SIEMENS

# SIMATIC S5

# PG 750-486 Programmer

## Manual


Introduction 1

Setup and Installation 2

Getting to Know Your PG 750-486 3

Connecting Peripherals 4

Linking Your Programmer 5

Working on the Open Unit 6

Error Diagnostics 7

Technical Data 8

Configuring Your Programmer 9

Appendix A: Connecting Cables 10

Appendix B: Glossary 11

Appendix C: Index 12

ESD Guidelines
Notes
Remarks Forms


C79000-G8576-C750-01

# Table of Contents


| | | |
|---|---|---|
| **1** | **Introduction** | **1-1** |
| 1.1 | How this Manual is Organized | 1-2 |
| 1.2 | How to Use this Manual | 1-5 |
| 1.3 | The PG 750-486 Programmer | 1-6 |
| **2** | **Setup and Installation** | **2-1** |
| 2.1 | Unpacking and Setting Up | 2-2 |
| 2.1.1 | Where to Set Up the PG 750-486 | 2-3 |
| 2.1.2 | Removing the Transport Protection | 2-6 |
| 2.2 | Connecting Up | 2-7 |
| 2.2.1 | Connecting the Power Supply | 2-7 |
| 2.2.2 | Connecting the Mouse | 2-9 |
| 2.2.3 | Connecting Printers | 2-9 |
| 2.2.4 | Connecting an External Monitor | 2-9 |
| 2.2.5 | Connecting SIMATIC S5 Programmable Controllers | 2-9 |
| 2.3 | Switching on for the First Time | 2-10 |
| **3** | **Getting to Know your PG 750-486** | **3-1** |
| 3.1 | Characteristics of the Casing | 3-2 |
| 3.2 | Drives | 3-5 |
| 3.2.1 | Floppy Disk Drive | 3-6 |
| 3.2.2 | Hard Disk Drive | 3-7 |
| 3.3 | Optical Indicators (LEDs) | 3-8 |
| 3.4 | Monitor | 3-9 |
| 3.4.1 | Color Graphics Interface Module | 3-9 |
| 3.4.2 | Demagnetization | 3-9 |

| | | |
|---|---|---|
| 3.5 | Keyboard | 3 - 10 |
| 3.5.1 | Typewriter Keyboard | 3 - 11 |
| 3.5.2 | Numeric Keypad with Cursor Control Keys | 3 - 13 |
| 3.5.3 | Function Keys | 3 - 15 |
| 3.5.4 | Special Keys | 3 - 16 |
| 3.5.5 | Special Key Combinations | 3 - 17 |
| 3.6 | Labeling Templates | 3 - 18 |
| 3.7 | Mouse | 3 - 19 |
| 3.8 | Submodule Programming Interface | 3 - 20 |
| 3.9 | Transport | 3 - 21 |
| **4** | **Connecting Peripherals** | **4 - 1** |
| 4.1 | Connecting Monitors | 4 - 2 |
| 4.2 | Recommended Printers | 4 - 3 |
| 4.2.1 | Connecting the Printers DR 210-N, DR 211-N, DR 230-N, DR 231-N | 4 - 3 |
| 4.2.2 | FASTPRINT Option | 4 - 5 |
| **5** | **Linking your Programmer** | **5 - 1** |
| 5.1 | Connecting to ARCNET | 5 - 2 |
| 5.1.1 | Network Structure | 5 - 2 |
| 5.1.2 | Setting the Node Number | 5 - 3 |
| 5.1.3 | Setting the Response Time | 5 - 3 |
| 5.1.4 | Setting the Address Range | 5 - 4 |
| 5.1.5 | Fiber Optic Cable for ARCNET | 5 - 4 |
| 5.2 | Point-to-Point Link | 5 - 5 |
| 5.2.1 | Linking the PG 750-486 with PLCs | 5 - 5 |
| 5.2.2 | Linking the PG 750-486 with other PGs | 5 - 7 |
| 5.2.3 | Suggestions for Configuring Interfaces with Current Loops (TTY, 20 mA) | 5 - 9 |

| | | |
|---|---|---|
| 5.3 | Linking the PG 750-486 via SINEC L2 (PROFIBUS) | 5 - 10 |
| 5.4 | Linking the PG 750-486 via SINEC H1 (ETHERNET) | 5 - 11 |
| **6** | **Working on the Open Unit** | **6 - 1** |
| 6.1 | Opening the Unit | 6 - 2 |
| 6.1.1 | How to Open the Unit | 6 - 4 |
| 6.1.2 | Functional Units | 6 - 5 |
| 6.1.3 | Mother Board | 6 - 6 |
| 6.2 | Installing a Memory Extension | 6 - 8 |
| 6.3 | Installing and Dismantling Drives | 6 - 9 |
| 6.4 | Reinstalling/Removing the Power Supply Unit | 6 - 10 |
| 6.4.1 | Removing the Power Supply Unit | 6 - 10 |
| 6.4.2 | Switching the COM 1 Port Active or Passive | 6 - 11 |
| 6.4.3 | Reinstalling the Power Supply Unit | 6 - 11 |
| 6.5 | Backup Battery | 6 - 12 |
| 6.6 | Installing Additional EISA/ISA Boards | 6 - 13 |
| 6.7 | Closing the Unit | 6 - 16 |
| 6.8 | Changing the Device Configuration (SETUP) | 6 - 17 |
| **7** | **Error Diagnostics** | **7 - 1** |
| 7.1 | Fault, Cause, Remedy | 7 - 2 |
| 7.2 | Acoustic Signals | 7 - 4 |
| **8** | **Technical Data** | **8 - 1** |

