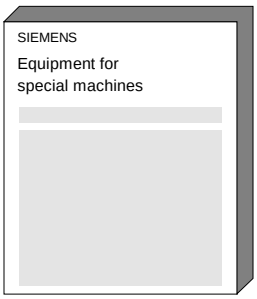
SIEMENS

Equipment for special machines
GRACIS
Interactive Graphics System for Process Monitoring and Diagnosis with Network Capabilities

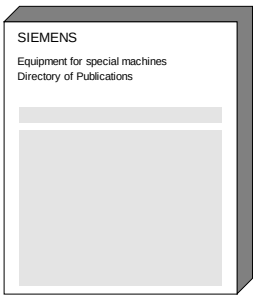
HPF Technical Description Edition 04.94

GRACIS V1.5

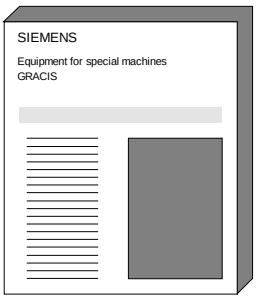
General documentation



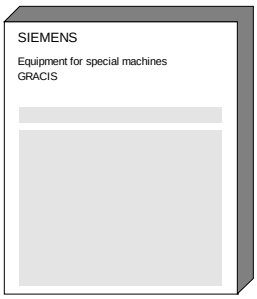
Catalog



Directory of Publications

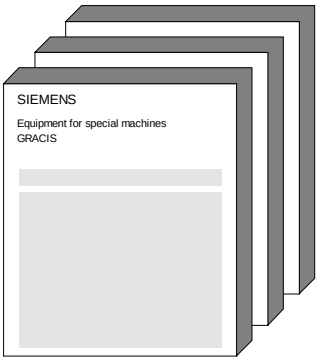


Product brief



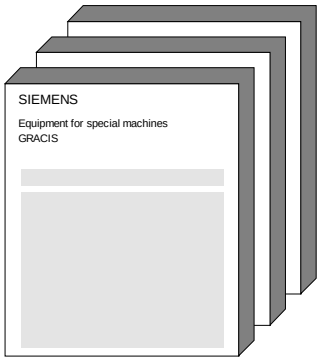
Description

User and service documentation



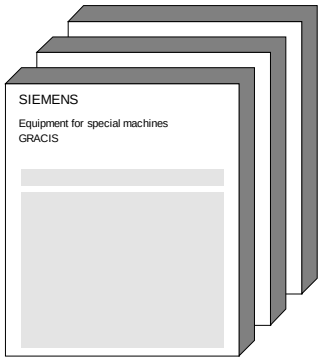
Technical Description

- HPF
- LPF



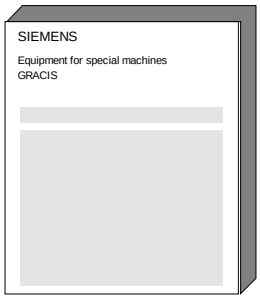
Installation Guide

- SIMATIC S5 Interface (local,H1)
- SIMATIC S5 Interface (L2)
- Process mode



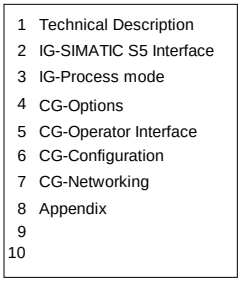
Configuration Guide

- Operator Interface
- Configuration HPF
- Configuration LPF
- Networking
- Options

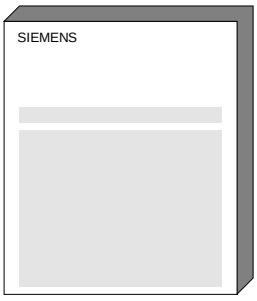


Appendix

Supplementary documentation

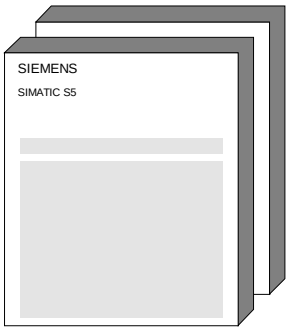


Register - cover page



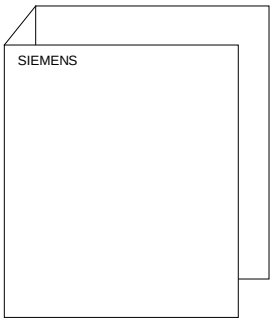
Reference manual for

- WS 400-30/WS 400-50
- MPs, monitors, keyboards
- IW 30, PC32-F, PC32-X
- VP 30, CP581



Manual for

- PG 7xx
- S5-115U
- S5-135U
- S5-155U



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GRACIS

Interactive Graphics System for Process Monitoring and Diagnosis with Network Capabilities

HPF Technical Description
GRACIS V1.5

Edition April 1994

Note

Because of clear arrangement, this documentation does not inform about all details of all types of the product. Therefore, it cannot take into account all possible cases of installation, operation and maintenance.

If you require additional information or have special questions, please seek further particulars from your local SIEMENS office.

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1 Preliminary Remarks

What is the subject of this publication ?

This publication contains a description of the GRACIS HPF hardware and its installation and start-up.

Who should read this publication ?

This publication is intended for installation and system engineers. The level of qualification required is specified below.

What previous knowledge is required ?

It is assumed that the reader has a good working knowledge of SIMATIC S5 programmable controllers and GRACIS.

The general safety regulations, VDE regulations and national regulations are fully applicable.

How can you find your way around this publication ?

A general overview of the GRACIS HPF hardware is followed by a description of the OP 40-SM and the CP 485/486 and their installation and start-up. Following this, there is a description of the requirements for operation of a GRACIS PG/PC.

Longer sections are preceded by a separate table of contents.

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What do the following terms mean ? For the purpose of this Installation Guide and product labels:

A qualified person is one who is familiar with the installation, construction and operation of the equipment and the hazards involved.

In addition, he has the following qualifications:

- ▷ Is trained and authorized to energize, de-energize, clear, ground and tag circuits and equipment in accordance with established safety practices.
- ▷ Is trained in the proper care and use of protective equipment in accordance with established safety practices.
- ▷ Is trained in rendering first aid.

DANGER

--Death, severe injury or substantial damage to property **will result** if the stipulated safety precautions are not taken.

WARNING

--Death, serious injury or considerable damage to property **can result** if the stipulated safety precautions are not taken.

CAUTION

--Minor injuries or damage to property **can result** if the stipulated safety precautions are not taken.

This symbol highlights important information on the product or on a specific part of the Reference Manual.

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GRACIS (Technical Description)

1.1 Guidelines for Handling Electrostatic Sensitive Devices (ESDs)

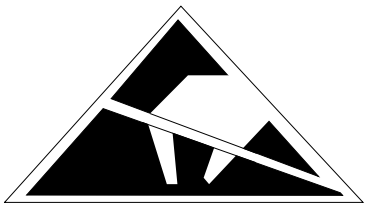
1.1.1 What are ESDs?

Almost all SIMATIC modules are equipped with LSI chips or components manufactured using MOS technology. The technological nature of these electronic components makes them highly sensitive to excess voltages and hence also to electrostatic discharge.

The abbreviation for such components is ESD

- Electrostatic Sensitive Device: ESD

The following symbol on signs on cabinets, subracks or packaging indicates the presence of electrostatic sensitive devices and the consequent sensitivity of the equipment to contact:



ESDs can be irreparably damaged by voltages and energy at levels far below the limits of human perception. Such voltages are generated as soon as a component or module is touched by a person who is not electrically discharged. In most cases, components which have been exposed to such excess voltages cannot be immediately diagnosed as defective, because an irregularity in the functional behaviour may take many hours of service to become apparent.

An electrostatic discharge requires at least

- 3500 V to be felt
- 4500 V to be heard
- 5000 V to be seen

But even a fraction of this voltage can cause partial or total damage to electronic components.

Changes in the typical performance data of components which have been damaged, overloaded or weakened by static discharge can lead to transient faults brought on, for example, by

- changes in temperature,
- impacts,
- vibrations,
- change in load.

Only through the consistent use of protective equipment and due observance of the handling rules can malfunctions and failures be prevented on equipment containing ESDs.

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1.1.2 When are Charges Produced?

You can never be sure that your person or materials and tools are not electrostatically charged.

Small charges of up to 100 V are normally present, but these charges can very quickly build up to 35000 V.

Examples of this include:

- Walking on a carpeted surface up to 35 000 V
- Walking on synthetic floor up to 12 000 V
- Sitting on an upholstered chair up to 18 000 V
- Plastic unsoldering set up to 8 000 V
- Plastic coffee cups up to 5 000 V
- Polythene bags up to 5 000 V
- Books and journals with plastic bindings up to 8 000 V

1.1.3 Important Protective Measures against Static Charges

Most plastic materials are highly prone to static build-up and should therefore be kept away from the sensitive components.

When working with electrostatic sensitive devices, care should be taken that persons, the working area and packaging are properly grounded.

1.1.4 Handling of ESDs

Contact with electronic components should always be avoided unless this is necessitated by work to be carried out on the equipment. When handling printed circuit boards, always avoid contact with the component pins and conductors.

Contact with components is only permitted if

- the person is continuously grounded by means of an ESD armband, or
- the person is wearing ESD shoes or ESD protective shoe grounding strips in conjunction with an ESD floor covering.

Before touching an electronic component, you must discharge your own body. You can do this easily by touching a conductive object which is grounded (such as a bare metal cabinet part, water pipe, etc.) immediately before you touch the component.

The components must not be brought into contact with chargeable and highly insulating materials, such as plastic, insulating table tops, garments containing synthetic fibers, etc.

The components must only be placed on conductive surfaces (such as a desk with an ESD covering, conductive ESD foam, ESD packaging bag or ESD transport container).

Keep the components away from CRTs, monitors and colour televisions (minimum clearance from the screen > 10 cm).

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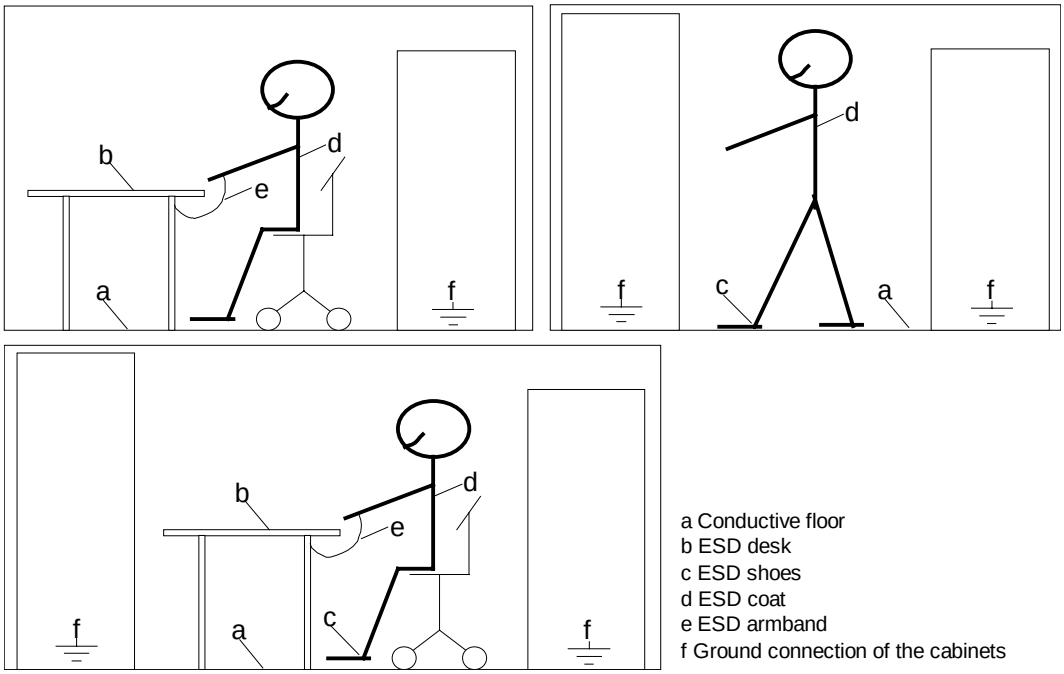
The following diagrams illustrate the necessary ESD protective measures again.



a Conductive floor
b ESD desk
c ESD shoes
d ESD coat
e ESD armband
f Ground connection of the cabinets

1.1.5 Performing Measurements and Modifications on ESDs

Measurements may only be carried out on the components if

- the measuring device is grounded (e.g. via a protective conductor) or
- the measuring head on a potential-free measuring device is discharged (e.g. by bringing it into contact with a bare metal controller housing) immediately before the measurement is performed.

When soldering, only a grounded soldering iron may be used.

1.1.6 Shipping of ESDs

Components and devices must always be stored and shipped in conductive packaging (such as metallic plastic boxes, metal containers, etc.).

If the packaging is not conductive, the components must be enclosed in a conductive lining before they are packaged. Suitable materials include conductive foam rubber, ESD bags, household aluminium foil or paper (and, in certain circumstances, plastic bags or plastic film).

In the case of components with integrated batteries, care should be taken that the conductive packaging does not touch or short-circuit the battery connections. Where appropriate, the connections should be covered with insulating tape or other insulating material.

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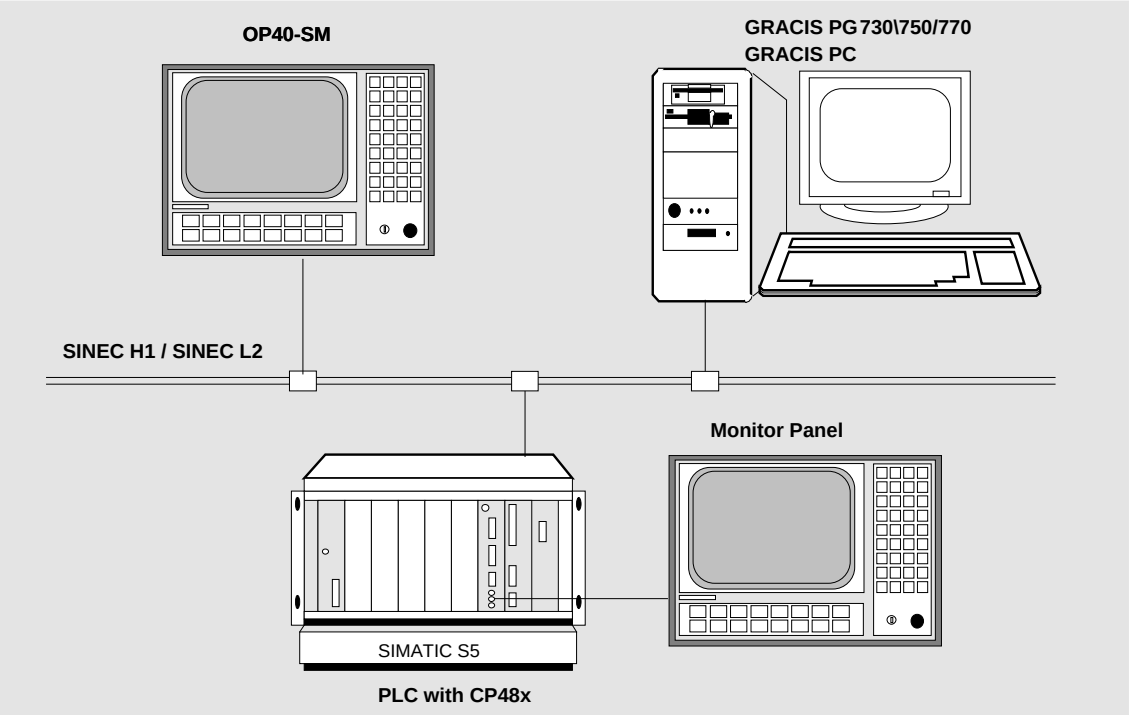
2 Introduction

The high-performance GRACIS system (GRACIS HPF) provides an open solution with parallel execution of PG functions and configuring for demanding visualization applications.

The hardware platform comprises GRACIS CP48x modules, the OP40-SM, PG 730/750/770 programming devices and AT-compatible PCs (80386 processor upwards).



The CP 485/486 is an interface module for use in the SIMATIC S5-115U, S5-135U and S5-155U programmable controllers. An adapter casing is required for use in a SIMATIC S5-115U. The CP 485, with AT processor core, 8 MB memory, dual-port RAM interface, graphics adapter and a mass storage module (120 MB) is the standard configuration which, in the case of the CP 486, can be expanded with a slot module (SINEC L2, SINEC H1 interface). The CP 485/486 can be ordered with the STEP 5/MT basic package in addition to GRACIS.

The OP 40-SM is used in harsh industrial environments for operator control and process monitoring in the vicinity of machinery. You can use a SINEC L2 or SINEC H1 interface to integrate the OP 40-SM in a visualization network over which serial interfaces read data from the S5 controllers. The OP 40-SM is an AT-compatible computer built into an industrial housing for mounting in cabinets or consoles.

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A GRACIS visualization network is characterized by the communication of several GRACIS systems over the SINEC H1 or SINEC L2 network. Both types of network can be operated in parallel. Data can also be requested from SIMATIC S5 programmable controllers via the serial interfaces and, with the CP 485/486, via the backplane bus of the PLC.

The features of the GRACIS visualization network include the following:

- Process data from displays, messages and reports can be stored on any controller on the network.
- The process can be operated from any station on the visualization network.
- Configuring of the visualization system is standard for all systems and can be carried out on any station.

The GRACIS network allows an entire plant to be operated and monitored from any location.

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Software

You can order the CP 485/486 and the OP 40-SM in various configurations. The hard disks on the units are partitioned and formatted and the software is preinstalled.

