SIEMENS

SIMATIC

C7-623, C7-624 Control Systems

Volume 1
Installation, Assembly, Wiring

Manual

C79000-G7076-C623-01

Safety Guidelines

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:

Warning

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

Note

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

Qualified Personnel

The device/system may only be set up and operated in conjunction with this manual.

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

Correct Usage

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.

Caution

UL + CSA: Lithium Battery Replacement
Danger of explosion if battery is incorrectly replaced. Replace only with same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

Warning

FM–WARNING – DO NOT DISCONNECT WHILE CIRCUIT IS LIVE UNLESS LOCATION IS KNOWN TO BE NONHAZARDOUS

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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.

Technical data subject to change.

Preface

Purpose

The information in this manual enables you to do the following:

- Install and wire a C7-623 or C7-624 (Volume 1)
- Parameterize the CPU of the C7-623 or C7-624, load a user program into this CPU and run the program (Volume 2)
- Put the C7-623 and C7-624 into operation and use the O/I functions (Volume 2).

Audience

The manual is divided to take account of two different types of reader:

- Volume 1:
  Users who carry out the mechanical and electrical installation of the C7 at the location of use and who bring the C7 to a state of readiness for immediate use.
- Volume 2:
  Users who create control programs and O/I configurations, load them into the C7, and print out screen displays and messages.

Contents of This Manual

The present manual describes the hardware and the software of the C7-623 and C7-624. It consists of two volumes.

Volume 1 of the manual covers the following topics:

- Installation and preparation of the C7-623 or C7-624
- Networking of the C7-623 or C7-624 with programming devices (PGs) and other devices
- Connecting the digital and analog I/O
- Connecting the I/O to the universal inputs
- Connecting the IM361 interface module
- Connecting a printer to the C7

Volume 2 of the manual covers the following topics:

- Startup (restart) of the C7
- Control with the C7 CPU
- Addressing and parameterizing the C7 I/O
- C7 diagnostics
- Using the MMI functions of the C7

Conventions Concerning C7

To make the manual easier to read, the device type description C7-623 or C7-624 will be referred to throughout the manual as **C7**.

Scope of This Manual

The present manual is valid for the following C7s:

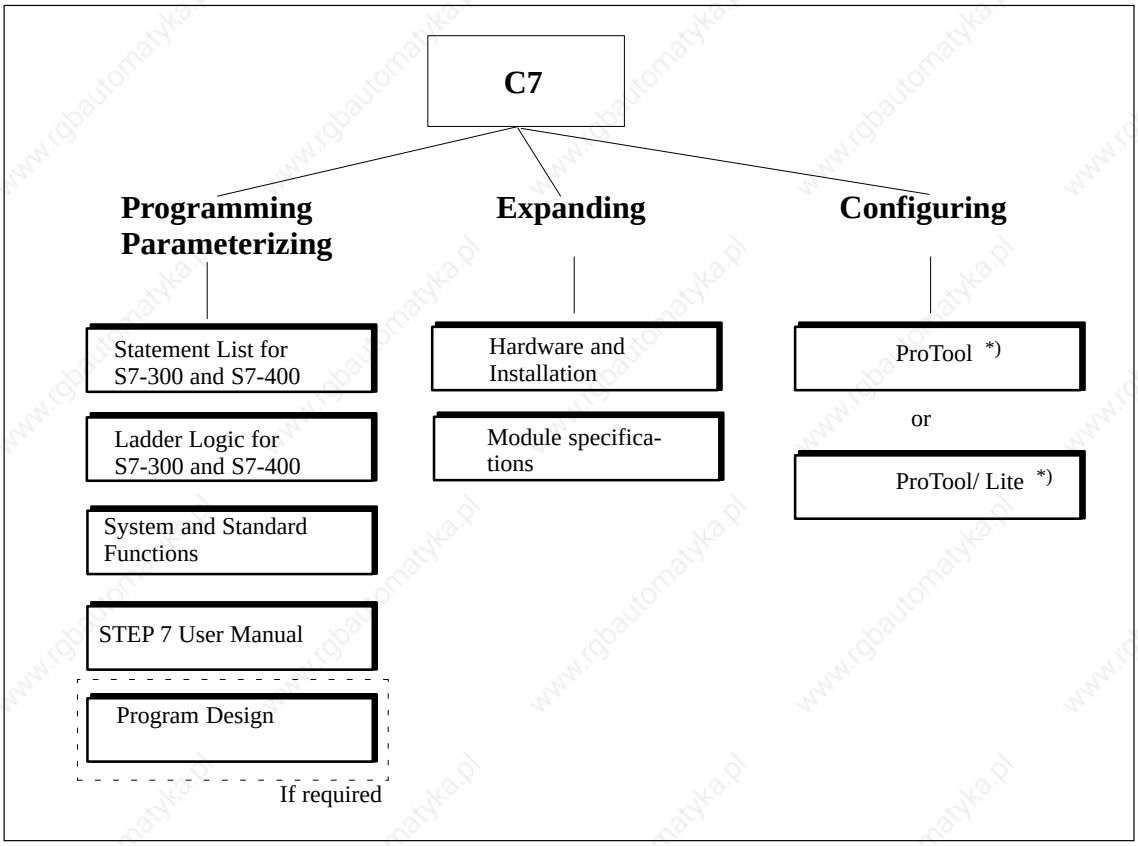
C7	Order Number	From Edition
C7-623	6ES7623-1AE00-0AE3	01
C7-624	6ES7624-1AE00-0AE3	01

C7 Manual

This manual is available under Order No. 6ES7623–1AE00–8AA0.

Other Pertinent Manuals

The present manual describes the C7-623 and C7-624 fully. For programming, expanding and configuring a C7, you require the following further manuals:



*) Identical functionality in connection with C7.

Table 1-1 STEP 7 Documentation Package. Order Number 6ES7810–4AA00–8AA0

Manual	Contents
Standard Software for S7 and M7 *STEP 7 User Manual*	Provides information for working with the STEP 7 tools • Installation and startup of STEP 7 on PC/programming device • Handling tools with the following contents: – Managing projects and files – Configuring and parameterizing the S7-300 – Assigning symbolic names for the user program – Creating and testing the user program in STL/LAD – Creating data blocks – Configuring communications between several CPUs – Loading, storing and deleting the user program in the CPU/programming device – Monitoring and forcing the user program (for example, variables) – Monitoring and forcing the CPU (for example, operating mode, memory reset, memory compress, protection levels)
Statement List for S7-300/S7-400 Programming Manual or *Ladder Logic for S7-300/S7-400 Programming Manual*	Reference manual for programming with STL or LAD: • Basics for working with STL/LAD (for example, structure of STL/LAD, number formats, syntax) • Description of all operations in STEP 7 (with programming examples) • Description of the different addressing possibilities in STEP 7 (with examples) • Description of all integral functions of the CPUs • Description of the CPU-internal registers
System Software for S7-300/S7-400 System and Standard Functions Reference Manual	Detailed description • of all standard functions (FCs) integrated into STEP 7 • of all system functions (SFCs) integrated into the operating system of a CPU
Standard Software for S7 *Converting STEP 5 Programs Manual*	Provides information for converting STEP 5 programs to STEP 7: • Working with the S5/S7 Converter • Rules for converting • The use of converted STEP 5 standard function blocks in STEP 7
Master Index	• Master index for all the manuals of the documentation package.

Other References

You will find a list of further information sources on the subject of the S7-300 and other programmable controllers in Appendix D of Volume 2 of this manual.

Table 1-2 Further Manuals

Manual	Contents
System Software for S7-300 and S7-400 Program Design Programming Manual	Provides basic knowledge for designing STEP 7 programs: • Instructions for the efficient solution of the programming task with the PC/PG and STEP 7 • Principle of operation of the CPUs (for example, memory concept, I/O access, addressing, blocks, data types, data management) • Description of STEP 7 data management • Using STEP 7 data types • Using linear and structured programming (with programming examples) • Using block call operations • Overview of the usage of the STEP 7 tools for developing projects (with detailed examples) • Using the test and diagnostics functions of the CPUs in the user program (for example, error OBs, status word)
S7-300 Programmable Controller Installation and Hardware	Describes the hardware of the S7-300: • Electrical configuration of the S7-300 • Installing the S7-300 • Wiring and preparing the S7-300 for operation • Characteristics and technical data of the S7-300 modules
S7-300/M7-300 Programmable Controllers Module Specifications Reference Manual	Describes the hardware of the S7-300 modules: • Analog modules • Digital modules • Interface modules • Characteristics and technical specifications of the S7-300 modules
S7-300 Programmable Controller CPU 312 / CPU 314/ CPU 315 / CPU 315–DP, Instruction List	Describes the instruction set of the CPU 312, CPU 314, CPU 315 and CPU 315–DP including the execution times of all operations.

Table 1-2 Further Manuals

Manual	Contents
PG 7xx	Describes the programming device (PG) hardware: • Assembly and startup of the PG • Expansion possibilities • Configuring • Fault diagnostics
COROS ProTool	Manual for creating configurations: • Using ProTool • Configuring • Displays and messages • Loading the configuration into the C7
COROS ProTool/ Lite	Manual for creating configurations: • Using ProTool/Lite • Configuring • Displays and messages • Loading the configuration into the C7

Structure of This Manual

The manual has the following aids to help you find specific information in the manual:

- At the beginning of the two volumes, you will find a complete directory of contents.
- In each chapter, you will find information on the left-hand column of every page giving you an overview of the contents of that section.
- After the Appendices, there is a Glossary containing important technical terms used in the manual.
- At the end of the manual, there is a detailed index.

Standards

The C7 control system conforms to standards as described in Appendix A.1.

Queries

If you have any questions concerning the C7 control system, please contact your local Siemens representative.

You will find a list of Siemens representatives worldwide in Volume 2 of the manual, Appendix E.

If you have any questions or remarks concerning the manual, please fill in and return the Suggestions/Corrections form at the back of Volume 2.

Contents

Product Overview

1

This Chapter

This chapter contains general information concerning the C7-623 and C7-624. A brief overview of the performance range provides you with a first impression of the two units.

This chapter also tells which additional components you can connect to a C7.

Accessories for Operating the C7

You require the following accessories to operate the C7:

- Programming device (PG) or PC with MPI and programming device cable.
- You must load the following on the programming device or PC
  - STEP Tools
  - ProTool or ProTool/Lite.

Overview

The C7 systems are available in two variants:

C7-623

Featuring a 4-line display with 20 characters per line and a character height of 5 mm (see Figure 1-1).

Figure 1-1 C7-623

C7-624

The character height on the display can be changed per software to 4 x 20 characters at a character height of 8 mm or 8 x 40 characters at a character height of 4.5 mm (see Figure 1-2).

Figure 1-2 C7-624

Performance Range

With the C7 systems you can:

- Run user programs that have been programmed in STL or LAD and loaded into the C7 CPU.
- Process digital and analog signals using the C7's integral I/O.
- Use interrupt inputs and counters (for purposes including frequency metering, period duration measurement).
- Load and use MMI applications that you have created using the "ProTool" or "ProTool/Lite" configuring tool.
- Use these configurations to monitor and intervene in the process you are controlling with the user program.
- Output data to a printer.

C7 Units

The C7 has two units that work independently of each other and can communicate with each other over the internally-looped C7 multipoint interface (MPI).

- C7 CPU
- C7 OP

These parts will be referred to explicitly in the manuals where required.

Connectable Components of a C7

In addition to the connections to the process, you can also connect different components to the C7. The most important components and their functions are listed in Table 1-1:

Table 1-1 Connectable Components of a C7

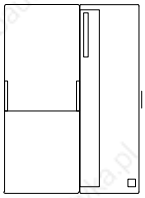
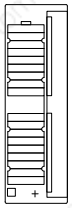
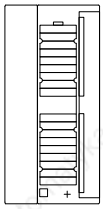
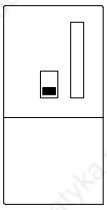
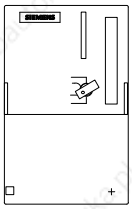
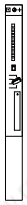
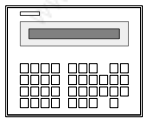
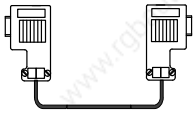
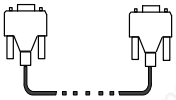
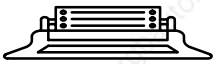
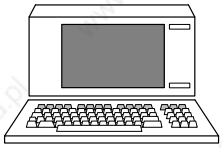
Components	Function	Illustration
Interface module (IM361)	...connects a C7 with an expansion rack for S7-300 modules	
Signal modules (SMs) (digital input modules, digital output modules, analog input module, analog output module, analog input/output modules)	...pass different process signal levels on to the C7 CPU. They can be connected via an IM361.	
Function modules (FMs)	...for time-critical and memory-intensive process signal handling tasks, for example, positioning or closed-loop control.	
Communications processors (CP)	...offloads the CPU of communications tasks, for example, CP 342-5 DP for linking to SINEC L2-DP.	
S7-300 (CPU)	...communicates over the MPI with the C7 and with other nodes on an MPI network.	

Table 1-1 Connectable Components of a C7

Components	Function	Illustration
S7-400 (CPU)	...communicates over the MPI with the C7 and with other nodes on an MPI network.	
OP (Operator Panel)	...executes operator interface functions.	
PROFIBUS bus cable with bus connector	...connects nodes on an MPI network or L2-DP network with each other.	
Programming device cable	...connects a PG/PC with a C7.	
Printer	...prints out MMI messages of the C7.	
Programming device (PG) or PC with the STEP 7 and ProTool software packages	...configures, parameterizes, programs and tests the C7	
RS 485 repeater	...for amplifying the signals in an MPI network or L2-DP network, and for linking segments of an MPI or L2-DP network.	

Example

Figure 1-3 shows some possible connections to other devices and the connection of signal inputs.

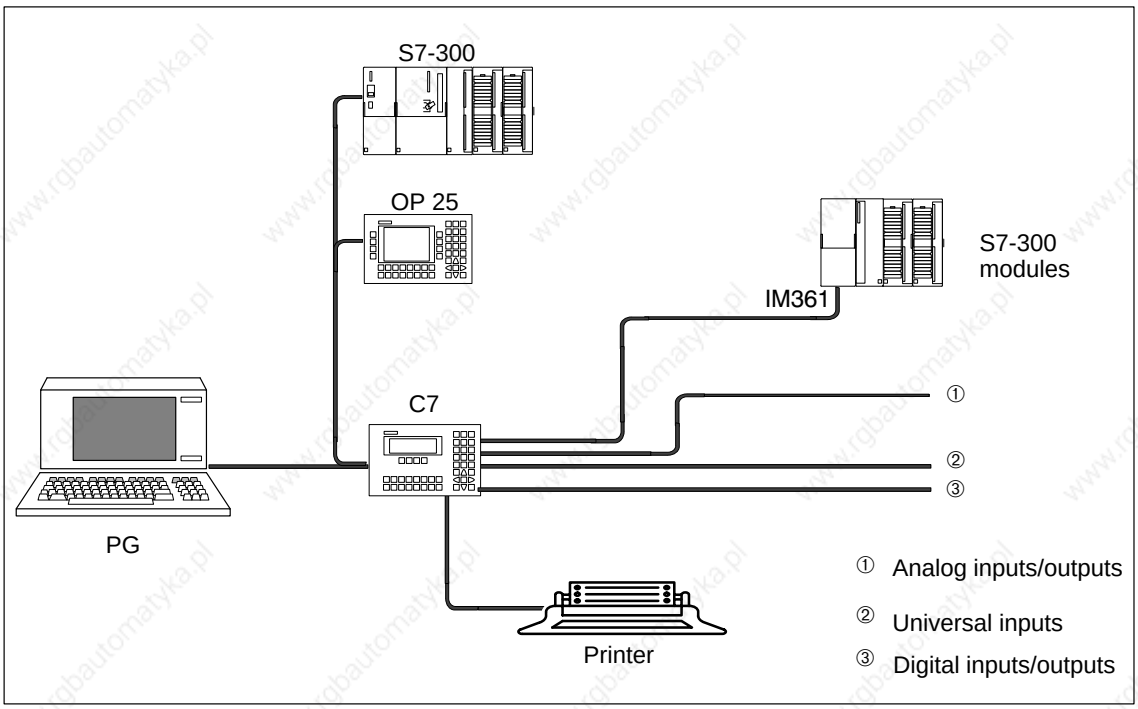


Figure 1-3 Some C7 Connection Possibilities

Installing and Preparing the C7

2

This Chapter

2.1 Scope of Supply and C7 Accessories

Parts Supplied

The following components are included in the scope of supply of the C7-623 or C7-624:

- C7-623 or C7-624
- A set of labeling strips (for function keys and softkeys)
- Battery
- A ground bar
- 6 shielding clips
- 1 seal and 4 brackets
- Product Information (if required)

Accessories

The following components can be ordered as **C7-specific accessories:**

- *C7-623/C7-624 Control Systems* manual comprising two volumes in the languages:
  German: 6ES7 623-1AE00-8AA0
  English: 6ES7 623-1AE00-8BA0
  French: 6ES7 623-1AE00-8CA0
  Italian: 6ES7 623-1AE00-8DA0
  Spanish: 6ES7 623-1AE00-8EA0
- Labeling strips for function keys and softkeys 6ES7 623-1AE00-1AA00
- Service package (seal and 4 brackets) 6ES 623-1AE00-3AA00
- Plug connectors for C7 I/O with coding keys and coding sliders 6ES7 623-1AE00-4AA0
- Backup battery 6ES 623-1AE00-5AA00

The following components can be ordered as important **standard accessories** for the C7:

- Programming device cable 6ES7 901-0BF00-0AA0 (for connecting the C7 to the PG)
- PC/MPI cable, 5 m 6ES7 901-2BF00-0AA0
- IM cable (for connecting additional S7-300)

  IM cable, 1 m 6ES7 368-3BB00-0AA0

  IM cable, 2.5 m 6ES7 368-3BC51-0AA0

  IM cable, 5 m 6ES7 368-3BF00-0AA0

  IM cable, 10 m 6ES7 368-3CB00-0AA0

- Printer cable (for V.24 serial interface) 6XV 1440-2C... (max. 16 m)

  The following applies for the length key:

		6XV1440-2C□□□
Multiplier	0.01 m	E
	0.1 m	H
	1.0 m	N
	10.0 m	T
	100.0 m	U
Length digit	10	1 0
	12	1 2
	15	1 5
	16	1 6
	20	2 0
	25	2 5
	32	3 2
	40	4 0
	50	5 0
	60	6 0
	63	6 3
	80	8 0

2.2 Inserting the Labeling Strips

Labeling Strips

The function keys and softkeys are labeled using labeling strips which are inserted into the keypad from the side.

The labeling as supplied is as follows:

- The function keys of the C7-623 are labeled with K1...K8 and K9...K16 and the softkeys are labeled with F1...F4.
- The function keys of the C7-624 are labeled with K1...K8 and K9...K16 and the softkeys are labeled with F1...F8.

Plant–Specific Labelling

A set of blank labeling strips are enclosed with the C7. They can be used for plant-specific labeling of the C7.

Caution

The writing on the strips must be wipe-resistant before inserting. A keypad membrane soiled on the inside cannot be cleaned and can only be replaced in the factory.

A sheet with plant–specific labelling strips is also provided. The strips must be cut off exactly along the marked line. If the labelling strips are too large, they cannot be inserted into the keyboard.

Labeling strips can only be changed when the C7 is not installed. The sealing ring should be replaced. Proceed as follows:

Step	Action
1.	Cut off the corners of the labelling strip that are marked with a ① C7–623 K1...K8 ①
2.	If possible, hold the labelling strip at the end you want to insert in the slit. Hold the strip horizontally. Hold the strip by touching both surface areas rather than the edges to facilitate insertion.
3.	Slide the strips into the slits provided. The location of the slits is shown in Figure 2-1.The strips are slid over the existing labeling.
4.	To avoid bending the strip as you insert it, move it backward and forward several times ↑ ↓.

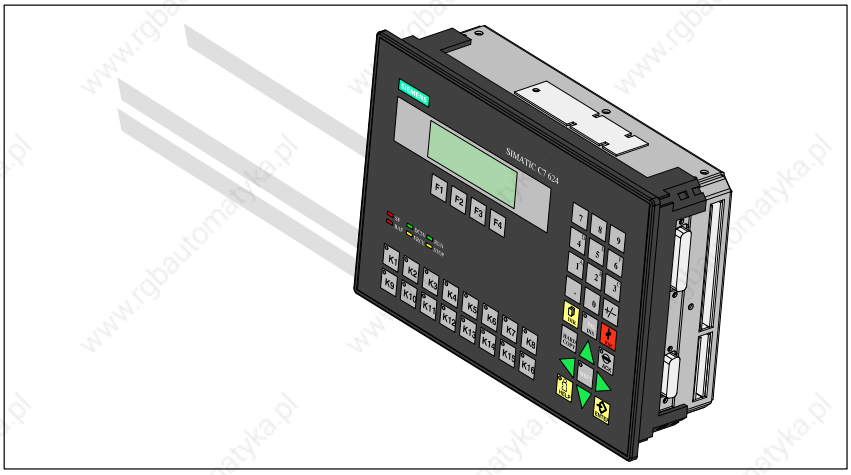


Figure 2-1 Inserting Labeling Strips

2.3 Installing a C7

Installation

The C7 has been prepared for fixed installation in a switching panel or cabinet door. Proceed as follows:

Step	Action
1.	Make a standard cutout in the switching panel in accordance with DIN 43700 (dimensions 230,5 x 158,5 mm).
2.	Insert the enclosed sealing ring behind the front panel (see Figure 2-2).
3.	Insert the C7 in the cutout in the switching panel.
4.	Insert the 4 fixing brackets (see Figure 2-4 ①) into the guides provided. Push the fixing brackets in until the spring engages.
5.	Screw the 4 fixing screws enclosed with the C7 into the 4 fixing brackets enclosed (see Figure 2-5) (approximately. 2 to 3 turns).
6.	Tighten the 4 screws lightly with a screwdriver.

