second one of two C79451-A3496-D2 cables with three ribbon cable connectors (also for stand-alone use) or crimping an additional ribbon cable connector onto an existing cable (system substitute to basic cabinet)

Note: The ribbon cable must be folded twice.

Note: C79451-A3496-D2 consists of two ribbon cables.

to version 3:

- analog to 2.

to version 4:

- analog to 1.

Note

The specified C79451-A3496-D1 or -D2 ribbon cable sets are not part of the migration rack.

6.3.2 Configuration of the I/O slots

Terminating resistors

The I/O slots are separated electrically and, with regard to signals, in a 3 : 2 ratio. This is why they can be configured separately. This includes the specification of position numbers as well as activation of pull-up resistors for stand-slone applications.
Slots 1, 2 and 3 (Bus A) are wired to ribbon cable connector X12, slots 4 and 5 (Bus B) to ribbon cable connector X34.
To activate the pull-up resistors for stand-alone mode, insert the jumpers according to the table below.
You can reach the jumpers from the front (see Figure 6-6).

	Jumper	Pull-up	Signal
X52	1 - 3	ON	PMEMR_N_A
	3 - 5	OFF	
X52	2 - 4	ON	PMEMW_N_A
	4 - 6	OFF	
	Jumper	**Pull-up**	**Signal**
X53	1 - 3	ON	PMEMR_N_B
	3 - 5	OFF	
X53	2 - 4	ON	PMEMW_N_B
	4 - 6	OFF	

The pull-up resistors are switched off by default.

Caution

Do not switch on the pull-up resistors if you connect an expansion unit EU or an ES 100 K expansion system!

Slot addresses

Two jumpers are available on every bus for setting the slot addresses for operation with TELEPERM-ME modules. The table below shows the respective slot addresses.
These jumpers can also access from the front.

Bus A / Bus B				
Position address		**Slot address**		
A10	**A11**	**SL 1**	**SL2**	**SL3**
x	x	13/113	14/114	15/115
0	x	29/129	30/130	31/131
x	0	45/145	46/146	47/147
0	0	61/161	(62/162)	(63/163)

BUS A / Bus B			
Position address		**Slot address**	
A10	**A11**	**SL 4**	**SL5**
x	x	14/114	15/115
0	x	30/130	31/131
x	0	45/145	46/146
0	0	(62/162)	(63/163)

x = Jumper inserted

0 = Jumper not inserted

~~(62/162)~~ = unusable or impermissible combination, SL can be used with bridge addresses.

Caution

Depending on the setting, you might create slots with the same slot address. Double addressing must be prevented with an appropriate configuration.

6.4 Connector pin-out

6.4.1 Pin-out 64-pole G-connector, all slots

Pin	f	d	b	z
30	nc	BS	PM	MZ
32	L+	L+	M24	M24

6.4.2 Pin-out X30, 25-pole Sub-D connector, process control signals

Pin	Signal	Meaning	Pin	Signal	Meaning
1	free		2	DO7	AM 3
3	DO6	Watchdog trigger	4	DO5	AM 2
5	DO4	AM 1	6	L+	= 24 VDC for DO 4...DO 7
7	M24	= M24 for DO 4...DO 7	8	DO3	Reserve message output
9	DO2	Message output for horn	10	DO1	PCM signal OUTPUT cabinet lamp CL
11	DO0	Reserve message output	12	L+	=24 VDC load power supply for DO 0...DO 3, fused
13	M24	= M24 for DO 0... DO 3	14	M24	= M24 for DI 0 and DI 1
15	DI0	Reserve message input	16	DI1	INPUT LK 1
17	M24	= M24 for DI 2, DI 3	18	DI2	INPUT Monitor T 1
19	DI3	INPUT TK 1	20	M24	= M24 for DI 4 and DI 5
21	DI4	Message input Bus redundancy display	22	DI5	Horn acknowledgement
23	M24	= M for DI 6 and DI 7	24	DI6	EM 1
25	DI7	EM2			

Signal image: see X31 ... X33, X35 ... X37 in Section 4.3

Note

Pins 6, 7, 12, 13, 14, 17, 20, 23 are pre-wired.