MS-DOS / FlexOS operating system

Software	CP 485	CP 485 /STEP 5	CP 486/L2	CP 486/H1	CP 486/L2 /STEP 5	CP 486/H1 /STEP 5
GRACIS process control	X	X	X	X	X	X
TF-Net			X	X	X	X
STEP 5/MT		X			X	X
GRACIS configuration	Opt.	Opt.	Opt.	Opt.	Opt.	Opt.
Modification journal	Opt.	Opt.	Opt.	Opt.	Opt.	Opt.
Diagnostics journal	Opt.	Opt.	Opt.	Opt.	Opt.	Opt
Tool management	Opt.	Opt.	Opt.	Opt.	Opt.	Opt.
NC data management	Opt.	Opt.	Opt.	Opt.	Opt.	Opt.

Software	OP 40-SM	OP 40-SM STEP 5	OP 40-SM /L2	OP 40-SM /H1	OP 40-SM /L2 /STEP 5	OP 40-SM /H1 /STEP 5
GRACIS process control	X	X	X	X	X	X
TF-Net			X	X	X	X
STEP 5/MT		X			X	X
GRACIS configuration	Opt.	Opt.	Opt.	Opt.	Opt.	Opt.
Modification journal	Opt.	Opt.	Opt.	Opt.	Opt.	Opt.
Diagnostics journal	Opt.	Opt.	Opt.	Opt.	Opt.	Opt
Tool management	Opt.	Opt.	Opt.	Opt.	Opt.	Opt.
NC data management	Opt.	Opt.	Opt.	Opt.	Opt.	Opt.

X : Software installed
Opt.: Software can be ordered additionally

The standard GRACIS software packages for process control and configuration contain a message system, printer reports, GRAPH 5 diagnostics and service module. The configuring software and the additional programs for process control (such as GRAPH diagnostics) can be run in German, English and French.

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3 OP 40-SM

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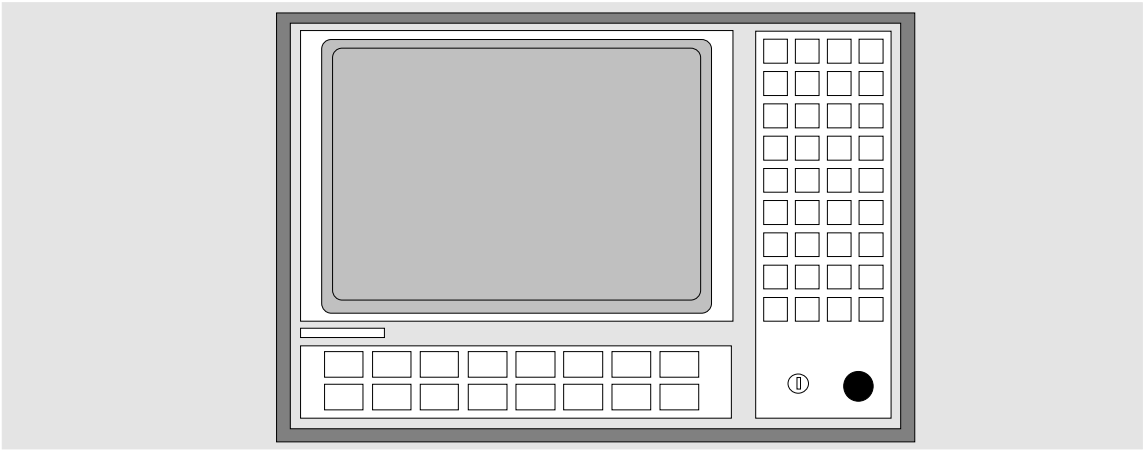
GRACIS (Technical Description)

The OP 40-SM is used in harsh industrial environments for operator control and monitoring in the direct vicinity of machinery. The GRACIS software package is installed for this purpose. The OP 40-SM can be used for self-configuration or for configuring other stations.



The OP 40-SM is an AT-compatible computer enclosed in an industrial housing for cabinet or console mounting. The OP 40-SM is characterized by the following features:

- AT CPU (386 or 486)
- 10 or 16 MB main memory
- VGA graphics controller
- 3.5" diskette drive and 85 MB hard disk
- Colour LCD display
- Membrane keypanels with 16 and 40 keys
- Interfaces: 2 serial, 1 parallel interface
  Ports for additional keyboards and an external diskette drive
  Connection possible to SINEC L2 and SINEC H1 networks
- Operation with 24 V DC supply

3.1 Assembly and Installation

3.1.1 Unpacking and Inspecting the Individual Components

- Unpack the OP 40-SM.
- Do not dispose of the original packaging but keep it for future transport.
- Complete the enclosed licence agreements (for the use of software products) and mail them to the address stated there.
- Read all the enclosed product information. It will provide you with any relevant information including possible errors, special cases, addenda, restrictions or modifications to the reference manual.

CAUTION

– The directions and warnings in the Instruction Manual must be observed in order to assure safe operation.
– Do not connect the device if there is evidence of external damage.
– VDE regulations and accident prevention rules must be observed.

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3.1.2 Instructions for Modifications

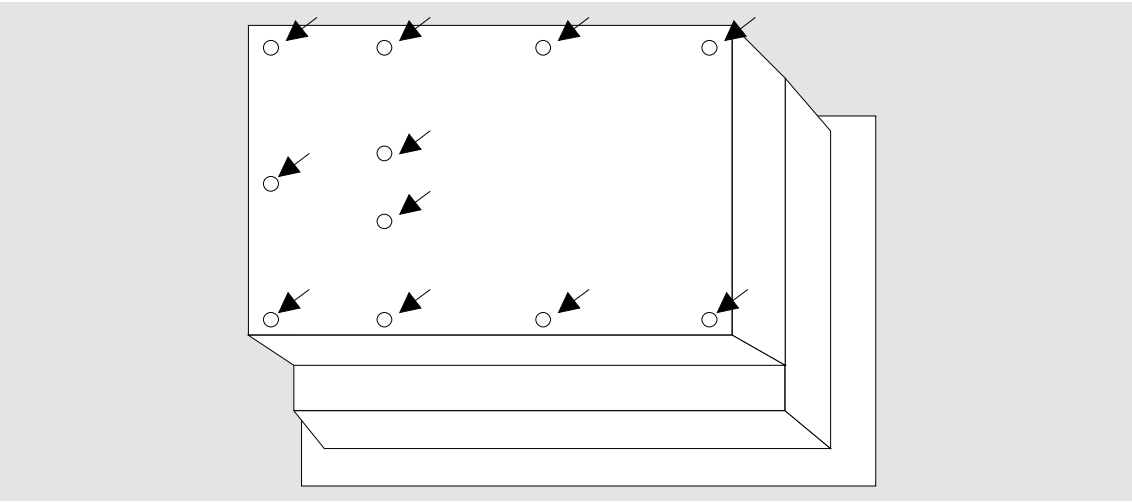
All of the software packages supplied with the OP 40-SM are already installed on delivery. The switch and jumper settings required for its operation are complete.

If you wish to modify or extend the hardware configuration following delivery, please proceed in accordance with the following instructions.

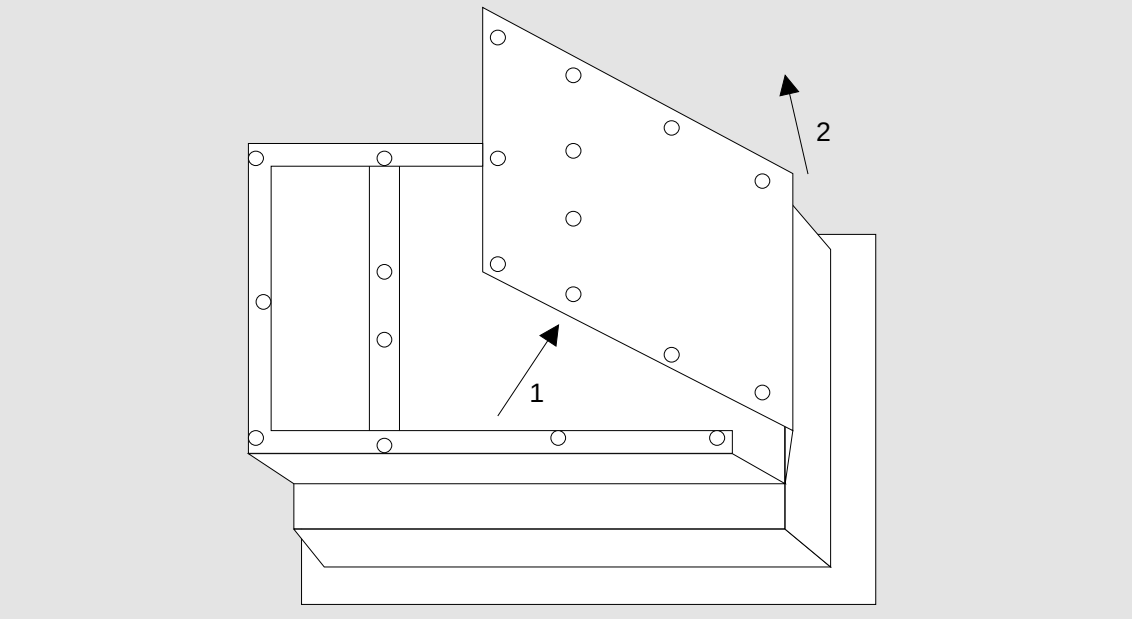
The device options, which you can add on yourself, are described in the section entitled *Device Options*.

Removing the cover plate

Using a suitable Phillips screwdriver, remove the eleven screws (indicated by arrows) securing the cover plate.



Then raise the left-hand side of the cover plate slightly (viewed from the rear) (1) and pull the cover plate out towards the rear of the unit (2).



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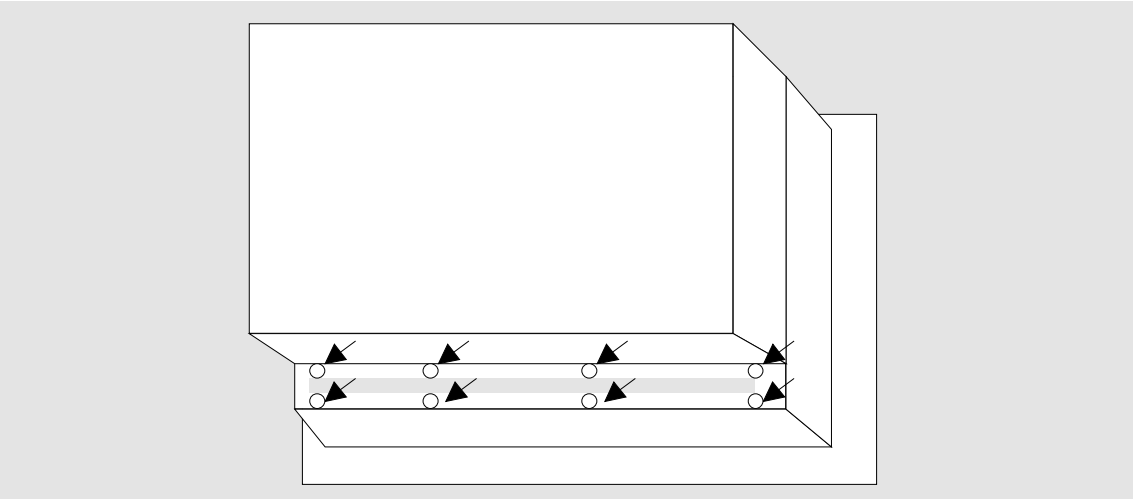
GRACIS (Technical Description)

Removing the cover fringe

Using a suitable Phillips screwdriver, remove the eight screws (indicated by arrows) securing the cover fringe and detach it towards the rear of the unit.



Closing the unit

To close the unit, proceed as for opening in the opposite direction.

☞	Please ensure that the three flaps on the cover plate are correctly inserted in the slot on the right-hand side of the housing.

3.1.3 Changing the Labelling Strips

The keys of the two key modules are labelled before delivery. It is possible to replace the labelling strips even after the OP 40-SM has been installed.

CAUTION

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The unit must be disconnected from the power supply when changing the labels. It is not sufficient to switch the unit off using the keyswitch.

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To exchange the OP 40-SM labels, proceed as follows:

- Place the unit on an even surface (with the front panel facing upwards).
- Detach the cover frame (remove the nine retaining screws).

> ☞ If the unit is installed, hold the protective screen and the two key modules in place.

- Carefully remove the cover frame (lift it off at the inner bars).
- Remove the operating key module without disconnecting the cable.
- Remove the function key module without disconnecting the cable.
- Place the modules on the supporting frame; if the unit is installed, the modules remain suspended on the connecting cables.
- Remove the old labels.

> ☞ Before the labelling strips are inserted, the labelling must be dry. Contamination caused by smearing on the inside of a key membrane cannot be removed.

- Slide in the prepared labelling strips.
- Insert the labelled modules in the supporting frame.
- Replace the cover (ensure that the seal is correctly seated).
- Insert the screws and tighten them evenly.

3.1.4 Installation Guidelines for Keyboards, Printers, Programming Devices and Monitors

In order to prevent the occurrence of faults, it is necessary to implement screening measures on automated plants.

In badly grounded plants, low-frequency (LF) or high-frequency (HF) interference signals can access the internal bus of the programmable controller system and cause a malfunction.

Interference signals can be generated, for example, by the operation of relays or contactors (high rates of voltage or current variation, HF signals) or by different ground potentials between two plant sections (LF interference signals).

3.1.4.1 Installation and Use of Interference-Free Cables

Only screened cables are permitted for all signal connections. On digital and analog signal conductors, the screens should be grounded on one side.

Cable screens should be grounded on both sides on
- connecting cables between the CPU and expansion units
- bus cables
- cables to peripheral devices

The standard connecting cables specified in Catalog AR 10 meet this requirement.
All connecting cables must be secured by screws or clamps.

Signal conductors may not be installed parallel to heavy-duty power cables. A separate cable run should be used at a minimum clearance of 50 cm from the heavy-duty power cables.

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GRACIS (Technical Description)

Interference-free hardware system

The basis for interference-free operation of programmable controllers is provided by the hardware system of the control unit. Where possible, any interference signals which filter through from the process should be kept away from the hardware system.

CAUTION

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All of the screening measures and installation guidelines contained in the EMC guidelines "Installation Guidelines for SIMATIC S5 (U-Range Programmable Controllers)" must be observed. Failure to observe these guidelines can result in the intrusion of interference signals in the hardware system, which may lead to malfunctions during program execution.

You will find the installation guidelines in the programmable controller manual. The following section describes the most important measures.

S5 cabinet installation

Components which are capable of passing external interference signals through to the cabinet should be arranged near the bottom. The grounding bar must be arranged at the immediate entrance to the cabinet so that cables which can conduct interference signals can be connected directly to ground. All screened cables - except coaxial cables with only one screen - should be connected here. In the case of signal conductors with double screening, it is only necessary to connect the outer screen at this point.

Long signal conductors should be installed along the cabinet walls. Due attention should be paid to electromagnetic compatibility during cabinet installation, in order to keep interference to a minimum. All connections to the cabinet chassis should be implemented with a large conductor cross-section across a large surface.

Analog devices located in the cabinet should be isolated and grounded to a point in the cabinet (use copper tape). The materials used should always be of similar quality (never use aluminium because of the danger of oxidation).

All doors and metal parts (sides, rear wall and top) of the cabinet must be connected to the cabinet frame at a minimum of three points (short, paint-free, large-surface connections).

In plants which generate a high electrostatic voltage (such as textile processing machines) the grounding bars of the machine parts carrying the interference signals should be connected to a separate station ground isolated from the central grounding point of the S5 cabinet (surface grounding with housing construction, armouring).

3.1.5 Mechanical Installation

The OP 40-SM can be installed in control cabinets or consoles (wall thickness max. 16 mm). A cut-out measuring 419 x 323 mm and eight mounting holes are required (see diagram). The OP 40-SM is secured to the cabinet/console using 8 countersunk M5 screws.

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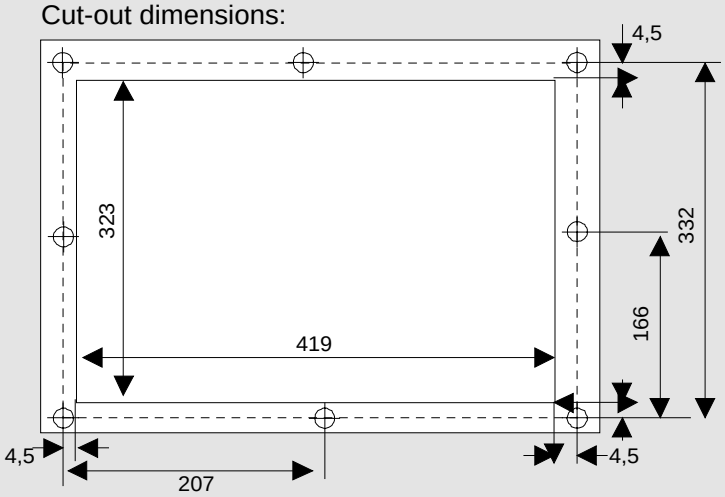
In order to assure degree of protection IP 65 the seal must be correctly seated in the supporting frame.
The ventilation slots on the rear of the unit must not be covered when installed.
The OP 40-SM should be protected against direct sunlight.

Cut-out dimensions:



Care should be taken to ensure there is sufficient clearance for changing the diskette.

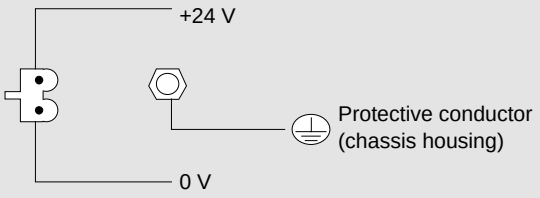
Installation orientation

The OP 40-SM operates normally when installed in any orientation. If the mounting angle, measured between the front panel and the vertical, exceeds 15°, the efficiency of the integrated cooler is impaired. In this case, the use of the fan subassembly, and where necessary the individual fan, is required.

3.1.6 Connecting the Unit

Power supply

Conductor cross-sections from 0.5 to 2.5 mm² can be used.



The protective conductor screw terminal is connected internally with 0V.