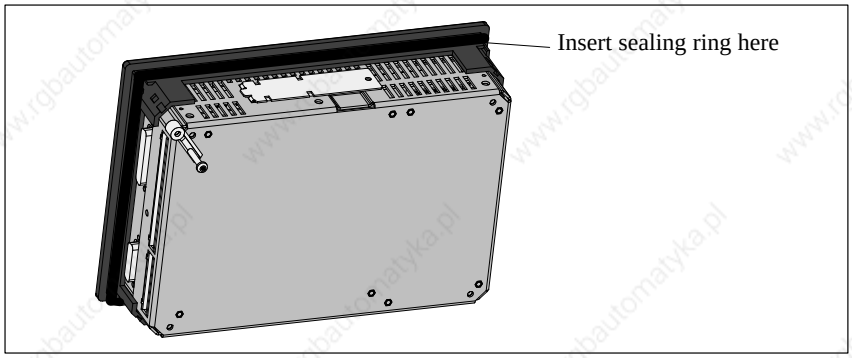


Figure 2-2 Inserting the Sealing Ring

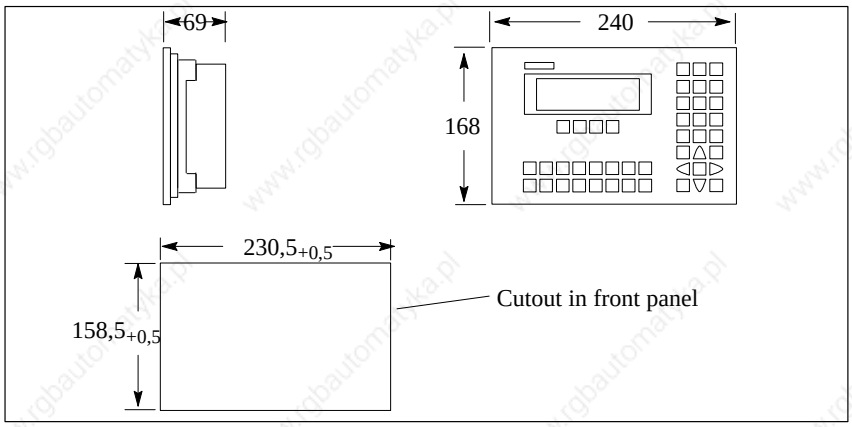


Figure 2-3 Dimension Drawings for the C7

Fixing Bracket Before Engaging

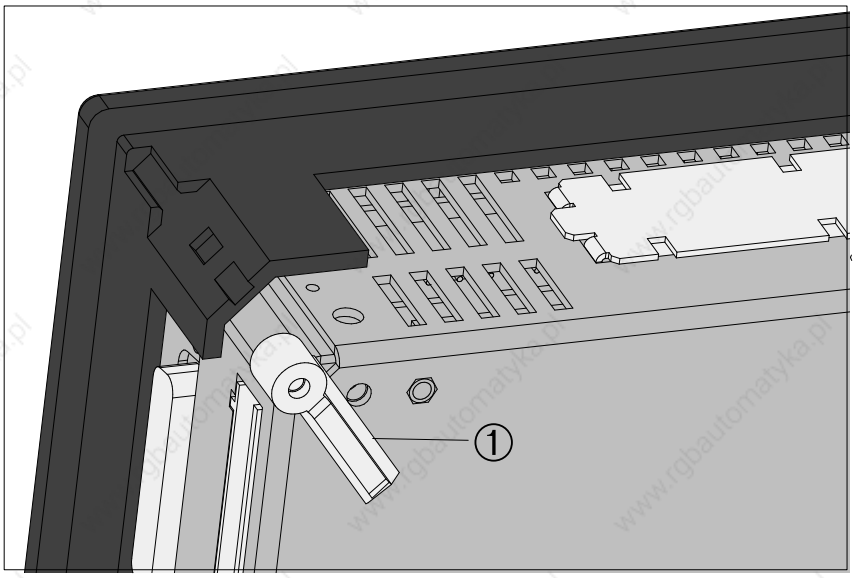


Figure 2-4 Fixing Bracket Before Engaging

Fixing Bracket Engaged

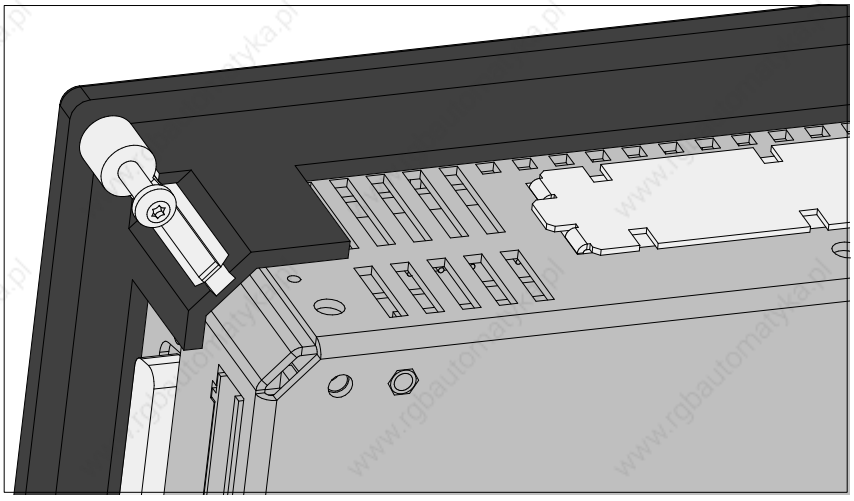


Figure 2-5 Fixing Bracket Engaged, with Screw

Loosening the Fixing Bracket

Proceed as follows when loosening the fixing bracket:

Step	Action
1.	Loosen screw.
2.	Lift fixing bracket (① in Figure Bild 2-6).
3.	Push fixing bracket out of guide (② in Figure 2-6).

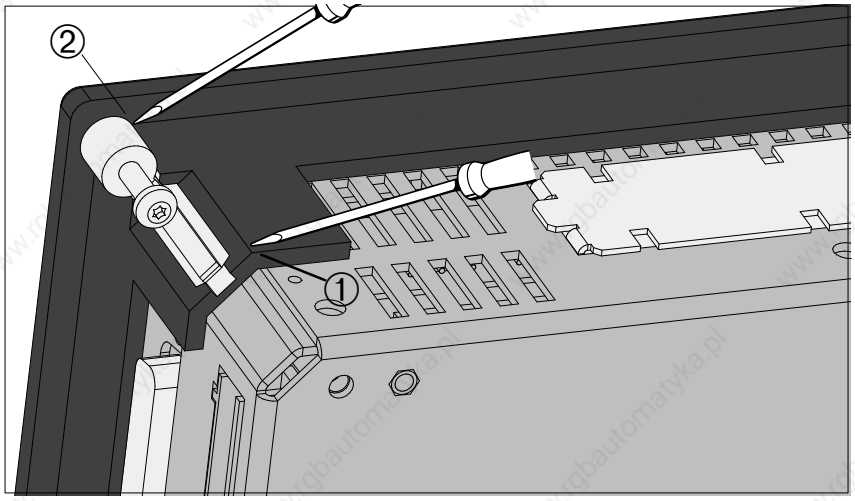


Figure 2-6 Loosening the Fixing Bracket

2.4 Arranging the C7 in the Mechanical Environment

Arranging the C7

When installing a C7, please note the following:

- The switching panel may be 1 to 4 mm thick. Make sure the sealing ring fits tight at all spots.
- A gap of 50 to 70 mm to a housing wall must be observed on the sides of the C7 as shown in Figure 2-7.
- The sealing ring on the frontplate must sit perfectly.
- The tabs of the insertion strips must not be caught.
- The C7 must be protected from direct sunlight.

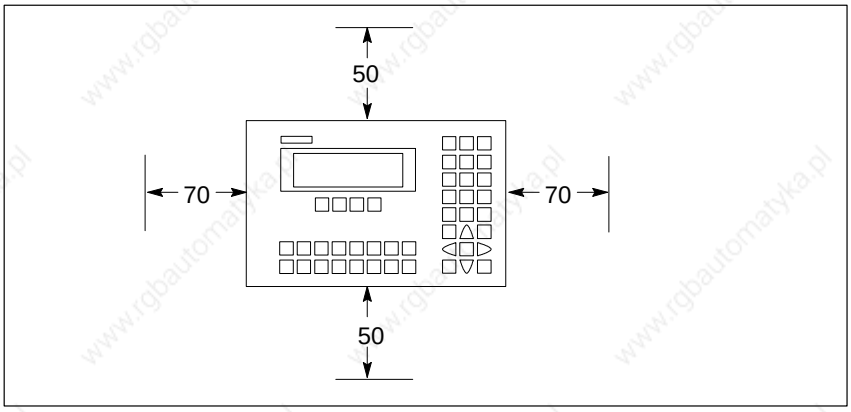


Figure 2-7 Gap Dimensions to be Adhered to when Installing the C7

2.5 Electrical Installation

Overview

The plug and socket connectors (interfaces) required for connecting the various inputs and outputs of the C7 are provided.

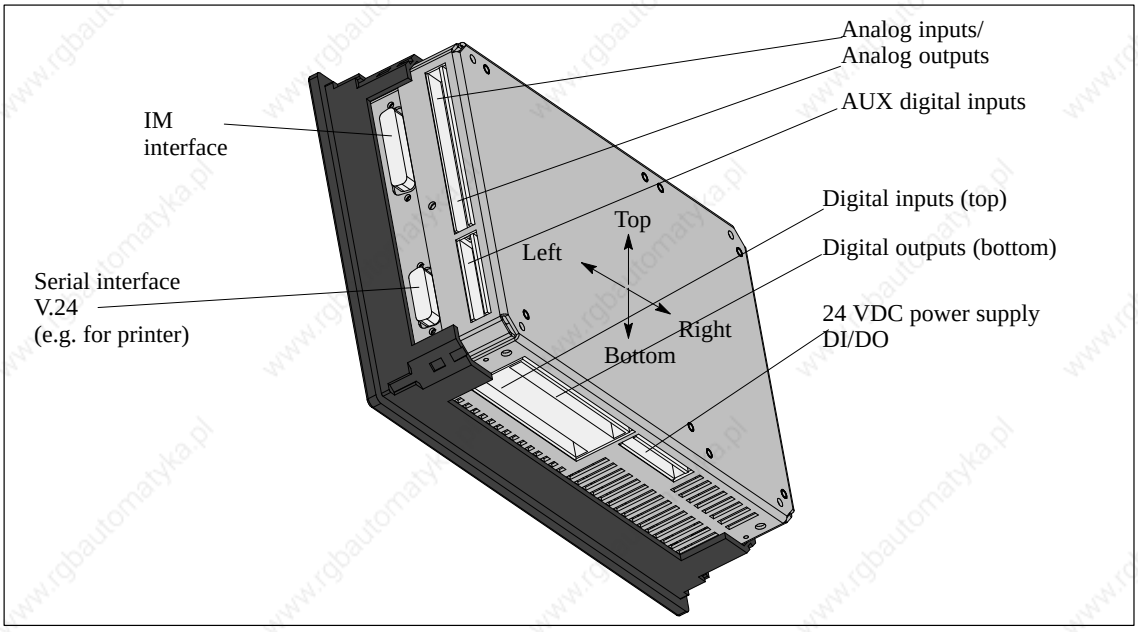


Figure 2-8 A view of the C7 with External I/O Interfaces

C7 Pin Assignments

Tables 2-1 to 2-6 show the pin assignments for the following C7 connectors.

Digital Inputs

Table 2-1 Pin Assignments of the Digital Inputs

Pin No.	Signal	Explanation
0.0	I0.0	Digital input 0
0.1	I0.1	Digital input 1
0.2	I0.2	Digital input 2
0.3	I0.3	Digital input 3
0.4	I0.4	Digital input 4
0.5	I0.5	Digital input 5
0.6	I0.6	Digital input 6
0.7	I0.7	Digital input 7
1.0	I1.0	Digital input 8
1.1	I1.1	Digital input 9

Table 2-1 Pin Assignments of the Digital Inputs

Pin No.	Signal	Explanation
1.2	I1.2	Digital input 10
1.3	I1.3	Digital input 11
1.4	I1.4	Digital input 12
1.5	I1.5	Digital input 13
1.6	I1.6	Digital input 14
1.7	I1.7	Digital input 15

Digital Outputs

Table 2-2 Pin Assignments of the Digital Outputs

Pin No.	Signal	Explanation
0.0	Q0.0	Digital output 0
0.1	Q0.1	Digital output 1
0.2	Q0.2	Digital output 2
0.3	Q0.3	Digital output 3
0.4	Q0.4	Digital output 4
0.5	Q0.5	Digital output 5
0.6	Q0.6	Digital output 6
0.7	Q0.7	Digital output 7
1.0	Q1.0	Digital output 8
1.1	Q1.1	Digital output 9
1.2	Q1.2	Digital output 10
1.3	Q1.3	Digital output 11
1.4	Q1.4	Digital output 12
1.5	Q1.5	Digital output 13
1.6	Q1.6	Digital output 14
1.7	Q1.7	Digital output 15

Analog Inputs/ Outputs

Table 2-3 Pin Assignments of the Analog Inputs/Outputs

Pin No.	Explanation
AI1-U	Analog input 1, signal input for voltage
AI1-I	Analog input 1, signal input for current
AI1-M	Analog input 1, reference potential
AI2-U	Analog input 2, signal input for voltage
AI2-I	Analog input 2, signal input for current
AI2-M	Analog input 2, reference potential
AI3-U	Analog input 3, signal input for voltage
AI3-I	Analog input 3, signal input for current
AI3-M	Analog input 3, reference potential
AI4-U	Analog input 4, signal input for voltage
AI4-I	Analog input 4, signal input for current
AI4-M	Analog input 4, reference potential
M_{ANA}	Reference potential of analog measuring circuit
AO-U	Analog output, signal output for voltage
AO-I	Analog output, signal output for current
AO-M	Analog output, reference potential

AUX Digital Inputs (Universal Inputs)

Table 2-4 Pin Assignments of the Universal Inputs

Pin No.	Explanation
M	Relevant ground
DI-X1	Universal input 1 (digital input, interrupt input or counter input)
DI-X2	Universal input 2 (digital input, interrupt input or counter input)
DI-X3	Universal input 3 (digital input, interrupt frequency or period duration counter input)
DI-X4	Universal input 4 (interrupt input or digital input)
–	Not connected
–	Not connected
–	Not connected

DI/DO 24 VDC Power Supply

Table 2-5 Pin Assignments of the Power Supply DI/DO

Pin No.	Explanation
1L+	24-volt supply for DI 0.0...1.7
1M	Relevant ground for DI 0.0...1.7
2L+	24-volt supply for DQ0.0...DQ0.7 (approx. 2 A)
2L+	24-volt supply for DQ0.0...DQ0.7 (approx. 2 A)
2M	Relevant ground for DQ0.0...DQ0.7
3L+	24-volt supply für DQ1.0...DQ1.7 (approx. 2 A)
3L+	24-volt supply for DQ1.0...DQ1.7 (approx. 2 A)
3M	Relevant ground for DQ1.0...DQ1.7

V.24 Serial Interface

Table 2-6 Pin Assignments for the V.24 Serial Interface (e.g. for Printer)

Pin No.	Explanation
1	C7-M (reference potential)
2	--
3	RxD
4	TxD
5	CTS
6	--
7	--
8	C7-M (reference potential)
9	--
10	RTS
11	--
12	C7-M (reference potential)
13	--
14	--
15	C7-M (reference potential)

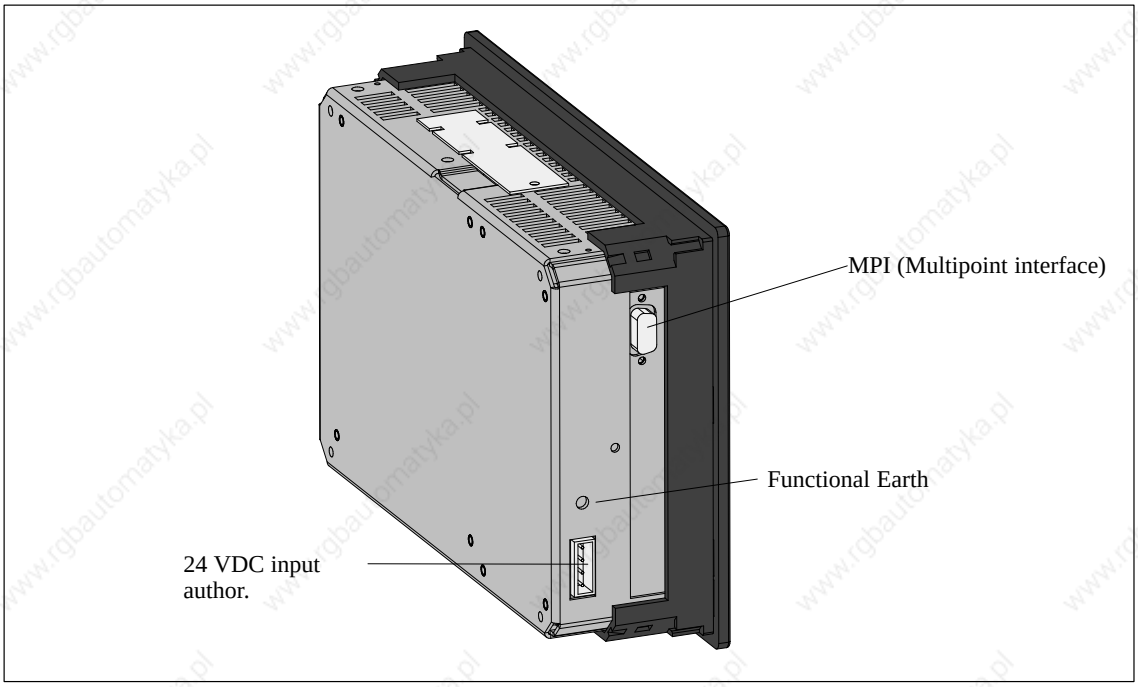


Figure 2-9 C7 View with MPI and C7 Power Supply

MPI

Pin No.	Explanation
1	NC
2	M24V
3	RS485 line B
4	RTSAS
5	M5V
6	P5V
7	P24V
8	RS485 line A

24 VDC input (C7 power supply)

Pin No.	Explanation
1	L+
2	M (ground M24V)
3	A+ (authorization input)
4	AE (authorization input)

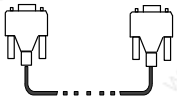
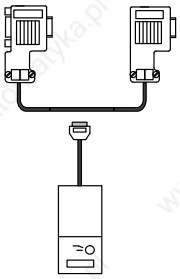
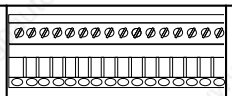
Functional Earth

Connect the functional ground terminal ⏚ (see Figure 2-8) to cabinet ground using a cable lug and a cable with a minimum cross–section of 4 mm.

C7 Device Connections

You can use the following cables for connecting the C7 to other devices:

Table 2-7 Cables for Connecting to the C7

Connecting Cable	Length	Special Features	Illustration	Connection Between ...
MPI				
Programming device cable	5 m	–		C7 ↔ PG C7 ↔ S7-300 C7 ↔ S7-400
PROFIBUS bus cable (interior cable/ direct-buried cable and bus connectors (without programming port/ with programming port) and PROFIBUS bus terminal RS 485 (with 1.5 m cable, with 3 m-cable, with programming port) and 1.5 m cable	–	User must prepare cable		C7 ↔ PG C7 ↔ C7 C7 ↔ S7-300 C7 ↔ S7-400
V.24 serial interface				
Serial interface (printer cable) For Siemens printers DR210/211/2303/231-N		See Catalog ST80.1		C7 → Printer
IM361				
IM361 cable		–		C7 ↔ additional I/O (S7-300)
C7 I/O connections				
Connectors for C7 I/O Cable diameter		16 pin 8 pin 4 pin 0,2...2,5 mm^2		C7 ↔ external sensors

2

2.6 Setup Guidelines for Interference-Proof Installation

Overview

An automation system must be shielded to prevent interference.

When a system is poorly groundet or not shielded, low-frequency and high-frequency interference signals can penetrate the internal bus of the PLC and cause malfunctions.

Interference signals can also be caused when relays or contactors switch (very rapid changes in current or voltage; high-frequency interference signals) or when two parts of a system have different grounding potentials (low-frequency signals).

Use and Installation of Interference-Proof Cables

Use only shielded cables for all signal connections.

- Ground the shields of cables on two sides for
  - cables to the PLC,
  - bus cables,
  - cables to I/O devices.
- The standard cables specified in the *ST80.1* catalog meet these requirements.
- Screw down or lock all plug connections.
- Do not install signal lines parallel to power lines. Use a separate cable duct located at least 50 cm from power lines.

Cabinet setup

Install devices which could bring in interference signals from the outside at the bottom of the cabinet. Place the grounding rail directly at the cabinet entrance so that cables which could be carrying interference signals can be applied directly to grounding potential. Apply all shielded lines with the shield here. Apply only the outer shield of double-shielded signal lines here.

Install long signal lines along the cabinet walls. Setting up the cabinet in accordance with EMC guidelines is an important factor in the reduction of interference. All grounding connections in the cabinet must have large cable cross sections and be applied over a large surface.

Insulate analog devices in the switching cabinet and ground them to a single point in the cabinet using copper tape.

Always use equivalent metals for the materials. Never use aluminum (danger of oxidation).

Connect all doors and metal parts (sides, back and cover) of the cabinet at least three times to the cabinet frame (short, paint-free, large-area connections).

Note

If your system generates high electrostatic voltages (for example, textile machines and special construction machines), run the grounding lines of the machine parts carrying interference signals to a separate operating ground isolated from the central grounding point of the cabinet (surface grounding with housing construction, reinforcement).

2.7 Connecting Shielded Cables

Overview

This section describes how to connect the shield of shielded signal lines to ground. The ground connection is made by directly connecting the shield with the ground terminal of the C7.

Procedure

Proceed as follows to install the grounding bar and shielding clips supplied with the C7:

1. Unfasten the two screws on the C7 as shown in Figure 2-10.
2. Position the grounding bar as shown in Figure 2-10 and fix this in place with the previously removed screw.
3. Affix the shielding clips to the grounding bar as shown in Figure 2-10.
4. Press the insulated cable into these shielding clips in such a way as to achieve optimal contact of the cable shield.

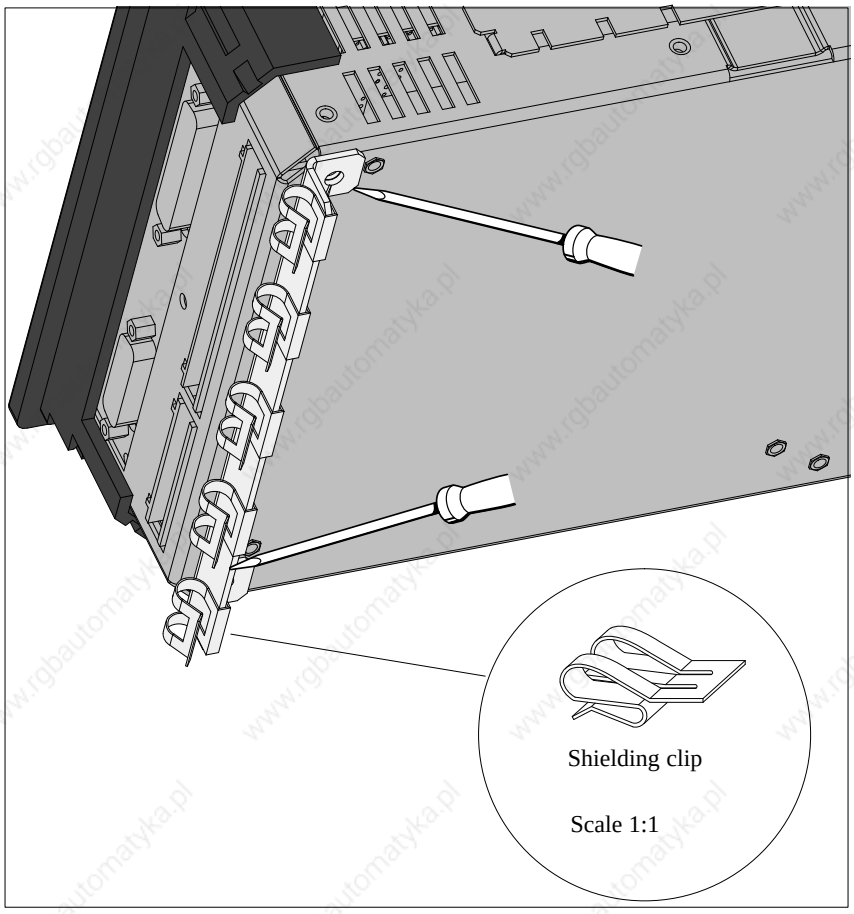


Figure 2-10 C7 with Grounding Bar and Shielding Clips

2.8 Keying Connectors

Overview

A set of connectors with solid and profiled coding keys can be ordered as C7 accessories (see Section 2.1 under Accessories). The keying of connectors will be described in the following:

Keying Connectors

The solid coding keys ① and profiled coding keys ② (see Figure 2-11) prevent a connector from being confused with another without polarity reversal.

Proceed as follows:

1. Insert the solid coding key ① into the notches provided on the connector part ❶.
2. Insert the profiled coding key ② into the respective cutouts on the housing part ❷.

Solid and profiled coding keys that face each other prevent the connector from being plugged in.

The connector can be plugged in if solid and profiled coding keys do not face each other.

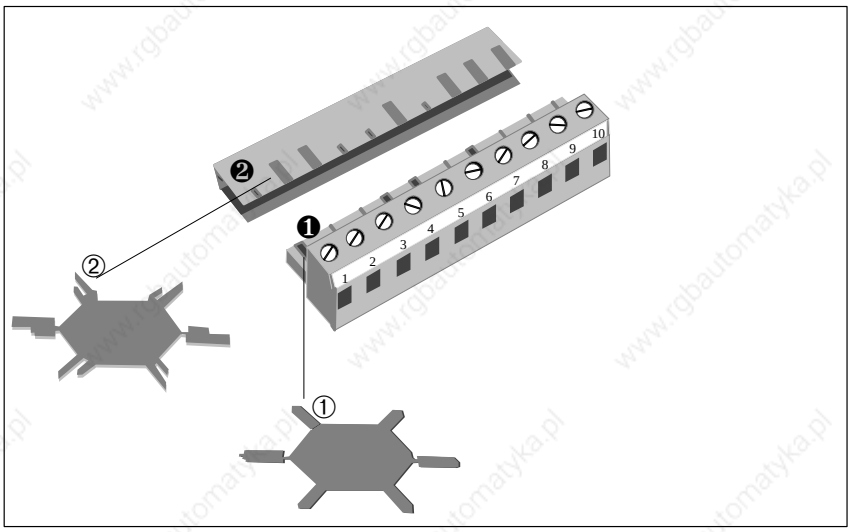


Figure 2-11 How to Key Connectors.