| | | |
|---|---|---|
| **9** | **Configuring your Programmer** | **9 - 1** |
| 9.1 | Features of the EISA Configuration Program | 9 - 2 |
| 9.1.1 | Configuring a New System | 9 - 3 |
| 9.1.2 | Software Requirements | 9 - 4 |
| 9.2 | Constructing the System Configuration | 9 - 7 |
| 9.2.1 | Adding Boards | 9 - 9 |
| 9.3 | Additional Functions | 9 - 14 |
| 9.3.1 | Manual Configuration | 9 - 14 |
| 9.4 | Board Conflicts | 9 - 16 |
| 9.4.1 | Missing ISA Configuration (.CFG) Files | 9 - 16 |
| 9.4.2 | Resolving Configuration Conflicts | 9 - 18 |
| **10** | **Appendix A: Connecting Cables** | **10 - 1** |
| 10.1 | Connecting the PG to External Devices | 10 - 2 |
| 10.2 | Connecting the PG to a Programmable Controller | 10 - 5 |
| 10.3 | Connecting the PG to Other Programmers | 10 - 8 |
| **11** | **Appendix B: Glossary** | **11 - 1** |
| **12** | **Appendix C: Index** | **12 - 1** |

# Introduction

# 1

This manual provides information on the installation, setup and operation of your PG 750-486 programmer. It is intended to give you continuous support during your work with the PG.

This manual is structured as a reference guide and divided up into sections according to the task in hand. If any questions arise while working with your PG which are not answered in this manual, do not hesitate to contact us using one of the remarks forms at the end of this book.

## 1.1 How this Manual is Organized

This manual is designed to support the PG user in a number of varied situations. For the standard functions of a PG (e.g. creating STEP 5 user programs) you will only require specific parts of the information contained in this book (e.g. → chapter 2). The advance organizer which follows shows you which areas of use are dealt with in which chapters and helps you to select the information which is relevant for your needs.

### ? You want to set up and install your PG

Chapter 2 **Setup and Installation** guides you through unpacking and setting up your unit to the point where you switch on your PG 750-486 for the first time. The important connections are explained so you will have no hardware problems when you begin to use the supplied software. After performing the steps described here, you can proceed straight to the instructions for your system software where you will find information on installing and operating the software.

### ? You want to learn about the hardware of your PG

Detailed information on the hardware components (e.g. disk drives, keyboard, programming submodule) is included in chapter 3 **Getting to Know your PG 750-486** which will enable you to operate your PG effectively.

? ● **You want to connect external devices to your PG**

Chapter 4 **Connecting Peripherals** explains how the range of functions of your PG 750-486 can be extended by connecting external devices (e.g. printer, monitor).

? ● **You want to link your PG with another PG or a PLC**

Chapter 5 **Linking your Programmer** describes the possible ways of linking your PG with other devices.

? ● **You want to open your device in order to change the setting from active to passive, for example**

Chapter 6 **Working on the Open Unit** describes all the maintenance and service tasks which are relevant for you on the PG 750-486. Please note that maintenance and repairs should only be performed on an open device by authorized Siemens repair centers.

? ● **You are experiencing problems with the hardware**

If you are experiencing problems with the hardware, you will find tips on error diagnosis and possible solutions in chapter 7 **Error Diagnostics**.

### ? • You want to reconfigure your PG

In chapter 9 **Configuring your Programmer** you will learn how you can use the EISA configuration utility to configure your PG having changed your system configuration, for example, when you add, remove or exchange an adapter card or replace a system board.

### ? • You want to order a connecting cable or connect a cable yourself

In **Appendix A** you will find circuit diagrams for most of the connecting cables introduced in chapters 4 and 5.

### ? • You want to find the explanation of a technical term

Look up the term in the Glossary in **Appendix B**. Most important terms are explained here.

### ? • You are looking for a particular piece of information on a specific topic

In **Appendix C** there is a comprehensive **Index** where you can find references to the information you require.

### ? • You require information on handling electrostatically sensitive devices

At the end of this book you will find the **ESD Guidelines** which you must observe when working on an open programmer.

## 1.2 How to Use this Manual

*Conventions*

The following information helps you become familiar with using the manual.

The conventions and typographic symbols used in this manual are intended to stress particularly important information. The conventions used are:

1. *Individual steps in a series of actions which should be performed in a set order are numbered and written in italics.*

- *Steps in a list of actions where the order is not important are indicated by stress points and written in italics.*

– Items in a list are indicated by a dash.

Messages displayed on the PG screen are shown in the manual in **`typewriter typeface`**.