The power supply of the OP 40-SM is protected on the primary side by a glass fuse-link (5x20 mm, 6.3 A, slow). The fuse holder is accessible below the MF2 keyboard port when the cover plate is removed.

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GRACIS (Technical Description)

CAUTION

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The fuse may only be exchanged for one of the same type.

3.1.6.1 Connecting the PLC

Depending on the hardware used and the GRACIS parameters, the programmable controllers can be connected in two ways.

- Direct connection via the serial TTY interface with a suitable adapter cable for operator control and monitoring on the shopfloor.
- Connection to the SINEC L2 or SINEC H1 bus for networked operator control and monitoring.

Direct connection

In a direct connection, the serial COM1 or COM2 interface of the OP 40-SM is connected to the programming interface on the PLC. Communication takes place in TTY mode, the OP 40-SM is active.

COM1 on the OP 40-SM has the same pin assignment as on the PG 730/750/770 programming devices. An RS 232/TTY converter is required for connection to the COM2 interface.

SINEC H1 link

The OP 40-SM must be equipped with the CP 1413 interface processor for connection over the SINEC H1 network.

SINEC L2 link

The OP 40-SM must be equipped with the CP 5410 interface processor for connection over the SINEC L2 network.

3.1.7 Start-Up

Checklist prior to switching on

CAUTION

--

The OP 40-SM may not be exposed to condensation. Condensation can occur, for example, if the unit is brought from a cold storage location to a warm installation location. In this case, leave the unit standing in the transport packaging for approximately two hours.

- Install any optional upgrades in the unit.

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- Check the jumper and switch settings on the system board and the options you have installed. The settings on the AT CPU board are made at the factory and may not be modified by the user.

- Prepare the mounting cut-out and mount the unit in the cabinet/console.

- Turn the keyswitch to the *Off* position and make the necessary connections (power supply, PLC link, peripheral devices).

- Switch on the unit at the keyswitch.

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GRACIS (Technical Description)

3.1.7.1 Power-Up Procedure

When the power and the unit have been switched on, the green LED on the operating key module lights up and the OP 40-SM performs a series of hardware test routines.

You can follow the power-up and the self-test of the AT CPU on the display. The components located on the subassembly are tested and compared with the configuration in SETUP (see below). If no discrepancies or errors are detected, the AT CPU starts loading the operating system from the boot drive.

SETUP

If any errors are detected during the self-test or if the CTRL, ALT and ESC or DEL keys are pressed, the OP 40-SM runs the SETUP program, which is used to set the system configuration. A form appears on the display, in which you can enter the individual parameters for the configuration. The instructions for operation of the form are displayed on the screen.

3.1.7.2 Switching On for the First Time and Creating Back-Up Diskettes

When the OP 40-SM is switched on for the first time it loads the MS-DOS 5.0 operating system and prompts you to make a back-up of the installed software.
You will need 8 to 9 formatted diskettes for a back-up on an OP 40-SM without STEP 5/MTand 20-21 diskettes for an OP 40-SM with STEP 5/MT.
The first diskette of the back-up becomes an MS-DOS boot diskette. All other diskettes contain compressed data.

To start GRACIS, enter 'GRACIS' after the back-up is complete. From this point on, the OP 40-SM will always branch directly to FlexOS and GRACIS.
To return to the MS-DOS operating system, you must open a new console under FlexOS with the key combination ALT and +. If you enter the command 'DOS' here, the OP 40-SM is restarted under the MS-DOS operating system.
To branch to GRACIS again, enter 'GRACIS'.

3.2 Device Description

The OP 40-SM is built into a housing whose front panel has degree of protection IP 65 when installed in a cabinet. The front panel consists of a supporting frame and a cover frame and holds the operating key module, function key module and the protective screen. The display is mounted directly in the supporting frame. A rubber seal is bonded to the cover frame in order to assure the IP 65 degree of protection.

The rear panel of the OP 40-SM consists of 1.5 mm-thick anodized aluminium with degree of protection IP 20. The mounting depth is only 125 mm even when the cables are connected.

The OP 40-SM uses ventilation slots for self-cooling.

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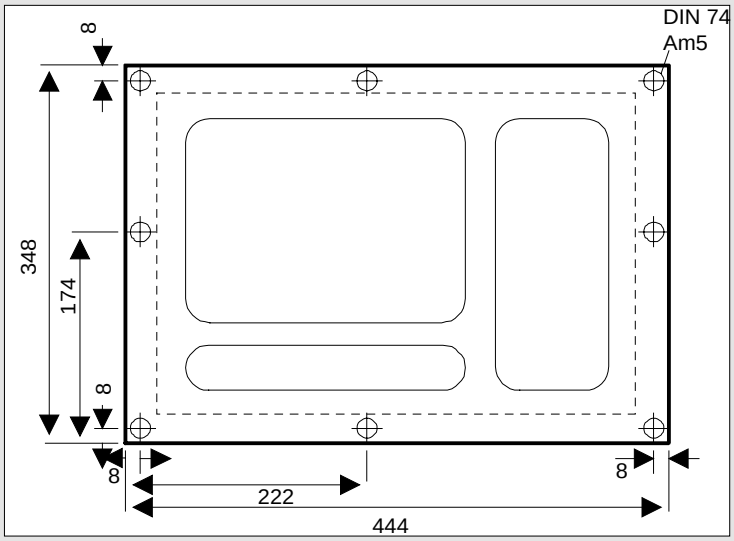
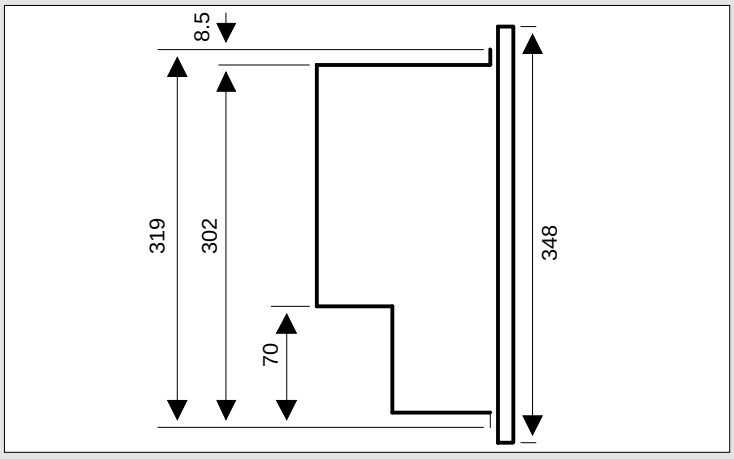
3.2.1 Dimension Diagrams

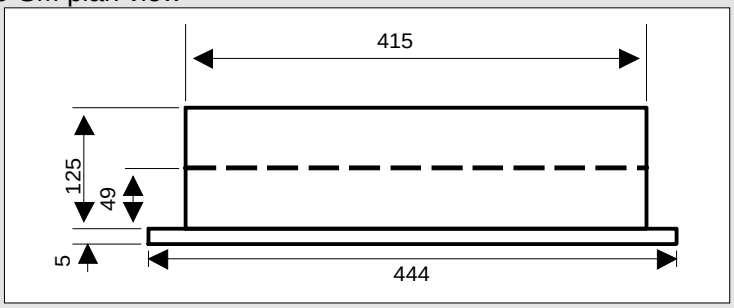
OP40-SM front view



OP40-SM side view



OP40-SM plan view



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GRACIS (Technical Description)

3.2.2 Operating Elements and Indicators

The standard version of the OP 40-SM is equipped with two key modules and a colour LCD screen.

The liquid crystal display (LCD) can visualize GRACIS process displays in 16 colours. To ensure consistent legibility in all light conditions it is equipped with constant background illumination.

The background illumination is deactivated when GRACIS blanks the screen. The LEDs above the "TAB"- und ">" keys of the operating key module flash to indicate to the user that the OP 40-SM is still active.

LCD display: key data	Active surface:	211 x 158 mm
	Resolution:	640 x 480 Pixel
	Pixel size:	0.33 x 0.33 mm
	Pixel arrangement:	R G B in vertical strips
	Possible colours:	256

Operating key module

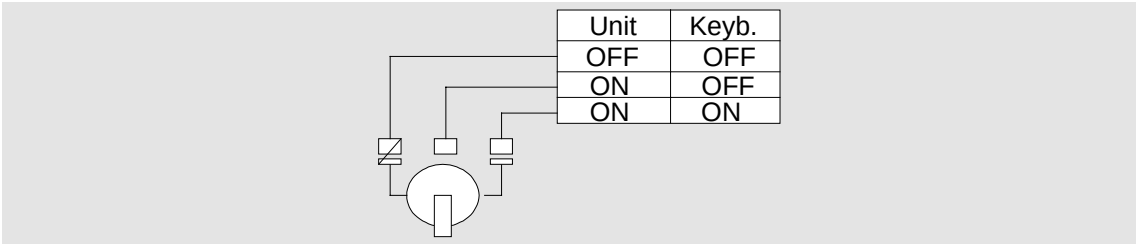
Forty keys (16 with LED), the operating power indicator, the keyswitch and the port for an MF2 keyboard are arranged on the operating key module.

The keys and the components underneath are protected by a membrane made of polyethylene. The membrane is resistant to aggressive soiling and many chemicals.

The function key module contains 16 function keys. A red LCD is assigned to each of the function keys.

The operating power LED lights up immediately the OP 40-SM is switched on.

The keyswitch can be removed in each of the three positions.



The use and assignment of the MF2 keyboard port are identical to the MF2 keyboard port at the rear of the unit.

The IP 65 degree of protection is maintained by using:
- a connector with a screw attachment or
- a screw-type sealing cap

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3.2.3 System Board

The system board contains the following components:

- DC/DC converter for generating the voltages required for the OP 40-SM from the power supply
- Signal adapter for converting the VGA signals to a form suitable for the display
- Coprocessor for matching different keyboards
- Temperature monitor and fan controller

The system board is located inside the housing immediately behind the front panel. It is only accessible to the user in the area below the cover fringe. The necessary connection and adjustment elements are located there.

DC/DC converter

The DC converter on the system board generates the following voltages for supply to the individual components.

Output voltage	Max. current	Ripple (peak to peak)
+ 5 V ± 2 %	5 A	50 mV
+ 12 V ± 5 %	4 A	100 mV
- 5 V ± 5 %	0.5 A	50 mV
- 5 V ± 5 %	0.5 A	50 mV

The voltage required for the display is also produced.

Technical specifications:

Input voltage	typ.	24 V DC
	permissible	18 .. 30 V DC
Input power	max.	100 W
Efficiency	typ.	85%
Fuse	primary	6.3 A

VGA display adapter

The VGA display adapter controls the integrated display. It takes the analog signals of the VGA piggyback subassembly and matches their level and timing to the required format.

3.2.4 Keyboard Matching

The coprocessor accommodated on the system board converts the signals of the various supported keyboards to scan codes which are used by the AT CPU. The coprocessor has inputs for the integrated key modules, an MF2 keyboard and one or two process control keyboards. A fixed connection is provided between the key modules integrated in the OP 40-SM and the coprocessor, with all of the keys having permanent functions.

The scan codes assigned to the individual keys depend on the setting of switches S1.1 to S1.6. The switches should be set as specified below. The DIL switch is accessible on the system board when the cover fringe is removed.

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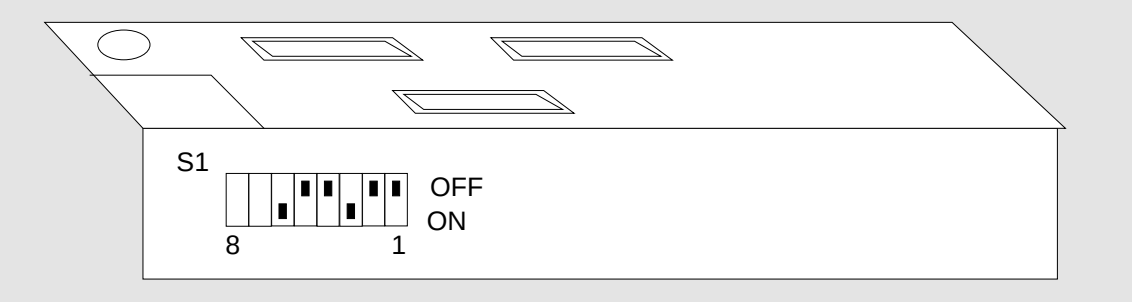

The OP 40-SM has two MF2 keyboard ports wired in parallel. Only one port at a time may be connected to a keyboard. The signals are relayed to the AT CPU without modification.

3.2.5 Temperature Monitoring

Two temperature sensors (between the display and the CPU board and in the area of the AT expansion slots) are used to continuously monitor the temperature of the OP 40-SM. The following measures are performed as soon as a critical value is reached:

	Internal temperature	Slot temperature
over 50°C	The fans of the fan subassembly are switched on	The individual fan is switched on
over 60°C	Reliable operation is no longer assured	
	4 LEDs flash in the top row of keys	4 LEDs flash in the second row of keys from the top
over 70°C	Background for colour LCD is switched off	
below 58°C again	LED display is switched back to normal operation	
	Background illumination is switched on again	
below 30°C again	Fans are switched off again	

The specified temperatures are subject to a manufacturing variation of ± 2°C.

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3.2.6 AT CPU Board

The AT CPU board makes the OP 40-SM a 100% PC/AT-compatible computer. The performance is determined primarily by the configuration ordered. It is not possible for the user to upgrade the equipment.

Processors: 80336 SX 25
80486 SX 25
80486 DX 33

Memory capacity: 10 MB
16 MB

Drive controller

The AT CPU supports operation of an IDE (AT bus) hard drive with integrated controller. The hard drive is connected using a 40-pin ribbon cable with standard assignment.

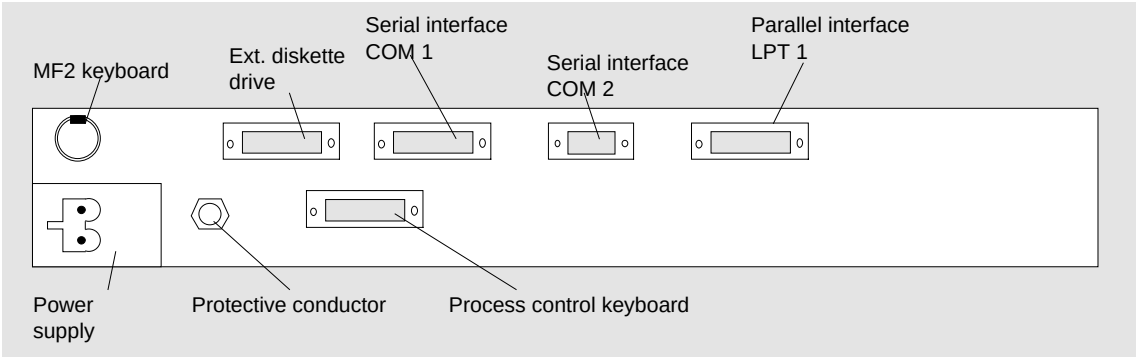
The diskette drive controller on the AT CPU board supports the connection of any two diskette drives (3.5" oder 5.25"). An external drive can be connected to the drive interface.

Expansion bus

The AT CPU is plugged into an expansion bus board which has three free 16-bit slots available to the user.

3.2.7 Interfaces

With the exception of the MF2 keyboard port on the front panel, all of the interfaces are accessible from below on the tiered rear panel of the unit.



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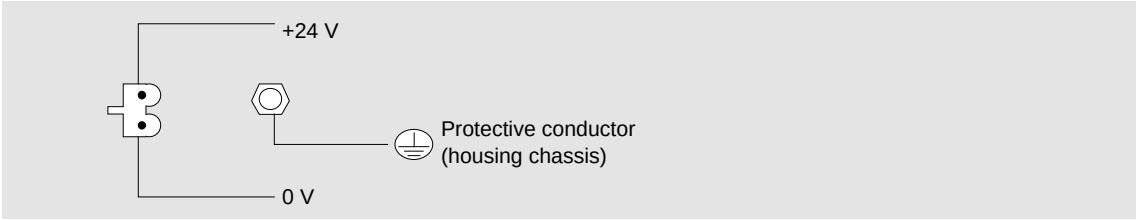
Power supply

The OP 40-SM operates with a system voltage of 24 V DC. The permissible range for the power supply is 18 .. 30 V DC.



The power supply is protected by a glass fuse-link (5x20 mm, 6.3 A).

The power input is also protected by a passive filter and a diode. Incorrect polarity on the power supply burns out the fuse and interrupts the supply of current.

3.2.7.1 COM1 Serial Interface

The RS 232 and TTY (20 mA current loop) interface signals are applied to the 25-pin female sub D connector of the COM1 interface.

Pin assignment:

Pin	RS 232	TTY
1	Screen	Screen
2	TxD (D1)	-
3	RxD (D2)	-
4	RTS (S2)	-
5	CTS (M2)	-
6	DSR (M1)	-
7	GND (E2)	-
8	DCD (M5)	-
9	-	+RxD
10	-	-RxD
11-17	-	-
18	-	+TxD
19	-	+24V
20	DTR (S1)	-
21	-	-TxD
22	RI (M3)	-
23-25	-	-

If the COM1 interface is used in RS 232 mode, current must **not** be applied to the TTY receiving diode (between pin 9, +RxD, and pin 10, -RxD).

When the standard programming device cable is used for connection to a PLC, jumper 3-20 in the connector must be opened.