2.9 Arrangement of Additional S7-300 Modules

Additional S7-300 Modules

You can connect further S7-300 modules to the C7 via the IM360 interface of the C7.

The manual **/30/** describes how to install S7-300 modules

Prerequisite

An IM 361 module of the S7-300 system must be connected to the C7.

Connecting the Additional I/O

You connect the additional I/O as follows:

1. Install the additional I/O as described for racks 1 to 3 in the manual **/70/**.
2. Connect the C7 to the IM361 via the IM standard cable (see also Figure 2-8 for connecting the C7).

When the C7 is first started up, it detects the additional connected modules.

IM 360 Interface Module

The C7 has an integral IM360 interface module for I/O expansion with external S7 standard I/O. This interface module is characterized by the following features:

- Data transmission from the IM360 to the IM361 of the first rack expansion via 368 connecting cable
- Maximum distance between IM360 and IM361: 10m

You can expand your C7 by up to 3 mounting racks using the IM360 interface module.

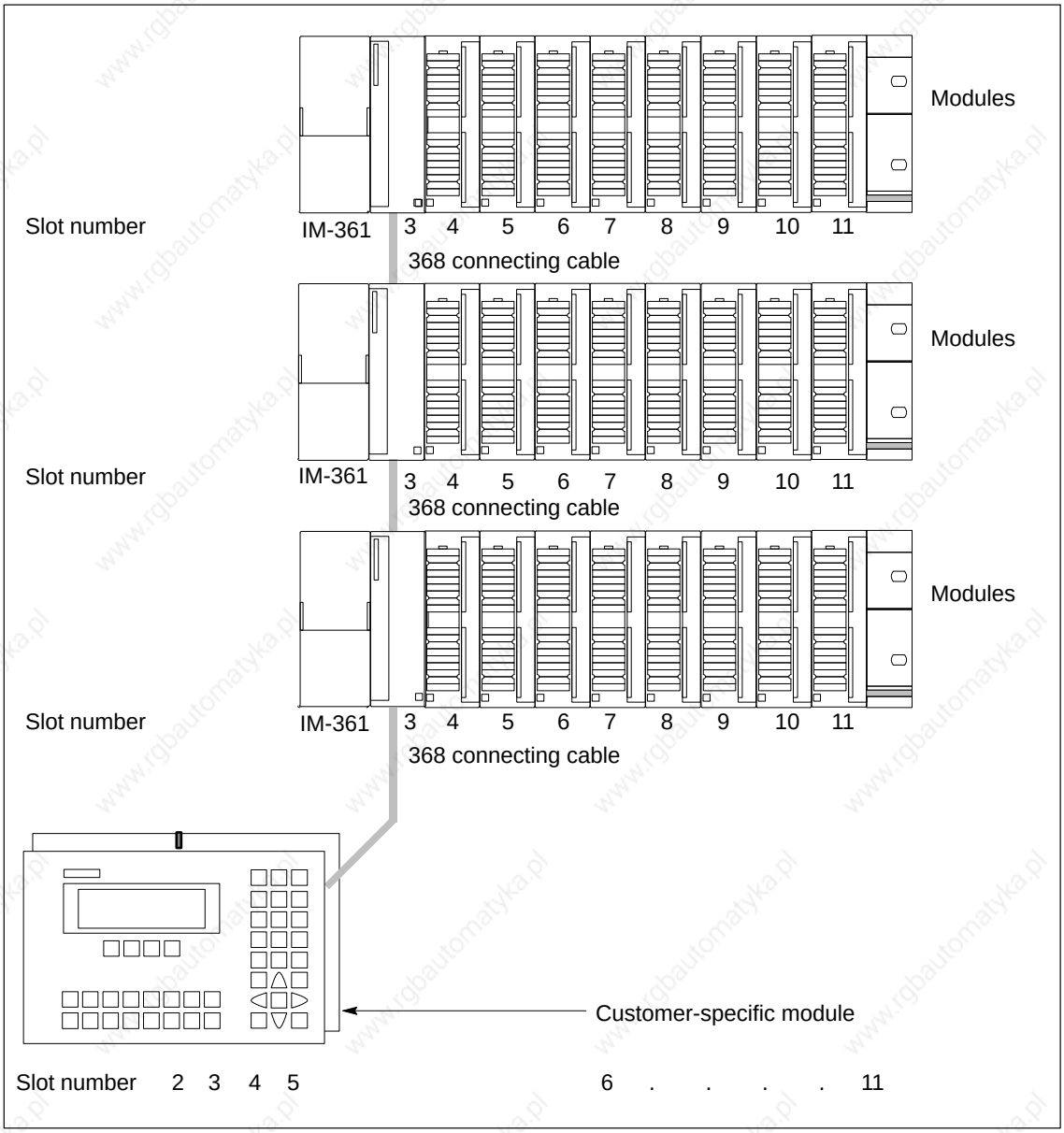


Figure 2-12 Maximum Configuration of the Slots of a C7

2.10 C7 Clocks

Overview

The C7 systems have two clocks:

- One clock in the C7 CPU
- One clock in the C7 OP section

Clock in the C7 CPU

The clock in the C7 CPU is an integral “real-time clock” (hardware clock). This clock is independent of the clock of the MMI section of the C7 OP.

Setting the C7 CPU Clock

The clock is supplied with the following value set:
DT#1994-01-01-00:00:00.

Master Clock

As an integrated clock, the C7 CPU clock can also function as the master clock within the C7 I/O configuration (see also Section 3.4.6 in Volume 2).

Setting and Reading the Clock in the Control Section

You can set and read the clock in the following ways:

- With the programming device (PG) using the STEP 7 tool S7 Info

  or

- In the user program with SFC0 “SET_CLK”. With SFC1 “READ_CLK”, you can read the current time of day (see the reference manual **/235/**).

Clock at Power Off

There are two situations influencing the clock response to POWER OFF:

- If the C7 has a backup battery, the clocks of the C7 continue to run at POWER OFF.
- If the C7 has no battery backup, clocks of the C7 continue at POWER ON with the time shown at POWER OFF. Since the C7 is not backed up, the clock will also not continue after POWER OFF.

Clock in C7 OP Section

The clock in the C7 OP section is independent of the clock in the C7 CPU.

Setting the MMI Clock

The clock is supplied with the following value set:
01.01.94 -00:00.

Setting and Reading the Clock in the C7 OP Section

The clock time:

- Can be set during configuration (for example, it is loaded from C7 CPU data)
- Can be read on-line by operator input if the special display “Clock time/ Date” has been configured and selected (see Volume 2, Section 6.7.1).

Operating Hours Counter

The C7 CPU provides you with an operating hours counter.

You can use this to keep count of the operating hours of the C7 CPU or of any controlled equipment.

You program the operating hours counter in the user program with the SFCs 2 “SET_RTM”, 3 “CTRL_RTM” and 4 “READ_RTM” (see the reference manual **/235/**).

2.11 Starting Up a C7

Clearing the C7 OP

The C7 must be switched off. Proceed as follows when clearing the C7 OP section:

- Press and hold the keys 

simultaneously
- Switch on the power supply to the C7.

The C7 OP section is now cleared, that is, the C7 OP has been reinitialized and **the entire configuration has been deleted.**

Clearing the C7 CPU

Clearing the C7 CPU means reinitializing the C7 CPU, deleting the current control program and reloading any user program located in the flash memory of the C7 CPU.

There are two methods of clearing the C7 CPU:

- Clearing with the C7 system function “Operating modes” of the C7
- Clearing with the PG function (see programming device manual)

Clearing with the PG function is only possible when the C7 CPU is at STOP

Clearing the C7 CPU with the System Function

The following is a description of how to clear the C7 CPU using the system function “C7 CPU Control modes”:

1. Select the **System Function Menu** by pressing the keys 

The following menu is displayed:

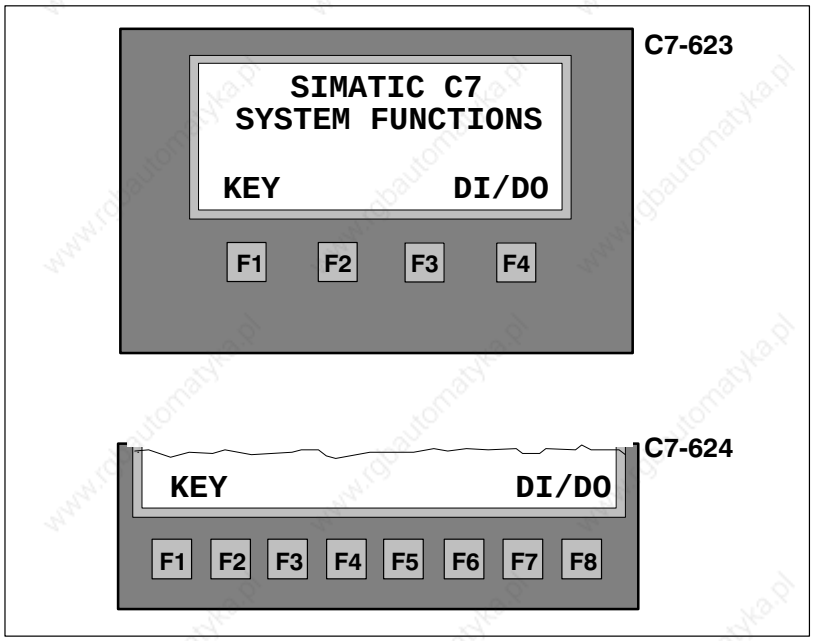


Figure 2-13 System Function Menu with Associated Function Keys

2. Select the **C7 CPU Modes** as follows:

   - C7-623: By pressing F1 or F2
   - C7-624: By pressing F1 or F4

The following menu is displayed:

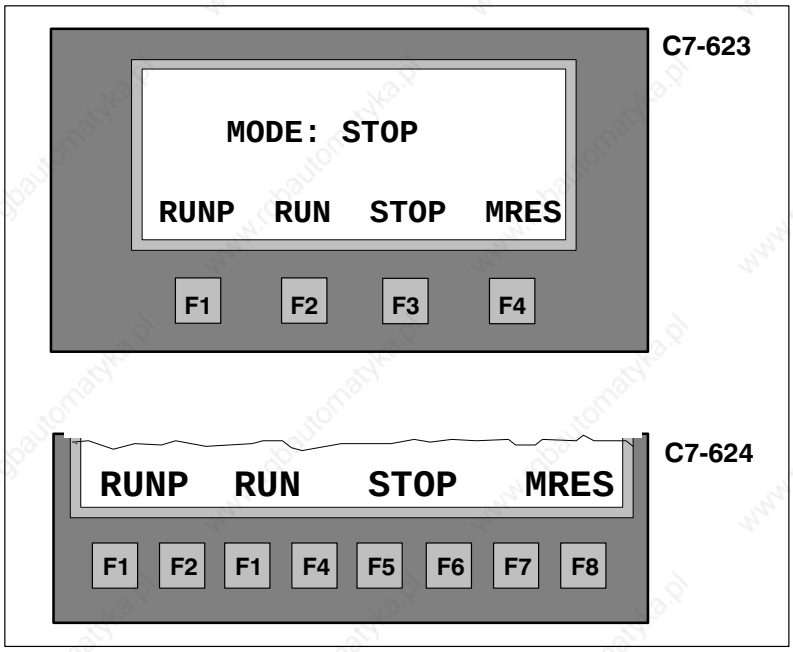


Figure 2-14 “C7 CPU Modes” Menu with Associated Function Keys

3. Select the STOP function by pressing the relevant function keys. The STOP indicator lights up.
4. Select the MRES (memory reset or clear) function and wait until the STOP LED lights up again (approximately 3 seconds).

   Result: The STOP indicator goes out and then lights up again after approximately 3 seconds.
5. Immediately after the STOP indicator lights up again: Select STOP with the relevant function keys and then initiate MRES again.

   Result:

   – If the STOP indicator blinks for approximately 3 seconds and then lights up again: everything is OK; the C7 CPU has been cleared.

   – If the STOP indicator of the C7 does not blink or other indicators light up or blink (exception: BAF indicator): repeat steps 4 and 5; if necessary, evaluate the diagnostics buffer of the C7 using the programming device.

   – If the BAF and SF indicators on the C7 light up, the backup battery is missing. If a battery is nevertheless inserted, you must look for additional error entries in the diagnostics buffer of the C7.
6. After a memory reset, you must explicitly set the C7 CPU to STOP or RUN/RUNP since the C7 CPU is still set to MRES.

2.12 Status and Fault LEDs on the C7

Status and Fault LEDs

The C7-623/C7-624 has the following status and fault LEDs:

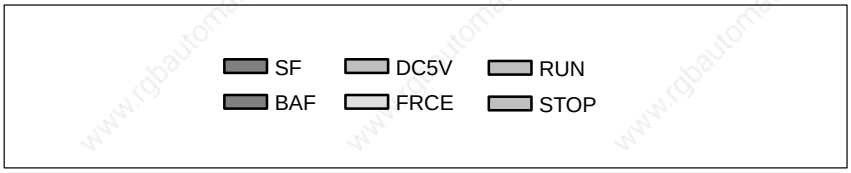


Figure 2-15 Status and Fault LEDs of the C7-623 / C7-624

Meaning of the Status and Fault LEDs

The status and fault LEDs are explained in the order in which they are arranged on the C7.

Display	Meaning	Explanation
SF (red)	C7 CPU group error	**Lights up** in the event ofei • Hardware faults • Firmware errors • Programming errors • Parameter assignment error • Arithmetic errors • Timer errors • Defective internal memory • Battery failure or no backup on POWER ON • I/O fault/error in the internal I/O functions You must use a programming device and read out the contents of the diagnostic buffer to determine the exact nature of the error/fault.
BAF (red)	Battery fault	**Lights up** if the battery • has too little voltage • is defective • is not inserted.
5VDC (green)	5VDC supply for C7	**Lights up** if the internal 5 V voltage is O.K.
FRCE (yellow)	Reserved	–
RUN (green)	RUN mode of the C7 CPU	**Lights up** if the C7 is executing a user program. **Flashes** (2 Hz) during C7 restart (the STOP LED also lights up; after the STOP LED goes dark, the outputs are enabled).
STOP (yellow)	RUN mode of the C7 CPU	**Lights up** if the C7 is not executing a user program. **Flashes** at 1-second intervals if the CPU requests a memory reset.

Configuring an MPI Network

3

This Chapter

This chapter describes how to configure an MPI network. You will learn the following:

- Which communication possibilities are open to you with an MPI network
- To which components you connect the nodes of an MPI network
- Which cable lengths you can implement
- How you can connect the PROFIBUS bus cable to the bus connector
- How to use an RS 485 repeater
- What to remember when connecting a programming device

You must assign MPI addresses to the individual nodes of an MPI network in order to enable them to communicate with each other. How you assign the MPI addresses and what rules you must observe are described in the user manual **/231/**.

In Volume 2 of the manual, Section 3.4.10, you will find all C7 CPU-specific data that you require for configuring communication.

3.1 Communication Over the MPI

Definition: Multipoint Interface MPI

The interface of the C7 for connecting, for example, programming devices, is called multipoint interface since several devices can communicate with the C7 over this interface (that is, communication can take place from several points).

Baud Rate

The baud rate of the C7 is permanently set to 187.5 kbps

Connectable Devices

You can connect the following devices to the MPI:

- Programming devices (PGs/PCs)
- Operator interface systems (OPs)
- S7-300 / M7-300
- S7-400 / M7-400
- Further C7s
- FMs/CPs

Device / Node

Convention: In the following, all devices that you connect in an MPI network are called nodes. Please note that the C7 occupies two MPI addresses and therefore consists internally of two nodes.

Segment

A segment is a bus line between two terminating resistances. A segment can contain up to 32 nodes.

Number of Nodes

You can connect up to 126 (addressable) nodes via the MPI.

MPI Addresses

You must assign an “MPI address” and a “highest MPI address” to each node to enable all nodes connected via the MPI to communicate with each other.

Note

The RS 485 repeater has no “MPI address”.

Default MPI Addresses of the C7

The following table shows the default MPI addresses with which the devices are supplied.

Node (Device)	Default MPI Address	Highest Default MPI Adress
PG	0	15
C7 OP	1	15
C7 CPU	2	15

Rules for the MPI Addresses

Please observe the following rules before assigning MPI addresses:

- All MPI addresses in an MPI network must be different
- The highest possible MPI address must be ≥ the largest actual MPI address and must be the same for all nodes. (Exception: Connecting a programming device to several nodes; see Chapter 4).

Special Features of CPs and FMs

CPs and FMs (as customized modules or in expansion racks) with their own MPI address have the following special feature: Their MPI address is determined automatically by the C7 and assigned in accordance with the following system:

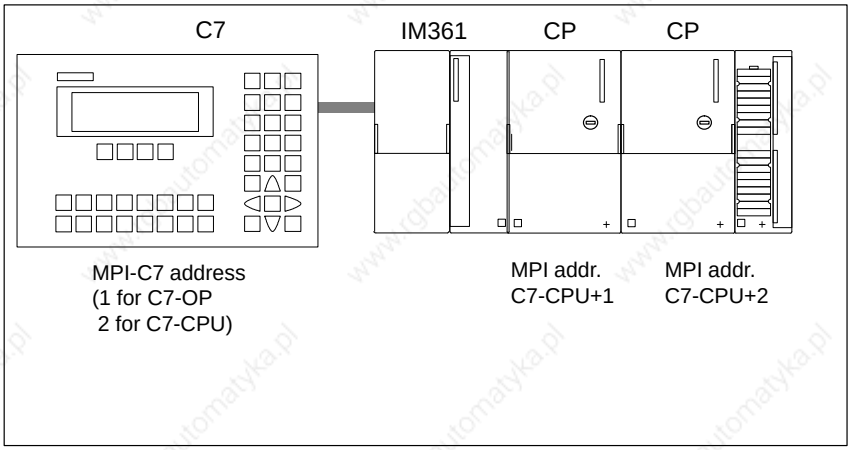


Figure 3-1 Automatic Assignment of MPI Addresses for CPs and FMs

CPU-CPU Communication

A C7 CPU can communicate with up to four C7 CPUs or S7-300 CPUs. They can exchange global data.
Please refer to **/231/** for detailed information on global data.

GD Circuit

Sending and receiving of global data is organized in GD circuits. Each C7 CPU may participate in up to four different GD circuits.

3.2 Rules for Configuring an MPI Network

Overview

In this section you will be shown

- how to configure an MPI network
- which rules you must observe.

Rules

You must observe the following rules when connecting the nodes of an MPI network:

- **Before** you interconnect the individual nodes of the MPI network, you must assign the MPI address and the highest MPI address to each node (with the exception of the RS 485 repeater).

  Tip: Mark all nodes in an MPI network with the MPI address on their housings. In this way, you can always see which node has been assigned which MPI address in your system.

- Connect all nodes in the MPI network as shown in Figure 3-5; that is, integrate the stationary programming devices and OPs direct in the MPI network.

  Connect only those programming devices/OPs that are required for startup or maintenance via spur lines to the MPI network.

- If you are operating more than 32 nodes in a network, you must link the bus segments via RS 485 repeaters.

- Ungrounded bus segments and grounded bus segments are connected via RS 485 repeaters.

- Each RS 485 repeater used reduces the maximum number of nodes per bus segment. This means, if there is an RS 485 repeater in a bus segment, there can then only be a maximum of 31 further nodes in the bus segment. The number of RS 485 repeaters has **no** effect on the maximum number of nodes on the bus.

  There can be up to 10 segments in one row.

- Switch the terminating resistance on at the geographical end point of the MPI network (see Section 3.3).

- **Before** you insert a new node into the MPI network, you must switch off its supply voltage.

Recommendation for MPI Addresses in the Network

The MPI addresses set at the factory should not be assigned as fixed node addresses since, otherwise, address conflicts (double MPI addresses) can arise when devices are replaced or the network is expanded.

- Reserve the MPI address “0” for a service PG
- Reserve the address “1” for the C7 OP
- Reserve the address “2” for the C7 CPU

This avoids double assignment of MPI addresses after installing a further preset C7 or S7-300 in the MPI network (for example, when replacing a C7).

Components

You connect the individual nodes via the bus connectors and the PROFIBUS bus cable. Remember to provide for the nodes a bus connector with PG socket to which a PG can be connected if required (see also Section 3.5).

Use the RS 485 repeater for connections between segments or for extending cables.

Using the RS 485 Repeater

See the reference manual **/71/** for details of how to install and use a repeater.

Terminating Resistance

A cable must be terminated with a surge impedance. For this purpose, switch on the terminating resistance at the first and last node of the network.

At least one of these two nodes must be supplied with power.

Terminating Resistance On Bus Connector

Figure 3-2 shows you where to connect the terminating resistance on the bus connector.

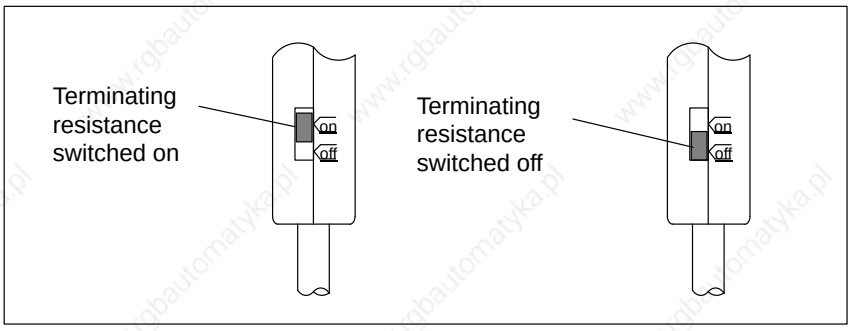


Figure 3-2 Terminating Resistance on the Bus Connector

Terminating Resistance On RS 485 Repeater

Figure 3-3 shows you where to connect the terminating resistance on the RS 485 repeater.

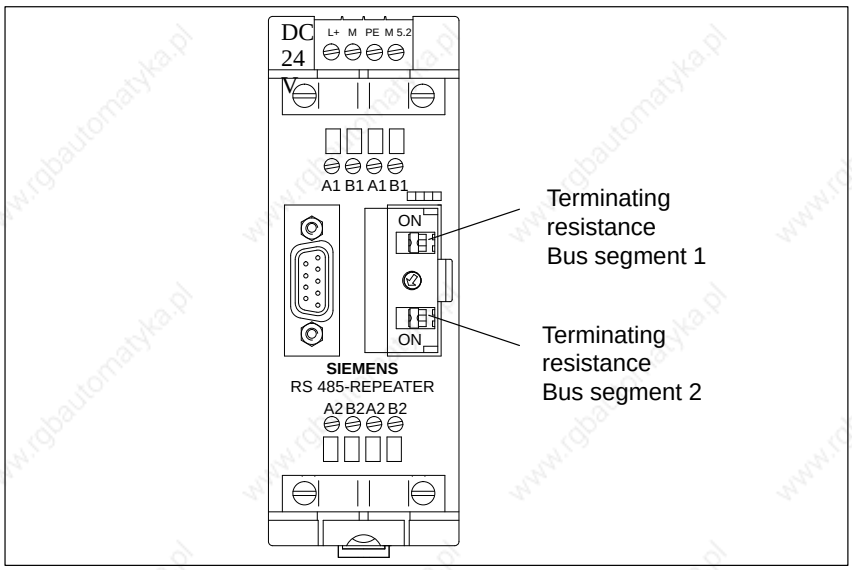


Figure 3-3 Terminating Resistance on the RS 485 Repeater

Example of Terminating Resistance in MPI Network

Using a possible MPI network configuration, Figure 3-4 shows where you must connect the terminating resistance.