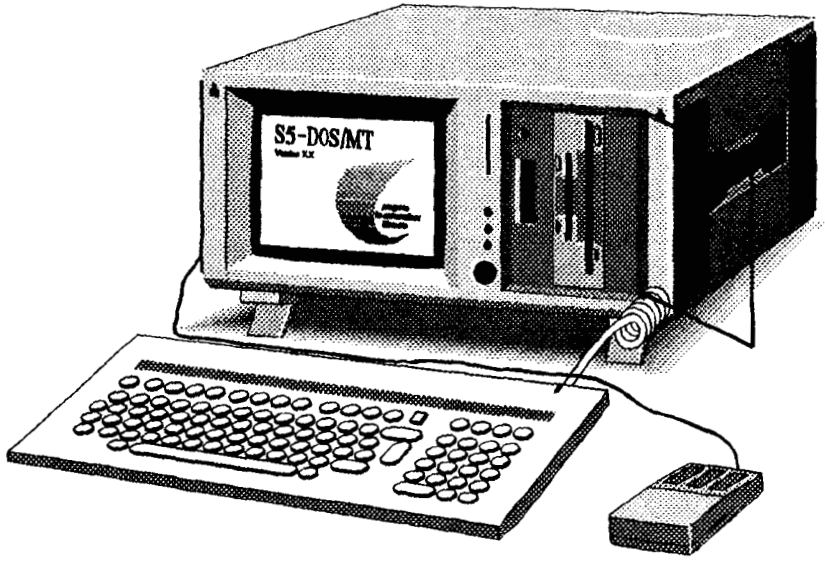
*Product Information*

When your PG is delivered, one of the items included is a *Product Information*. This contains information on any special problems, additional tips and restrictions to the manual or the product. It should be regarded as a separate part of this manual, and in case of doubt the information in the Product Information should always be considered more up-to-date. The Product Information should always be kept together with this manual.

*Feedback*

The authors of this manual would appreciate any suggestions or criticisms that would improve the quality of this documentation. For this purpose, please use one of the remarks forms to be found at the end of this book.

## 1.3 The PG 750-486 Programmer




*Characteristics*

The PG 750-486 is suitable for creating, testing and documenting user programs for SIEMENS programmable controllers. With a view to future development, the PG 750-486 provides an operating system platform which ensures that it can be integrated into SIEMENS production automation systems.

The compact PG 750-486 is nevertheless a complete device, with all its components, such as display, drives, keyboard and mouse integrated in the device or attached to it.

Its modular design makes the PG 750-486 particularly easy to maintain and service. It is robust and built to withstand tough industrial working conditions.

The program packages you require to start work with the PG immediately are already installed on the hard disk when you receive your device.

# Setup and Installation

# 2

The following chapter describes how to set up your PG 750-486 and how to connect it correctly.

After following the instructions in this chapter you will be ready to switch on the PG 750-486 and start the software.

## 2.1 Unpacking and Setting Up

*Unpacking*

- *First unpack the PG 750-486.*
- *Do not throw away the original packing. This should be kept in case you wish to transport the unit at any time.*
- *Check that all the components have been included.*

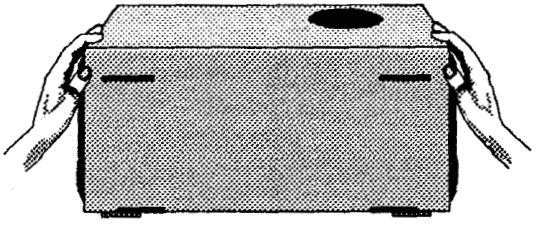
The enclosed **Packing list** and **Product Information** make checking the components easier.

> **Note**
> When transporting the unit in cold weather, when it may be submitted to extreme variations in temperature, care must be taken that no condensation is allowed to form on or in the unit. The PG 750-486 should be allowed to reach room temperature slowly before it is started up.
> If condensation has formed, the PG should be left for four hours before being switched on (→ chapter 8, "Technical Data").

*Setting up*

Proceed as follows:

1. *Open the cover on the back panel by pulling out the two rubber buttons. The mouse and the power supply cable are located in the cover.*
2. *If your PG is equipped with an optical mouse, remove the mouse pad from the compartment below the unit.*
3. *Lower the two feet at the bottom front of the unit.*
4. *To open the keyboard which also serves as the front cover, press down the two fasteners with your thumbs.*

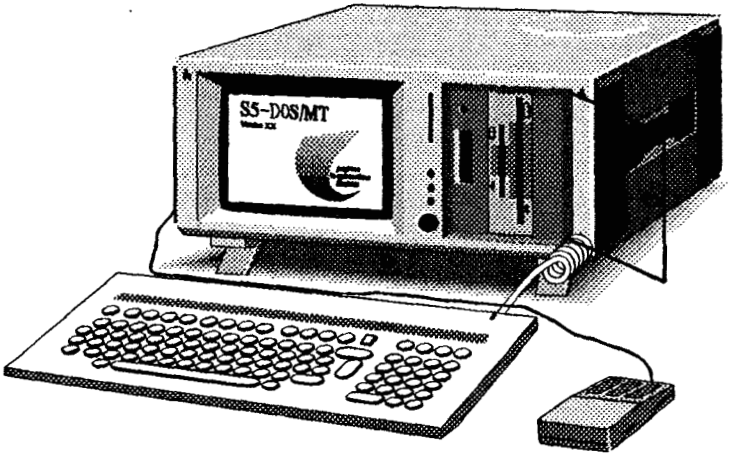


## 2.1.1 Where to Set Up the PG 750-486

The PG 750-486 can be set up in various locations to suit your particular situation.

*Desk top*

The PG 750-486 is most commonly set up on a desk top.



This is convenient, provides great flexibility and can be adapted to suit the particular location.