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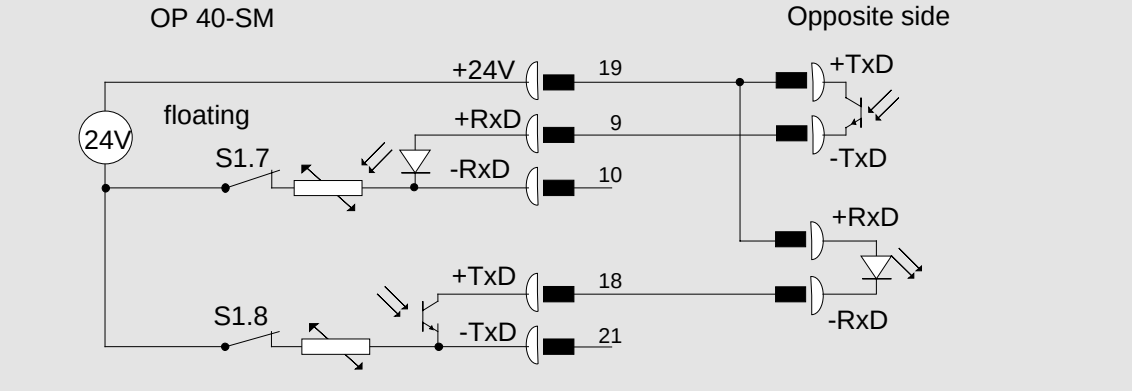
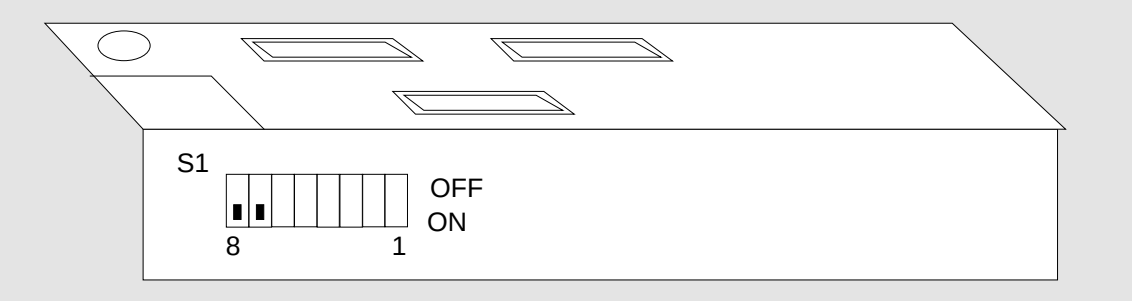
TTY mode, active:

The pin assignment and internal circuit for the TTY signals of COM1 are identical to those of the PG 730/750/770 programming devices. The circuit is as follows:



On delivery, the OP 40-SM is preset to *active*. Switches 7 and 8 of DIP switch 1 are closed (ON setting). S1 is accessible on the system board when the cover fringe is removed.



TTY mode, passive

If the OP 40-SM is to be the passive partner in TTY mode on COM1, both of the switches 7 and 8 of DIL switch 1 must be open (OFF setting) and the external circuit must be modified accordingly.

3.2.7.2 COM2 Serial Interface

The RS 232 interface signals are applied to the 9-pin female sub D connector of the COM2 interface.

Pin assignment:

Pin	RS 232
1	DCD (M5)
2	RxD (D2)
3	TxD (D1)
4	DTR (S1)
5	GND (E2)
6	DSR (M1)
7	RTS (S2)
8	CTS (M2)
9	RI (M3)

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3.2.7.3 LPT1 Parallel Interface

The 25-pin female sub D connector of the LPT1 interface conforms to a PC-standard Centronics interface.

Pin assignment:

Pin	Signal
1	STROBE
2	DATA 0
:	:
9	DATA 7
10	ACKNOWLEDGE
11	BUSY
12	PAPER END
13	SELECT
14	AUTO NEW LINE
15	ERROR
16	INIT
17	SELECT
18 .. 25	GND

3.2.7.4 Port for External Diskette Drive

The external diskette drive is connected to a 37-pin sub D female connector with TTL transmission level.

Pin assignment:

Pin	Signal
1	VCC
2	nc
3	DS3
4	HEADLD
5	nc
6	IND
7	MOTREN_A
8	DRIVES_B
9	DRIVES_A
10	MOTREN_B
11	DIRC
12	STEP
13	WRTD
14	WRITE
15	TRACK0
16	WRITEP
17	READD
18	HEADS
19	DCHG
20 .. 37	GND

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3.2.7.5 MF2 Keyboard Port

The MF2 keyboard is connected to the 7-pin round connector on the rear or front panel of the OP 40-SM. The two connectors are wired in parallel; only one keyboard may be connected at a time.

Pin assignment:

Pin	Signal	
1	Transmission cycle	
2	Data	
3	Free	
4	0 V	Power supply
5	+5 V / 0.3 A	for keyboard
6, 7	Free	

3.2.7.6 Process Control Keyboard Port

The RS 485 (X.27) and RS 232 (V.24) interface signals are applied to the 15-pin female sub D connector.

Pin assignment:

Pin	General (TTL)	RS 485	RS 232
1	Screen		
2			TxD
3			RxD
4,5	nc		
6	Softreset		
7	nc		
8	GND	GND	GND
9	nc		
10	+5 V		
11		+R_Dat	
12		-R_Dat	
13		+T_Dat	
14		-T_Dat	
15	Reset_in		

3.3 Device Options

The device options are subdivided into
- ordering options and
- upgrade options.

Ordering options are selected at the time of ordering and are integrated in the OP 40-SM and tested before delivery. All of the switch and jumper settings are complete.

Upgrade options are hardware modifications carried out by the user on previously supplied equipment in order to expand or improve the performance.

CAUTION

--

The power cable must be removed before attempting to open the unit.
It is not sufficient to switch the unit off using the keyswitch.

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3.3.1 Hard Disk

The standard version of the OP 40-SM is equipped with a hard disk with a storage capacity of 85 MB. Hard disks with larger capacities are available on request.

3.3.2 Diskette Drive

An external diskette drive can be connected to the OP 40-SM in addition to the internal diskette drive.

The internal diskette drive is suitable for 3.5" diskettes of the type
- 2S/2H (720 KB)
- 2S/HD (1440 KB)

An external diskette drive is connected to the 37-pin sub D connector. The connector is located on the bottom of the rear panel of the unit.

The power is supplied across this connection for a 3.5" drive. The operating voltages for a 5.25" drive are **not** available on the OP 40-SM and must be provided externally.

3.3.3 Keyboards

An additional keyboard is required for certain applications. The following keyboards can be connected:
- MF2 keyboard
- Process control keyboard (PBT)

MF2 keyboard

The OP 40-SM is equipped with two 7-pin round connectors, one of which can be used at a time. One of the round connectors is located on the operating key module while the other is on the bottom side of the cover hood.

The two round connectors may not be used simultaneously, i.e. it is not possible to operate two MF2 keyboards in parallel.

The IP 65 degree of protection for connection to the front panel is maintained by using:
- a connector with a screw attachment or
- a screw-type sealing cap

Process control keyboard

Process control keyboard PBT 20 is suitable for use in industrial applications as a membrane keyboard with degree of protection IP 54. It consists of an alphanumeric keyboard with 91 keys, a keyswitch, an operating power indicator (green LED) and an error indicator (red LED).

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3.3.4 Expansion Cards

The OP 40-SM supports up to three additional AT-compatible expansion cards. The CP 1413 (SINEC H1) and CP 5410 (SINEC L2) communications processors can be ordered with the unit and, in this case, are already installed in the OP 40-SM.

The following requirements apply to the use of AT-compatible expansion cards:

Subassembly size

Slot	Length of card	
	uncooled	with individual fan
1	225 mm	225 mm
2	225 mm	205 mm
3	225 mm	205 mm

Electrical specifications

The power drawn from slots 1 to 3 must be less than 25 W in total. The power used on slots 1 to 3 must be less than 40 W in total. The power used is calculated from the sum of the power drawn from the slots and the power supplied externally.

Installation

- Open the cover plate.
- Remove the slot cover.
- Plug-in the expansion card.
- Screw in the slot cover.
- Close the unit.

No responsibility can be accepted for any damage resulting from the use of subassemblies of third-party manufacturers.

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3.3.5 Forced-Air Cooling

CAUTION

The OP 40-SM must be disconnected from the power supply before installing the fan subassembly or the individual fan.

3.3.5.1 Fan Subassembly

If the installation orientation of the OP 40-SM exceeds 15° from the vertical, heat will accumulate in the unit. In order to prevent this accumulation of heat, it is necessary to install the fan subassembly.

Installation:

- Remove the cover fringe.
- Rotate the fan subassembly until the arrow on the label is pointing at the interfaces. The arrow indicates the position of the connector on the system board.
- Plug the two-pin connector into the connector on the system board.
- Secure the fan subassembly with the 8 retaining screws.

3.3.5.2 Individual Fan

If the total power used on slots 1 to 3 exceeds 25 W, the individual fan must be used. The power used is composed of the power drawn from the slots and the power supplied externally.

Installation:

- Remove the cover plate.
- Install and secure the fan.
- Connect the two-pin connector to the system board.

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3.4 Technical Specifications

AT CPU board	
Microprocessor	80386SX (25MHz) i486SX (25MHz) i486DX (33MHz)
Coprocessor	Standard
System memory	10 or 16 MB

Interfaces	Port	Transmission level
COM1 serial interface	25-pin sub D connector	RS 232 and TTY
COM2 serial interface	9-pin sub D connector	RS 232
LPT1 parallel interface	25-pin sub D connector	TTL
External diskette drive	37-pin sub D connector	TTL
MF2 keyboard/front panel	7-pin round connector	TTL
MF2 keyboard/rear panel	7-pin round connector	TTL
Process control keyboard	15-pin sub D connector	RS 232 and X.27

Display		Colour LCD
Colours		256
Active surface		211 x 158 mm
Pixels, total		640 x 480
Viewing angle	vertical	+10° / -30°
	horizontal	±45°

Key modules	
Function key module	16 keys 16 red LEDs
Operating key module	40 keys 16 red LEDs Keyswitch (three positions) 1 green LED MF2 port

Power supply		
Input voltage	typ. permissible	24 V DC 18 .. 30 V DC
Input power	typ. permissible	65 W 100 W
Fuse		Miniature fuse 6.3 A, slow
Back-up battery		Lithium battery 3V 480 mAh

Housing		
Degree of protection	Front panel Rear panel	IP 65 (when correctly installed) IP 20
Dimensions		
Front panel (W x H x T)		444 x 348 x 5 mm
Housing (W x H x T)		415 x 319 x 120 mm
Mounting cut-out		419 x 323 mm
Mounting depth		125 mm
Weight		4 kg approx.

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Ambient conditions	
Operating temperature	0° to 40° C
Atmospheric pressure	860 to 1860 hPa
Storage temperature	-20° bis 60° C
Relative humidity (storage and operation)	≤ 95% at T ≤ 40° C, no condensation
Shock load	Test level 10 g, 11ms to DIN 40046, Part 7

Noise immunity	
Interference voltage/radiated noise	Radio interference suppression level N to VDE 0871, VDE 0875
Static discharge	up to 8 kV (on housing parts)
HF interference	up to 3 V/m
Burst interference on conductors	up to 1 kV

3.5 Appendix

3.5.1 Memory Addresses

FF:FFFF 10:0000	15 MB DRAM
0F:0000	64 KB EPROM (BIOS)
0C:0000	Extended BIOS and USER EPROM
0A:0000	128 KB Video RAM
00:0000	640 KB DRAM

3.5.2 I/O Addresses

000-00F	DMA controller
020-03F	Interrupt controller
040-05F	Timer
060-06F	Keyboard (8742)
070-07F	Real-time clock, NMI mask
080-09F	DMA page register
0A0-0BF	Interrrupt controller 2
0C0-0DF	DMA controller 2
1F0-1F7	Hard disk
2x8-2xA	EMS register (x = 0 or x = 1)
201	Watchdog timer, PDO, User
278-27A	LPT2
378-37A	LPT1
2F8-2FF	COM2
3F2-3F7	Floppy
3F8-3FF	COM1

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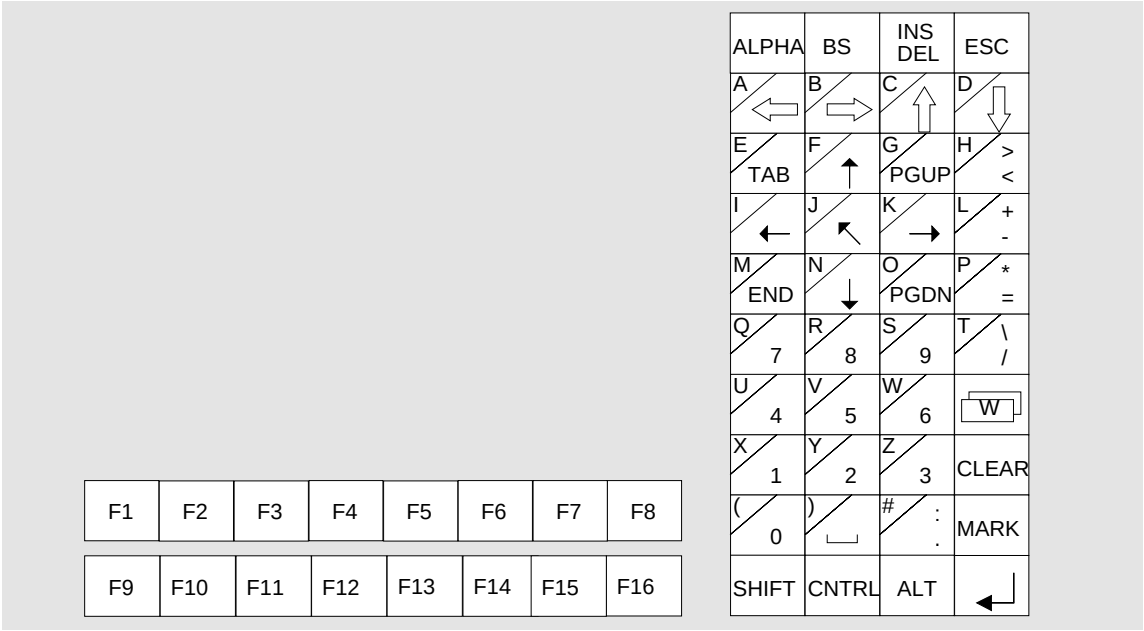
3.5.3 Keyboard Labelling



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4 CP 485/486

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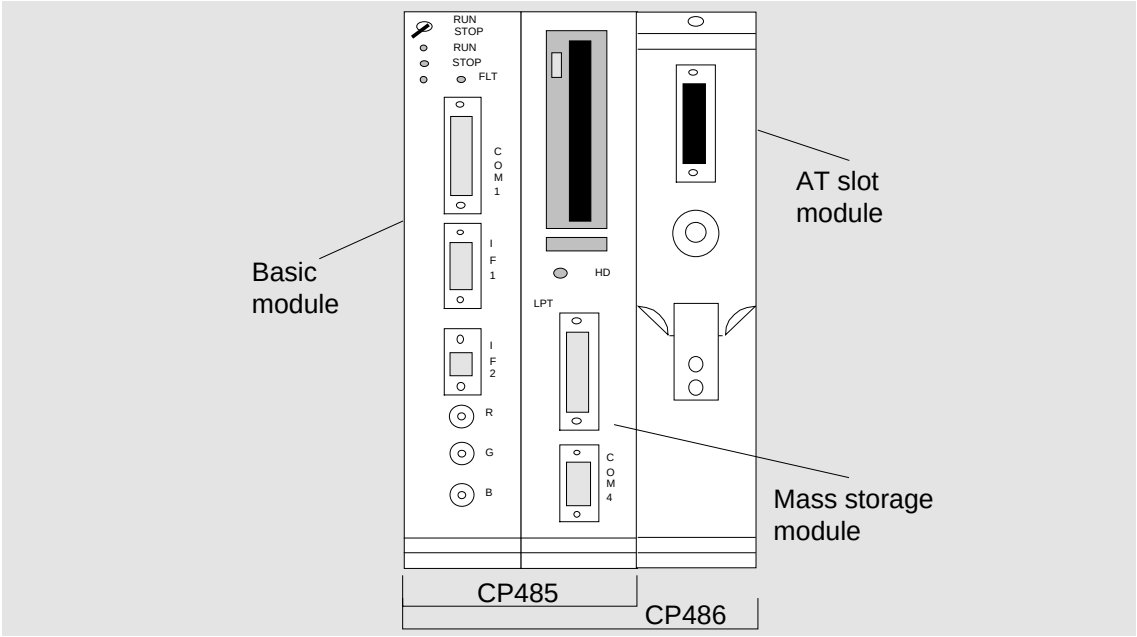
The CP 485/486 is a modular PC/AT-compatible computer for process control and pixel-graphics process visualization. The CP 485/486 can be plugged directly into the SIMATIC S5 115U, 135U and 155U programmable controllers. Communication between the CP and the PLC takes place over the backplane bus.

The CP 485 and CP 486 differ solely with respect to their hardware configuration.

The CP 485 consists of a basic module, containing the PC/AT computer unit, and a mass storage module housing the hard disk and a 3.5" diskette drive.

The third component of the CP 486 is an AT slot module which accommodates either a CP 1413 for connection to the SINEC H1 network or a CP 5410 for connection to the SINEC L2 network.



The available interfaces of the CP 485/486 allow you to choose from a wide range of peripheral devices. Examples of compatible devices include:

- Printers (with serial or parallel interface)
- Keyboards (PG keyboard, standard MF2 keyboard, process control keyboard)
- RGB monitors (office or industrial versions)
- Monitor panels (degree of protection IP 65)

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4.1 Assembly and Installation

4.1.1 Unpacking and Inspecting the Individual Components

- Unpack the CP485/485.

> The CP 485/486 is fitted with a hard disk which is sensitive to shocks and vibrations. Please handle the unit with appropriate care.

- Do not dispose of the original packaging but keep it for future transport.
- Complete the enclosed licence agreements (for the use of software products) and mail them to the address stated there.
- Read all the enclosed product information. It will provide you with any relevant information including possible errors, special cases, addenda, restrictions or modifications to the reference manual.

CAUTION

– The directions and warnings in the Instruction Manual must be observed in order to assure safe operation.
– Do not connect the device if there is evidence of external damage.
– VDE regulations and accident prevention rules must be observed.
– The ESD rules must be observed during installation of the module.