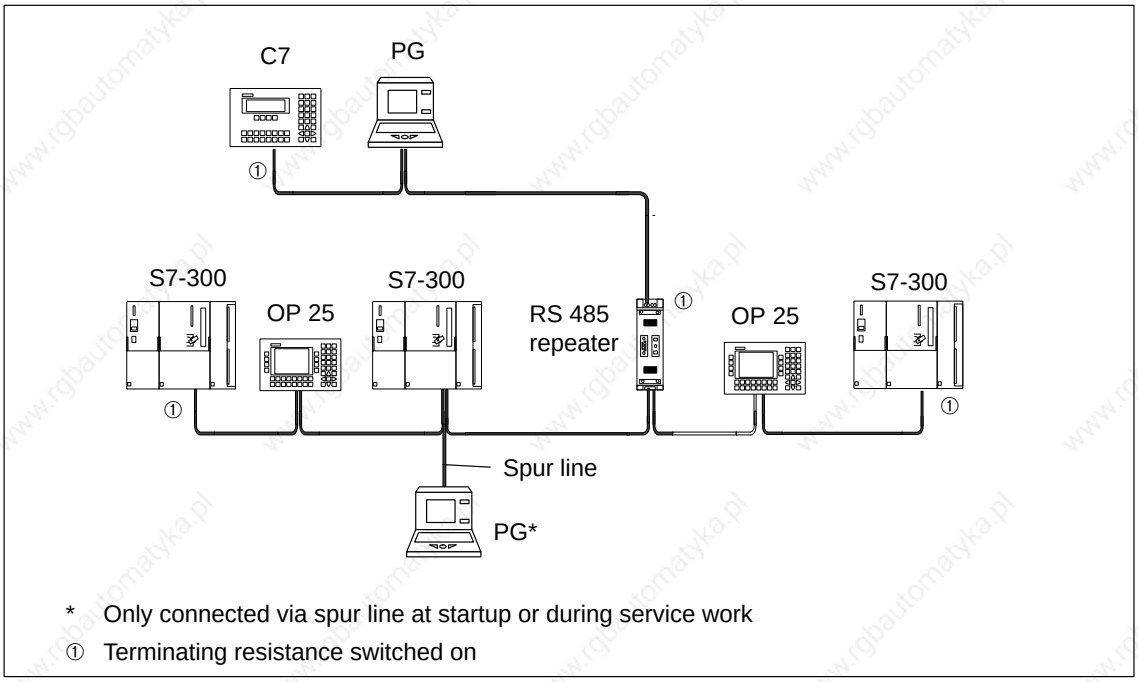


Figure 3-4 Switching Terminating Resistances into an MPI Network

Example for an MPI Network

Figure 3-5 shows the principle of configuring an MPI network according to the rules listed above.

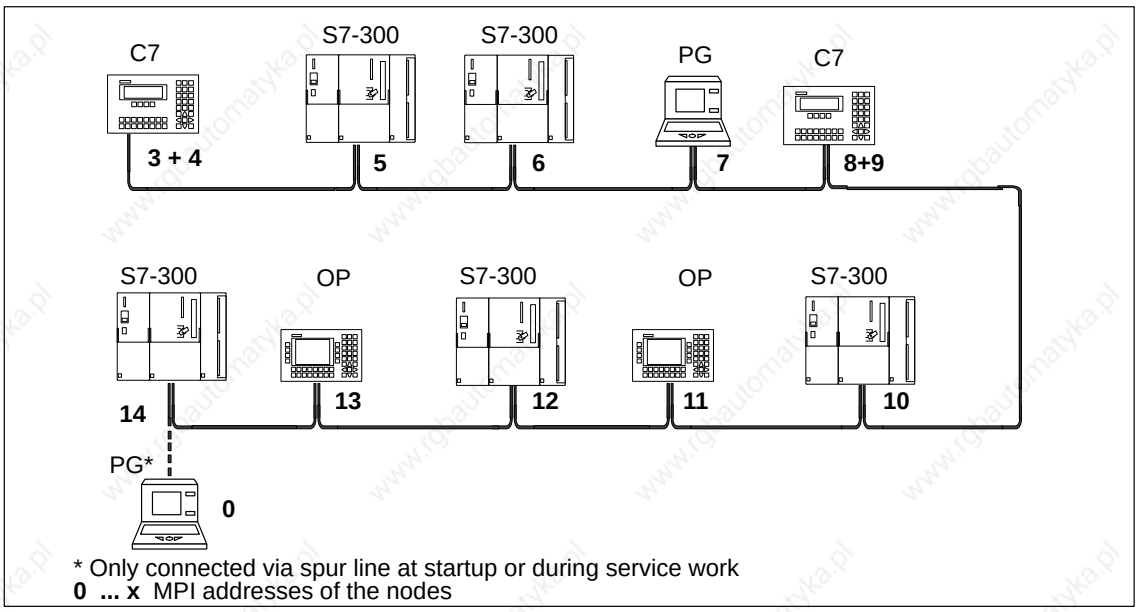


Figure 3-5 Example of an MPI Network

3.3 Cable Lengths

Segment in MPI Network

You can implement cable lengths up to 50 m in a segment of an MPI network. The 50 m applies from the 1st node to the last node of the segment.

Longer Cable Lengths

If you implement longer cable lengths than those permissible in one segment, you must use RS 485 repeaters. The possible maximum lengths between two RS 485 repeaters correspond to the cable length of a segment. However, when using these maximum cable lengths, please note that there must be **no** other node (remote segment) between the two RS 485 repeaters. You can connect up to nine RS 485 repeaters in series.

When calculating the total number of nodes to be connected, please note that an RS 485 repeater counts as a node of the MPI network, even if it has not been assigned its own MPI number.

Figure 3-6 illustrates the principle of “cable extension” with RS 485 repeaters for the MPI.

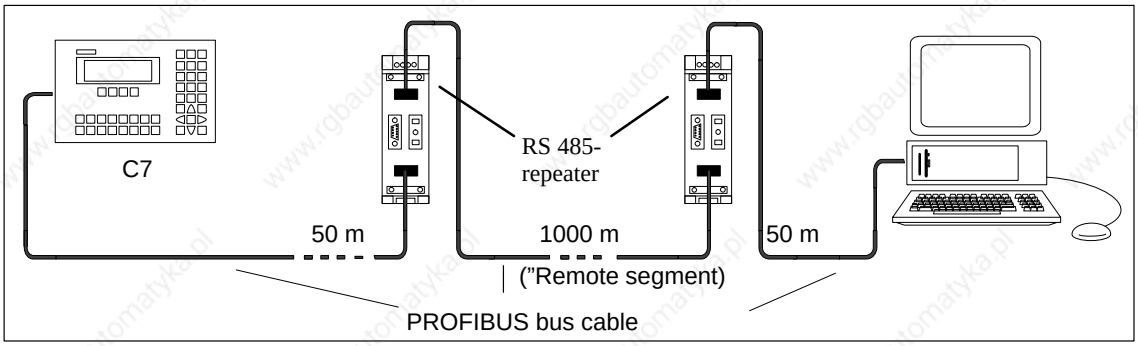


Figure 3-6 Maximum Cable Length Between Two RS 485-Repeaters

Spur Lines

Spur lines are cables with which you can connect programming devices or OPs to a network for startup or service purposes. Spur lines should be as short as possible. They are restricted in their length and number.

Thefollowing Table shows the maximum permissible lengths of spur lines in a segment.

Table 3-1 Maximum Permissible Length of Spur Lines in a Segment

Baud Rate	Max. Perm. Length of Spur Lines in Segment	Number of Nodes for a Spur Line Length of ...	
		1.5 m or 1.6 m	3 m
187.5 kbaud	75 m	32	25

Example

Figure 3-7 shows a possible MPI network configuration. The example indicates the maximum possible distances in an MPI network.

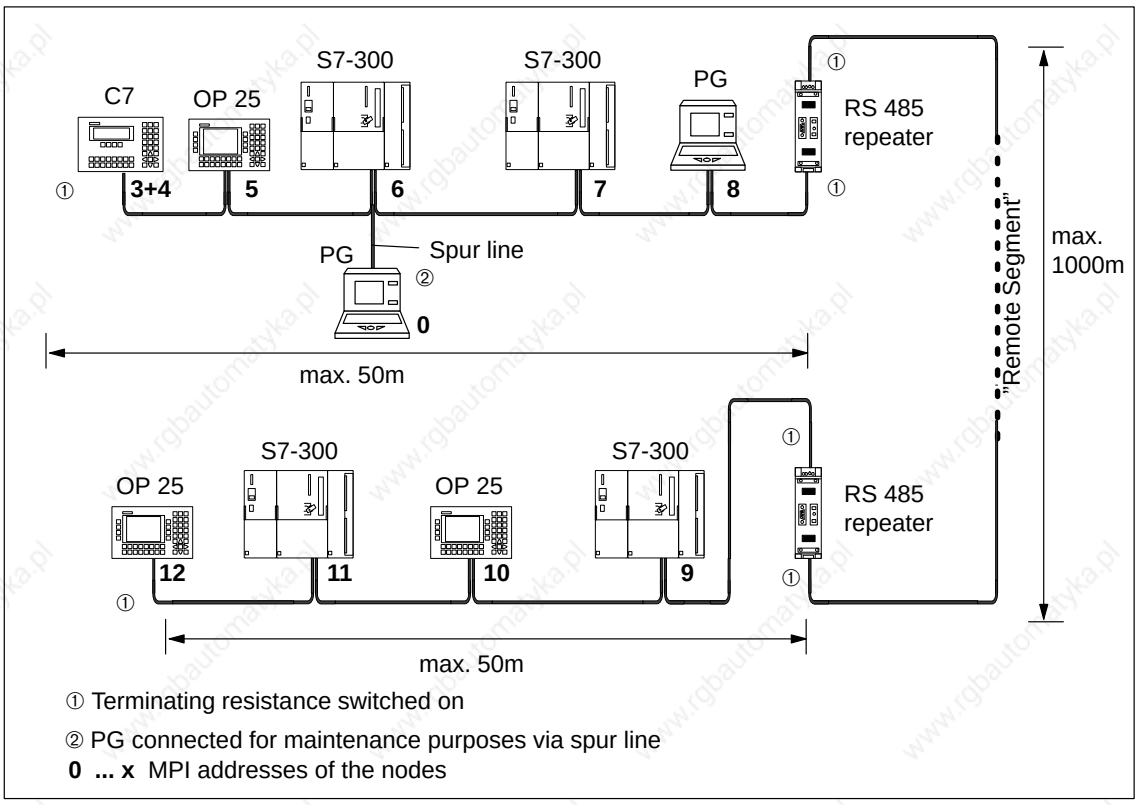


Figure 3-7 Cable Length in an MPI Network

3.4 Network Components

Purpose

You require network components...

Table 3-2 Network Components

Purpose	Components
... for building a network	PROFIBUS bus cable
... for connecting a node to the network	Bus connector
... for amplifying the signal ... for linking segments	RS 485 repeater
... for converting the signal to fiber-optic transmission (PROFIBUS-DP network only)	Optical Link Module
... for connecting programming devices/OPs to the network	Programming device cables (spur lines)

PROFIBUS Bus Cable

We offer the following PROFIBUS bus cables:

Table 3-3 Bus Cables

PROFIBUS bus cable	6XV1 830-0AH10
PROFIBUS direct-buried cable	6XV1 830-3AH10
PROFIBUS drum cable	6XV1 830-3BH10
PROFIBUS bus cable with PE sheath (for food and drinks industry)	6XV1 830-0BH10
PROFIBUS bus cable for festooning	6XV1 830-3CH10

Characteristics of the PROFIBUS Bus Cable

The PROFIBUS bus cable is a two-core, twisted and shielded cable with the following characteristics:

Table 3-4 Characteristics of the PROFIBUS Bus Cable

Features	Values
Surface impedance	Approx. 135 to 160 Ω (f = 3 to 20 MHz)
Loop resistance	≦ 115 Ω/km
Operating capacitance	30 nF/km
Attenuation	0.9 dB/100 m (f = 200 kHz)
Permissible core cross-section	0.3 mm^2 to 0.5 mm^2
Permissible cable diameter	8 mm ± 0.5 mm

Rules for Cable Laying

When laying the PROFIBUS bus cable, you must **not**

- twist it,
- stretch it or
- press it.

In addition, when laying the interior bus cable, you must observe the following boundary conditions (d_A = outer diameter of the cable):

Table 3-5 Boundary Conditions when Laying the Interior Bus Cable

Features	Edge Conditions
Bending radius when bent once	$\geq$ 80 mm ($10 \times d_A$)
Bending radius when bent several times	$\geq$ 160 mm ($20 \times d_A$)
Permissible temperature range when laying	– 5 °C to + 50 °C
Storage and stationary operating temperature	– 30 °C to + 65 °C

3.5 Bus Connectors

Purpose of the Bus Connector

The bus connector is used for connecting the PROFIBUS bus cable to the MPI. This is how the connection to further nodes is established.

There are two different bus connectors:

- Up to 12 Mbaud
  - Without heavy-gauge threaded joint (6ES7 972-0BA10-0XA0)
  - With heavy-gauge threaded joint (6ES7 972-0BB10-0XA0)
- Up to 12 Mbaud, optionally with vertical or angular outgoing cable
  - Without heavy-gauge threaded joint (6ES7 972-0BA20-0XA0)
  - With heavy-gauge threaded joint (6ES7 972-0BB20-0XA0)

No Application

The bus connectors are **not** required for the RS 485 repeater:

3.5.1 Bus Connectors 6ES7 972-0B.20-0XA0

Design (6ES7-972-0B.20 ...)

Figure 3-8 shows the bus connector 6ES7 972-0B.20 ...:

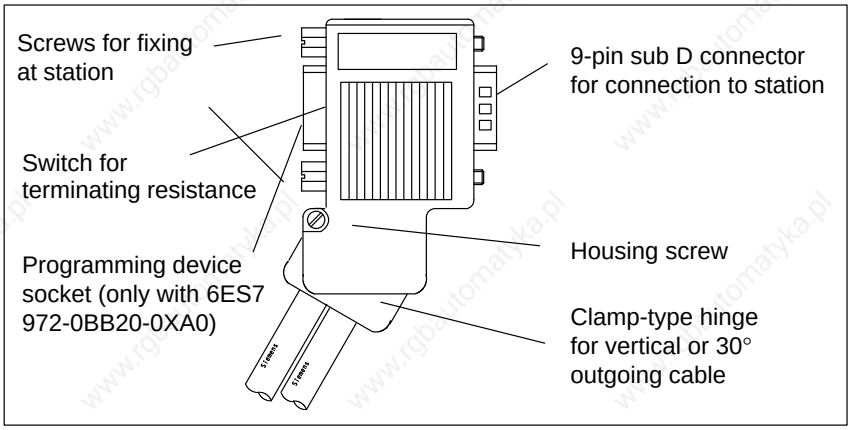


Figure 3-8 Design of Bus Connector 6ES7 972-0B.20 ...

Mounting the Bus Cable

Connect the bus cable to the bus connector 6ES7 972-0B.20 ... as follows:

1. Strip the insulation off the bus cable as shown in Figure 3-9.

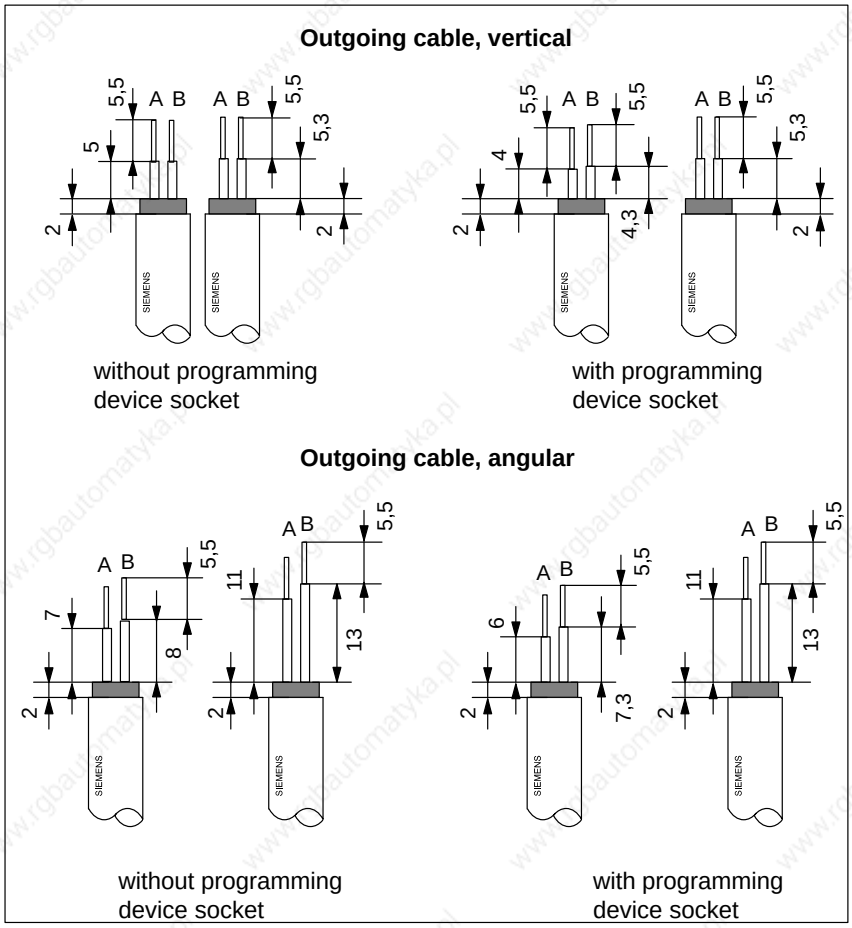


Figure 3-9 Length of Stripped Insulation for the Connection to the Bus Connector 6ES7 972-0B.20 ...

2. Open the housing of the bus connector by loosening the housing screw and swinging the cover upward.
3. Remove the clamp-type hinge cover.
4. The bus connector 6ES7 972-0B.20 is delivered prepared for an angular outgoing cable.

   If a vertical outgoing cable arrangement is required

   – loosen the screw at the left side of the hinge,
   – slightly lift the hinge and
   – turn the hinge inward.
   – For fixing the hinge, tighten the screw on the left.

5. Insert the green and red wires into screw-type terminal block as shown in Figure 3-10.

   Make sure that you always connect the same wires at the same terminal. A or B (for example, always connect green wire to terminal A and red wire to terminal B).

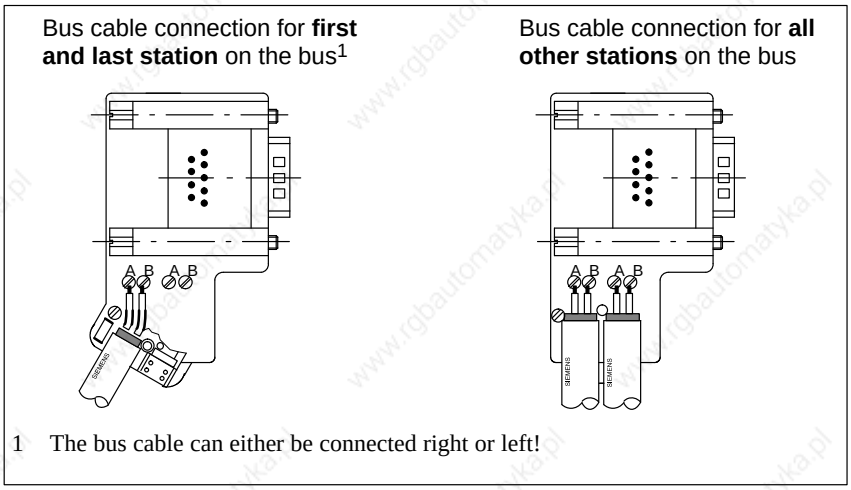


Figure 3-10Connecting the Bus Cable at the Bus Connector (6ES7 972-0B.20 ...)

6. Screw tight the clamp-type hinge cover.

   Make sure that the shielding is bare under the screw-type terminal.

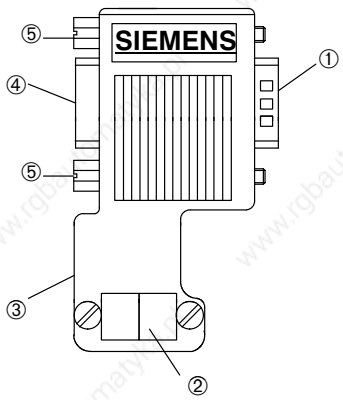
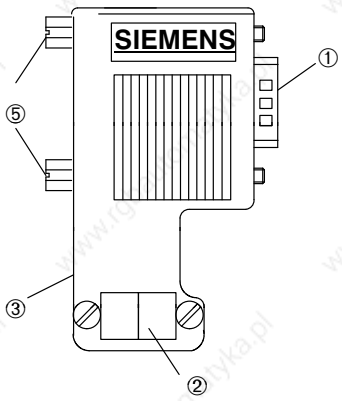
7. Tighten the green and red wires in the screw-type terminal.
8. Close the cover of the bus connector and
9. Screw down the housing.

3.5.2 Bus Connectors 6ES7 972-0B.10-0XA0

Appearance

Table 3-6 shows the bus connectors 6ES7 972-0B.10-0XA0.

Table 3-6 Description and Function of the Bus Connectors 6ES7 972-0B.10-0XA0

Appearance of the Bus Connectors		No.	Function
with heavy-gauge threaded joint	without heavy-gauge threaded joint		
		①	Connection to the MPI, PROFIBUS-DP interface (9-pin connector)
		②	Connection for the PROFIBUS bus cable
		③	Terminating resistance
		④	Interface for PG/OP
		⑤	Screws for fixing to the node

Installing the PROFIBUS Bus Cable for Bus Connectors

Proceed as follows to connect the PROFIBUS bus cable to the bus connector 6ES7 972-0B.10-0XA0:

1. Cut the bus cable to the desired length.
2. Insulate the bus cable in accordance with Figure 3-11.

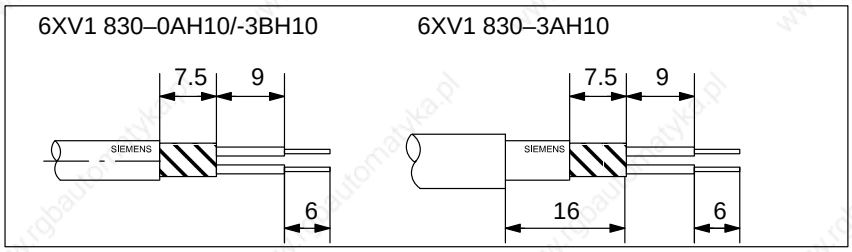


Figure 3-11 Length of Bared Wire for Connecting to the Bus Connector

3. Open the housing of the bus connector by loosening the housing screws
4. Remove the cover.

5. Insert the green core and the red core in the screw terminal block in accordance with Figure 3-12.

   Please ensure that the same cores are always wired to the same connection A or B (for example, always wire the green core to connection A and the red core to connection B).

6. Press the cable sheath between the two clamping grips. This will hold it in place.

7. Screw the green and red core tightly in the screw terminal.

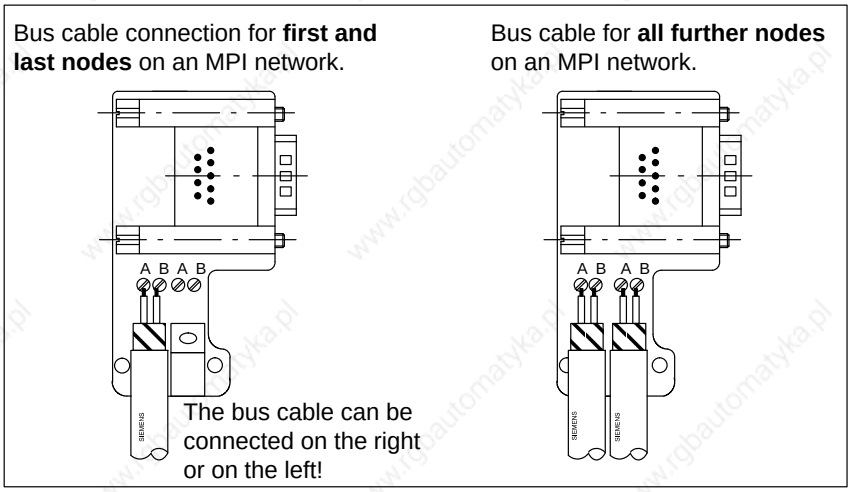


Figure 3-12 Connecting Bus Cable to the Bus Connector

8. Screw the housing back on.

   Please ensure that the cable shielding is bare under the shielding clip.

3.5.3 Plugging the Bus Connector into the Module

Connecting the Bus Connector

Proceed as follows to connect the bus connector:

1. Plug the bus connector into the module.
2. Screw the bus connector to the module.
3. If the bus connector (Order No. 6ES7 ...) is at the start or end of a segment, you must switch on the terminating resistance (switch position “ON”) (see Figure 3-13).