6.4.3 Migration rack connector panel

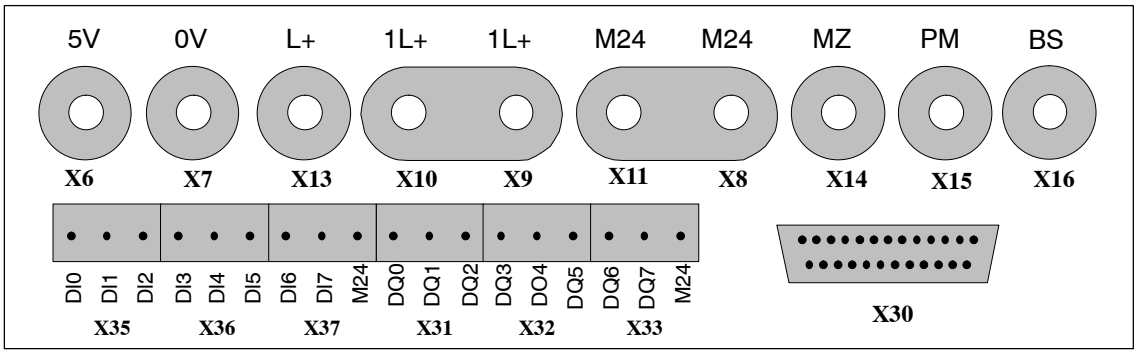

Figure 6-4 Migration rack connector panel

Signals on X31 ... X33, X35 ... X37: see section 4.2

Note

Connections X33-M24 and X37-M24 are general purpose outputs.