4.1.2 Installation

4.1.2.1 Slots of the CP 485/486 in the Programmable Controller

The CP 485/486 can be installed in the following programmable controllers:

- S5-115U with CPU 941, CPU 942, CPU 943 and CPU 944 (A and B)
- S5-135U with CPU 922, CPU 928A and CPU 928B
- S5-155U with CPU 946/947, CPU 922, CPU 928A and CPU 928B
- S5-115H, S5-155H

> The CP 485/486 can only be plugged into the EU 185U in a switched I/O.

CAUTION

The CP 485/486 should not be plugged in or removed when connected to the mains. The power supply should be disconnected before assembly/dismantling.

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The CP 485/486 should, where possible, only be plugged into slots with 48-pin connectors. The module may tilt if plugged into a slot with a 64-pin connector. For this reason, care should be taken with these slots to ensure that the module is guided correctly and accurately into the connector.

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Permissible slots

The CP 485/486 occupies 2 to 4 slots in the PLC, depending on the configuration.

In the following tables of permissible slots, the slot for the basic module is specified.

S5-115U permissible slots in the central rack:

CR700-0LB	PS	CPU	0	1	2	3	IM			
			Ü							
CR700-3	PS	CPU	0	1	2	3	4	5	6	IM
			Ü	Ü	Ü					

- Installation is only possible in racks CR700-0LB and CR700-3.
- The 7/15 A power supply with safe isolation is required for the CP 485/486. Use with a 3A power supply module is not permitted.
- An adapter casing is required for 2 or 4 slots (depending on the configuration). The CP 485/486 may only be aligned to the left in the adapter casing for 4 slots. Only in this way can it be mechanically secured.

S5-135U, S5-155U permissible slots in the central rack:

	3	11	19	27	35	43	51	59	67	75	83	91	99	107	115	123	131	139	147	155	163
S5-135U 1) 2) 6ES5 135-3KAXX			Ü	Ü	Ü	Ü	Ü	Ü	Ü												
S5-135U 1) 2) 6ES5 135-3UAXX			Ü	Ü	Ü	Ü	Ü	Ü	Ü	Ü	Ü	Ü	Ü	Ü	Ü	Ü	Ü				
S5-155U 1) 2) 6ES5 135-3UAXX			Ü	Ü	Ü	Ü	Ü	Ü		Ü	Ü	Ü	Ü	Ü	Ü	Ü	Ü				

1) A coordination processor is not required when using the CP 485/486 provided only one CPU is used.

2) The special PG-MUX and interrupt generation functions cannot be used on a slot occupied or covered by a CP 485/486.

S5-185 EU permissible slots in the expansion unit for S5-155U, -135U and -155U:

	3	11	19	27	35	43	51	59	67	75	83	91	99	107	115	123	131	139	147	155	163
S5-185U EU			Ü	Ü	Ü	Ü	Ü	Ü	Ü	Ü	Ü	Ü	Ü	Ü	Ü	Ü	Ü	Ü			

The connection to the central rack is implemented using the IM 304/314 or IM 307/317 interface module.

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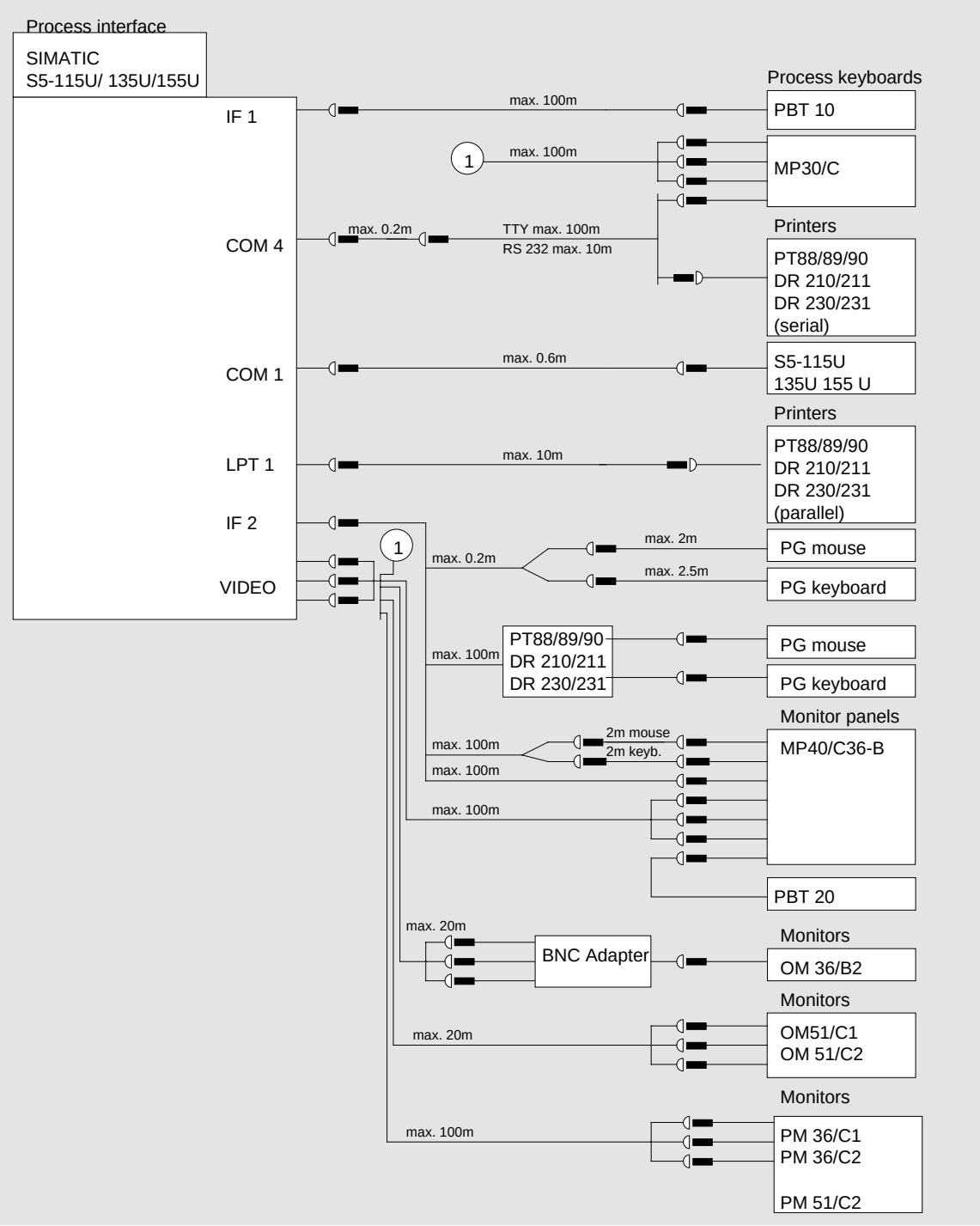
4.1.2.2 Connecting the Peripheral Devices

The following diagram provides an overview of the preferred devices for connection to the CP 485/486. Standard cables are available for connection (see Catalog AR 10).



4.1.2.3 Network Connection

The CP 486 is optionally equipped with a CP 1413 for connection to the SINEC H1 network or a CP 5410 for connection to the SINEC L2 network.

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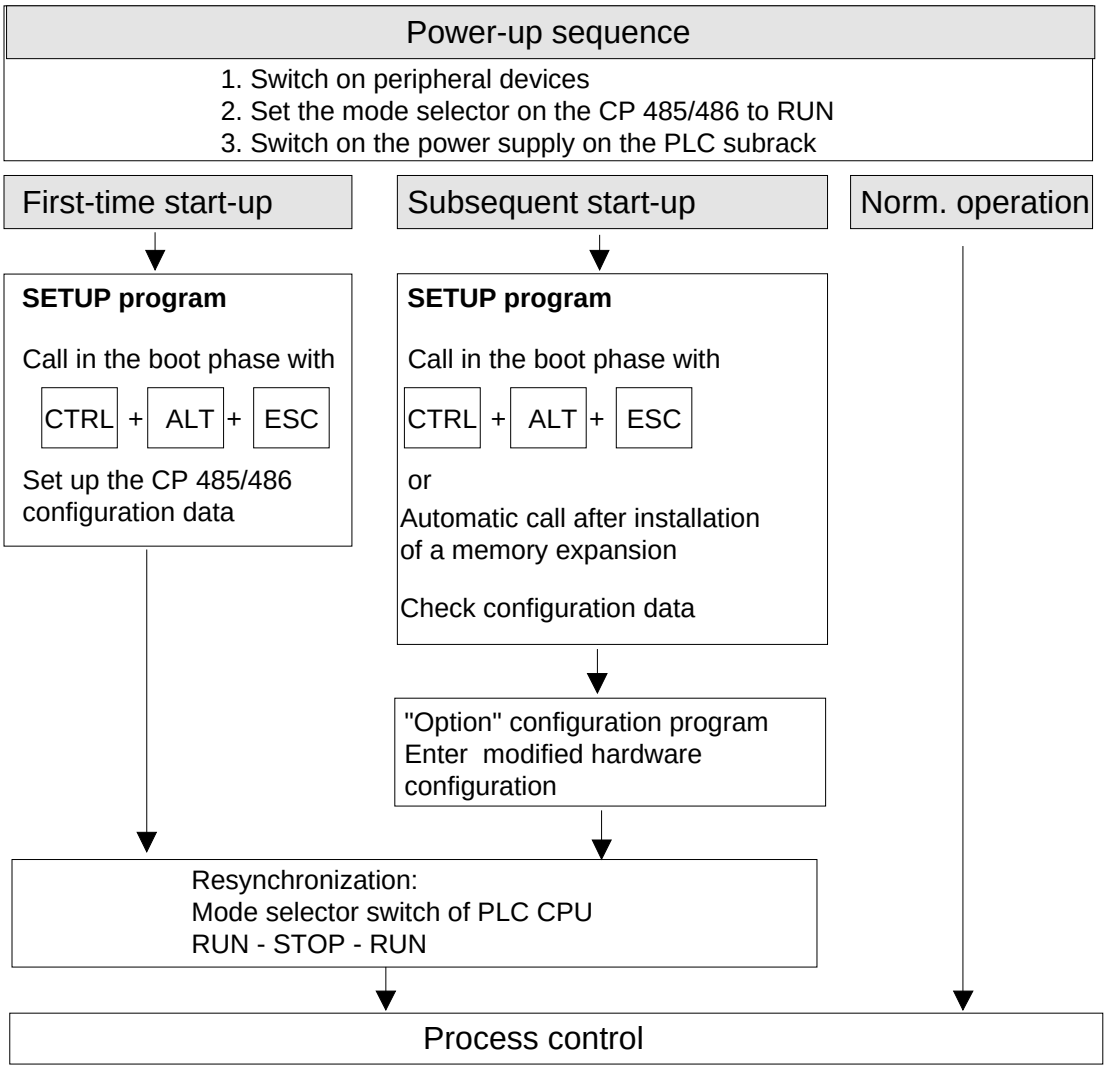
4.1.3 Start-Up

Checklist prior to start-up

- Is the power supply correctly dimensioned in the rack?
- Have you taken the ambient conditions into account for the CP 485/486 and the connected peripheral devices?
- Have you made the code switch and jumper settings on the CP 485/486 and the peripheral devices?
- Is the CP 485/486 plugged into a correct slot in the rack?
- Are the peripheral devices connected correctly?
- Have you installed all the cable screens correctly?
- Have you placed the monitor in a suitable position and made appropriate allowance for the ambient conditions?
- Have you observed the S5 installation guidelines for programmable controllers?

Start-up guide

The following overview shows the main steps for starting up for the first time, starting up following the installation of options and normal operation following start-up of the CP 485/486.



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4.1.3.1 Starting Up for the First Time

1. After switching on the power supply, call up the SETUP program with the key combination CTRL+ALT+ESC. The SETUP program presents a menu with 3 screen pages in which the CP 485/486 configuration can be entered and displayed. You will find a more detailed description of the SETUP program in the section entitled *SETUP Program.*

2. Enter the following data in the SETUP menu:
   - The current date and time (page 1)
   - The configuration of the S5 interface (page 2)
     - No. of page frames to be used
     - Paged/linear addressing
     - Page frame number

3. Exit the SETUP program by pressing the F10 key and then the F5 key (Save).

4. When the OP 40-SM is switched on for the first time it loads the MS-DOS 5.0 operating system and prompts you to make a back-up of the installed software.
   You will need 8 to 9 formatted diskettes for a back-up on an OP 40-SM without STEP 5/MTand 20-21 diskettes for an OP 40-SM with STEP 5/MT.
   The first diskette of the back-up becomes an MS-DOS boot diskette. All other diskettes contain compressed data.

5. To start GRACIS, enter 'GRACIS' after the back-up is complete. From this point on, the OP 40-SM will always branch directly to GRACIS.
   To return to the MS-DOS operating system, you must open a new console under GRACIS with the key combination ALT and +. If you enter the command 'DOS' here, the OP 40-SM is restarted under the MS-DOS operating system.
   To branch to GRACIS again, enter 'GRACIS'.

6. Switch the mode selector on the PLC CPU from RUN to STOP and back to RUN to resynchronize the interface.

4.1.3.2 Starting Up after Installing Options

1. Switch the power on to start the CP 485/486.

   - If a memory expansion has been installed, the SETUP program is called up automatically. The new data are displayed on the screen. To accept these data, press the F10 key followed by the F5 key.

   - If the CP 485/486 has not been plugged into the PLC for over 15 minutes, you should call up the SETUP program (CRTL+ALT+ESC during the boot phase), check the configuration data and make any necessary corrections.

2. The configuration program is called up automatically when the hardware configuration is changed.

   - Enter the hardware revision level of the installed options.
     The hardware revision level will be between 31 and 39 and is printed on an adhesive label on every option.
     For example, 31 32 33 X 35 36 37 38 39 indicates a hardware revision level of 34.

   - Press the ESC key to terminate the program and save the configuration.

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4.1.4 SETUP Program

The SETUP program is stored in the ROM-BIOS of the CP 485/486. The program provides the operating system with information on the CP 485/486 configuration.
The SETUP program can be used to display and edit the configuration data.

Calling Setup

The SETUP program can be called during the boot phase of the CP 485/486 with the key combination CTRL + ALT + ESC.

A display appears describing the SETUP data which can be edited.
When you press any key, the SETUP program is continued. A menu is provided with 3 screen pages for displaying and editing the configuration data:

Page 1: General data such as drives and memory capacity
Page 2: Configuration data of the S5 interface
Page 3: Options such as memory management, cache settings

Terminating Setup

1. Press F10 to exit the menu

2. Press F5 to save the changes
   or
   Press F1 to quit without saving the changes (the old values are retained)

Operation

The following list shows the possible operations in the SETUP program. The key assignments apply to the PG 770 keyboard.

In the menu

Page Up Page Down	Display previous/next page of the menu
ALT+ F1	Call up help on menu
F2	Switch display colour
Print	Print the menu page (the printer must be connected to LPT1)
F10	Exit the SETUP menu

In the input box

Arrow keys	Select box with arrow keys; the selected box is highlighted
+ -	Display the next/previous value in the selected box
F1	Display help on the selected box

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GRACIS (Technical Description)

4.1.4.1 Setup Menu Page 1

Date and Time
Select the appropriate box for selection and set the current value with the + and - keys or the numeric keypad. It is also possible to set the time using the MS-DOS or FlexOS Date and Time commands and the GRACIS system parameters.

Drive A, Drive B
"Drive A: 1.44M, 3.5 in " is used for the CP 485/486; you should select "None" for Drive B:.

Video
The type of graphics adapter is always EGA/VGA

POST Messages
When the CP 485/486 boots, it carries out a self-test (POST). The POST and its messages can be modified with the following settings:
- Minimize: displays only errors and important messages
- Maximize displays all POST comments

Quick Boot
The scope of the memory check during POST is specified with the Quick Boot switch:
- OFF complete memory check
- ON reduced memory check (shorter boot time)

Halt On
This entry specifies whether the system power-up is interrupted on detection of a non-critical error during the self-test:

"NO ERRORS"	The system power-up is not interrupted
"ALL BUT KEYBOARD"	Command execution is not interrupted in the case of keyboard errors
"ALL BUT DISKETTE"	The system power-up is not interrupted in the case of diskette and hard disk errors
"ALL BUT DISK KEY"	The system power-up is not interrupted in the case of keyboard, diskette and hard disk errors

Critical errors always halt the system.

Boot Sequence
Determines the first drive to be accessed during the boot phase (A: diskette drive, C: hard drive).

Auto Detect IDE
Specifies whether the setting for the hard disk is entered automatically.

Base Memory
The base memory is the working memory available to the DOS operating system.

Extended Memory

The extended memory is the memory area whose address area begins at 1 MB. The system automatically enters the size of the extended memory, detected during the self-test, in this box.

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The following settings are possible depending on the memory capacity:

Total memory	Extended memory
8 MB	7168
12 MB	11264
20 MB	19456

Expanded Memory
Standard setting 0 MB

Other Memory
Other Memory is the memory area which is not available. The standard setting is 384 KB

Total Memory
The total memory capacity, standard setting 8192 (8 MB)

Security
You can protect the access to the system and/or to SETUP by password.

	System	Setup
Disabled	Free	Free
Setup access	Free	Password required
System access	Password required	Password required

To enter the password, press the ENTER key following the selection (Setup or System), enter the password and exit the menu with ESC. When the module is disconnected, the password is deleted.

The password protection should not be activated, as this can lead to problems in synchronization when booting after a power failure.

Drive C, Drive D
Type of installed hard drive

CAUTION

You should only change the setting for the hard disk type if you install another hard disk. If the incorrect hard disk type is entered, the system cannot be started.

The types of installed hard disks are entered in these two input boxes. The settings "1" to "49" and "NONE" are possible.