Please ensure that the stations with the terminating resistance are always supplied with power during power up and during operation.

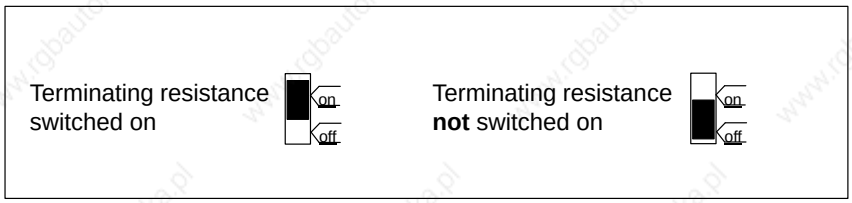


Figure 3-13 Bus Connectors (6ES7 ...): Terminating Resistance Switched On and Not Switched On

Removing the Bus Connector

You can remove the bus connector with **looped-through bus cable** from the PROFIBUS-DP interface at any time without interrupting data traffic on the bus.

Warning

Possibility of interrupting data traffic on the bus!

A bus segment must always be terminated at both ends by the terminating resistance. This is not the case if the last slave with bus connector is not supplied with power. Since the bus connector draws its power from the node, the terminating resistance is ineffective.

Please ensure that the stations in which the terminating resistance is switched in, are always supplied with power.

Connecting a Programming Device / PC to a C7

4

This Chapter

4.1 Connecting a Programming Device/PC to a C7

Possibilities

This chapter covers the methods open to you for connecting a programming device or PC via an MPI.

Cable Lengths

You will find information on cable lengths possible in each case in Section 3.3.

Connecting a Programming Device/PC to a C7

You can connect a programming device or PC with the MPI of the C7 using a prefabricated programming device cable.

Alternatively, you can make up the connecting cable yourself using the PROFIBUS bus cable and bus connectors (see Section 3.5).

Figure 4-1 shows the components for connecting a programming device/PC to a C7.

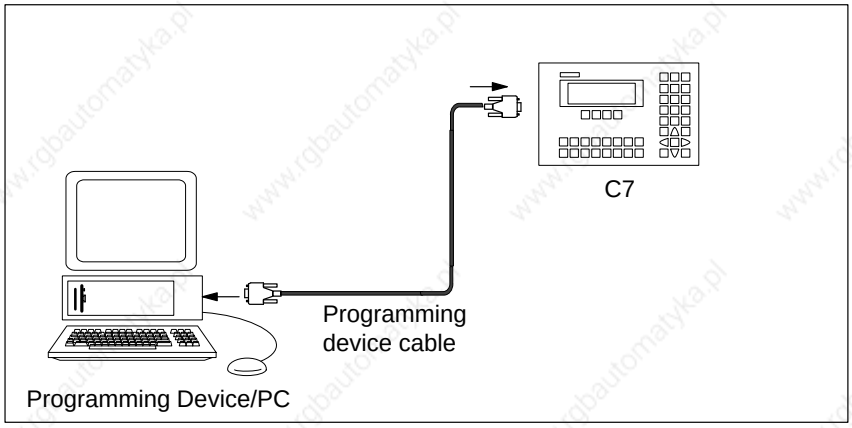


Figure 4-1 Connecting a Programming Device/PC to a C7

4.2 Connecting a Programming Device/PC to Several Nodes

Possibilities

This chapter shows you how to connect a programming device or PC to several networked nodes via the MPI:

Two Installation Variants

When you connect a programming device/PC to several nodes, you must differentiate between two installation variants:

- Fixed installation of the programming device/PC in the MPI network
- Programming device/PC connected for startup and maintenance purposes.

Depending on this, you connect the programming device/PC with the other nodes as follows (see also Section 3.2).

Installation Variant	Connection
Fixed installation of the programming device/PC in the MPI network	The programming device/PC is linked direct into the MPI network
Programming device/PC connected for startup and maintenance purposes	The programming device/PC is connected to one node via a spur line

Fixed Installation of Programming Device/PC

With fixed installation of a programming device/PC in the MPI network, you connect the programming device/PC via a bus connector direct with the other nodes of the MPI network in accordance with the rules listed in Section 3.2.

Figure 4-2 shows a C7 network with two C7s. Both C7s are connected to each other over the PROFIBUS bus cable.

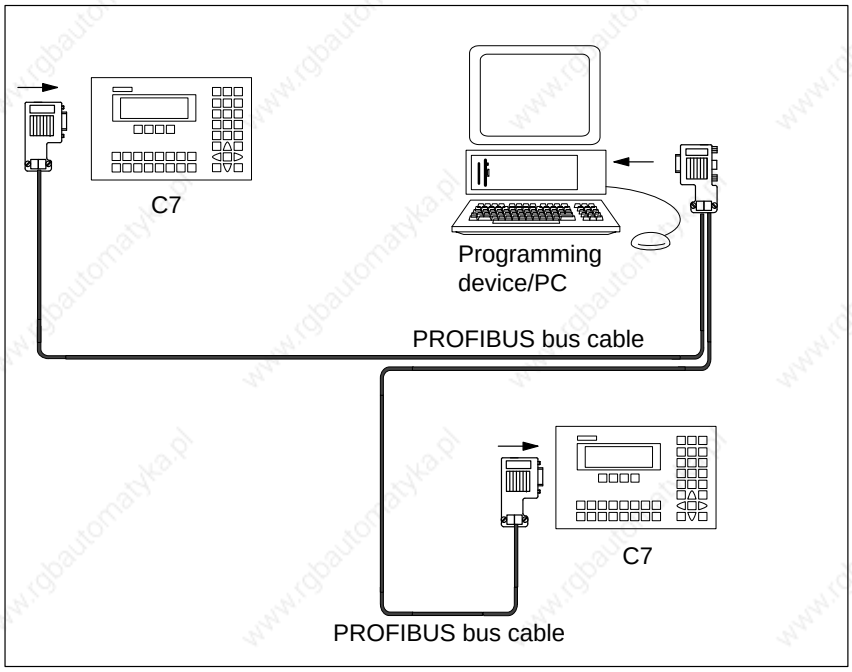


Figure 4-2 Connecting a Programming Device to Several C7s

Connecting the Programming Device/PC for Service Purposes

If there is no stationary programming device/PC available, we recommend the following:

In order to connect a programming device/PC for service purposes to an MPI network with “unknown” node addresses, we recommend that you set the following address on the service programming device/PC:

- MPI address: 0
- Highest MPI address: 126.

Then find out the highest MPI address in the MPI network via S7 Configuration and adjust the highest MPI address on the programming device/PC to suit that of the MPI network.

Programming Device/PC for Startup or Maintenance

For startup or maintenance purposes, connect the programming device/PC via a spur line to a node of the MPI network. The bus connector of this node must possess a heavy-gauge threaded joint for this purpose (see also Section 3.5).

Figure 4-3 shows two networked C7s to which a programming device/PC is connected.

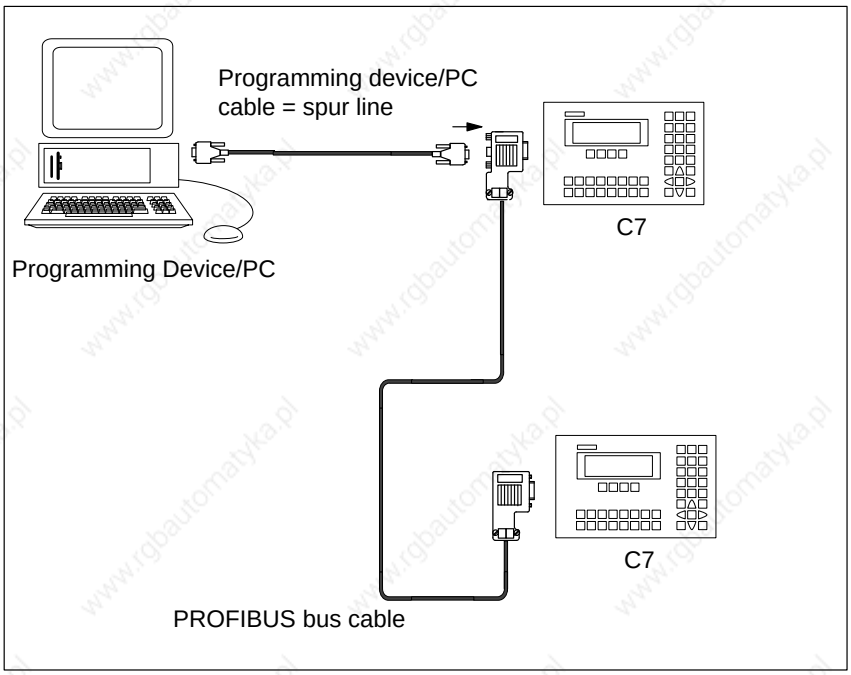


Figure 4-3 Connecting a Programming Device/PC to an MPI Network

C7 Digital Input/Output

5

This Chapter

5.1 Digital Input Function

Introduction

The C7 has different digital inputs for connecting sensors.

Digital Input Function

This chapter presents the technical specifications of the C7's digital inputs.

In addition to the technical specifications of the digital inputs, this chapter also describes

- The characteristics
- The special features
- The terminal connection and block diagrams of the digital inputs

Characteristics

The digital input function has the following characteristics:

- 16 inputs, isolated as a group
- Nominal input voltage: 24 VDC
- Suitable for switches and 2-wire proximity switches (BEROs), for example.

Terminal Connection and Block Diagram

Figure 5-1 shows the terminal connection and the block diagram of the digital input function.

The pages following contain detailed technical specifications of the digital inputs.

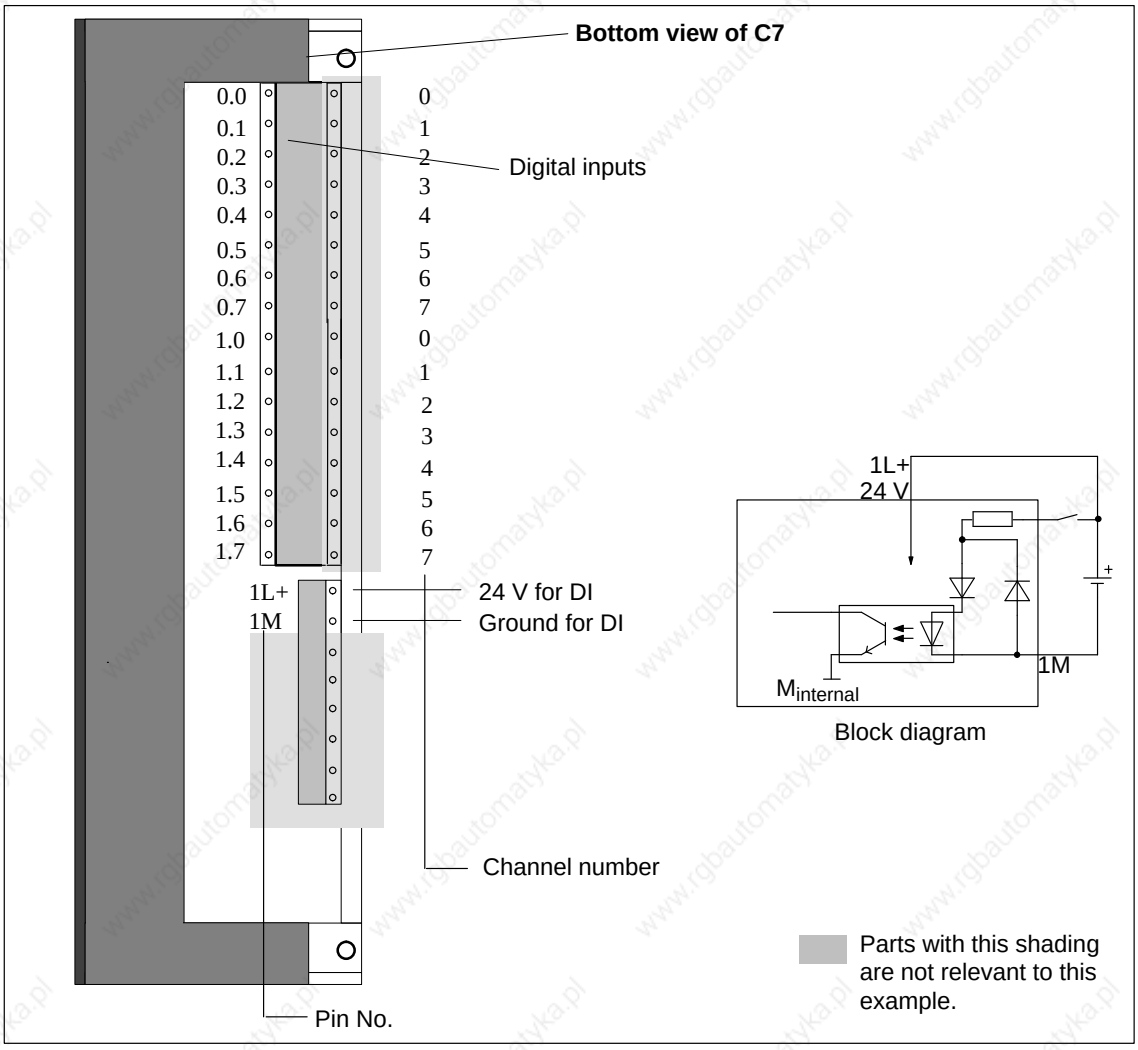


Figure 5-1 Terminal Connection and Block Diagram of the Digital Input Function

5

Specific Data of the Digital Input Function	
Number of inputs	16
Cable length	
• Unshielded	600 m
• Shielded	1000 m
Voltages, Currents, Potentials	
Nominal load voltage L +	24 VDC
Number of simultaneously energizable inputs	16
Galvanic isolation	Yes (optocoupler)
• In groups of	16
Permissible potential difference	
• Between the M terminals of the groups	–
• Insulation resistance	500 VDC
Status, Interrupts, Diagnostics	
Interrupts	No
Diagnostics functions	No

Data for Selecting a Sensor	
Input voltage	
• Nominal voltage	24 VDC
• For “1” signal	from 11 to 30 V
• For “0” signal	from -3 to 5 V
Input current	
• For “1” signal	from 6 to 11.5 mA
Input delay time	
• Programmable	No
• At “0” to “1”	from 1.2 to 4.8 ms
• At “1” to “0”	from 1.2 to 4.8 ms
Input characteristic	In accordance with DIN EN 61131–2 (IEC 1131, Part 2)
Type of input in accordance with IEC 1131	Type 2
Connection of 2-wire BEROs	Possible
• Permissible quiescent current	$\leq$ 2 mA

5.2 Digital Output Function

Characteristics

The digital output function has the following characteristics:

- 16 outputs, isolated.
- Output current: 0.5 A
- Nominal load voltage: 24 VDC
- Suitable for solenoid valves and d.c. contactors.

Special Feature

When the supply voltage is switched on, the digital output function sends a pulse to the outputs. A pulse can be approximately 50 µs within the permissible output current range.

Terminal Connection and Block Diagram

Figure 5-2 shows the terminal connection and the block diagram of the digital outputs.

The pages following contain detailed technical specifications of the digital outputs.

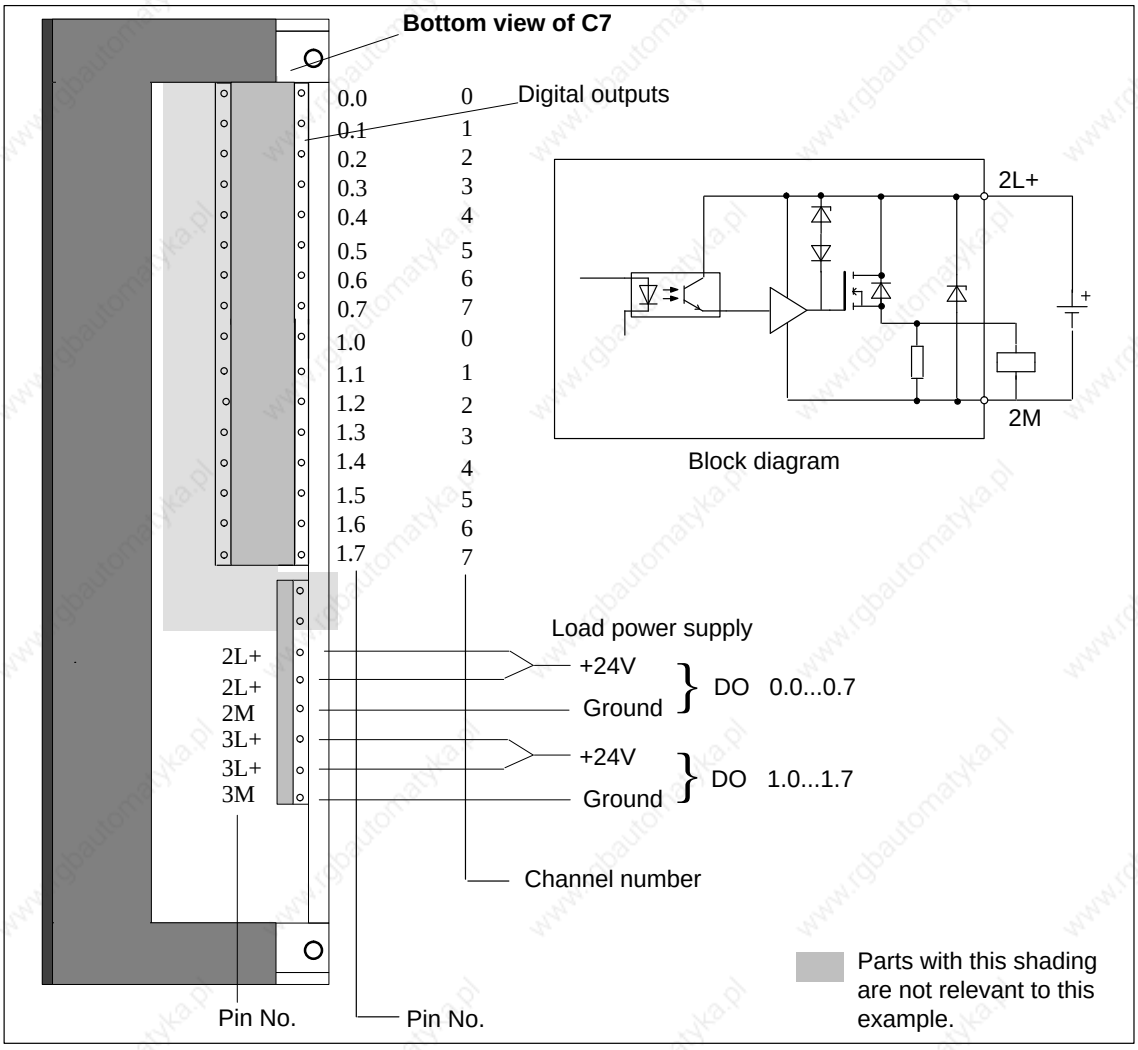


Figure 5-2 Terminal Connection and Block Diagram of the Digital Outputs

Connection of Load Power Supply

If the maximum permissible current is utilized for the load power supply, both pins should be wired to avoid overloading of the contacts. For relatively low currents, wiring of only one +24V pin is sufficient.

Specific Data of the Digital Output Function	
Number of outputs	16
Cable length	
• Unshielded	600 m
• Shielded	1000 m
Voltages, Currents, Potentials	
Nominal load voltage L +	24 VDC/0.5A
Total current of the outputs (per group)	
• Up to 20 °C	4 A
• Up to 45 °C	2 A
Galvanic isolation	Yes (optocoupler)
• In groups of	8
Insulation resistance	500 VDC
Status, Interrupts, Diagnostics	
Interrupts	No
Diagnostics functions	No

Data for Selecting an Actuator	
Output voltage	
• At “1” signal	L + (– 0.8 V)
Output current	
• At “1” signal nominal value Permissible range	 0.5 A 5 mA..0.5 mA
• At “0” signal (quiescent current)	max. 0.5 mA
Lamp load	max. 5 W
Parallel switching of 2 outputs	
• For logic operations	Possible (outputs of the same group only)
• For enhancing performance	Not possible
Activating a digital input	Yes
Max. switching frequency	
• With resistive load/lamp load	100 Hz
• With inductive load	0.5 Hz
Inductive cutoff voltage limited (internally) to	L + (– 48 V)
Short-circuit protection of the outputs	Yes, electronically timed
• Operating point	1 A

5.3 Status Displays of DI/DO

Overview

The process image of the digital I/O can be displayed using a C7 system function. The values represented are read as direct process image of the DI and internal process image of the DO of the C7 and displayed in BIN format. It is not possible to change the display.

In the STOP state, the actual process status for DO is 0. The process image displayed may deviate from this; it is the last status set by the control program.

Selecting the DI/DO Status Display

Selection of the DI/DO status display does not require an operator password. You select the function as follows:

- Select the **System Function Menu** by pressing SHIFT HELP
- C7-623: By pressing F3 or F4
- C7-624: By pressing F5 .... F8

The following data are supplied:

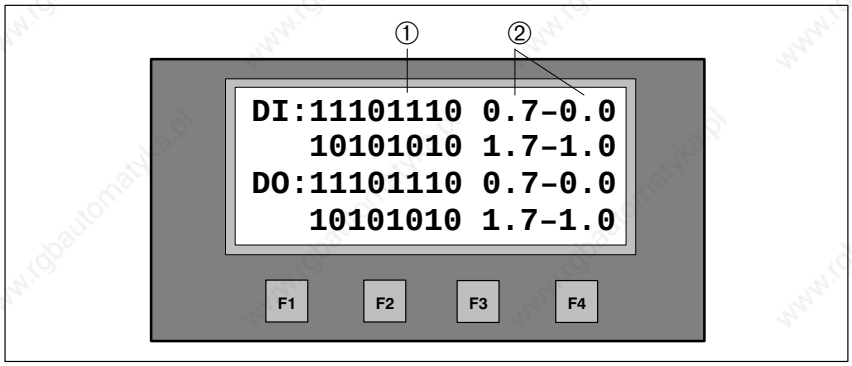


Figure 5-3 DI/DO Status Display on a C7-623

Table 5-1 Explanation of the DI/DO Display in Figure 5-3

Position	Explanation
①	Signal status of the DI/DO • 1 DI/DO set • 0 DI/DO reset
②	Pin no. from – to

Note

Since the display is based on a polling read access, status changes within an interval < 400 ms cannot be detected. However, modifications of the cyclic 400 ms grid may result in an unstable display.

Exiting the DI/DO Display

Exit the DI/DO display by pressing ESC and then press ESC again to exit the **System Function Menu.**

5

C7 Analog Input/Output

6

This Chapter

6.1 Analog Technology

Introduction

There are different analog inputs and one analog output available to you in the C7 for connecting sensors and/or loads/actuators.

Analog I/O

This section covers the following:

- A description of analog value representation, the measuring types, measuring ranges and output ranges in the C7
- A description of how to connect the sensors or loads/actuators to the analog I/O
- The principles of using analog I/O
- Behavior of analog I/O

Ungrounded Configuration

The C7 cannot be installed in an ungrounded configuration.

6.2 Connecting Transducers to Analog Inputs

Overview

You can connect various types of transducers to the analog inputs:

- Voltage transducers
- Current transducers as 4-wire transducers

This section tells you how to connect up your transducers and what precautions you have to take when doing so.

Cables for Analog Signals

To reduce electrical interference, you should use twisted-pair shielded cables for the analog signals. The shield of the analog signal cables should be grounded at both cable ends. If there are potential differences between the cable ends, an equipotential bonding current can flow over the shield. This can interfere with the analog signals. In such a case, you should ground the shield at one end of the cable only.

Isolated Analog Input

The analog input is isolated and so there is no electrical connection between the reference point of the measuring circuit M_{ANA} and the M terminal of the C7 power supply (see Figure 6-1).

A potential difference U_{ISO} can occur between the reference point of the measuring circuit M_{ANA} and the M terminal of the C7. Make sure that U_{ISO} does not exceed the permissible value. Where it is possible that the permissible value might be exceeded (see technical specifications), establish a connection between the M_{ANA} terminal and the M terminal of the C7.

Connecting Transducers to Analog Inputs

A potential difference U_{CM} (common mode voltage) may occur between the measuring line AIx-M of the input channels and the reference point of the measuring circuit M_{ANA}. However, this potential difference must not exceed the permissible value. Where it is possible that the permissible value for U_{CM} might be exceeded, or where you cannot determine the difference in potential accurately, you must connect AIx-M to M_{ANA}. Please observe this also for the unused inputs.