6.4.4 Rear view of the bus PCB

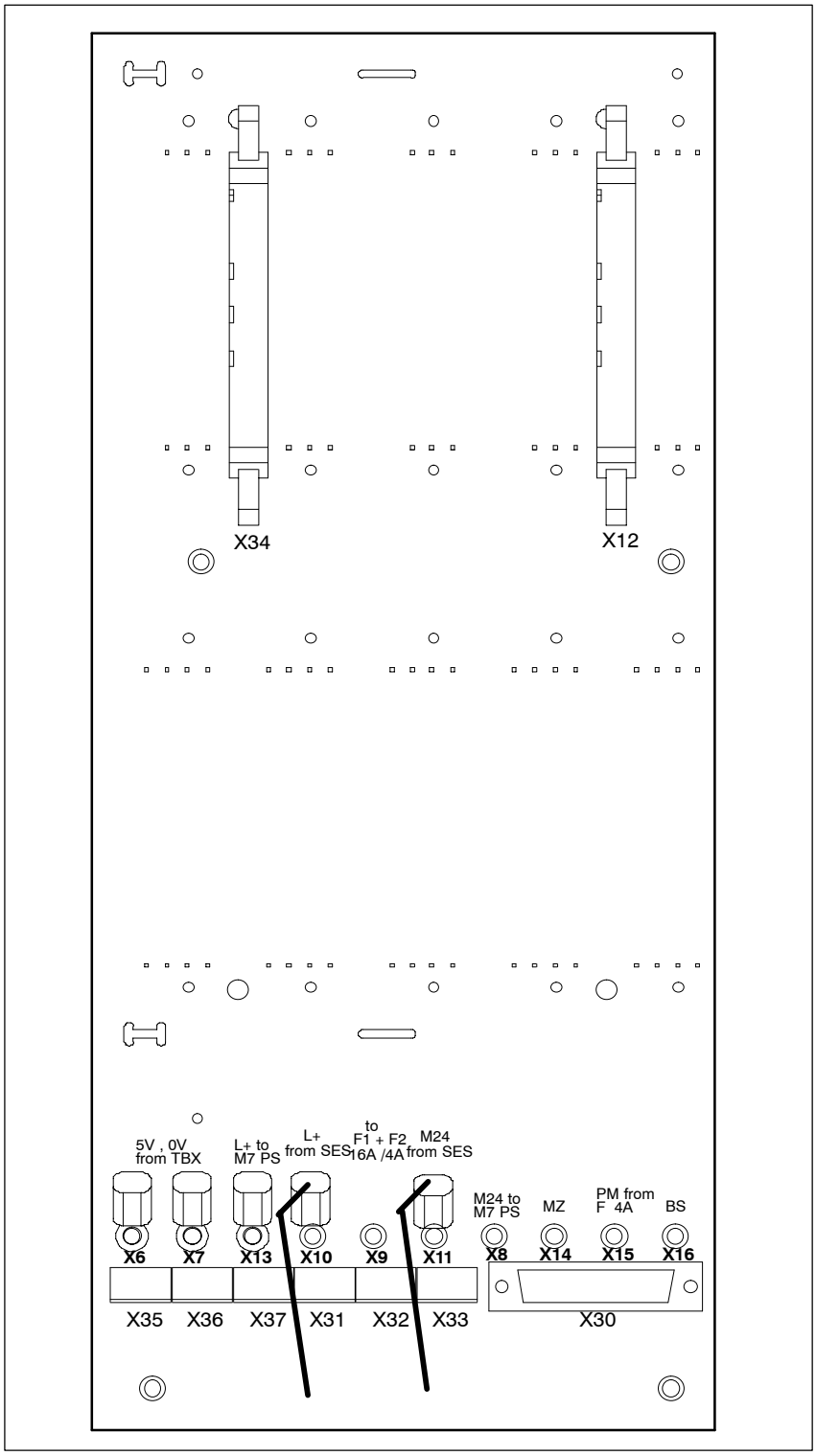

Figure 6-5 Rear view of the bus PCB

6.4.5 Front view of the bus PCB

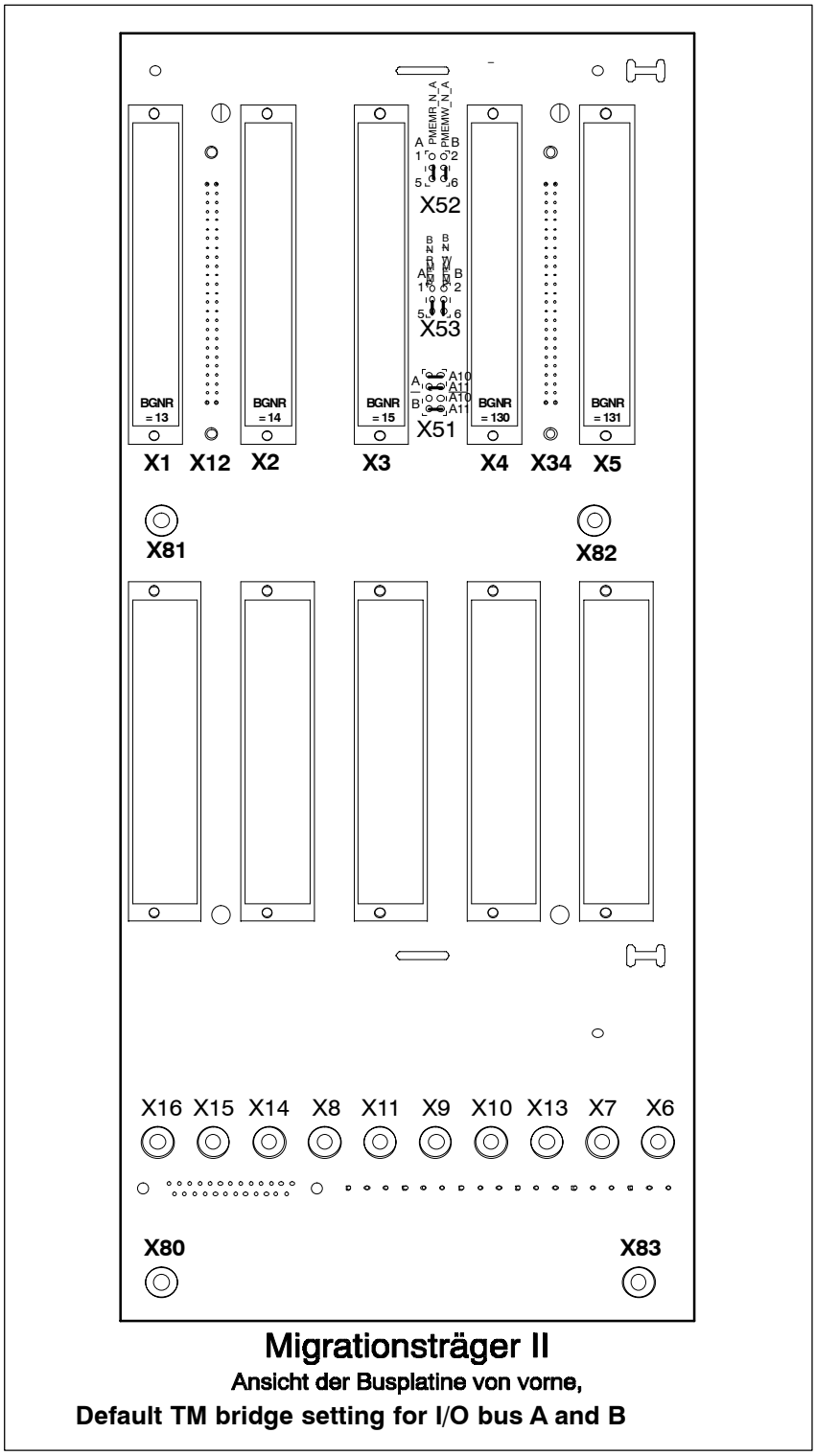

Figure 6-6 Front view of the bus PCB

6.5 Operating conditions

PCS7/TM with TELEPERM M I/O:

You can use all TELEPERM I/O modules listed in ”Supplementary System Documentation AS 388/TM and AS 488/TM”, Order No. C79000-G8076-C700, Catalog PLT 112 and those published on the Intranet/ Internet TELEPERM M site.

Special notes:

Expansion units

Migration rack II, together with TPM 478-2, is approved for operation with up to seven expansion units (3 in the basic cabinet, 4 for in the expansion cabinet). The ribbon cable must be adapted as required.
If you include 1 to 4 ES 100 K per I/O bus, the max. number of addressable I/O module racks is 2 x 4 EU/ES.

CP 581-TM

The module CP 581-TM can only be operated on a PCS7/TM in combination with S5Kx drivers.
You can operate only one module of the type CP 581-TM per configuration (migration rack plus basic cabinet plus expansion cabinet) (5-V supply condition). You cannot operate an additional N.V-24.

LED

Errors/failures/disturbances of the I/O bus system are not indicated by LEDs on TPM 478-2. This can be recognized, for example, on driver failure messages.