Various hard disks and their data are entered in the settings from 1 to 47. You can select a type of hard disk from this list of options. If you are using a type of hard disk which does not match any of these settings, you can describe your special hard disk in the settings "48" or "49". The setting for drive D is entered under type 48 and drive C is entered under type 49. The settings (cylinders, heads, etc.) must be entered on the keyboard.
A 120 MB hard disk is installed on delivery.

Capacity	Type	CYLS	HEADS	SECTORS	PRE-COMP	LAND-ZONE
120 MB	CP 2124	762	8	39	None	761

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4.1.4.2 Setup Menu Page 2

The S5 interface settings are entered on page 2 of the SETUP menu. These values are stored in an EEPROM and are retained even when the module is unplugged.

CONTROL

The settings for the S5 interface are organized hierarchically. You can enable/disable the entire interface or areas of it by means of the switches in the "Control" box. The settings for the components of the S5 interface are entered in the other boxes.

S5 Interface
The "Enable/Disable" setting is used to enable or disable the entire interface for the S5 bus; when "Disable" is entered, all of the other settings are ignored. Standard setting: Enable

Page Frames
The "Enable/Disable" setting enables or disables the paging area; when the "Disable" setting is active, the subsidiary settings are ignored. Standard setting: Enable

I/0 Pointer
The "Enable/Disable" setting enables or disables the I/O or extended I/O; when the "Disable" setting is active, the subsidiary settings are ignored.
The default setting "Disable" should not be changed, as the software cannot currently evaluate the entry.

Pointer Read
The "Enable/Disable" setting enables or disables read-out of the I/O pointers.

PAGE FRAMES

Frames
The setting specifies the number of page frames to be enabled (1,2,4 or 8). Allowance should be made for the distribution on the PLC.

Mode
Addressing type
Paged = paged addressing
Linear = linear addressing of all paging areas up to 8 KB on the S5 backplane bus.
The *paged* addressing type must be entered for GRACIS.

Number
Page frame number (0..255, must be divisible by the number of enabled page frames)
Standard setting: 64

Base
Base page frame address (0000H...FFFFH) in 400H intervals (Standard setting: F400H)

CAUTION

The standard setting may not be changed because of the standard data handling blocks.

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I/O Pointers

Range
Selection of the I/O area used

P: I/O area (FOOOH...FOFFH)
Q: Extended I/O area (F1 OOH...F1 FFH).

Base
Base address for the I/O area (hexadecimal, see above, step interval 8).

Communication Flags

The communication flag areas are enabled/disabled individually using the "Enable/Disable" setting.

- The default setting "Disable" should not be changed, as the software cannot currently evaluate the communication flags.

4.1.4.3 Setup Menu Page 3

Memory Controller

Remap UMBs
Enable or disable the unused memory area above 1 MB as extended memory.

Enabled: Memory area is used
Disabled: Memory area is not used

DRAM Mode
Defines the type of access to the DRAM. Standard setting: H/S Fast Page

This setting must not be changed.

Shadow
The system and video BIOS (Basic Input/Output System) routines are stored in an EPROM. The accesses to this memory are relatively slow. It is possible to copy these routines into the DRAM in order to increase the access speed.

The following settings are possible:
Disabled - Shadow function is deactivated.
System - Only the system BIOS is copied.
Video - Only the video BIOS is copied.
System/Video - The system and video BIOS are copied.
Standard setting: System/Video

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GRACIS (Technical Description)

Memory areas for the shadow function:

System	-	FOOOOH to FFFFFH
Video	-	C0000H to C7FFFH
System/Video	-	Both areas

Cache Controller

The 8 and 16 MB memory expansions contain a cache memory (high-speed 64 KB memory).

Cache
The cache memory function maps part of the working memory in the high-speed memory. This enables program instruction sequences and accesses to data to be executed substantially faster. The speed (performance) of the system is enhanced considerably.

Mapping in the cache memory is performed automatically by the system according to the accesses to the working memory.

There are four possible settings:
- Disabled
- Memory Mapped
- 2-Way Set
- 4-Way Set

The standard setting is 4-Way Set; it does not need to be changed, even for modules without a cache.

NON-CACHE REGIONS
Three memory areas can be defined which are not copied to the cache. The starting point and size of areas 1-3 are entered here.

The starting point can be selected (addresses are specified in hexadecimal) for

Area 1 from 0..576 K in 64 K steps (00000000..... 00090000),
Areas 2/3 from 640 K..1008 K in 16 K steps (000A0000. . .000FC000).

The size is:

Area 1 64..640 K in 64 K blocks,
Area 2/3 16..384 K in 16 K blocks.

Standard settings:

Area 1: 00000000 0 KB Disabled
Area 2: 000A0000 384 KB Enabled
Area 3: 000A0000 0 KB Disabled

CAUTION

--

The area 0CC000H...0CFFFFH must be disabled for the cache (S5 interface dual-port RAM area), i.e. NON-CACHE REGIONS must be set to ENABLED for this area.

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MEMORY MAPPED I/0 REGIONS
The start address, size and status are defined for a memory area which is used for memory-mapped I/O functions. The address is a hexadecimal value in the range 0...32 MB, defined in steps of 32 K. The area can be defined in sizes of 16K, 32K or 64K.

The Enabled/Disabled status setting is used to enable or disable the area. When the memory mapped I/O area is used, all accesses to this area are made direct to the ISA bus and not to the memory of the module.

Standard setting: Region 1: 000A0000 32 KB Disabled

Speed Control

CPU Default Speed
Speed Control defines the system speed effective at system start. It can be set to Fast or Slow.

- Fast corresponds to 25 MHz
- Slow corresponds to the value set for CPU Slow.

The
CPU Slow setting specifies the ratio of the "Slow" setting to the fast CPU speed. Possible settings are:
- Fast
- Fast /2
- Fast /4
- Fast /8

4.1.5 Option Configuration Program

Function

When the CP 485/486 is powered up, the configuration data stored in the EEPROM are compared with the actual configuration. If the data do not match, the program is called automatically in editing mode. The user can now enter the actual hardware configuration (e.g. required for updates).

Calling the program

The command syntax for calling the program is

Option [-i] [-e]

-i The status (installed/not installed) and the revision level of the following options are displayed:
  - Arithmetic processor
  - Memory expansion
  - VPGRAPH
  - AT slot 1
  - AT slot 2

-e Editing mode is called up. Changes can be made to the settings.

Terminating the program

Pressing the ESC key terminates the program and saves the configuration in the EEPROM.

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4.1.6 Data Back-Up and Data Security

Creating back-up diskettes

When you start up the CP 485/485 for the first time, you are prompted to set the standard language and the device configuration and to make a back-up copy of the data on the hard disk. You are strongly advised to make a back-up of the software installed on the CP 485/486 by copying the software onto diskettes using the back-up routine provided.

You should make regular back-ups of the applications and data once the CP 485/486 is in operation.

CAUTION

Switching off the power when data is being written to the hard disk or diskette can occasionally lead to the loss of data.

4.1.7 Start-Up Procedure

When the power supply of the PLC is switched on, the CP 485/486 is booted. The same procedure is carried out if the reset button on the CP 485/486 is pressed (the mode selector on the CP 485/486 must be in the STOP position).

A program diskette should not be in the drive when the CP 485/486 is booted, otherwise the following message appears:

"No System Disk"

If this happens, remove the diskette and press any key to boot the CP 485/486 from the hard disk.

A hardware test is performed when the CP 485/486 is booted (POST: Power On Self Test). You will know the test is running when the operating indicators light up on the diskette drive, hard disk and again on the diskette drive of the mass storage module. The LEDs on the LOCK, NUM LOCK and SCROLL LOCK keys of the connected PG 770 keyboard subsequently light up briefly. The operating indicator on the hard drive will now light up each time the hard disk is accessed.

When the CP 485/486 is ready for operation (the configuration data in SETUP are correct), the CP 485/486 automatically goes into process control mode.

Start-up with SETUP

If incorrect configuration data or an altered configuration are detected during the boot phase (e.g. following installation of a memory expansion), the SETUP program is called automatically and the configuration data can be corrected or confirmed.

During the subsequent normal start-up of the CP 485/486, it is necessary to resynchronize the CP 485/486 and PLC:

Switch the mode selector on the PLC CPU from RUN to STOP and back to RUN.

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Hardware error

If an error is detected during the hardware self-test (POST), the start-up is aborted and a message is displayed.

If you have been working under the MS-DOS operating system, you must enter "GRACIS" to restart GRACIS.

The CP 485/486 automatically starts the operating system which was last active when it is switched on or following a power failure.

If a power failure occurs when you are working under MS-DOS, the S5 driver is not loaded when you restart and no synchronization takes place with the CPU. When you change back to GRACIS, it is necessary to resynchronize.

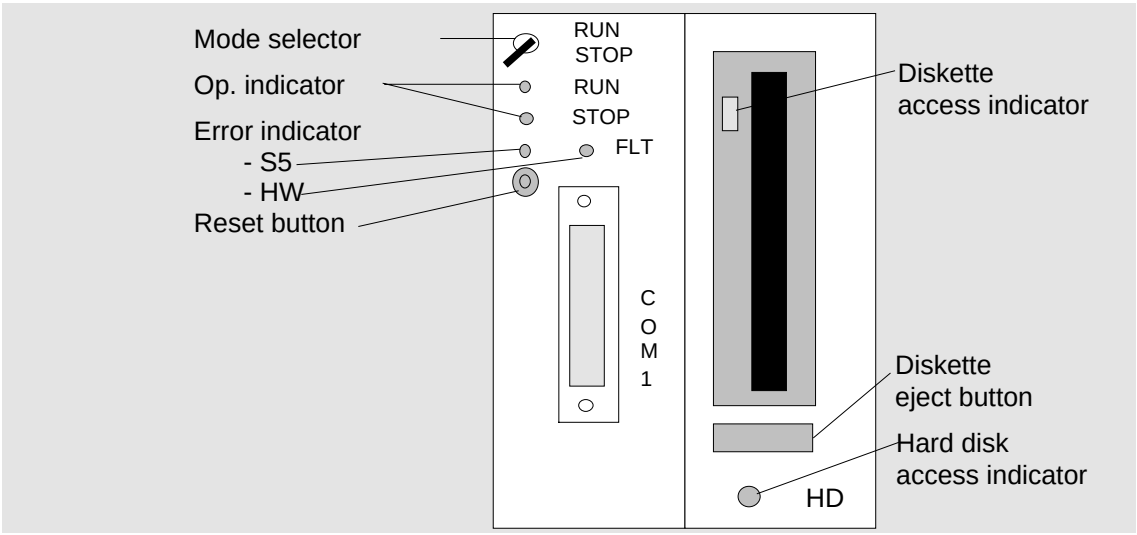
4.2 Device Description

The CP 485/486 is a modular unit consisting of several subassemblies (Eurocard format).

The CP 485 consists of a basic module and a mass storage module. The CP 486 has an extra AT slot module and is equipped with a CP 1413 (SINEC H1) or a CP 5410 (SINEC L2).

The individual modules are connected electrically by ISA bus connectors and screwed together as a single unit using spacing bolts.

4.2.1 Operating Elements and Indicators



The RUN and STOP modes are set with the mode selector switch.

- RUN: Unrestricted operation (normal operation) of the CP 485/486
- STOP: No data communication with the programmable controller

When the unit is switched from RUN to STOP, the current job is interrupted. It is necessary to evaluate the feedback signal to the PLC.

If this switch is changed quickly from RUN to STOP and back to RUN during process control, the process link is interrupted and no more data are updated by the CP 485/486.

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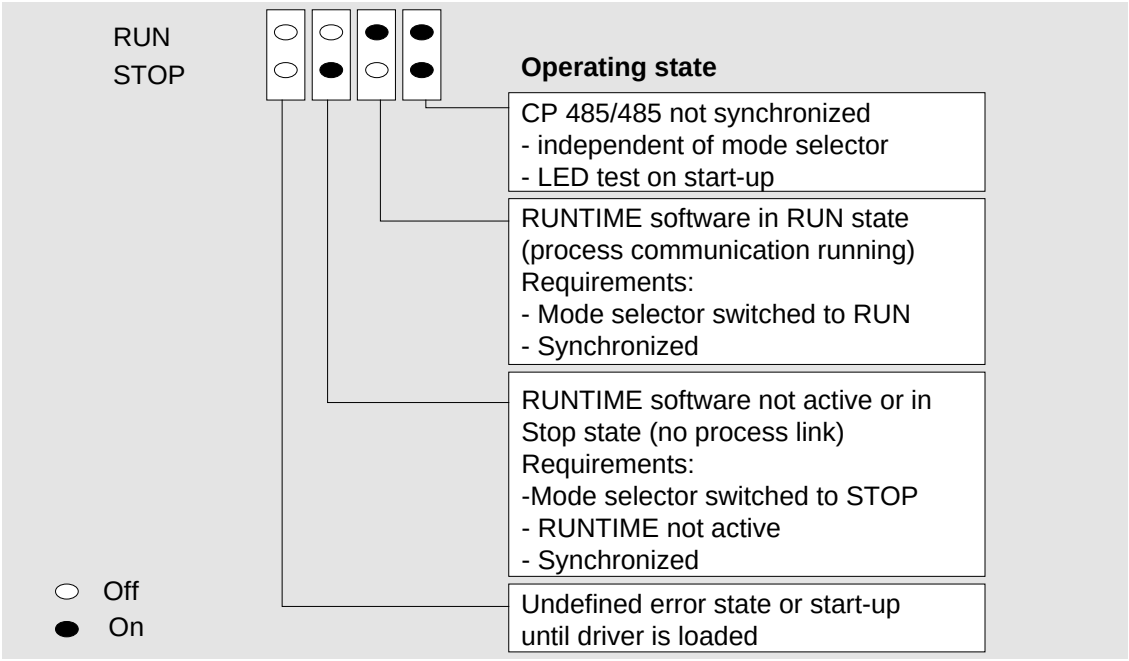
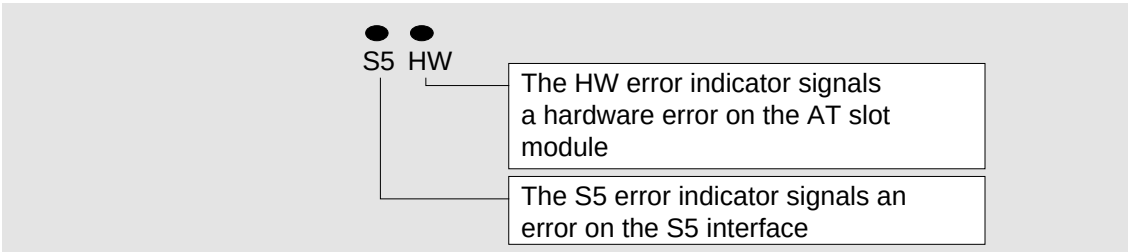
Pressing the reset button aborts all running programs and reloads the operating system. The reset switch can only be operated when the mode selector switch is set to STOP. It is housed in a recess to avoid accidental activation and should be pressed using a pen or similar pointed object.

The RUN and STOP LEDs indicate the current mode on the module.

Operating indicators:



Error indicator :



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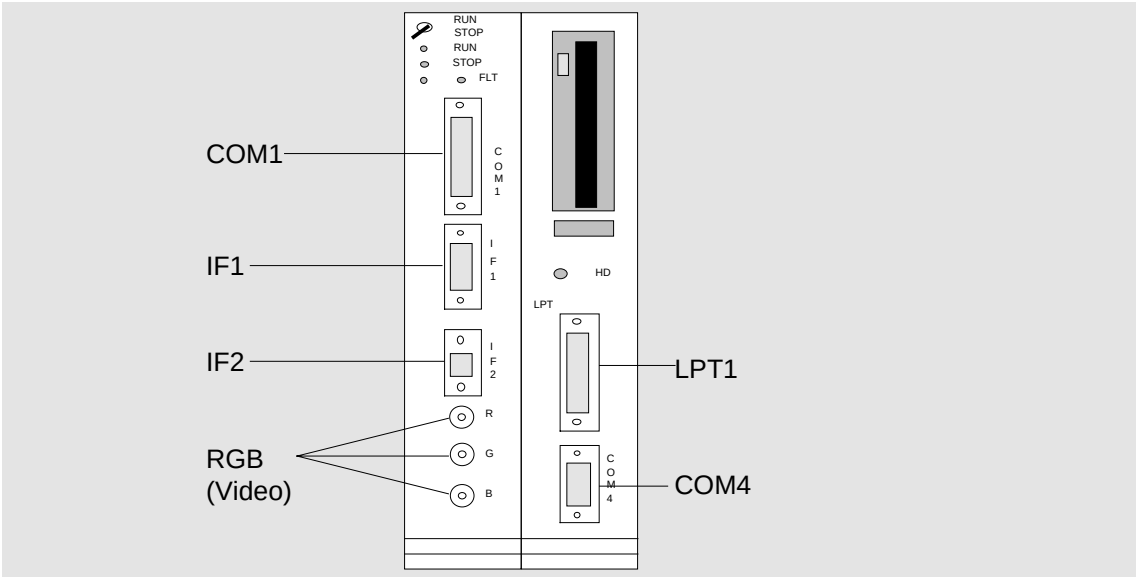
4.2.2 Interfaces on the CP 485/486

The following overview shows the physical ports on the CP 485/486 and the interfaces assigned to them.



Port	Interface	Level	Example for use
COM1	COM1	RS 232 (V.24) TTY (**passive**[1]/active)	Serial printer
IF1	COM2	RS 232 (V.24) RS 485 (X.27)	PG keyboard with integrated mouse connection
	COM3	RS 485 (X.27)	Process control keyboard
	Keyboard	TTL RS 485 (X.27)	MF2 keyboard
IF2	COM5	RS 485 (X.27)	Process control keyboard
	COM2 [2]	RS 485 (X.27)	Mouse
COM4	COM4	RS 232 (V.24) TTY (**active**[1]/passive)	Serial printer
LPT1	LPT1	TTL	Parallel printer
RGB (Video)		RGB analog	Monitor panel, industrial monitor, office monitor

1) Default setting on delivery.