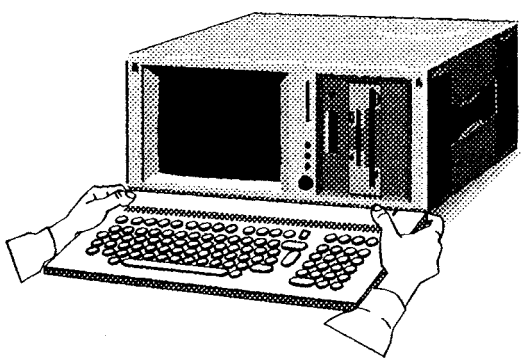
When the unit is set up in this way and the keyboard is still attached to the unit, it is angled at 12 °.

**Caution**
Make sure that the ventilation slits are not covered. The heat generated by the unit will not be adequately dissipated if the ventilation slits are covered → section 3.1.

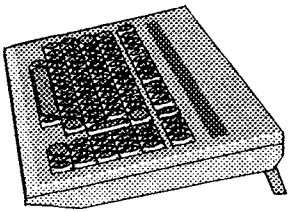
*Removing the keyboard*

Proceed as follows to remove the keyboard:

1. *Press down the fastener in the middle of the hinges.*
2. *Pull the keyboard out toward the front.*



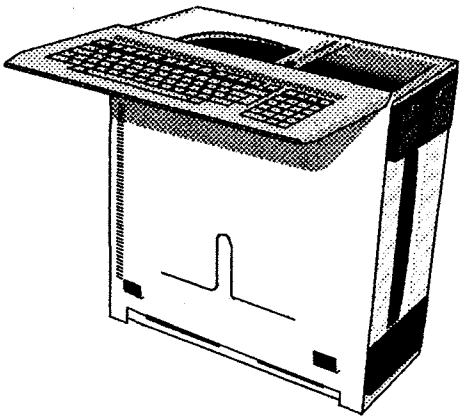
The hinges can be folded back and locked in this position. They then serve as feet. The keyboard then lies at the recommended angle of 6 °.



*Vertical position*

If there is little space available, the PG 750-486 can also be operated standing on its rear panel.

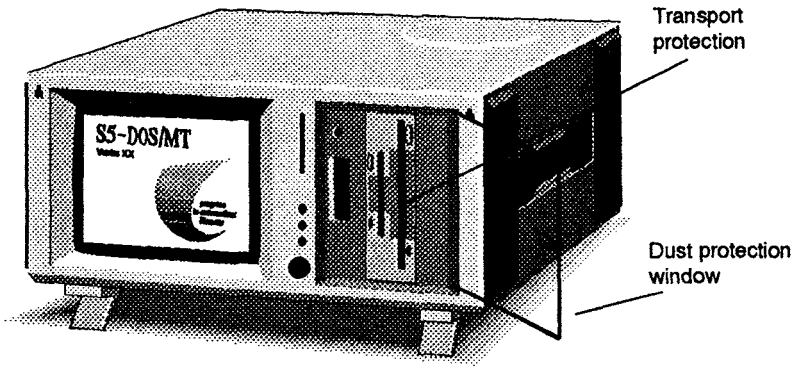
*1. Lower the keyboard to form a right angle at the front.*



## 2.1.2 Removing the Transport Protection

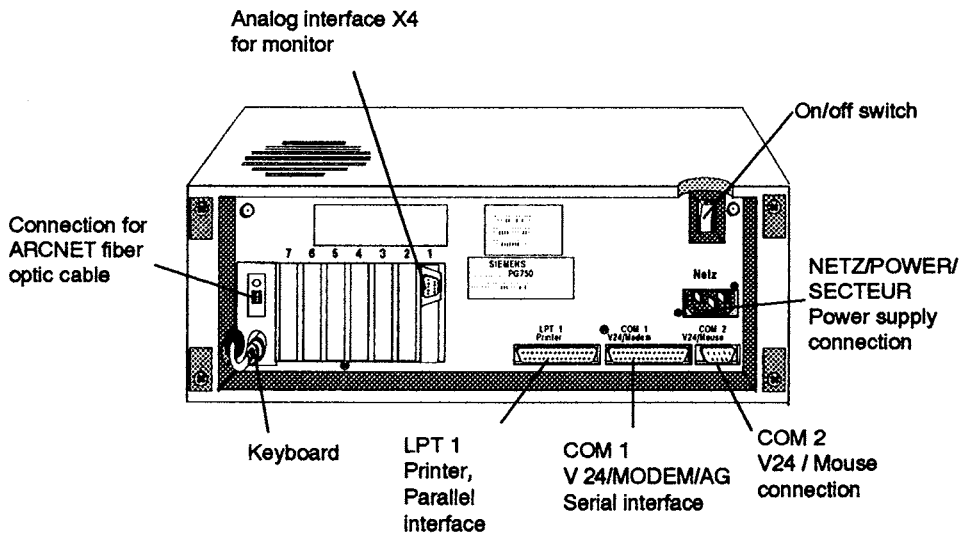
You have now set up your PG to suit your workplace.
The front of the unit with the monitor, one 3.5" floppy disk drive and one 5.25" floppy disk drive is accessible. The drives and the EPROM programming submodule are protected by a transparent dust protection window.