Technical Data

A

In this Appendix A

Appendix A treats the following topics:

In Chapter	you find	on Page
A.1	Technical data of the TPM 478-2 interface module	A-2
A.2	Connector and socket pin-out of TPM 478-2	A-4

A.1 Technical data of the TPM 478-2 interface module

Logic characteristics data

Circuit structure:

- Microprocessors
  - I/O processor: 80C186

Memory:

- RAM: 32 Kbytes
- FEPROM: 256 Kbytes

Interfaces:

- ISA bus
  - parallel
  - 16-bit data bus
  - 24-bit address bus
- I/O bus
  - parallel 8-bit data bus
  - transmission speed approx. 300 Kbps
  - max. 4 x 14 (+ 5) I/O modules on one I/O bus (A/B)
  - Double address monitoring via One-Of-n-Check (OONC)
  - Access monitoring via RDY
  - External power supply (5-V bus) for module bus logic

Electrical data

Operating values:

- Power supply + 5 V ± 5 %
- rated current 0.5 A
- Power loss 2.5 W

Interfaces

I/O bus A

I/O bus B

+5 V I/O bus

Mechanical data

Dimensions:

- Mounting width 2 mounting positions (50 mm)
- Height 290 mm
- Depth 210 mm.

Weight: 1.5 kg

Ambient conditions

Ambient conditions:

- Temperature range: 0 to +60 °C
- Storage temperature: -40 to +85 °C.