2) The COM2 interface is available on ports IF1 and IF2
Please remember that this interface can only be used once.

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4.2.2.1 COM1 Serial Interface

The RS 232 and TTY (20 mA current loop) interface signals are applied to the 25-pin female sub D connector of the COM1 interface.

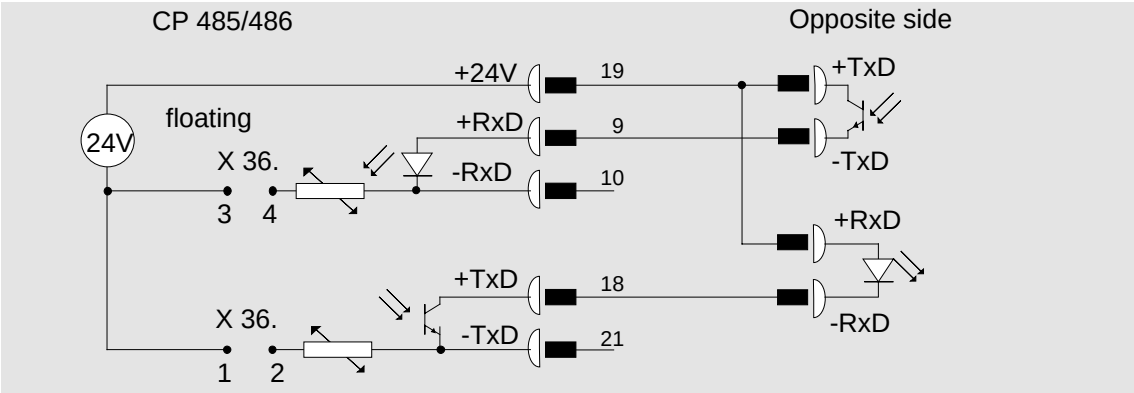
Pin assignment:

Pin	RS 232	TTY
1	Screen	Screen
2	TxD (D1)	-
3	RxD (D2)	-
4	RTS (S2)	-
5	CTS (M2)	-
6	DSR (M1)	-
7	GND (E2)	-
8	DCD (M5)	-
9	-	+RxD
10	-	-RxD
11-17	-	-
18	-	+TxD
19	-	+24V
20	DTR (S1)	-
21	-	-TxD
22	RI (M3)	-
23-25	-	-

If the COM1 interface is used in RS 232 mode, current must **not** be applied to the TTY receiving diode (between pin 9, +RxD, and pin 10, -RxD).

TTY mode, passive:

The pin assignment and internal circuit for the TTY signals of COM1 are identical to those of the PG 730/750/770 programming devices. The circuit is as follows:



On delivery, the CP 485/486 is preset to *passive*. Jumpers X36.1-2 and X36.3-4 are not plugged in.

TTY mode, active

If the CP 485/486 is to be the active partner in TTY mode on COM1, both of the jumpers must be plugged in and the external circuit modified accordingly.

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4.2.2.2 IF2 (COM2/COM3/Keyboard Serial Interfaces)

The RS 485 (X.27), RS 422 (X.27) and RS 232 (V.24) interface signals are applied to the 26-pin female sub D connector.

Pin assignment:

	Keyboard		COM2		COM3
Pin	TTL	X.27	V.24	X.27	X.27
1	Data	-	-	-	-
2	Clock	-	-	-	-
3	+ 5 V	-	-	-	-
4	-	-	TxD (D1)	-	-
5	-	-	RTS (S2)	-	-
6	-	-	DTR (S1)	-	-
7	-	-	-	-	RxD B
8	-	-	-	-	TxD B
9	-	-	-	-	TxD A
10-	-	Data B	-	-	-
11	-	Clock B	-	-	-
12	Ground	(Ground)	Ground	Ground	(Ground)
13	-	-	RxD (D2)	-	-
14	-	-	CTS (M2)	-	-
15	-	-	DSR (M1)	-	-
16	-	-	RI 2 (M3)	-	-
17	-	-	-	-	RxD A
18	-	-	-	-	Ground (24V)
19	-	Data A	-	-	-
20	-	Clock A	-	-	-
21	^-	-	Ground (E2)[1]	Ground	-
22	-	-	-	RxD B	-
23	-	-	-	RxD A	-
24	-	-	-	TxD B	-
25	-	-	-	TxD A	-
26	-	-	-	-	+24 V [2]

1) The assignment is independent of plug-in jumper X30 on the motherboard
connected = Ground for mouse of the PG keyboard
open = KBD enable for standard keyboard

2) +24 V floating, power supply for PBT keyboard.

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4.2.2.3 IF2 (COM2/COM5 Serial Interfaces)

The RS 485 (X.27) interface signals are applied to the 15-pin female sub D connector.

Pin assignment:

Pin	COM2 (X.27)	COM5 (X.27)
1	Screen	Screen
2		LG-SW B
3		LG-SW A
4		LG-IMP B
5		LG-IMP A
6	TxD (B)	
7	TxD (A)	
8	RxD (B)	
9	RxD (A)	
10		TxD (B)
11		TxD (A)
12		RxD (B)
13		RxD (A)
14	+ 24 V (floating)	
15	Ground (24 V)	

4.2.2.4 LPT1 Parallel Interface

The 25-pin female sub D connector of the LPT1 interface conforms to a PC-standard Centronics interface.

Pin assignment:

Pin	Signal
1	STROBE
2	DATA 0
:	:
9	DATA 7
10	ACKNOWLEDGE
11	BUSY
12	PAPER END
13	SELECT
14	AUTO NEW LINE
15	ERROR
16	INIT
17	SELECT
18 .. 25	GND

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4.2.2.5 COM 4 Serial Interface

The RS 485 (X.27), RS 422 (X.27) and RS 232 (V.24) interface signals are applied to the 26-pin female sub D connector.

Pin assignment:

Pin	RS 232	TTY
1	RI	-
2	DCD	-
3	RTS	-
4-9	-	-
10-	DSR	-
11	RxD	-
12	Ground	-
13	-	+24 V
14	-	RxD+
15	-	TxD +
16-18	-	-
19	TxD	-
20	DTR	-
21	CTS	-
22	-	RxD -
23	-	´TxD -
24-26	-	-

The TTY interface is set to active on delivery.

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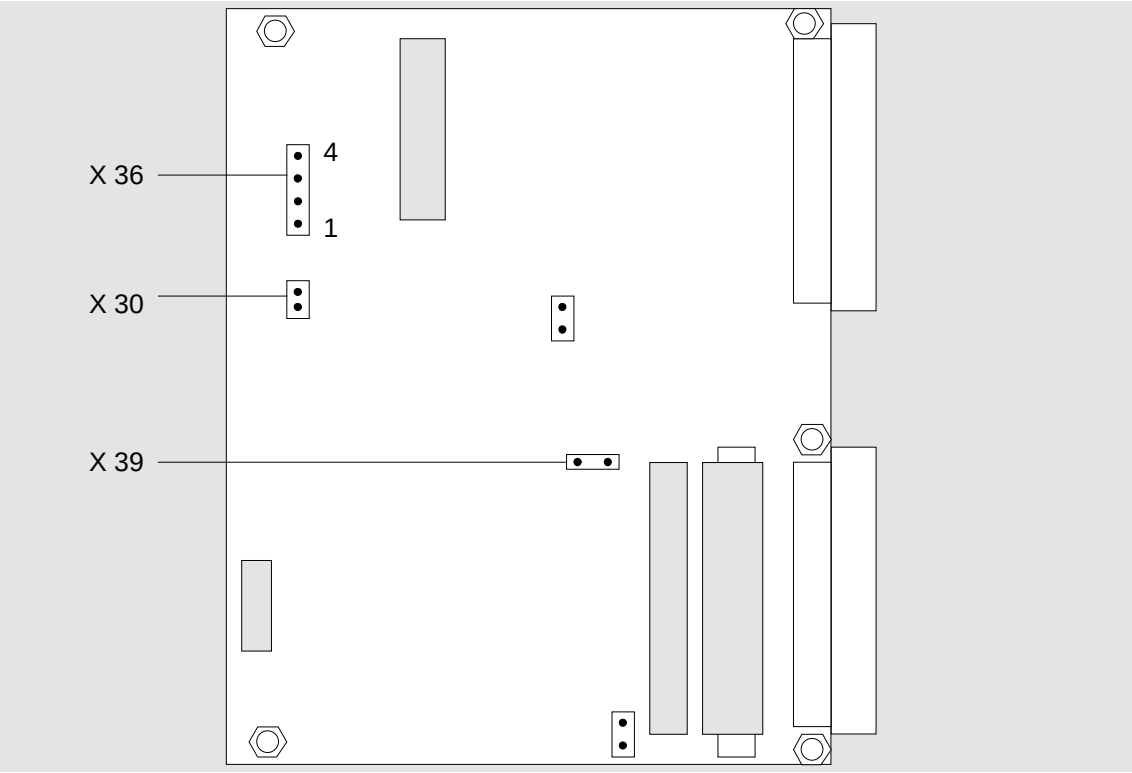
4.2.3 Setting Elements

The CP485/486 modules contain various setting elements (jumpers and switches). The function of these elements is described in the following paragraphs.

4.2.3.1 Basic Module

Position of the jumpers



X36 TTY mode passive/active on interface COM1

- No jumper TTY mode passive
- Jumper 1-2 and 3-4 TTY mode active

X30 keyboard type on IF1

Jumper X30 specifies whether a PG keyboard or a standard MF2 keyboard is operated on port IF1. The jumper setting affects the RS 232 signal assignment on the COM2 interface.

- No jumper Setting for standard keyboard
- Jumper 1-2 Setting for PG keyboard with integrated mouse connection

X39 local VGA enable/disable

- No jumper Local VGA disabled, for operation of an external VGA card using an AT slot
- Jumper 1-2 Local VGA enabled, operation of the internal VGA on the basic module

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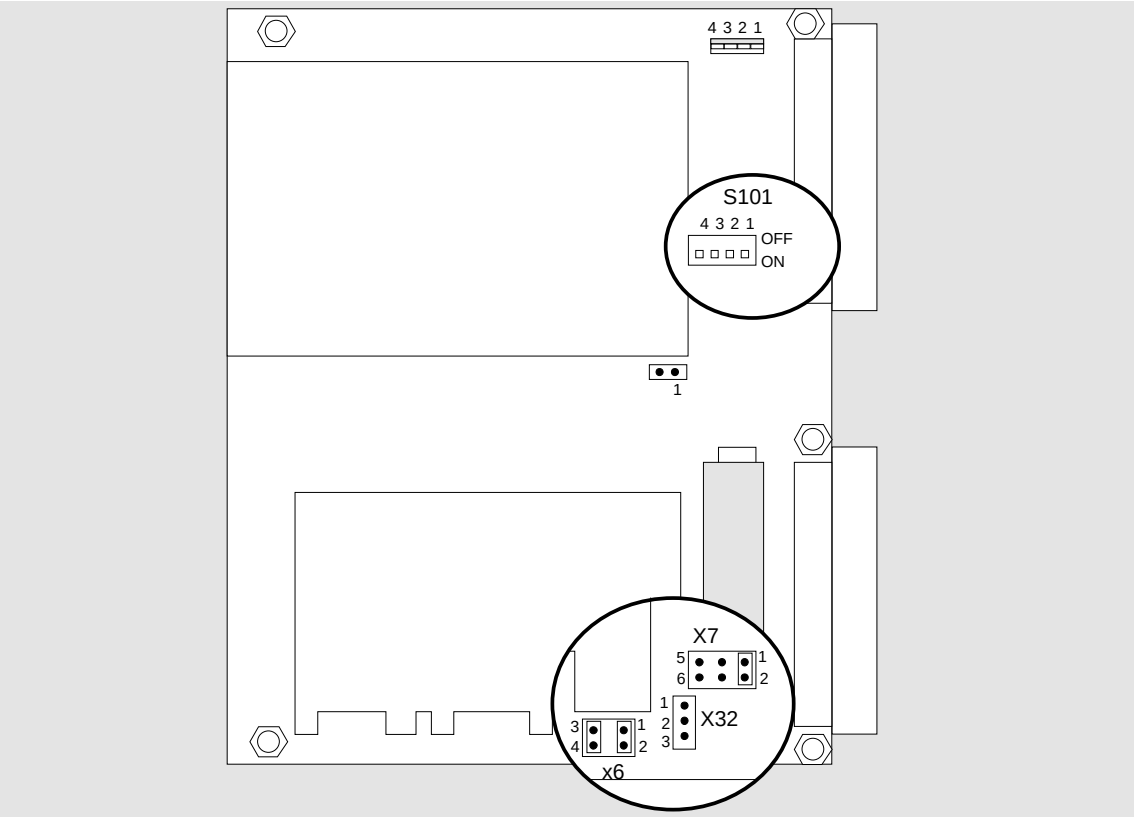
GRACIS (Technical Description)

4.2.3.2 Mass Storage Module



DIL switch S101
- Hard disk identification on/off
- COM4 interface on/off

S101.1	OFF: ON:	Hard disk identification off Hard disk identification on
S101.2	OFF ON	COM4 interface off COM4 interface on
S101.3 and S101.4	always ON	

X32 LPT1 interrupt
- No jumper LPT has no interrupt
- Jumper 1-2 LPT interrupt IRQ 7
- Jumper 2-3 LPT interrupt IRQ 5

X7 COM4 interrupt
- No jumper COM4 has no interrupt
- Jumper 1-2 COM4 interrupt IRQ 5
- Jumper 5-3 COM4 interrupt IRQ 11
- Jumper 4-2 COM4 interrupt IRQ 12
- Jumper 5-6 COM4 interrupt IRQ 10

X6 TTY mode active/passive on interface COM4
- No jumper TTY mode active
- Jumper 1-2 and 3-4 TTY mode passive

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4.3 Operator Panels and Peripheral Devices

4.3.1 Installation Guidelines for Peripheral Devices

In order to prevent the occurrence of faults, it is necessary to implement screening measures on automated plants.

In badly grounded plants, low-frequency (LF) or high-frequency (HF) interference signals can access the internal bus of the programmable controller system and cause a malfunction.

Interference signals can be generated, for example, by the operation of relays or contactors (high rates of voltage or current variation, HF signals) or by different ground potentials between two plant sections (LF interference signals).

4.3.1.1 Installation and Use of Interference-Free Cables

Only screened cables are permitted for all signal connections. On digital and analog signal conductors, the screens should be grounded on one side.

Cable screens should be grounded on both sides on
- connecting cables between the CPU and expansion units
- bus cables
- cables to peripheral devices

The standard connecting cables specified in Catalog AR 10 meet this requirement.
All connecting cables must be secured by screws or clamps.

Signal conductors may not be installed parallel to heavy-duty power cables. A separate cable run should be used at a minimum clearance of 50 cm from the heavy-duty power cables.

Interference-free hardware system

The basis for interference-free operation of programmable controllers is provided by the hardware system of the control unit. Where possible, any interference signals which filter through from the process should be kept away from the hardware system.

CAUTION

All of the screening measures and installation guidelines contained in the EMC guidelines "Installation Guidelines for SIMATIC S5 (U-Range Programmable Controllers)" must be observed. Failure to observe these guidelines can result in the intrusion of interference signals in the hardware system, which may lead to malfunctions during program execution.

You will find the installation guidelines in the programmable controller manual. The following section describes the most important measures.

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GRACIS (Technical Description)

S5 cabinet installation

Components which are capable of passing external interference signals through to the cabinet should be arranged near the bottom. The grounding bar must be arranged at the immediate entrance to the cabinet so that cables which can conduct interference signals can be connected directly to ground. All screened cables - except coaxial cables with only one screen - should be connected here. In the case of signal conductors with double screening, it is only necessary to connect the outer screen at this point.

Long signal conductors should be installed along the cabinet walls. Due attention should be paid to electromagnetic compatibility during cabinet installation, in order to keep interference to a minimum. All connections to the cabinet chassis should be implemented with a large conductor cross-section across a large surface.

Analog devices located in the cabinet should be isolated and grounded to a point in the cabinet (use copper tape). The materials used should always be of similar quality (never use aluminium because of the danger of oxidation).

All doors and metal parts (sides, rear wall and top) of the cabinet must be connected to the cabinet frame at a minimum of three points (short, paint-free, large-surface connections).

In plants which generate a high electrostatic voltage (such as textile processing machines) the grounding bars of the machine parts carrying the interference signals should be connected to a separate station ground isolated from the central grounding point of the S5 cabinet (surface grounding with housing construction, armouring).

Connection of monitors

Environments prone to ambient electromagnetic interference require the use of coaxial cables with double screening (TRIAX cables). Only the outer screen on these cables should be connected to the chassis of the process monitor. The metal clamp can be used for the monitor cable on some Siemens process monitors. Other process monitors require the attachment of a grounding bar to the housing (available as an accessory). Large-surface metal/metal connections should be used.

The electronic ground of the monitor must be separated from the chassis ground (jumpers are provided with most Siemens monitors).
The monitor and the programmable controller should be connected to the same mains phase.

Special measures for office monitors

Monitors with metallic plastic housings (office monitors) are unsuitable for environments prone to electromagnetic interference, as the internal metal surface cannot subsequently be connected to the outer grounding bar. The mandatory separation of the electronic ground from the chassis ground is not possible on most office monitors.

These types of office monitor can be used in conjunction with cable with single-screening. Connection to the CP 485/486 is therefore restricted, as only shorter distances can be bridged with this cable.

Possible faults can be avoided if the monitor and programmable controller are connected to the same reference potential or mains phase (via a mains filter). In local installations this can be achieved by running a power cable from the programmable controller to the monitor.

When used in conjunction with PCs or other similar automation equipment, the monitors should therefore be connected to the power outlet provided in the S5 cabinet.