1. *Open the dust protection window.*
2. *Turn the lever on the 5.25" floppy disk drive to open it. You will find a plastic or cardboard "diskette" in the floppy disk drive which protects the drive during transport.*
3. *Remove this transport protector from the drive.*



## 2.2 Connecting Up

All the important connections for the external devices including the power supply connection are located on the rear panel of the PG.




### 2.2.1 Connecting the Power Supply

The PG 750-486 can be operated with 115 V and 230 V mains power. The voltage is switched over automatically.

The power supply cable is located along with the mouse in the cover of the back panel.

- *Plug the power cable supplied into the socket labeled "Netz" and connect it to a mains socket with an equipment grounding conductor.*

The on/off switch for the power supply to the unit is directly above the power supply connector. When the PG 750-486 is switched on, this switch is illuminated green. A cut-away section in the mounting base makes it easier to locate the switch.

**Warning**
For operation in Canada and the USA, a CSA or UL-listed power supply cable must be used.
The unit is intended for operation with normal grounded power supply networks (referred to as TN systems according to IEC 364-3).
The unit is not intended for operation with non-grounded or impedance-grounded networks (referred to as IT systems).

### 2.2.2 Connecting the Mouse

The mouse is required as an input device for making entries in certain programs which run with a mouse. The COM 2/V24 port is located below the power supply connection.

- *Connect the mouse to the COM 2/V24 port.*

### 2.2.3 Connecting Printers

You can connect printers with a parallel or serial interface to the PG 750-486 by using the LPT 1 (parallel) or COM 1 and COM 2 (serial) ports. Section 4.2 contains information on connecting the recommended printers.

**Caution**
Only connect a printer with a parallel interface to the parallel port LPT 1 when the PG is switched off (the printer should also be switched off). An incorrect connection can damage the printer or your PG.

### 2.2.4 Connecting an External Monitor

An external monitor can also be connected to the PG 750-486 via the analog interface X4: ANAL. (→ section 4.1 "Connecting Monitors").

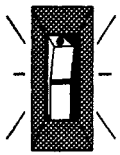
### 2.2.5 Connecting SIMATIC S5 Programmable Controllers

A special adapter cable can be used to connect your PG 750-486 to a SIMATIC S5 programmable controller. This cable is supplied with your PG.

- *Plug the connecting cable into the COM 1 / V24 Modem/AG port.*

**Caution**
Only connect the original cable for the programmable controller to the COM 1 port and make sure you do not confuse the serial port COM 1 with the parallel port LPT 1. The interface may otherwise be damaged.

## 2.3 Switching on for the First Time



1. *Connect the mains power cable as described in → section 2.2.1.*
2. *Insert the key in the keyswitch and turn it to the vertical position "NORMAL".*
3. *Press the on/off switch.*

The PG now starts up and boots the system after performing an internal hardware test.

*Optical indicators*

The "Power" LED on the front panel is lit continuously when the device is switched on.

The LEDs in the NUM LOCK and SCROLL LOCK keys light up briefly. The access indicators for the drives light up in the sequence floppy disk drive, hard disk drive and then floppy disk drive again.

A message appears on the screen which looks like the following, giving the BIOS version and the copyright:

```
Phoenix Advanced VIDEO BIOS Version xxx
```

The LED on the hard disk drive lights up from now on whenever the hard disk drive is accessed.

*Acoustic signals*

One beep indicates that the PG is functioning correctly. Several beeps in sequence are signal codes which indicate errors. Chapter 7 "Error Diagnostics" lists the meanings of these codes.

> **Note**
> If you do not wish to make any changes to your hardware configuration as delivered and want to start work immediately with the system software as installed, you can skip the following chapters. You will find further information on installing and using the system software in the S5-DOS/ST and/or S5-DOS/MT manuals.

# Getting to Know your PG 750-486

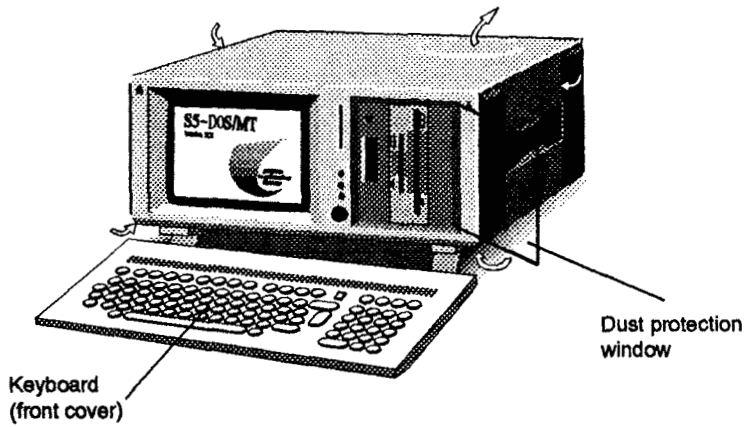
# 3

This chapter provides all the information you need about the hardware of the PG 750-486 and its most important components (disk drives, keyboard and programming submodule).

We recommend you read this information, which will enable you to work effectively and safely with your PG.

## 3.1 Characteristics of the Casing

The casing of the PG 750-486 has a number of practical design details.




*Ventilation grille*

The ventilation outlet grille on the top of the unit is raised. Raising the grille is intended to remind the operator that the opening must not be covered, otherwise there is a risk of overheating.

**Warning**

Ensure that the ventilation grilles (marked with arrows in the figure above) are not covered.
If the grilles are covered during operation, the heat produced cannot escape. Overheating can lead to defects and malfunctions.