Type of protection: IP 20 to IEC 536

Standards

The module conforms to following guidelines, amongst others:

- CE
- UL/CSA
- FM

A.2 TPM 478-2 connector and socket pin-out

Pin-out

The left side of the TPM 478-2 module front panel is equipped with a 50-pole Sub-D socket for connecting the I/O bus cable. I/O bus A and B are connected respectively to the two 50-pole Sub-D sockets in the right section.

Refer to Table A-1 to A-3 for details on pin-out.

Table A-1 Pin-out of the 50-pole-Sub-D socket at the left side of TPM 478-2, for connecting the I/O bus

I/O bus 

Socket	Signal	Meaning
1	0 V	
2	0 V	
3	+5 V Bus	
4	+5 V Bus	
5	+5 V Bus	
6	+5 V Bus	
7	+5 V Bus	
8	+5 V Bus	
9	PMEMR_N	Peripheral Memory Read
10	PMEMW_N	Peripheral Memory Write
11	0 V	
12	-	nc
13	PRDY_N	Peripheral Ready
14	PESPA	Peripheral memory A
15	-	nc
16	PCPKL_N	Peripheral CPU clear
17	0 V	
18	INT1_N	Interrupt 1
19	INT2_N	Interrupt 2
20	PESPB	Peripheral memory B
21	-	nc
22	EANK_N	One-Of-N-Check
23	0 V	
24	PDB6	Peripheral Data Bus 6
25	PDB7	Peripheral Data Bus 7
26	PDB2	Peripheral Data Bus 2
27	PDB3	Peripheral Data Bus 3
28	PDB4	Peripheral Data Bus 4
29	PDB5	Peripheral Data Bus 5
30	PDB0	Peripheral Data Bus 0
31	PDB1	Peripheral Data Bus 1
32	0 V	
33	0 V	
34	PADB9	Peripheral Address Bus 9
35	PADB10	Peripheral Address Bus 10
36	PADB11	Peripheral Address Bus 11
37	PADB3	Peripheral Address Bus 3
38	PADB4	Peripheral Address Bus 4
39	PADB5	Peripheral Address Bus 5
40	PADB6	Peripheral Address Bus 6
41	PADB7	Peripheral Address Bus 7
42	PADB8	Peripheral Address Bus 8
43	PADB0	Peripheral Address Bus 0
44	PADB1	Peripheral Address Bus 1
45	PADB2	Peripheral Address Bus 2
46	0 V	
47	-	nc
48	-	nc
49	-	nc
50	0 V	

Table A-2 Pin-out 50-pole-Sub-D socket at the right side of TPM 478-2, for connecting I/O Bus A

I/O bus A 

Socket	Signal	Meaning
1	0 V	
2	0 V	
3	+5 V Bus	
4	+5 V Bus	
5	+5 V Bus	
6	+5 V Bus	
7	+5 V Bus	
8	+5 V Bus	
9	PMEMR_N	Peripheral Memory Read
10	PMEMW_N	Peripheral Memory Write
11	0 V	
12	-	nc
13	PRDY_N	Peripheral Ready
14	PESPA	Peripheral memory A
15	-	nc
16	PCPKL_N	Peripheral CPU clear
17	0 V	
18	INT1_N	Interrupt 1
19	INT2_N	Interrupt 2
20	PESPB	Peripheral memory B
21	-	nc
22	EANK_N	One-Of-N-Check
23	0 V	
24	PDB6	Peripheral Data Bus 6
25	PDB7	Peripheral Data Bus 7
26	PDB2	Peripheral Data Bus 2
27	PDB3	Peripheral Data Bus 3
28	PDB4	Peripheral Data Bus 4
29	PDB5	Peripheral Data Bus 5
30	PDB0	Peripheral Data Bus 0
31	PDB1	Peripheral Data Bus 1
32	0 V	
33	0 V	
34	PADB9	Peripheral Address Bus 9
35	PADB10	Peripheral Address Bus 10
36	PADB11	Peripheral Address Bus 11
37	PADB3	Peripheral Address Bus 3
38	PADB4	Peripheral Address Bus 4
39	PADB5	Peripheral Address Bus 5
40	PADB6	Peripheral Address Bus 6
41	PADB7	Peripheral Address Bus 7
42	PADB8	Peripheral Address Bus 8
43	PADB0	Peripheral Address Bus 0
44	PADB1	Peripheral Address Bus 1
45	PADB2	Peripheral Address Bus 2
46	0 V	
47	-	nc
48	-	nc
49	-	nc
50	0 V	