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4.3.2 Monitors

The monitor is connected to the RGB outlets on the CP 485/486 via three triaxial cables (maximum distance 200 m; depending on the monitor). The screen should be connected to the chassis potential.

4.3.3 Monitor Panels

A monitor panel contains a monitor and a process control keyboard. The monitor is connected to the RGB outlets on the CP 485/486 via three triaxial cables.

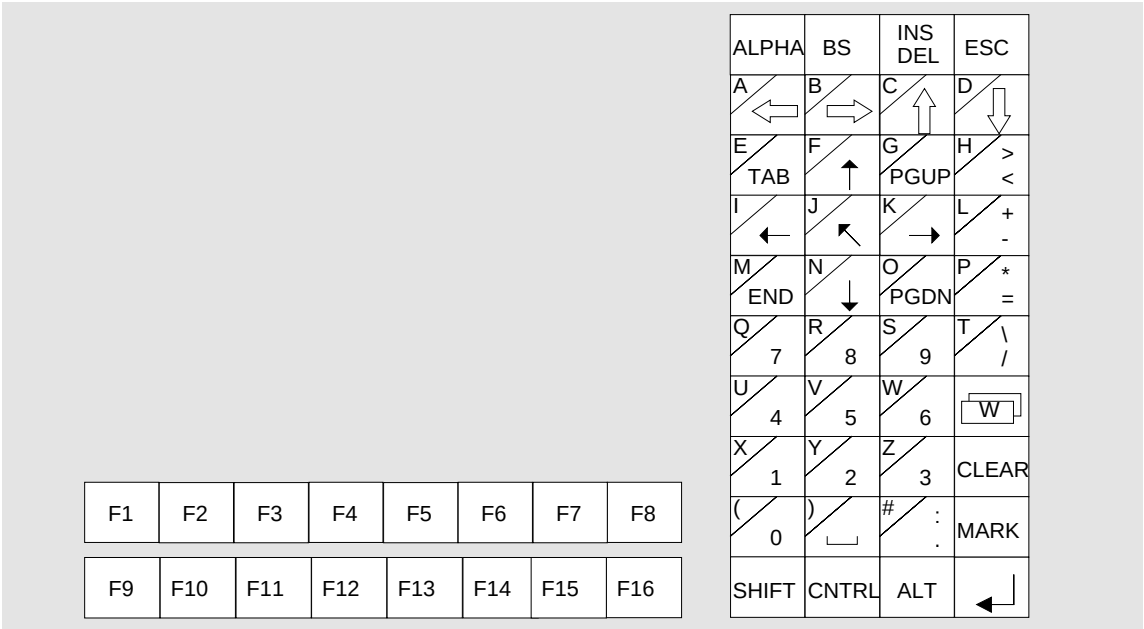
COM4 is used for the operator panel interface in the standard configuration. If you have an MP 40, you can also use interface IF1. Both configurations are stored in two files: CONFIG.MP3 and CONFIG.MP4. The MP3 configuration does not permit simultaneous operation of a serial printer and the STEP 5/MT software on the COM1 serial interface.

	Operator panel	Printer	STEP 5/MT	
CONFIG.MP3	COM4	COM1	COM1	used alternatively
CONFIG.MP4	IF1	COM4	COM1	

To activate the CONFIG.MP3 configuration, enter the following command line under MS-DOS:
- COPY C:\BOOT\CONFIG.MP3 C:\BOOT\CONFIG.BAT

To activate the CONFIG.MP4 configuration, enter the following command line under MS-DOS:
- COPY C:\BOOT\CONFIG.MP4 C:\BOOT\CONFIG.BAT

4.3.3.1 MP Key Assignment for GRACIS



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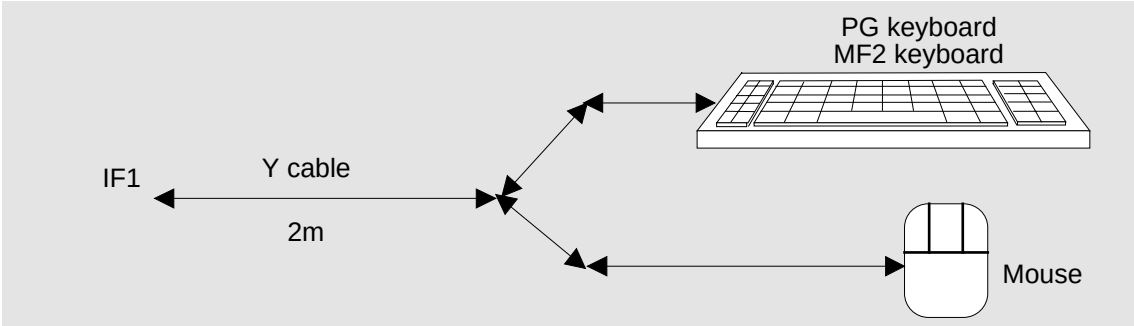
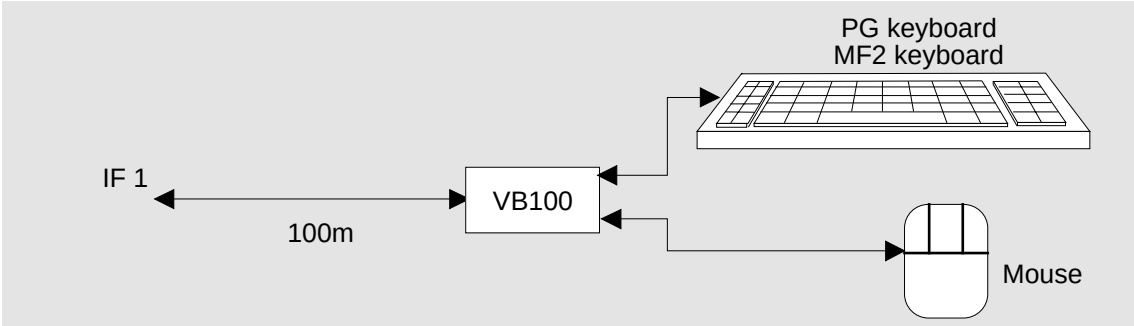
4.3.4 Keyboards

The keyboard and mouse are connected to interface IF1 on the CP 485/486. The following configurations are possible:

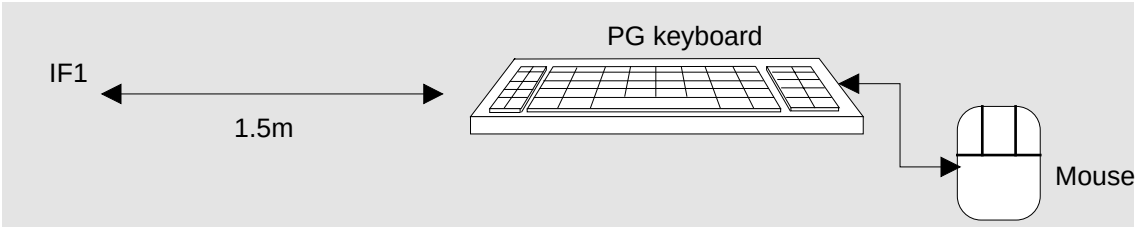
Connection via Y cable for distances up to 2m



Connection via operating channel extension VB 100 for distances up to 200m



Use of the integrated mouse port on the PG keyboard



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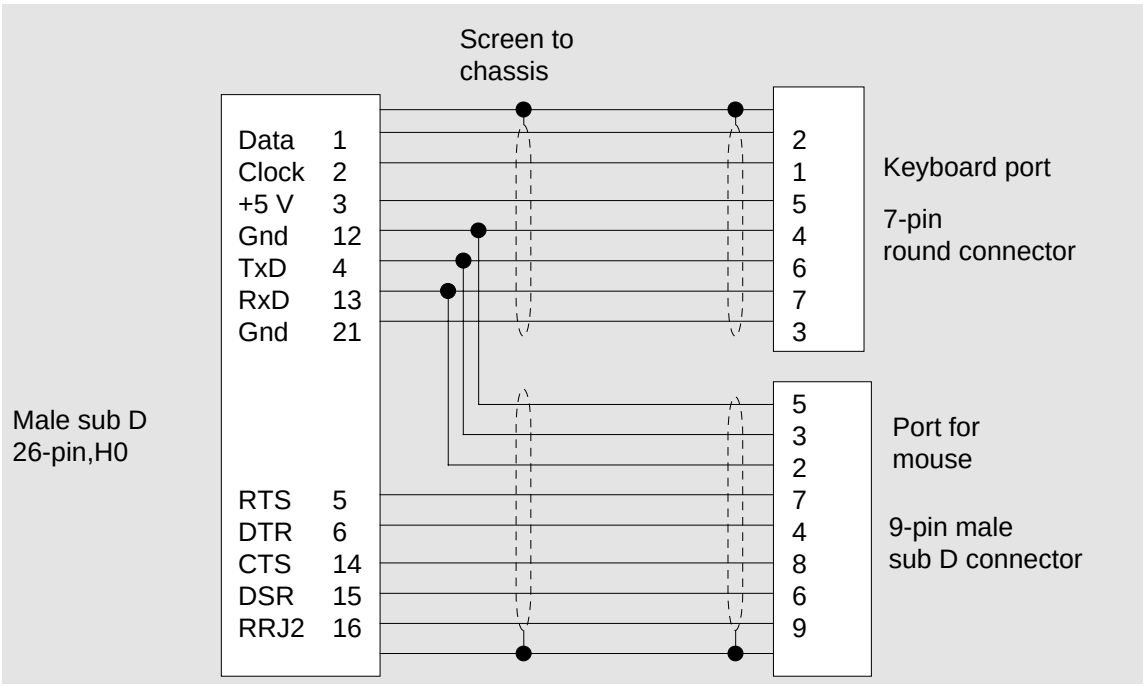
IF1 Y cable for mouse and keyboard connection

The IF1 Y cable distributes the signals on the IF1 port to both of the connectors for keyboard and mouse.



4.3.5 Process Control Keyboard

The PBT 20 process control keyboard is connected to the IF2 interface (COM4/X.27) or to the MP40/C36-B monitor panel. The maximum cable length is 100m.

4.3.6 Printers

Printer types DR210, DR211, DR230 and DR231, PT88/89 and the GRACIS Printer are supported by GRACIS for connection to the CP 485/486.

The printers can be operated on the LTP1 parallel interface or the COM1 or COM4 serial interface (see "Monitor Panels").

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4.4 Technical Specifications

Dimensions and weight		
	CP 485	CP 486
PCB format	Double-height Eurocard format (160mm x 233.4 mm)	
Front panel width	40.64mm, 2 slots	60.96 mm 3 slots
Weight	1.5 kg approx.	1.9 kg approx.
Power supply		
Supply voltage	+5 V, ±5% +24 V, +24%/-15%	
Power consumption at 5V	typ. 2.5 A on start-up max 3A	with CP1413 4.2 A with CP 5410 3.7A
at 24 V	max 0.1 A	
Back-up current (min. 2.7 V)	typ. 0.03mA	
Degree of protection	IP 00 to DIN40050/ICE 529	
Electromagnetic compatibility (EMC)		
RFI suppression	to VDE 0871 = CISPR 11 limit class A	
Noise immunity		
Conducted interference on signal conductor	to DIN VDE 0843 Part 4 ICE 801-4 (Burst): 2 kV	
Immunity to interference caused by the discharge of static electricity	6 kV in closed cabinet, 6 kV in open cabinet	
Immunity to interference from electromagnetic fields	to ICE 801-3: 3V/m	
Climatic ambient conditions		
Temperature	tested to DIN ICE 68-2-1/2	
• Operation with forced-air cooling	+5°C to +50°C (diskette to 40°C only)	
• Operation without forced-air cooling	+5°C to +40°C	
• Storage	-10°C to +60°C	
Temperature variation		
• Operation	max 10K/h	
• Storage/transport	max 20K/h	
Relative humidity		
• Operation/ storage/ transport	8% to 80% at 25°C, no condensation	
Altitude with reference to MSL		
• Operation	-50m to 2500m	
• Storage/transport	up to 10,000m	
Mechanical ambient conditions		
Vibration	tested to DIN ICE 68-2-6	
• Operation	10 to 58Hz: amplitude 0.035mm 58 to 500 Hz: amplitude 5m/s² (0.5g) (measured on the drive)	
• Transport	5 to 9 Hz: amplitude 0.035mm 9 to 500 Hz: amplitude 10m/s² 1 g)	
Shock	tested to DIN ICE 68-2-27	
• Operation	Half-sine: 50m/s² (5g), 11ms (measured on the drive)	
• Transport	Half-sine: 500m/s² (50g), 11ms	

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Technical data	
Processors	
• Microprocessor, 32-bit	386SL
• Arithmetic processor	80387SL (optional)
• Graphics controller	WD90C11A
• S5 interface	SICAT-ASIC (16 KB dual-port RAM)
Memory capacity	
• Main memory	8 MB DRAM
• Expandable to	12 and max. 20 MB
Hard disk	
• Capacity	120 MB
• Average access time	typ. 17 ms
• MTBF	typ. 150,000 h
• START/STOP	60,000 cycles
Diskette drive	
• Capacity	3.5"/1.44 MB
• MTBF	10,000 h
• Typical service life	5 years

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5 GRACIS PG/PC

GRACIS PG is a pure software version of the GRACIS functionality for the PG 730/750/770 programming devices with the FlexOS operating system.

The GRACIS PC version is supplied in addition to the FlexOS operating system and therefore runs on programming devices without FlexOS as well as on AT-compatible PCs. A guarantee is provided for use with the PG programming devices, Siemens SICOMP PC32-D/G/R/T and Siemens Nixdorf PCD-4G/4NCsl.

The standard software is available in two different packages:
- GRACIS Configuration and
- GRACIS Process Control.

Minimum hardware requirements

- Processor: 80386 / 25 MHz
- Memory: 8 MB
- Hard disk: 50 MB free
- Diskette drive: 3.5"

Process communication with a programmable controller takes place via

- SINEC H1
- SINEC L2
- or a serial link.

A CP 1413 is required for SINEC H1 communication, a CP 5410 is required for SINEC L2.

The serial link can be implemented using the COM1 and COM2 interfaces or the interfaces of the DF 20 interface module. The TTY interface signals are required for the serial interface. An RS 232 (V.24) interface can only be used with a suitable RS 232/TTY converter cable.

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	Suggestions **Corrections**
Siemens AG AUT V240 Postfach 3180 D-91050 Erlangen	For Publication / Manual: GRACIS Technical Description HPF Order No.: 6ZB5 440-0UA02-0AA0 Edition: April 1994
From: Name: _____ Company/Dept.: _____ Address: _____ Telephone: /	Should you come across any printing errors when reading this publication, please notify us on this sheet. Suggestions for improvement are also welcome.

Suggestions and / or corrections:

Content and target group of the GRACIS documentation

Acquisition phase

Product Brief HPF/LPF

6ZB5 440-0TX02-0BA1

Target group: O/I users

General, brief overview of the GRACIS system covering hardware and software components.

Description HPF/LPF

6ZB5 440-0TY02-0BA0

Target group: O/I users

General system overview

AR10 Catalog HPF/LPF

E86060-K6310-A101-A4-7600

Target group: Special machine builders

Order numbers / scope of supply

General GRACIS publications

Operator Interface HPF/LPF

6ZB5 440-0UD02-0AA0

Target group: GRACIS configurat. engineer

Like all system, GRACIS has its own term.

Terms like "work window", "slider", etc. are explained for you. You will also get to know the GRACIS operator panels. The last chapter lists the operator panels against their functs.

GRACIS LPF

Technical Description LPF

6ZB5 440-0VD02-0AA1

Target group: Startup engineers/ system configuration engineers/ process operators

This publication enables you to start up a GRACIS system.

The emphasis is on hardware startup. There is a description of how to incorporate the components from the configurat. stage (S5 program list and GRACIS list) .

You will become familiar with the GRACIS-specific characteristics in process mode..

- Service modul
- GRAPH 5 sequence diagnostics

Configuration LPF

6ZB5 440-0VE02-0AA0

Target group: GRACIS configurat. engineer

With its information on how to configure GRACIS, you are certain to use this publication frequently in the future.

- First steps in configuring
- Management, system services

Configuring from

- Process displays
- Printouts
- Text list
- Messages
- GRAPH 5

Configuration stage GRACIS HPF

SIMATIC S5 Interface (local and SINEC H1)

6ZB5 440-0UB02-0AA0

Target group: S5 programmers

You get to know the interface between SIMATIC S5 and GRACIS for local and SINEC H1 networked systems.

You program the exchange of process displays and the specialist applications of central function control.

SIMATIC S5 Interface (SINEC L2)

6ZB5 440-0UW02-0AA1

Target group: S5 programmers

You get to know the interface between SIMATIC S5 and GRACIS for local and SINEC H1 networked systems.

You program the exchange of process displays.

Configuration HPF

6ZB5 440-0UE02-0AA1

Target group: GRACIS configurat. engineers

With its information on how to configure GRACIS, you are certain to use this publication frequently in the future.

- First steps in configuring
- Management, system services

Configuring of

- Process displays
- Printouts
- Text list
- Messages
- Access control
- GRAPI
- GRAPH 5

Networking

6ZB5 440-0UF02-0AA0

Target group: Networking engineers

This publication shows you how to configure and execute a GRACIS network. It explains both serial connection and networking via SINEC L2 and SINEC H1.

Configuring Options

6ZB5 440-0UG02-0AA1

Target group: GRACIS configurat. engineer

You become familiar with the available GRACIS options.

The publication gives information on functions, configuration and incorporation into the GRACIS system.

Process mode phase GRACIS HPF

Process mode

6ZB5 440-0UC02-0AA1

Target group: Process operators

Here you learn the GRACIS-specific characteristics in process mode.

You learn the effects of active fields, input/ output fields, display control, cursor control and password interlocking in process mode.

- Saving GRACIS data
- Service modul
- GRAPH 5 sequence diagnostics

Technical Description HPF

6ZB5 440-0UA02-0AA0

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This publication enables you to start up a GRACIS system.

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