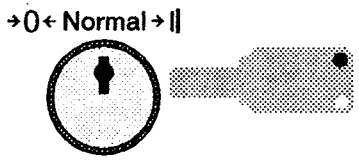
*Front cover*

The keyboard is connected to the main body of the unit by hinges. When transporting the unit, the keyboard is folded up and then serves as the front cover.

To use the keyboard separately you can remove it from its hinges and position it as required.

*Keyswitch*

The keyswitch on the front of the PG 750-486 has the following settings:




| | |
|---|---|
| **Key to the right:** | keyboard input locked |
| **Key in middle position:** | normal operating position |
| **Key to the left:** | resets the hardware; all currently active programs are aborted and when the key is switched to the middle position again, the operating system is re-booted from diskette or hard disk. |

*Brightness control*

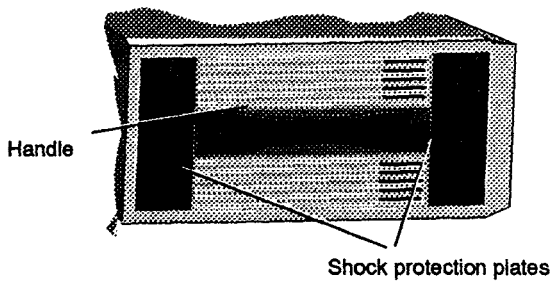
Above the keyswitch and the three LEDs on the front panel you will find the brightness control for the integrated monitor. The brightness is regulated by a slider control.

*Dust protection window*

To prevent dust and dirt from entering the drives and the EPROM programming submodule, a transparent window has been fitted. It can be opened easily to change diskettes and use the programming submodule. By opening the window beyond the stop position, it can be removed. Its hinges function like pushbuttons, which makes assembly very simple. In normal operation, the window should be left closed; the LEDs can still be seen clearly.

*Handles*

To the left and right there are handles in the sides of the casing. These can be pulled out to move the unit.




*Shock protection plates*

There are two plates on each of the side walls to protect the unit from shock. The unit can be set down on these during transport.

*Mounting base*

As described in → section 2.1.1, the PG 750-486 can also be operated standing on its rear panel, which is equipped with a mounting base. This accommodates the rear panel cover which clips to the unit with a pushbutton. The cover holds the power supply cable and mouse.

*Rear panel*

The rear panel is constructed so that the connectors are well inside the casing. This means that the cables from and to the PG 750-486 will not be kinked.
Cutouts in the cover allow cables to be connected with the cover in place.

*Compartment for mouse pad*

Below the unit there is a compartment for the mouse pad for the optical mouse (no mouse pad is supplied with the roller ball mouse as it is not required).

## 3.2 Drives

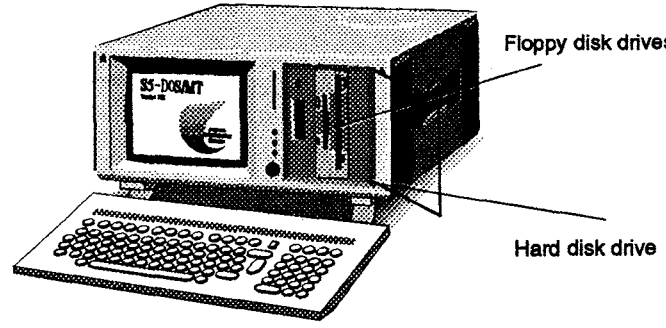
*Drive types*

As standard, the PG 750-486 is equipped with the following drives:

- double floppy disk drive for 3 1/2-inch and 5 1/4-inch diskettes,
- hard disk drive.

Both disk drives are situated behind the transparent dust protection window.

The drives are mounted in special damping elements. These elements reduce the influence of oscillations and shock on the function of the drives.



### 3.2.1 Floppy Disk Drive

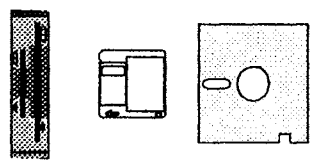
The maximum storage capacity of the 5 1/4-inch drive is 1.2 MB, and of the 3 1/2-inch drive 1.44 MB. The floppy disk drives are used to store programs and data on diskette and load them from diskette into the PG 750-486.

*Diskette types*

The following types of diskette can be used:

- double-sided high density 135 TPI (80 tracks).
- double-sided double density 135 TPI (80 tracks).
- double-sided high density 96 TPI (80 tracks).
- double-sided double density 96 TPI (80 tracks).

The diskettes should be inserted in the drive as shown below.



**Caution**
Do not remove a diskette from a floppy disk drive when the LED on the drive is lit (drive active). The data on the diskette may be damaged or lost.

## 3.2.2 Hard Disk Drive

The PG 750-486 is equipped with a 3 1/2-inch hard disk drive. Depending on the operating system, logical drives can be created. (Refer to the description of the respective operating system).

*Supplied software*

The hard disk of your PG has been formatted, and the software supplied with the PG is already installed.

For some applications it may be necessary to configure the hard disk again or to modify the configuration. Refer to the S5-DOS/ST or S5-DOS/MT for PG manual.