Table A-3 Pin-out 50-pole-Sub-D socket at the right side of TPM 478-2, for connecting I/O Bus B

I/O bus B 

Socket	Signal	Meaning
1	0 V	
2	0 V	
3	+5 V Bus	
4	+5 V Bus	
5	+5 V Bus	
6	+5 V Bus	
7	+5 V Bus	
8	+5 V Bus	
9	PMEMR_N	Peripheral Memory Read
10	PMEMW_N	Peripheral Memory Write
11	0 V	
12	-	nc
13	PRDY_N	Peripheral Ready
14	PESPA	Peripheral memory A
15	-	nc
16	PCPKL_N	Peripheral CPU clear
17	0 V	
18	INT1_N	Interrupt 1
19	INT2_N	Interrupt 2
20	PESPB	Peripheral memory B
21	-	nc
22	EANK_N	One-Of-N-Check
23	0 V	
24	PDB6	Peripheral Data Bus 6
25	PDB7	Peripheral Data Bus 7
26	PDB2	Peripheral Data Bus 2
27	PDB3	Peripheral Data Bus 3
28	PDB4	Peripheral Data Bus 4
29	PDB5	Peripheral Data Bus 5
30	PDB0	Peripheral Data Bus 0
31	PDB1	Peripheral Data Bus 1
32	0 V	
33	0 V	
34	PADB9	Peripheral Address Bus 9
35	PADB10	Peripheral Address Bus 10
36	PADB11	Peripheral Address Bus 11
37	PADB3	Peripheral Address Bus 3
38	PADB4	Peripheral Address Bus 4
39	PADB5	Peripheral Address Bus 5
40	PADB6	Peripheral Address Bus 6
41	PADB7	Peripheral Address Bus 7
42	PADB8	Peripheral Address Bus 8
43	PADB0	Peripheral Address Bus 0
44	PADB1	Peripheral Address Bus 1
45	PADB2	Peripheral Address Bus 2
46	0 V	
47	-	nc
48	-	nc
49	-	nc
50	0 V	

Abbreviations

B

UP	User program
AS	Automation system
STL	Instruction list
O&M	Operating and monitoring
ME	Module error
MNO	Module number
MOD	Module
CFC	Continuous Function Chart
CP	Communication processor (bus interface module)
CPU	Central Processing Unit (central module)
DB	Data block
EANK	1–of–N–Check (Double addressing of modules on the TM I/O bus)
I/O	Input/Output
EU	TELEPERM M expansion unit
EN	Enable input

ES 100 K	Expansion system for TELEPERM M PLCs
FB	Function block
FC	Function Call (Function)
FM	Function module (Module)
IBS	Commissioning
IEC	International Electronical Commission
PCM	Process Control Message
MPI	Multi Point Interface
CNO	Channel number
OB	Organization block
OS	Operator Station
PIO	Output process image
PII	Input process image
PC	Personal Computer
PCS 7	Process Control System 7
PG	Programming device
PCS	Process control system
PCT	Process control technology

PS	Power Supply
ACKD	Acknowledgement delay
SCL	Structured Control Language
SFB	System function block
SFC	System function call (system function)
SINEC	Siemens Network Architecture
PLC	Programmable Logic Controller
STEP 7	Software development environment for SIMATIC S7 / M7
SSL	System Status List
S5	SIMATIC Line 5
S7	SIMATIC Line 7
TAC	Test and Commissioning.
TM	TELEPERM M
TPM	TELEPERM Process Module
WinCC	Windows Control Center (Operating & Monitoring System)