Abbreviations

The abbreviations used in Figures 6-1 to 6-3 have the following meanings:

AIx-X:	Measuring line AIx-U or AIx-I
AIx-M:	Reference potential of the measuring line
M_{ANA}:	Reference potential of the analog measuring circuit
M:	Ground terminal of the C7
U_{CM}:	Potential difference between inputs and M_{ANA}
U_{ISO}:	Potential difference between M_{ANA} and the M terminal of the C7

Isolated Transducers

The isolated transducers are not connected with the local ground potential. They can be operated free of potential. Local conditions or interference can cause potential differences U_{CM} (static or dynamic) to occur between the measuring lines M of the input channels and the reference point of the measuring circuit M_{ANA}. However, this potential difference must not exceed the permissible value. Where it is possible that the permissible value for U_{CM} might be exceeded, or where you cannot determine the difference in potential accurately, you must connect AIx-M to M_{ANA}.

Figure 6-1 shows the principle of connecting isolated transducers to an isolated analog input module.

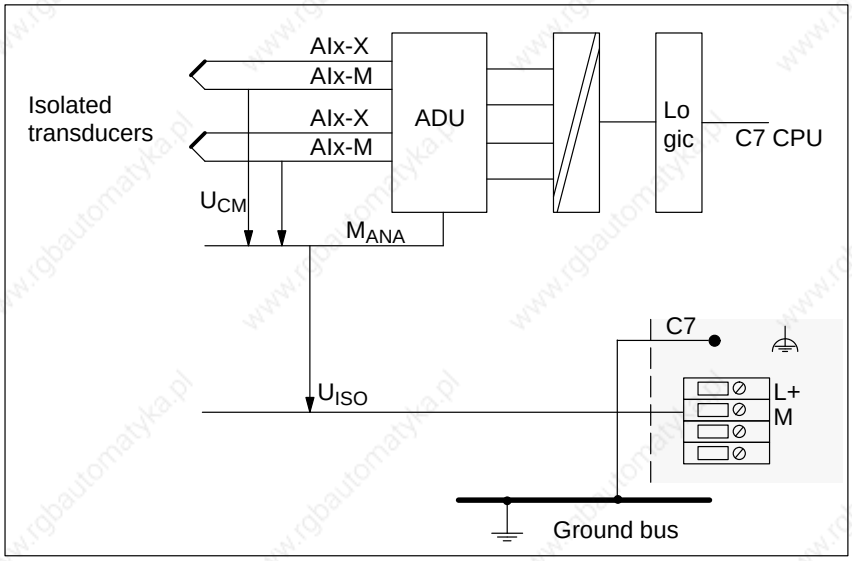


Figure 6-1 Connecting Isolated Transducers to an Isolated Analog Input Module

Non-Isolated Transducers

The non-isolated transducers are connected on-site with the ground potential. Depending on local conditions or interference, potential differences (static or dynamic) can occur between the locally distributed measuring points. To prevent these potential differences, you must provide equipotential bonding conductors between the measured value points.

In addition, potential differences U_{CM} (static or dynamic) can arise between the measuring lines AIx-M of the input channels and the reference point of the measuring circuit M_{ANA}. However, these potential differences must not exceed the permitted value. Where it is possible that the permissible value for U_{CM} might be exceeded, or where you cannot determine the difference in potential accurately, you must connect AIx-M to M_{ANA}.

Figure 6-2 shows the principle of connecting non-isolated transducers to an isolated analog input module.

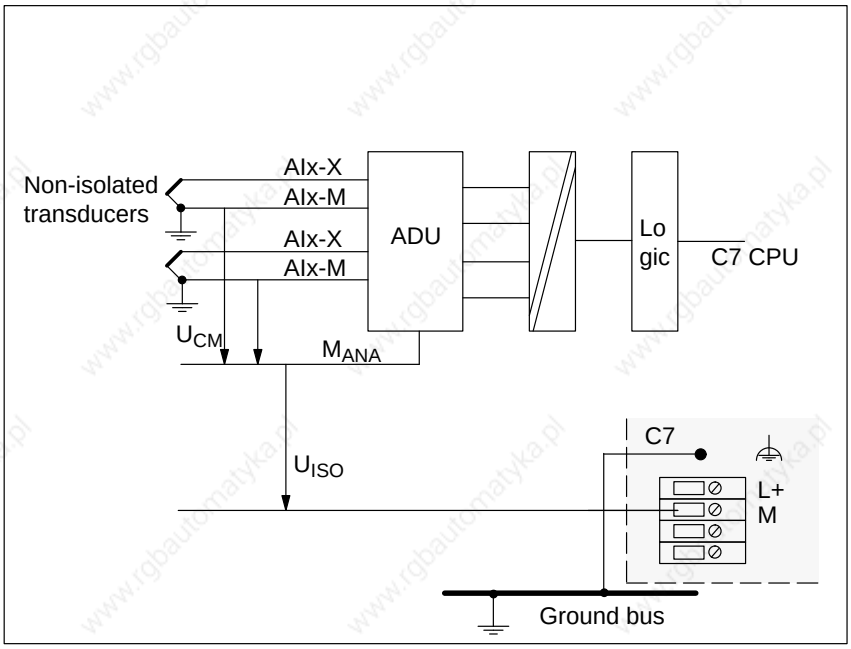


Figure 6-2 Connection of Non-Isolated Transducers to an Analog Input Module

6.2.1 Connecting Voltage and Current Transducers

Abbreviations and Mnemonics

The abbreviations and mnemonics used in Figures 6-3 to 6-4 have the following meanings:

AIx-X: Measuring line AIx-I or AIx-U

AIx-M: Reference potential of the measuring line

M_{ANA}: Reference potential of the analog measuring circuit

Connecting Voltage Transducers

Figure 6-3 shows the connection of voltage transducers to an isolated analog input.

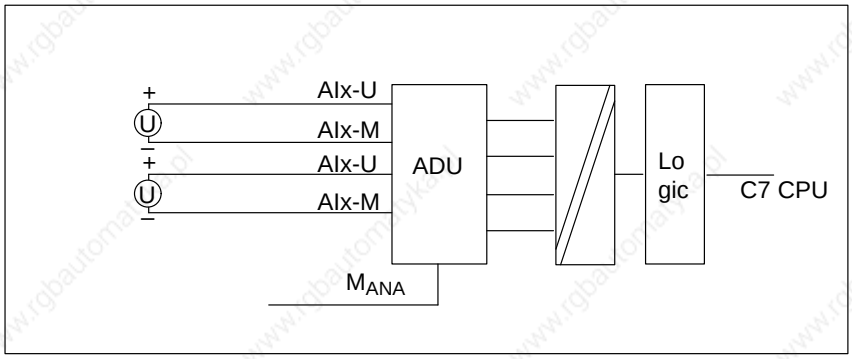


Figure 6-3 Connecting Voltage Transducers to an Isolated Analog Input

Connecting Current Transducers as 4-Wire Transducers

4-wire transducers possess a separate voltage supply. Figure 6-4 shows the connection of current transducers as 4-wire transducers to a non-isolated analog input module.

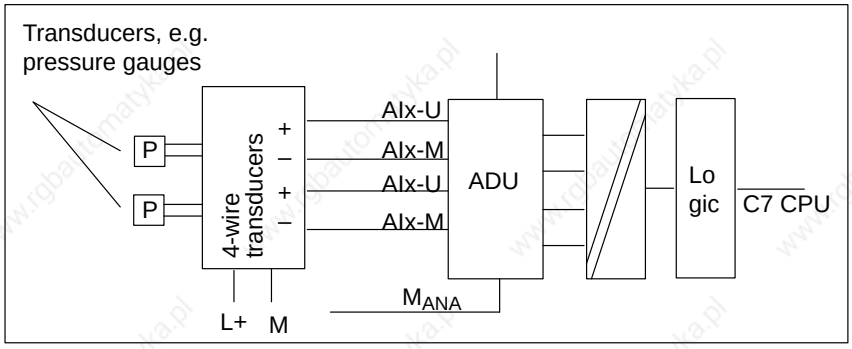


Figure 6-4 Connecting 4-Wire Transducers to a Non-Isolated Analog Input Module

6.3 Connecting Loads/Actuators to the Analog Output

Overview

You can provide loads/actuators with current or voltage using the analog output.

Cables for Analog Signals

To reduce electrical interference, you should use twisted-pair shielded cables for the analog signals. The shield of the analog signal cables should be grounded at both cable ends. If there are potential differences between the cable ends, an equipotential bonding current can flow over the shield. This can interfere with the analog signals. In such a case, you should ground the shield at one end of the cable only.

Isolated Analog Output

The analog output is isolated and so there is no electrical connection between the reference point of the AO-M analog circuit and the M terminal of the C7.

A potential difference U_{ISO} can occur between the reference point of the analog circuit M_{ANA} and the M terminal of the C7. Make sure that U_{ISO} does not exceed the permissible value. Where it is possible that the permissible value might be exceeded (see technical specifications, establish a connection between the AO-M terminal and the M terminal of the C7.

Abbreviations and Mnemonics

The abbreviations and mnemonics in the Figures 6-5 to 6-6 have the following meanings:

AO-I:	Analog output: current
AO-U:	Analog output: voltage
R_L:	Load/actuator
AO-M :	Ground terminal (reference potential of the analog output)
L+:	Terminal for 24 VDC supply voltage
M_{ISO}:	Potential difference between M_{ANA} and the M terminal of the C7.

Figures 6-5 to 6-6 show you how to connect loads/actuators to the current and/or voltage outputs of the analog output module.

Connecting Loads to a current Output

You must connect loads to a current output at Q_I and the reference point of the analog circuit M_{ANA}

Figure 6-5 shows the principle of connecting loads to a current output of an isolated analog output module.

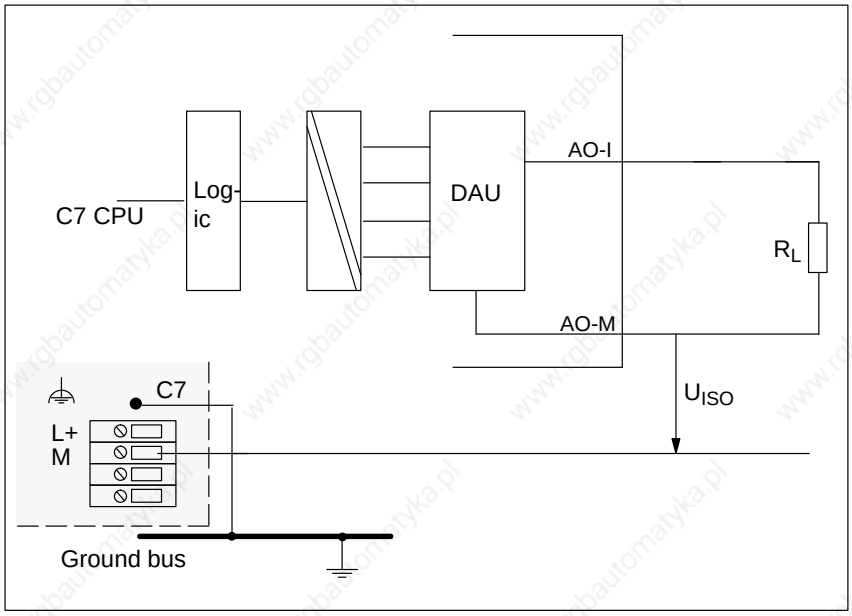


Figure 6-5 Connecting Loads to a Current Output of an Isolated Analog Output Module

Connecting Loads to a Voltage Output

Connection of loads to a voltage output is only possible in 2-wire circuits as there is only one output.

2-Wire Connection

2-wire connection of loads to a voltage output is carried out at terminal Q_V and the reference point of the measuring circuit M_{ANA}.

Figure 6-6 shows the principle of connecting loads to a voltage output of a non-isolated analog output module with 2-wire connection.

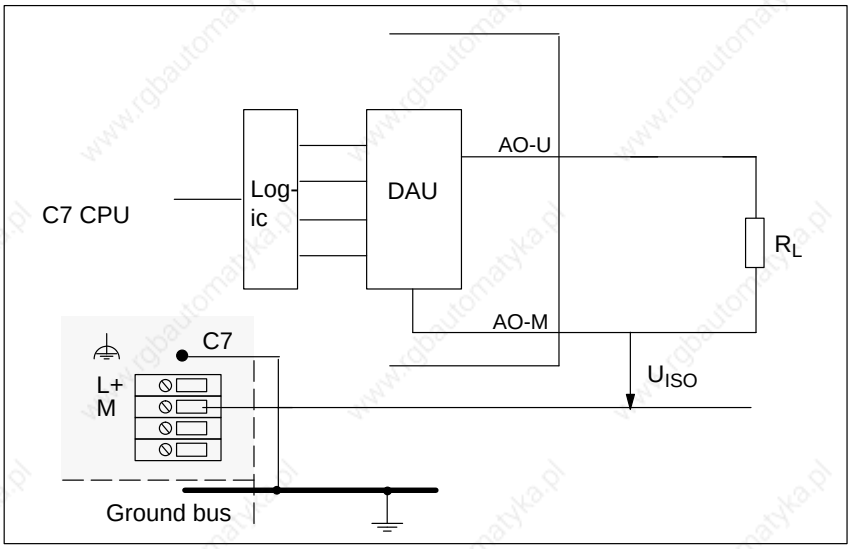


Figure 6-6 2-Wire Connection of Loads to a Voltage Output of an Analog Output Module

6.4 Analog Input Function

This Section

This section contains

- The characteristics of the analog input module
- The technical specifications of the analog input module

You will learn

- How to start up the analog input module
- The measuring ranges provided by the analog input module
- The parameters you can use to influence the characteristics of the analog input module.

Available Measurement Types

The following measurement types are available on the analog input module:

- Voltage measurement
- Current measurement

Measuring Ranges

The measuring ranges are:

- Voltage: ± 10V
- Current: ± 20mA, 4 to 20mA

Wire Break Check

For the current range 4 to 20 mA, a current of < 1.6 mA is interpreted per software as a wirebreak (see Volume 2, Section 5.2).

Measuring Ranges for 4-Wire Transducers

Measuring ranges for current measurement with 4-wire transducers:

- ± 20mA
- 4 to 20mA

6.4.1 Characteristics and Technical Specifications of the Analog Input Module

Characteristics

The analog input module has the following characteristics:

- 4 inputs
- Measured value resolution
  - 12 bits incl. sign
- Measurement type selectable:
  - Voltage
  - Current
- Choice of measuring range per input
- Parameterizable diagnostics
- Parameterizable diagnostics interrupt
- Parameterizable interrupt cycle
- Isolated

Terminal Connection Diagram

Figure 6-7 shows the terminal connection diagram of the analog inputs.

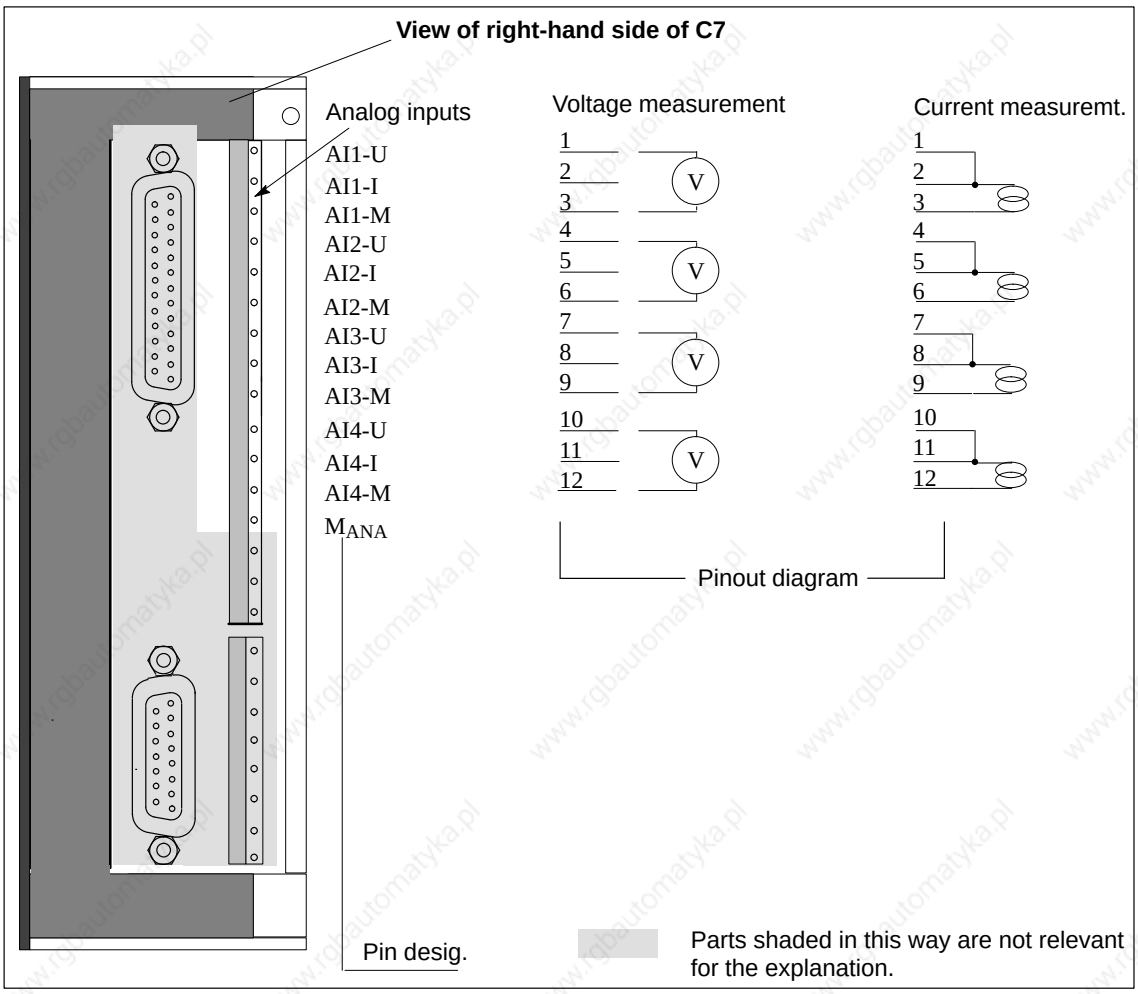


Figure 6-7 Terminal Connection Diagram of the Analog Inputs

Caution

The jumper between pins 1 + 2, 4 + 5, 7 + 8, 10 +11 must also be wired in the case of current measurement.

Channels

Three pins are combined to form a channel.

Table 6-1 Channels of the Analog Input Module

Pin-No.	Value	Channel
AI1–U	Voltage input	Channel 1 (AI1)
AI1–I	Current input	
AI1–M	Reference potential	
AI2–U	Voltage input	Channel 2 (AI2)
AI2–I	Current input	
AI2–M	Reference potential	
AI3–U	Voltage input	Channel 3 (AI3)
AI3–I	Current input	
AI3–M	Reference potential	
AI4–U	Voltage input	Channel 4 (AI4)
AI4–I	Current input	
AI4–M	Reference potential	

Connection of an Analog Input

Only one analog sensor can be connected to an analog input channel.

Voltage Measurement

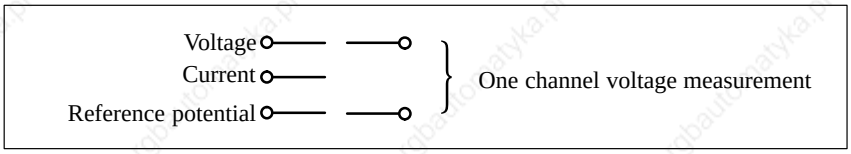


Figure 6-8 Connection of a Channel for Voltage Measurement

Current Measurement

When connecting a current measurement channel, the voltage pin and the current pin are to be jumpered.

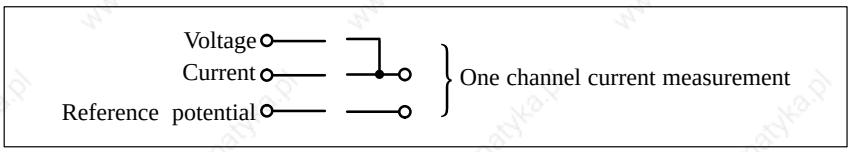


Figure 6-9 Connection of a Channel for Current Measurement

Block Diagram

Figure 6-10 shows the block diagram of the analog input module. The input resistances are 140 Ω / 125 mW. The next page contains detailed technical specifications of the analog input module.

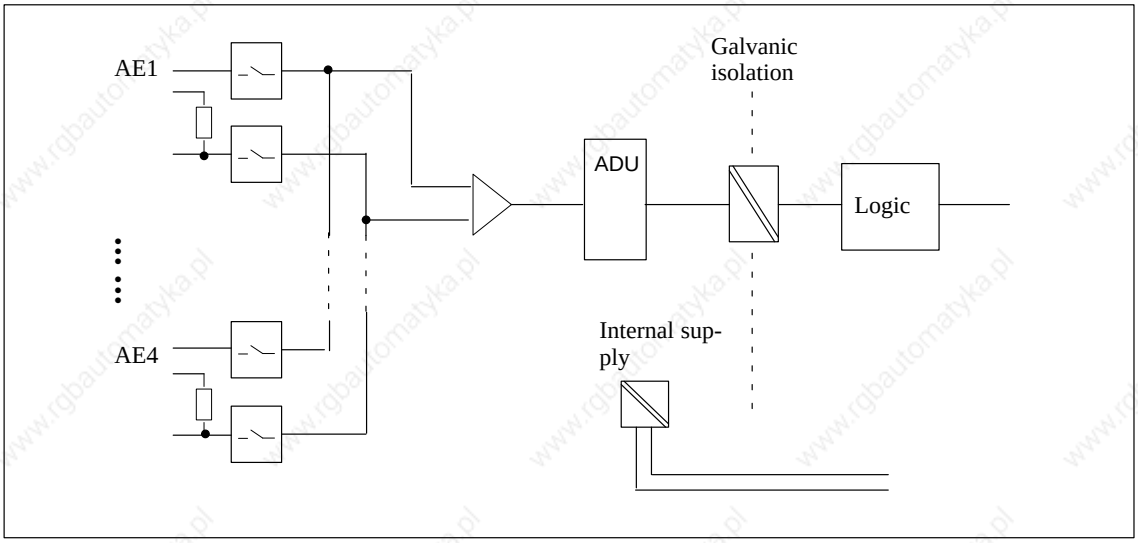


Figure 6-10 Block Diagram of the Analog Input Module

Technical Specifications

Specific Data of the Analog Input Function	
Number of inputs	4
Cable length, shielded	200 m
Voltages, Currents, Potentials	
Nominal load voltage L +	24 VDC
• Polarity reversal protection	Yes
Voltage supply to the transducers	
• Short circuit protection	Yes
Galvanic isolation (analog I/O to electronics)	Yes
Permissible potential difference	
• Between reference potential of inputs and M_{ANA} (U_{CM}) if signal = 0V	2.5 VDC
• Insulation resistance	500 VDC

Analog Value Generation		
Measurement principle	Momentary value	
• Basic conversion time	2.5	ms
• Resolution in bit incl. sign (incl. overrange)	12	
• Transition frequency input filter	132	kHz
Measurement ranges:	V/A at different pins –> no coding pin	
Voltage	–10...10V	
Current	–20...20mA, 4...20mA	
Measurement tolerance	± 1% of the end value	

Interference Suppression, Error Limits		
Interference voltage suppression for f = n × (f1 ± 1 %), (f1 = interference frequencies)		
• Common mode interference (U_{pp} < 2.5 V)	> 70 dB	
• Series-mode interference (peak value of interference < nominal value of input range)	> 40 dB	
Cross-talk between the inputs		
• At 50 Hz	50 dB	
• At 60 Hz	50 dB	
Basic error limit (operational limit at 25 °C)	1%	
Data for Selecting a Sensor		
Input ranges (nominal values)/input resistance		
• Voltage	± 10 V;	/100 kΩ
• Current	± 20 mA; 4 to 20 mA;	<250 Ω <250 Ω
Permissible input voltage for voltage input (destruction limit)	18 V	
Permissible input current for current input (destruction limit)	30 mA	
Connection of signal sensors		
• for voltage measurement	Possible	
• for current measurement as 4-wire transducer	Possible	
Temperature compensation	Balanced by continuous on-line calibration	

Status, Interrupts, Diagnostics	
Interrupts	
• Interrupt cycle	Yes, parameterizable
• Diagnostic interrupt	Yes, parameterizable
Diagnostic functions	Yes, parameterizable
• Diagnostic information readable	Yes
Time intervals	Yes, parameterizable
Wirebreak detection	Parameterizable (per software) at measuring range 4 to 20mA

6

6.5 Analog Output Function

This Section

This section contains

- The characteristics of the analog output function
- The technical specifications of the analog output function

You will learn

- How to start up the analog output function
- The various ranges of the analog output function
- The parameters you can use to influence the characteristics of the analog output function
- The technical specifications of the analog output function.