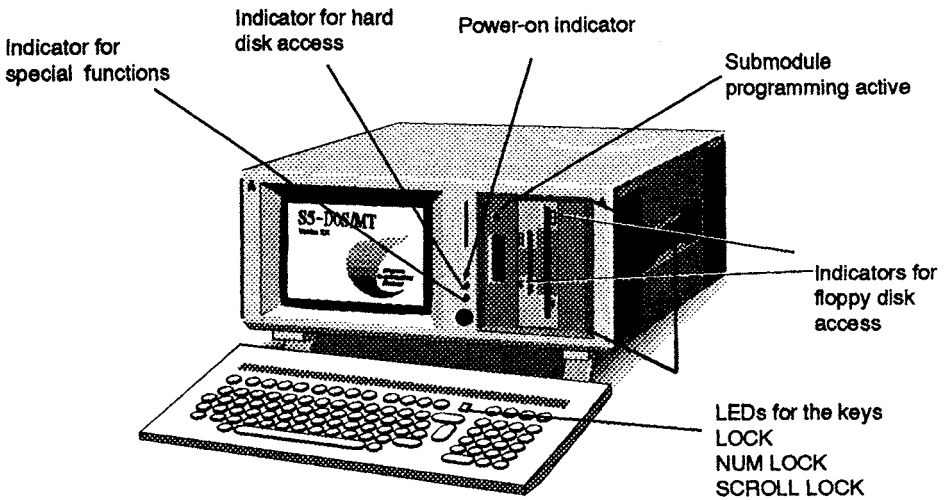
*Self-test*

Every time the PG 750-486 is switched on or reset, the hard disk drive performs a self-test which is repeated during operation.

Whenever the hard disk drive is accessed, the access indicator (LED) on the front of the unit for the hard disk lights up.

**Caution**
Drives are sensitive to shock.
If you want to transport the PG, wait until the drive has come to rest before you move it.
If the drive is subjected to shocks or bumps while it is operating, data may be lost or the drive may be damaged.

## 3.3 Optical Indicators (LEDs)




*Optical indicators on the keyboard*

Three keys on the keyboard (LOCK, NUM LOCK, and SCROLL LOCK) are linked to LEDs which are located in the top row of the keyboard (function keys). These indicate the current key assignment (→ section 3.5 "Keyboard"). When the unit is switched on, the LEDs for the keys NUM LOCK, SCROLL LOCK and LOCK light up briefly twice. This means the keyboard is connected correctly and operational.

*Optical indicators above the keyswitch*

The three LEDs located above the keyswitch have the following functions:

- power-on indicator
- hard disk access indicator
- free indicator for special functions.

*Access indicators*

Access indicators are also found on the EPROM programming submodule and on the floppy disk drive.

## 3.4 Monitor



The PG 750-486 has a color monitor built in which can process both RGB analog and TTL video signals. The picture synchronization, the picture height adjustment and the TTL/analog switchover are automatic. The brightness can be adjusted manually.

### 3.4.1 Color Graphics Interface Module

The color graphics interface module of the PG 750-486 is compatible with the industry standard. Two parts are integrated in the module:

- the VGA part for standard applications,
- the GSP part for complex graphics applications.

The heart of the GSP part is the graphics processor TMS 34010. The GSP and VGA parts are two completely independent graphics inteface components. Both are capable of controlling the integrated monitor.

You can also run an external monitor with the color graphics interface in the PG 750-486 using the VGA port. You do not need to switch over manually, nor do you need to change any cables (→ chapter 4 "Connecting Peripherals").

### 3.4.2 Demagnetization

The PG 750-486 automatically demagnetizes the color tube when the cold unit is switched on. The demagnetization prevents color distortion caused by direct-current magnetic fields or by the geomagnetic field in the unit. If color distortion occurs during operation, switch off the unit and switch on again after approximately 15 to 20 minutes and the color purity will be restored. Repeat this procedure if there is considerable color distortion.

*True color reproduction*

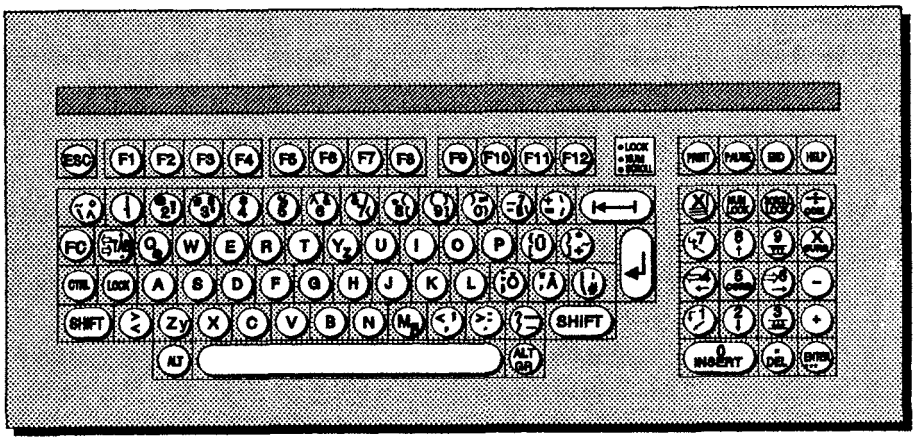
Ideal colors are achieved when the cold unit is switched on in the position in which it is to be operated.

## 3.5 Keyboard

*Keyboard areas*

The keyboard is divided into three areas:

- the typewriter keyboard,
- the numeric keypad with cursor control keys, and
- the function keys.