Literature List

C

You can order the following manuals and instructions from your Siemens partner:

Number	Title	Order from	Order Nr.
/3/	Description: TELEPERM M TPM 478-2 Interface Modules	 KA	 C79000-G8076-C710 Reg. 5
/8/	Reference Manual: Automation System SIMATIC S7-400, M7-400 Module Data		C79000-G7076-C411 Part of 6ES7498-8AA01-8BA0
/10/	Manual: PLC SIMATIC S7-400, M7-400		 6ES7498-8AA01-8BA0
/11/	Manual: TELEPERM M I/O Modules (Function Mod., Signal Mod., Interf. and Calc. Mod.)		C79000-G8076-C030 C79000-G8076-C031 C79000-G8076-C032
/17/	Manual: PROFIBUS Networks (Architecturs, Installation, Configuration, Components)		6GK1970-5CA10-0BA0
/18/	Quick Guide: PROFIBUS		 6ZB5530-0AQ01-0BA7
/30/	Manual: TELEPERM M Notes and Guidelines for Planning, Installation and Operation		C79000-G8076-C417
/31/	Installation Guide: PLC S7-400, M7-400 Assembly	LZN	C79000-G7076-C410, Part of 6ES7498-8AA01-8BA0
/32/	Description: TELEPERM M Migration Rack II for PCS7/TM	 KA	 C79000-G8076-C710 Reg 6
/34/	Technical Description: Migration TELEPERM M - SIMATIC PCS7 WinCC/TM /TM-OCX(NORA)	 KA KA	 C79000-T8076-C740 C79000-T8076-C741
/106/	Manual: SIMATIC Application Module FM 456, Assembly and Commissioning		C79000-G7076-C456
/230/	Manual: SIMATIC Standard Software for S7, Converting S5 Programs		C79000-G7076-C501
/231/	User Manual: SIMATIC Standard Software for S7 and M7 STEP 7 User Manual		C79000-G7076-C502 Part of 6ES7810-4CA02-8BA0

Num-ber	Title	Order from	Order Nr.
/232/	Manual: SIMATIC Statement List (STL) for S7-300 and S7-400, Programming		C79000-G7076-C505
/233/	Manual: SIMATIC Ladder Logic (LAD) for S7-300 and S7-400 Programming		C79000-G7076-C504
/234/	Programming Manual: SIMATIC System Software for S7-300 and S7-400 Program Design		C79000-G7076-C506 Part of 6ES7810-4CA02-8BA0
/235/	Reference Manual: SIMATIC System Software for S7-300 and S7-400 System and Standard Functions		C79000-G7076-C503
/280/	Programming Manual: SIMATIC System Software for M7-300 and M7-400 Program Design		C79000-G7076-C851 Part of 6ES7802-0FA01-8BA0
/282/	User Manual: SIMATIC System Software for M7-300 M7-400 Installation and Operation		C79000-G7076-C850 Part of 6ES7802-0FA01-8BA0
/350/	User Manual: SIMATIC Standard Control		C79000-G7076-C195
/701/	User Manual: SIMATIC Modular PID Control		C79000-G7076-C121
/702/	Manual: SIMATIC Programming FBD for S7-300/400 Blocks		C79000-G7076-C508
/703/	Addendum for Manual SIMATIC S7		C79000-Z7076-C412

Glossary

I

ISA bus — **I**ndustry **S**tandard **A**rchitecture Bus. Standard bus for AT compatible Personal Computers.

M

Memory Card — The plug-in Memory Card can be used to store the complete software, or parts thereof, of a CPU of function module, as well as static data.

M7-400 — M7-400 is an AT-compatible automation computer of the SIMATIC product family. It is designed in SIMATIC S7-400 technology.

P

PROFIBUS — Standardized bus system to DIN 19245 (PROFIBUS).

PS — Power supply module

R

RS232 — Serial interface to DIN 66020.

S

SMD — Abbreviation for **S**urface **M**ounted **D**evice. Designation for surface-mount chips.

T

TPM 478-2 The TPM 478-2 interface module is used to interconnect the TELEPERM M I/O bus.