Characteristics

The output function has the following characteristics:

- 1 output
- The output can be selected either as
  - Voltage output or
  - Current output
- Resolution 12 bits incl. sign
- Parameterizable diagnostics
- Isolated

Note

If you modify the output ranges during operation of the analog output function, intermediate values can arise at the output!

Terminal Connection Diagram

Figure 6-11 shows the terminal connection diagram of the analog output function.

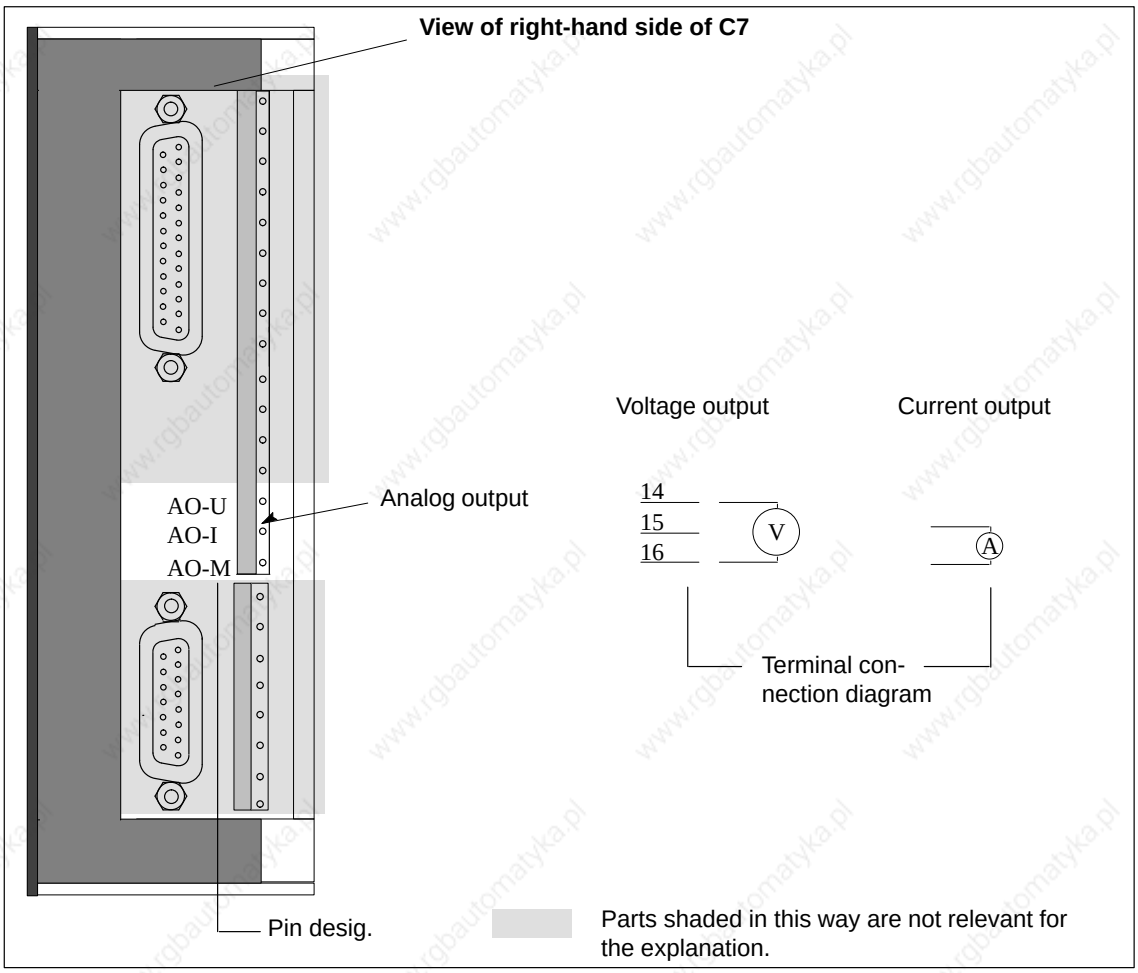


Figure 6-11 Pinout Diagram of the Analog Output Function

Block Diagram

Figure 6-12 shows the block diagram of the analog output module. You will find detailed technical specifications of the analog output module on the following pages.

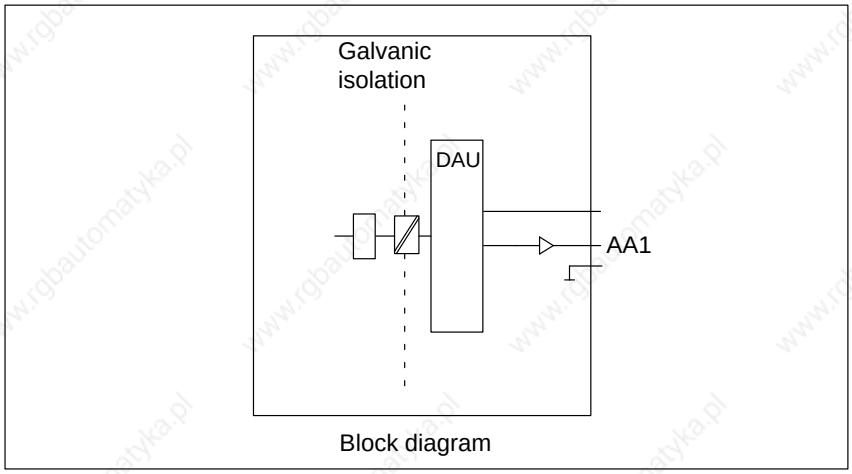


Figure 6-12 Block Diagram of the Analog Output Function

Technical Specifications

Specific Data of the Analog Output	
Number of outputs	1
Cable length, shielded	200 m
Voltages, Currents, Potentials	
Galvanic isolation	Yes
Insulation resistance	500 VDC
Measurement ranges: Voltage Current	V/A at different pins –> no coding pin ±10V ±20mA, 4...20mA
Analog Value Generation	
Resolution (including over-range)	
• ±10 V; ±20 mA; 4 to 20 mA	12 bits incl. sign
Conversion time	max. 0.8 ms
Settling time	
• For resistive load	0.1 ms
• For capacitive load	3.3 ms
• For inductive load	0.5 ms
Substitute value injectable	Yes, parameterizable

Interference Suppression, Error Limits	
Measuring tolerance	±1% of end value
Basic error limit (operational limit at 25 °C, referred to output range)	
• Voltage	± 1%
• Current	± 1%
Output ripple (referred to output range)	± 0.05 %
Status, Interrupts, Diagnostics	
Interrupts	
• Diagnostics interrupt	Yes, parameterizable
Diagnostics functions	Yes, parameterizable
• Diagnostics information readable	Yes, group error/fault

Data for Selecting an Actuator	
Output ranges (nominal values)	± 10 V ± 20 mA from 4 to 20 mA
Load resistance	
• At voltage outputs	min. 2 k Ω
• At current outputs	max. 500 Ω
• Capacitive Load	max. 1 µF
• Inductive Load	max. 1 mH
Voltage output	
• Short-circuit protection	Yes (countervoltage–proof)
• Short-circuit current	max. 25 mA
Current output	
• Idle voltage	min. ± 15V
Connection of actuators	
• For voltage output 2-wire connection	Possible
• For current output 2-wire connection	Possible
Supply of sensors	External (not via C7)

Universal Inputs

7

Universal Inputs

This chapter describes the technical specifications and characteristics of the universal inputs for the C7.

Overview

The C7 has 4 digital universal inputs that provide the following functionality:

- Interrupt input
- Counter input
- Frequency/period duration counter input
- Digital input

These input functions can be set by parameterization.

Terminal Connection Diagram

Figure 7-1 shows the pin assignments of the universal inputs

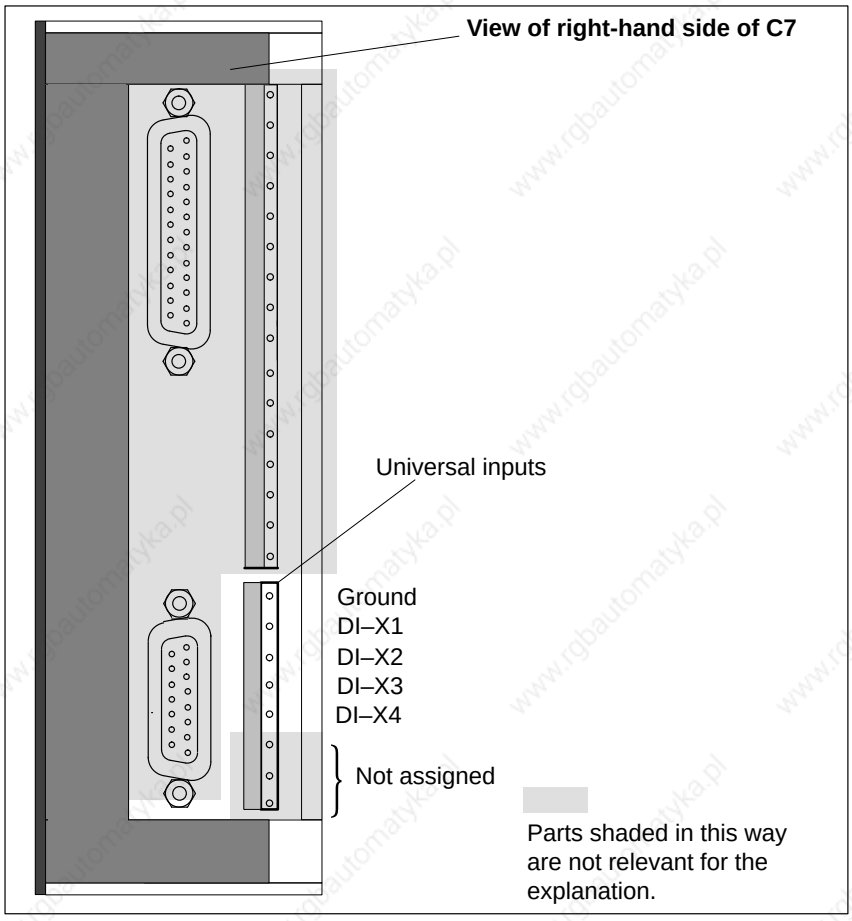


Figure 7-1 Pin Assignments of the Universal Inputs

Pin Assignments of the Universal Inputs

The pin assignments of the universal inputs are as follows:

Table 7-1 Assignments of the Universal Inputs

Pin No.	Function
M	Relevant ground
DI–X1	Universal input 1 (interrupt input, digital input, or counter input)
DI–X2	Universal input 2 (interrupt input, digital input, or counter input)
DI–X3	Universal input 3 (interrupt input, digital input, counter input, frequency counter input or period duration counter input)
DI–X4	Universal input 4 (interrupt or digital input)
	Not connected
	Not connected
	Not connected

Parameterizing the Inputs

The universal inputs are set per software. This is done using the “S7 Configuration” tool. You use this tool to determine which function the individual input is to execute (see Table 7-1).

Interrupt Input

If this function is set, the input responds like a normal interrupt input, that is, a process interrupt is triggered in the C7 CPU as a response to the parameterized edge.

Digital Input

If this function is set, the input responds like a normal digital input (see Section 5.2). The only difference here is that the current process signal is not automatically fed to the control program but must first be read in from the I/O.

Counter Input

These universal inputs enable you to capture counter pulses up to a frequency of 10 kHz. The counter can count either up or down.

Frequency Counter

This enables you to count pulses within a programmed length of time. From this you can calculate a frequency $\leq$ 10 kHz.

Period Duration Counter

This function enables you to count fixed timer ticks between two equal edges. From this you can calculate the duration of an interval period.

Technical Specifications of the Universal Inputs

Specific Data of the Universal Inputs		
Number of inputs		4
Cable length,	shielded	1000 m
	unshielded	600 m
Voltages, Currents, Potentials		
Nominal load voltage L +		24 VDC
Number of simultaneously energizable inputs		4
Galvanic isolation		No
Function, Interrupts, Diagnostics		
Interrupts		Parameterizable
Counter functions		Parameterizable
Max. counter frequency		10 kHz
		Module standard diagnostics in conjunction with analog I/O. No channel-specific diagnostics
Counters		Max. 3
• Principle		Edge counting
• Counter range	up	0 to 65535
	down	65535 to 0
• Limit value (setpoint) specification		1 value per counter
• Counter interrupt of up counter		When limit value is reached
• Counter interrupt of down counter		When “0” is reached
• Enable		In the program
Period Duration Counter		Max. 1
• Principle		Counting between fixed time units from two positive edges
• Counter range		0 to 16777215
• Max. period duration		8.395 s or 0.119 Hz
Frequency Counter		Max. 1
• Principle		Counting of pulses within a time period
• Counter range		0 to 16777215
• Gate width		0, 1s, 10s (settable)
• Max. frequency		10 kHz; limited by input filter

Data for Selecting a Sensor	
Input voltage	
• Nominal voltage	24 VDC
• For “1” signal	from 11 to 30 V
• For “0” signal	from –3 to 5 V
Input current	
• At “1” signal	from 2 to 8 mA
Input delay time	
• Programmable	No
• At “0” to “1”	approx. 0.01 ms
• At “1” to “0”	approx. 0.01 ms
Input characteristic	In accordance with IEC 1131, Part 2
Type of input in accordance with IEC 1131	Type 2
Input current	
• At “1” signal	From 6 to 11.5 mA

Maintenance

8

This Chapter

8.1 Changing and Disposing of the Backup Battery

Change During POWER ON Only

You must always change the backup battery during POWER ON. This prevents any data loss in the internal user memory during battery change.

Changing the Backup Battery of the C7

Note

The data in the internal user memory will be lost if you change the battery during POWER OFF!

Change the battery during POWER ON only!

Proceed as follows to change the backup battery:

Step	Action
1.	Unscrew the cover of the C7 battery compartment (see Figure 8-1).
2.	Lift the cover up and to the right (see Figure 8-2). Make sure you raise the cover only as far as the battery connections allow.
3.	Remove the battery connector of the old backup battery.
4.	Loosen the cable binders with which the backup battery is attached to the cover (see Figure 8-3).
5.	Attach the new backup battery with the cable binders to the cover.
6.	Plug the battery connector of the new backup battery into the relevant socket in the battery compartment of the C7. The notch on the battery connector must point to the left (see Figure 8-3).
7.	Close the battery cover with the springs to the left onto the C7 and screw the cover tight again.

Note

Do not touch any interior components of the C7 with your hands or a metal part (screwdriver). Electrical components and PCB are not sufficiently protected for this purpose. Please observe ESD guidelines.

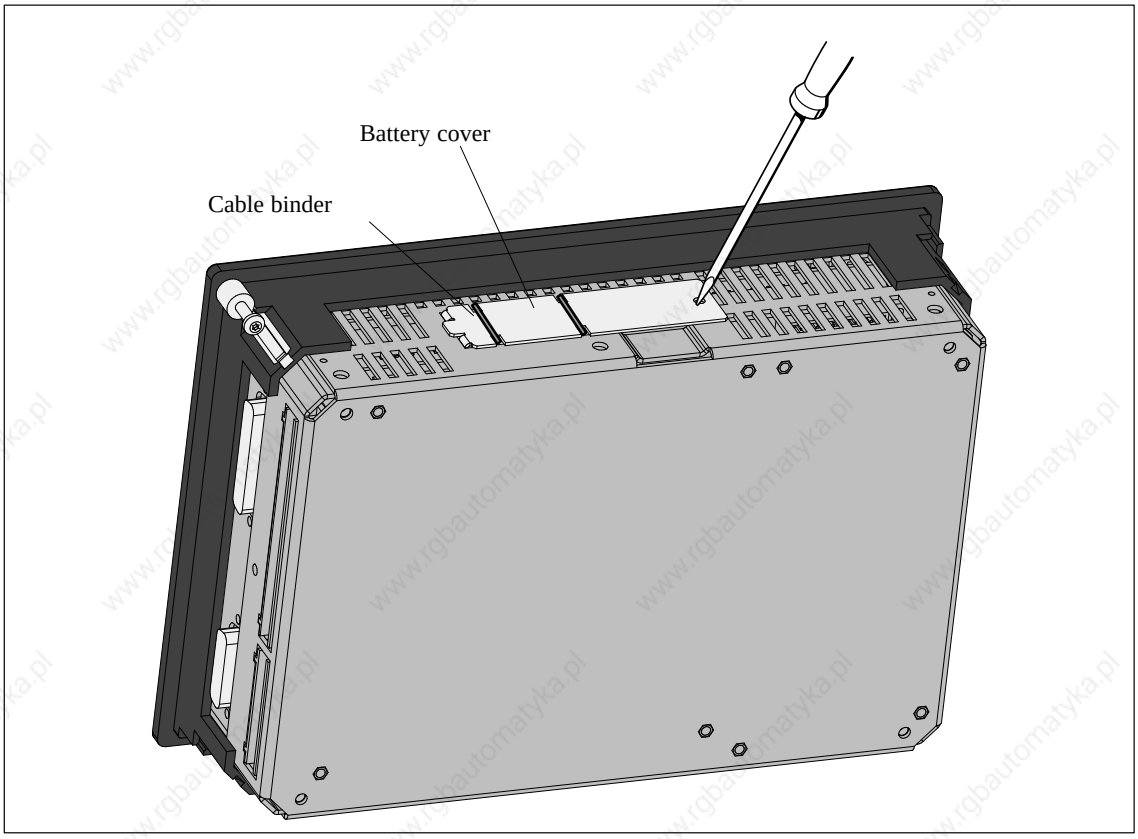


Figure 8-1 Battery Cover Before Opening

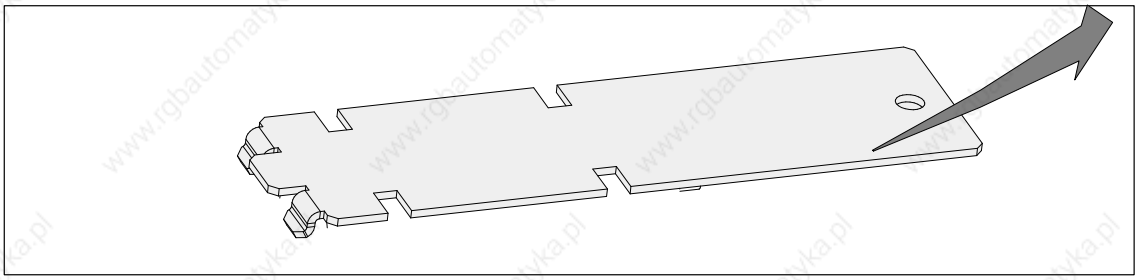


Figure 8-2 Battery Cover

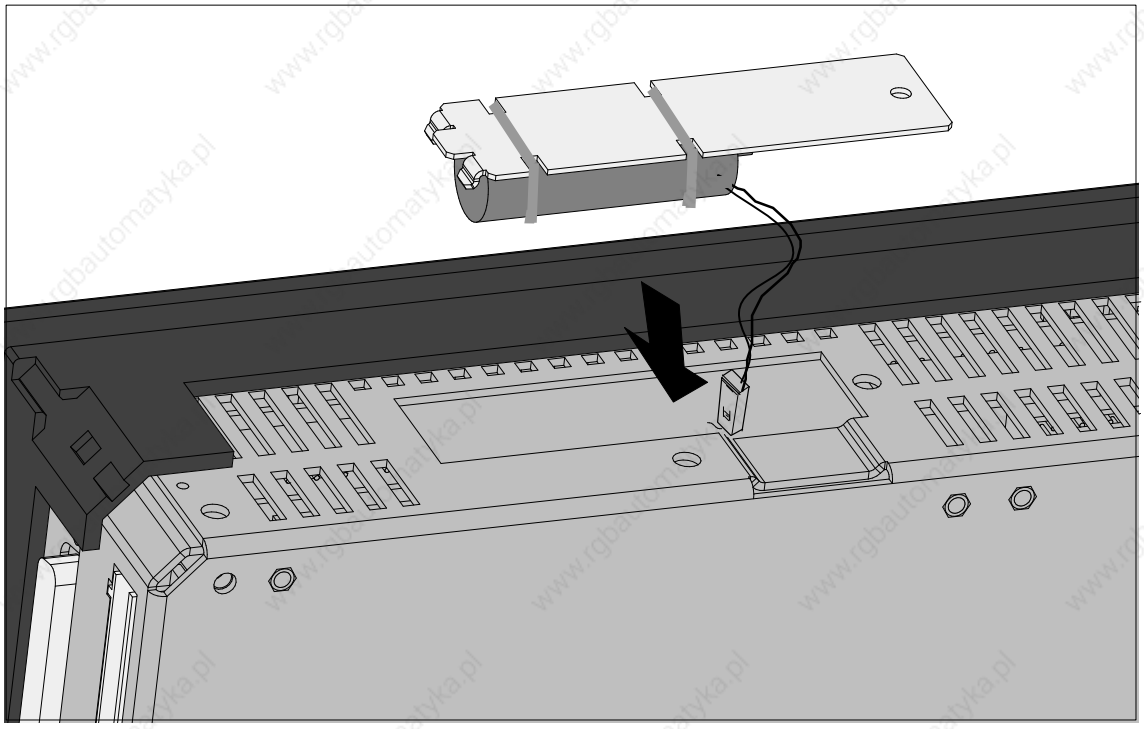


Figure 8-3 Inserting the Backup Battery

How Often Should You Change the Battery

We recommend that you change the battery every year.

Disposal

Please observe national regulations/guidelines concerning the disposal of backup batteries.

Storage of Backup Batteries

Store backup batteries in a cool, dry place.

Backup batteries can be stored for up to 5 years.

Warning

Backup batteries can ignite or explode and constitute a serious fire hazard if they are heated or damaged!

Store backup batteries in a cool and dry place.

Rules for the Handling and Use of Backup Batteries

To prevent hazard in the use of backup batteries, you must observe the following rules:

Warning

The use of backup batteries can result in injury and damage.

Wrongly handled backup batteries can explode or cause serious burns.

Do not

- recharge
- heat
- burn
- drill
- crush
- short-circuit

backup batteries.

8.2 Replacing the C7

Introduction

On-site repair of the C7 has not been provided for. For this reason, a defective C7 must be replaced.

Prerequisite

The following prerequisites must be met for replacing a C7:

Hardware

- Programming device/PC with MPI interface module
- Relevant connecting cable

Development tools

- STEP 7
- ProTool or ProTool/ Lite

User software (stored outside the C7)

- User configuration
- User control software (if data from the C7 CPU no longer readable).

Removal

Proceed as follows:

- Mechanical removal takes place in the opposite order to the installation.
- Connect a PG/PC to the MPI.
- Use STEP 7 to transfer the user program stored in the C7 CPU to a PG/PC.
  If the C7 CPU is defective and the user program can no longer be read out, remove the C7 without any further safety measures.
- The configuration loaded onto the C7 cannot be read out. It must be available on a PG/PC.

Installation

As soon as you have a new C7, install it as follows:

1. The mechanical and electrical installation is as described in the manual.
2. Connect a PG/PC to the MPI.
3. Perform a memory reset of the C7 as described.
4. Transfer the previously saved user program from the PG/PC with the relevant data to the C7 CPU (using STEP 7).
5. Load your configuration with ProTool or ProTool/Lite into the C7.
6. Start the user program.

General Technical Specifications

A

What Are General Technical Specifications?

This chapter lists the general technical specifications of the C7:

These general technical specifications contain the standards and test values that the C7 conforms to, or the criteria against which the C7 has been tested.

This Chapter

A.1 Technical Specifications

The table contains the technical specifications of the overall unit. The data for the I/O can be found in the relevant chapters.

Table A-1 Technical Specifications of the C7

Criterion	Technical Specifications
C7-623 C7-624	
Order number	C7-623 : 6ES7623-1AE00-0AE3 C7-624 : 6ES7624-1AE00-0AE3
Dimensions	240 x 168 x 60 mm (H x W x D)
Weight	C7-623: 1350g C7-624: 1390g
C7-623 display	STN-LC display/ 4 lines of 20 characters each, 5mm character heght/ LED backlit
C7-624 display	STN-LC display / 4 x 20 characters, 8 mm character height or 8 x 40 characters;4.5 mm character height / LED backlit
Keypad	Membrane keypad with metal domes C7-623: 44 keys C7-624: 48 keys 26 integral LEDs
Serial interface	V.24 (printer)
MPI	Standard MPI
Backup battery	Backup time approx. 1 year
C7-OP	
Flash memory (configuring memory)	C7-623: 128 Kbytes C7-624: 256 Kbytes
Work memory	128 Kbytes
Power supply	
Supply voltage (U_N) • Polarized input voltage connection • Voltage interruption (can be jumpered)	24V DC; (20.4 to 30.2V DC; safety low voltage) The,C7–623 and C7–624 has no internal protection against high–energy surge pulses in the µs range. Yes ≥ 20ms
Current consumption (I_N)	2400 mA max.
Safety	
Standardization	DIN EN 61131–2 ≙ IEC 1131–2
Electromagnetic compatibility (EMC)	
Emitted interference Limit value class	B in accordance with EN 55022 ≙ CISPR 22

Table A-1 Technical Specifications of the C7

Criterion	Technical Specifications
Conducted interference on AC voltage supply lines	±2kV (in accordance with IEC 801-4/IEC 1000–4–4; burst) ±1kV (in accordance with IEC 801-5/IEC 1000–4–5; µs pulse / line to line) ±2kV (in accordance with IEC 801-5/IEC 1000–4–5; µs pulse / line to ground)
Noise immunity on signal lines	±2kV (in accordance with IEC 801-4/IEC 1000–4–4; burst)
Noise immunity against discharge	±6kV, discharge on contact (in accordance with IEC 801-2/IEC 1000–4–2; ESD) ±8kV, atmospheric discharge (in accordance with IEC 801-2/IEC 1000–4–2; ESD)
Immunity to high-frequency radiation	10V/m with 80% amplitude modulation with 1kHz, 10kHz-80MHz (in accordance with EN 50 141) 10V/m with 80% amplitude modulation with 1kHz, 80kHz-1GHz (in accordance with EN 50 140) 10V/m, pulse–modulated, 50 % c.d.f. with 900 MHz (to EN 50 140)
Climatic conditions	
Temperature	Tested in accordance with DIN IEC 68-2-1, DIN IEC 68-2-2
Operating	± 0°C to +45°C if installed at an angle of 45° ± 0°C to +50°C for vertical installation **Note:.** • C7–624: At 45°C and with horizontal installation, legibility of the display is restricted.. • C7–623: At temperatures < 10°C, fast changing values are no longer s hown correctly.
Non-operating	–20°C to +70°C
Relative humidity	Tested in accordance with DIN IEC 68-2-3
Operating	5% to 95% at 25°C (no condensation)
Non-operating	5% to 95% at 25°C (no condensation)
Atmospheric pressure	
Operating	1080–795 hPa (≙ –1000m bis +2000m)
Non-operating	1080–660 hPa (≙ –1000m bis +3500m)
Mechanical environmental conditions	
Vibration	Tested in accordance with DIN IEC 68-2-6
Operating	10 to 58Hz, amplitude 0.075mm 58 to 500Hz, acceleration 9.8m/s^2
Non-operating	5 to 9Hz, amplitude 3,5mm 9 to 500Hz, acceleration 9.8m/s^2
Shock	Tested in accordance with DIN IEC 68-2-29
Operating	Semi-sinusoidal: 100m/s^2 (10g), 16ms, 100 shocks
Non-operating	250m/s^2 (25g), 6ms, 1000 shocks
Resistance to fire hazards:	
Connector strips	V2
Connector strips in housings	V0

A

24 V DC Power Supply

The entire 24 V DC power supply for the C7–623 and C7–624 (operating voltage, load voltage, relay power supply, etc.) must be provided in the form of safety extra-low voltage (SELV).

Warning

Personal injury and damage to property can occur.

If you do not provide the correct 24 V DC power supply for your C7–623 and C7–624, this may result in damage to components of your programmable controller and personal injury.

Use only safety extra-low voltage (SELV) for the 24 V DC power supply to your C7–623 and C7–624.

Relevant for the U.S.A. and Canada

The following markings are used to show the relevant approval:

Underwriters Laboratories (UL) to UL 508 standard

UL-Recognition-Mark

Canadian Standard Association (CSA) to standard C 22.2. No 142

FM Approval

FM-Standards No. 3611, 3600, 3810 APPROVED for use in Class I, Division 2, Group A, B, C, D indoor hazardous locations.

A.2 Notes on the CE Marking

EC EMV Directive 89/336/EEC

Products bearing the CE marking meet the requirements of the EU directive 89/336/EEC “Electromagnetic Compatibility”.

In accordance with the above-mentioned EU directive, Article 10 (1), the EU declarations of conformity and the relevant documentation are held at the disposal of the competent authorities at the address below:

Siemens Aktiengesellschaft
Bereich Automatisierungstechnik
AUT E 14
Postfach 1963
D-92209 Amberg
Federal Republic of Germany

Area of Application

The product has been designed for use in the following areas in accordance with its CE marking:

Area of Application	Requirements:	
	Emitted Interference	Immunity
Industrial– and Office area	EN 50081-2: 1993	EN 50082-2: 1995
Household, business and trade area, small plants	EN 50081-1: 1992	EN 50082-1: 1992

Observing the Installation Guidelines

The installation guidelines and safety instructions described in the manual must be observed when installing and operating the device.

A

A.3 Notes for the Machine Manufacturer

Introduction

The SIMATIC programmable controller system is not a machine as defined in the EU Machinery Directive. There is therefore no declaration of conformity for SIMATIC with regard to the EU Machinery Directive 89/392/EEC.

EU Machinery Directive 89/392/EEC

The EU Machinery Directive 89/392/EEC regulates requirements relating to machinery. A machine is defined here as an assembly of linked parts or components (see also EN 292-1, Paragraph 3.1).

SIMATIC is part of the electrical equipment of a machine and must therefore be included by the machine manufacturer in the declaration of conformity procedure.

Electrical Equipment of Machinery in Accordance with EN 60204

The EN 60204-1 standard (Safety of Machinery, Electrical Equipment of Machines, Part 1, Specification for General Requirements) applies for electrical equipment of machinery.

The table below is designed to help you with the delcaration of coformity and to show which criteria apply to SIMATIC according to EN 60204-1 (as at June 1993).

EN 60204-1	Subject/Criterion	Remarks
Paragraph 4	General requirements	Requirements are met if the devices are mounted/installed in accordance with the installation guidelines. Please observe the explanations on the previous pages.
Paragraph 11.2	Digital input/output interfaces	Requirements are met.
Paragraph 12.3	Programmable equipment	Requirements are met if the devices for protection of memory contents against change by unauthorized persons are installed in locked cabinets.
Paragraph 20.4	Voltage tests	Requirements are met.

A.4 Transport and Storage Conditions for Backup Batteries

Transport of Backup Batteries

Transport backup batteries where possible in their original packaging. Observe the regulations for the transport of dangerous goods and substances. The backup battery contains approximately 0.25 g of lithium.

Note: According to air freight transport regulations, the backup battery is in Hazardous Goods Class 9.

Storage of Backup Batteries

Store backup batteries in a cool, dry place.

Backup batteries can be stored for up to 5 years.

Warning

Backup batteries can ignite or explode and constitute a serious fire hazard if they are heated or damaged!

Store backup batteries in a cool and dry place.

Rules for the Handling and Use of Backup Batteries

To prevent a hazard in the use backup batteries, you must observe the following rules:

Do not

- recharge
- heat
- burn
- drill
- crush
- short-circuit

backup batteries.

A

Guidelines for Handling Electrostatic Sensitive Devices (ESD)

B

This Chapter

B.1 What is ESD?

Definition

All electronic modules are equipped with large-scale integrated ICs or components. Due to their design, these electronic elements are very sensitive to overvoltages and thus to any electrostatic discharge.

These **E**lectrostatic **S**ensitive **D**evices are commonly referred to by the abbreviation **ESD**.

Electrostatic sensitive devices are labelled with the following symbol:

Caution

Electrostatic sensitive devices are subject to voltages that are far below the voltage values that can still be perceived by human beings. These voltages are present if you touch a component or module without previously being electrostatically discharged. In most cases, the damage caused by an overvoltage is not immediately noticeable and results in total damage only after a prolonged period of operation.

B.2 Electrostatic Charging of Objects and Persons

Electrostatic Charging

Every object with no conductive connection to the electrical potential of its surroundings can be charged electrostatically. In this way, voltages up to 15 000 V can build up whereas minor charges, i.e. up to 100 V, are not relevant.

Examples:

• Plastic covers	up to 5 000 V
• Plastic cups	up to 5 000 V
• Plastic-bound books and notebooks	up to 8 000 V
• Desoldering device with plastic parts	up to 8 000 V
• Walking on plastic flooring	up to 12 000 V
• Sitting on a padded chair	up to 15 000 V
• Walking on a carpet (synthetic)	up to 15 000 V

Limits for Perceiving Electrostatic Discharges

An electrostatic discharge is

- perceptible from 3500 V
- audible from 4500 V
- visible from 5000 V

A fraction of these voltages is capable of destroying or damaging electronic devices.

Carefully note and apply the protective measures described below to protect and prolong the life of your modules and components.

B

B.3 General Protective Measures Against Electrostatic Discharge Damage

Keep Plastics away

Keep plastics away from sensitive devices. Most plastic materials have a tendency to build up electrostatic charges easily.

Provide Sufficient Grounding

Make sure that the personnel, working surfaces and packaging are sufficiently grounded when handling electrostatic sensitive devices.

Avoid any Contact

If possible, avoid any contact with electrostatic sensitive devices. Hold modules without touching the pins of components or printed conductors. In this way, the discharged energy cannot affect the sensitive devices.

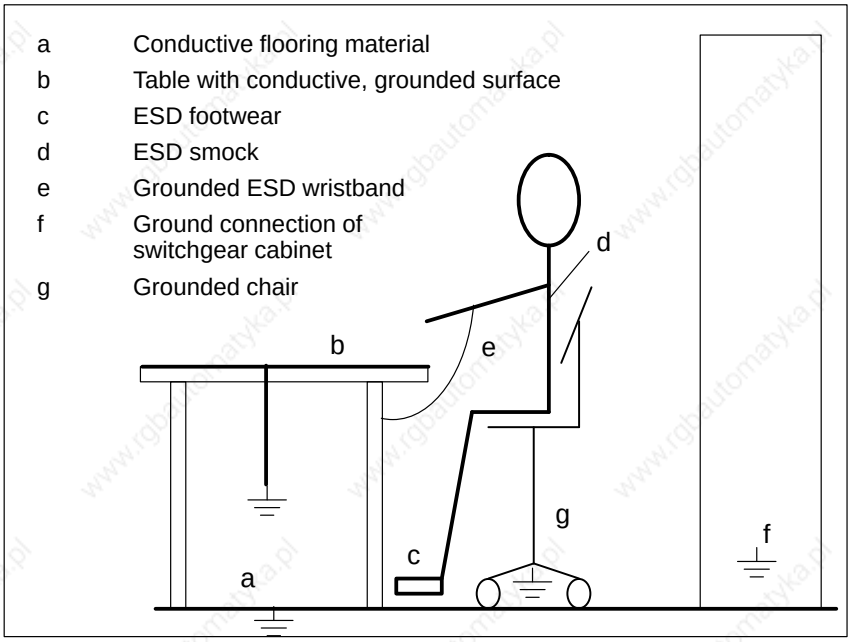
Additional Precautions for Modules without Housings

Note the following measures that have to be taken for modules that are not protected against accidental contact:

- Touch electrostatic sensitive devices only
  - if you wear a wristband complying with ESD specifications or
  - if you use special ESD footwear or ground straps when walking on an ESD floor.
- Persons working on electronic devices should first discharge their bodies by touching grounded metallic parts (e.g. bare metal parts of switchgear cabinets, water pipes, etc.).
- Protect the modules against contact with chargeable and highly insulating materials, such as plastic foils, insulating table tops or clothes made of plastic fibres.
- Place electrostatic sensitive devices only on conductive surfaces:
  - Tables with ESD surface
  - Conductive ESD foam plastic (ESD foam plastic is mostly coloured black)
  - ESD bags
- Avoid direct contact of electrostatic sensitive devices with visual display units, monitors or TV sets (minimum distance to screen > 10 cm).

ESD Precautions

The following Figure once again illustrates the precautions for handling electrostatically sensitive devices.



B

B.4 Taking Measurements and Working on ESD Modules

Use Grounded Measuring Devices Only

Measurements may be taken on electrostatic sensitive devices only if

- the measuring device is grounded (e.g. via protective conductor) or
- the tip of the isolated measuring device has previously been discharged (e.g. by briefly touching grounded metal parts).

B.5 Packing Electrostatic Sensitive Devices

Using Conductive Material for Packing Modules without Casing

Generally use conductive materials for packing modules without casing and components. You may also use metal-clad plastics boxes or metal cans. Always store ESD modules in conductive packing material.

Cover Batteries

When packing modules incorporating batteries, cover the battery connections with insulating tape or insulating material to avoid short-circuiting of the battery. Remove the battery, if possible.

Glossary

A

Analog Input/Output Module

Analog input/output modules convert analog process values (for example, temperatures) into digital values that can be further processed by the C7 CPU or they convert digital values into analog manipulated variables.

B

Backup Battery

The backup battery guarantees that the → user program in the → C7 CPU is stored safe from power failures and that data areas, memory bits, timers and counters remain retentive.

Backup Memory

The backup memory guarantees backup of memory areas of the → C7-620 without a backup battery. A programmable number of timers, counters, memory bits and data bytes, the retentive timers, counters, memory bits and data bytes are backed up.

Baud rate

Speed at which data are transmitted (transmission rate in bit/s).

Bus

A bus is a transmission medium that connects two or more nodes with each other. Data transmission can be serial or parallel, over electrical conductors or fiber optic cable.

C

C7-620

The C7-620 complete system comprises a S7-300 CPU, a COROS OP, I/O and an IM 360 interface module, all integrated in one unit.

C7 CPU

The C7 CPU (central processing unit) contains the controller and arithmetic unit, memory, operating system and programming ports. The C7 CPU is dependent on the → C7 OP. The C7 CPU has its own MPI address and is connected with the C7 OP via the MPI.

C7 I/O

The C7 I/O (→ signal module) forms the interface between the process and the programmable controller. It provides digital input and output signals as well as analog input and output signals. The integral universal inputs have special functions in the C7 (interrupt/counter inputs).

C7 OP

The C7 OP handles the OP functions of the C7. It is independent of the → C7 CPU and continues to operate if, for example, the C7 CPU goes to the STOP mode. The C7 OP has its own MPI address and is connected to the C7 CPU via the MPI.

Chassis Ground

Chassis ground is the totality of all connected inactive parts of an operating resource that cannot carry a hazardous touch voltage even in the event of a fault.

Communications Processor

Communications processors are modules for point-to-point links and for bus links.

Complete Restart

When a C7 CPU is restarted (for example, after selection of one of the **C7 CPU Operating Modes** in the System Functions menu or on switching the mains power ON), the organization block OB 100 (complete restart) is executed before cyclic program execution (OB1). At complete restart, the process image of the inputs is read in and the STEP 7 user program is executed starting at the first instruction in OB1.

Configuration

Assignment of modules to mounting racks/slots and addresses (in the case of signal modules, for example).

Configuration Memory

The configuration memory is a flash memory containing the configuration data and integrated in the C7 OP.

CP

Communications processors (CPs) are intelligent modules with their own processor. They form an important group within the components of a programmable controller. We differentiate between various types of communications processors according to their tasks, for example, CPs for signaling and listing, for point-to-point connection, for the operator interface (COROS), for bus connections (SINEC) and for diagnostics and mass storage applications.

Cycle Time

The cycle time is the time required by the → C7 to execute the → user program once.

D

Diagnostics

→ Diagnostics functions, → System diagnostics

Diagnostics Buffer

The diagnostics buffer is a buffered memory area in the C7 CPU in which diagnostics events are stored in order of occurrence.

Diagnostics Events

Diagnostics events include errors in a digital function in the C7, system faults in the C7 caused, for example, by programming errors or operating mode transitions.

Diagnostics Functions

The diagnostics functions encompass the entire system diagnostics and include the detection, evaluation and signaling of faults within the C7.

Diagnostics Interrupt

Modules with diagnostics capability signal detected system errors to the → C7 CPU via diagnostics interrupts.

E

Equipotential Bonding

Electrical connection (equipotential bonding conductor) that brings the bodies of electrical resources to the same or approximately the same potential as foreign conducting bodies in order to prevent interference or hazardous voltages arising between the bodies.

Error display

Error display is one of the possible responses of the operating system to runtime errors. The other possible responses are: Error response in the user program, STOP status of the C7 CPU.

F

Flash EPROM

FEPROMs correspond in their function to the electrically-erasable EEPROMs but they can be erased significantly faster (FEPROM = flash erasable programmable read-only memory)

The following data can be stored in a flash EPROM safe from power failure:

- The → user program
- The → parameters that determine the behavior of the → C7 CPU and the I/O functions of the C7.

Flash Memory

→ Flash EPROM

FM

An FM (function module) is a module that offloads the CPU of the S7-300 and S7-400 programmable controllers of time-critical or memory-intensive process signal handling tasks. FMs generally use the internal bus for high-speed data exchange with the CPU. Examples of FM applications include counting, positioning, closed-loop control.

Function Grounding

Grounding with the sole purpose of ensuring the intended purpose of the electrical resources. Function grounding has the effect of short-circuiting interference voltages that would otherwise have impermissible influence on the resources.

G

Ground

Conductive ground whose electrical potential at every point can be taken as zero.

In the area of grounding electrodes, ground can have a potential different to zero. This is frequently referred to as “reference ground”.

Ground (verb)

To connect an electrically conductive part with the grounding electrode (one or more conductive parts that have very good contact to ground) via a grounding point.

I

Info Function

The STEP 7 info functions offer you the possibility of displaying status information on the programming device via the connected C7 during the different phases of startup and during operation of a programmable controller.

Interface, multipoint

→ MPI

Interrupt

The → operating system of the C7 CPU recognizes 10 different priority classes governing execution of the user program. Interrupts such as process interrupts belong to these priority classes. When an interrupt occurs, the operating system automatically calls an assigned organization block in which the user can program the desired response (for example, in an FB).

Isolated

In isolated input/output modules, the reference potentials of the control circuit and the load circuit are galvanically isolated by, for example, optocouplers, relay contactors or transformers. Input/output circuits can be connected to common potential.

L

Load Memory

The load memory is a component part of the C7 CPU. It contains objects (load objects) created by the programming device. It is implemented as a fixed integrated memory.

M

Memory Reset

When clearing the → **C7 CPU**, the following memories are deleted:

- The → work memory
- The read/write memory area of the → load memory
- The → system memory
- The → backup memory

and the user program is reloaded from the → flash memory.

When clearing the → **C7 OP**, the following memories are deleted:

- The → work memory
- The → configuration memory

The C7 OP then does not contain a user configuration.

MPI

The multipoint interface (MPI) is the programming device port of SIMATIC S7. It enables simultaneous operation of several nodes (programming devices, text displays, operator panels) on one or several CPUs. The nodes on the MPI are connected to each other via a network. Each node is identified by a unique address (MPI address).

MPI Network

A network is a connection of several C7s and/or S7-300s and further terminals, such as a programming device, over a → connecting cable. Data are exchanged between the connected devices over the network.

N

Node Number

The node number represents the “access address” of a C7 CPU, C7 OP or a programming or other intelligent I/O module when it communicates with other nodes over an → MPI network. The node number is assigned to the C7 CPU, C7 OP and programming.

Non-Isolated

In non-isolated input/output modules, the reference potentials of the control circuit and the load circuit are electrically connected.

O

Operating System of the C7 CPU

The operating system of the C7 CPU organizes all functions and sequences of the C7 CPU that are not connected with a special control task.

P

Parameter

1. Variable of a STEP 7 code block
2. Variable for setting the behavior of a module (one or more per module). Each module is supplied from the factory with a meaningful basic setting that can be modified using the STEP 7 tool S7 Configuration.
There are → static parameters and → dynamic parameters.

Parameterization

Parameterization refers to the setting of the behavior of a module.

Parameters, Dynamic

In contrast to static parameters, dynamic module parameters can be modified during operation by calling an SFC in the user program, for example, limit values of an analog signal input module.

Parameters, Static

In contrast to dynamic parameters, static module parameters cannot be modified via the user program. They can only be modified via the software tool S7 Configuration, for example input delay of a digital signal input module.

PG

→ Programming device

PLC

→ Programmable controller

Process Image

The signal states of the digital inputs and outputs are stored in the C7 CPU in a process image. We differentiate between the process-image input table (PII) and the process-image output table (PIQ).

The process-image input table is read by the input modules before execution of the user program.

The process-image output table is transferred to the output modules by the operating system at the end of the user program.

Process Interrupt

A process interrupt is triggered by interrupt-triggering modules as the result of certain events in the process. The process interrupt is signaled to the C7 CPU. Depending on the priority of the interrupt, the corresponding organization block is then executed.

Programmable Controller

An automation system of the SIMATIC S7 range.

Programmable controllers (PLCs) are electronic controllers whose function is stored as a program in the CPU. The design and wiring of these devices therefore does not depend on the controller function. The programmable controller has the structure of a computer; it consists of a CPU with memory, inputs and outputs and an internal bus system. The I/O and the programming language are designed specifically for the requirements of control engineering.

Programming Device

Programming devices are essentially personal computers that are compact and portable and suitable for use in industry. They are characterized by being equipped with special hardware and software for SIMATIC programmable controllers.

R

RAM

Random access memory is a read/write memory in which each memory cell can be addressed individually and can be changed. RAM memories are used as data memories and program memories

Reference Ground

→ Ground

Reference Potential

Potential from which the voltages of the connected circuits are considered and/or measured.

S

Signal Module

Signal modules (C7 I/O) form the interface between the process and the C7. There are digital input and output modules and analog input and output modules.

STEP 7

Programming software for creating user programs for SIMATIC S7 programmable controllers.

STEP 7 Tool

A STEP 7 tool is a tool of → STEP 7 tailored to a specific task.

Substitute Value

Substitute values are values that are output to the process or used in the user program in place of a process value in the event of a fault occurring in signal modules. The substitute values can be specified by the user (for example, keep old value).

System Diagnostics

System diagnostics includes the detection, evaluation and signaling of faults occurring within the programmable controller. Examples of such faults include program errors or module failures. System faults can be displayed via LEDs or using the S7 Information tool.

System Memory

The system memory is integrated on the CPU and implemented in the form of a RAM. The address areas (for example, timers, counters, memory bits) and the data areas required internally by the operating system (for example, buffers for communications) are stored in the system memory.

T

Time-Delay Interrupt

The time-delay interrupt belongs to one of the priority classes in program execution on the C7 CPU. It is generated after expiry of a time started in the user program. The relevant organization block is then executed.

Timed Interrupt

A timed interrupt is generated periodically by the C7 CPU according to a parameterizable time grid. It triggers execution of the relevant organization block.

Time-of-Day Interrupt

The time-of-day interrupt belongs to one of the priority classes in program execution on the C7 CPU. It is generated dependent on a specific date (or daily) and time (for example, 9:50 or hourly, by the minute). The relevant organization block is then executed.

Tool → STEP 7 tool

Total Current Sum of the currents of all output channels of a digital output module.

U

Ungrounded Without galvanic connection to → ground

User Memory The user memory contains the code and data blocks of the user program. The user memory is integrated into the C7 CPU as a flash memory. However, the user program is executed in the → work memory of the C7 CPU.

User Program The user program contains all the statements and declarations as well as data for signal processing by which a plant or process can be controlled. It is assigned to a programmable module (for example, C7 CPU, FM) and can be structured in smaller units (blocks).

V

Varistor Voltage-dependent resistor

W

Work Memory The work memory is a RAM in the → C7 620 that the processor uses to access the user program during program execution.

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