*Keyboard assignment*

The keyboard of your programmer can be assigned according to the functions of the software you are currently working with. This also applies to the STEP 5 software ( → *STEP 5* manual).

The following section describes the default MS-DOS keyboard assignment with the international character set.

*Setting up*

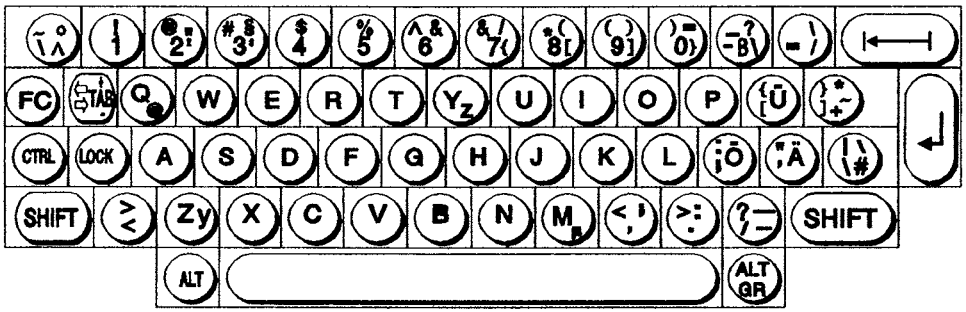
The keyboard is connected to the PG 750-486 by two hinges. By pressing the middle of the hinge gently, the keyboard can be removed and set up away from the main unit. The hinges are then lowered and fixed in place by two studs. In this position, they serve as feet for the keyboard. With the feet, the keyboard angle is 6° and the height of the middle row of keys is 30 mm. Ergonomically, this is the ideal position for a keyboard.

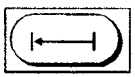
*Keyboard cable*

A 7-pin spiral cable connects the keyboard to the central unit. The cable is led to the keyboard connector on the rear panel via a cable tunnel.

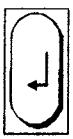
### 3.5.1 Typewriter Keyboard

The largest of the three keypads is the typewriter or alphanumeric keyboard which contains the keys for the alphabet, for numbers and for special characters.



The BACKSPACE key moves the cursor one space to the left and deletes the character that was at this position. The function of the backspace key depends on the application (program) selected.



The RETURN key is also called the ENTER key. If you press the RETURN key, the cursor jumps to the first space in the next line. The application you choose determines when to use the RETURN key.


The alphanumeric keyboard has three shift keys. If you press the LOCK key on the international keyboard, the LED in the key lights up and all the letters are written in uppercase. Pressing the SHIFT key again reverses the effect. The LOCK key on the German keyboard functions as a permanently pressed SHIFT key. Pressing the SHIFT key cancels this function.


The tabulator key moves the cursor by one or more positions to the right to a set tab.


Next to the tabulator key is the special key "FC". This key can be used to switch between the cursor functions and the numbers on the numeric keyboard.


The CTRL key has functions which are explained in the operating system and user program descriptions. The CTRL key is always pressed in combination with other keys.

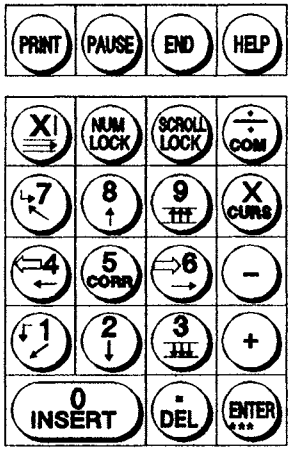
One example of an important key combination using the CTRL key is <CTRL><ALT> + <DEL>. This key combination resets the computer and restarts the operating system.


The ALT key - like the CTRL key - has varying functions that depend on the operating system or the program you are using. The ALT key is also used in combination with other keys.
When you press the ALT key, you can enter the hexadecimal value of an ASCII character (use the alphanumeric keypad on the right of the keyoard). The operating system interprets the ASCII character and displays it on the screen.
For example: <ALT> 155 will give you the "¢" character.


The ALT GR key is similar to the ALT key. The ALT GR key allows you to generate additional key codes. Example for the German keyboard:
<ALT GR> + <ß> will give you " \ ".

## 3.5.2 Numeric Keypad with Cursor Control Keys

The keypad to the right of the typewriter keyboard is used to control the cursor or to input numerical data.




*Switching over with NUM LOCK*


Depending on the operating system, either the cursor controls or the numeric keys are activated when the PG is turned on. The LED for the NUM LOCK key indicates which function on the numeric keypad is currently active.
Press the NUM LOCK key (LED is lit) to switch from cursor control to numeric characters. The numeric keys make it easier to enter long columns of numbers. Press the NUM LOCK key again to switch back to cursor control (LED not lit). By pressing the FC key and one of the cursor keys you can switch briefly to the cursor function while inputting lists of numbers.

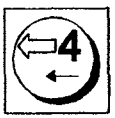
*Cursor keys*

The following cursor keys are available on the numeric keypad:


Cursor up


Cursor down


Cursor right




Cursor left


Cursor to start (home)


Cursor to end


Scroll backward (page up)


Scroll forward (page down)

### 3.5.3 Function Keys

There is a row of twelve programmable function keys located above the typewriter keyboard.

These function keys take on specific functions in conjunction with the STEP 5 programming software (→ *STEP 5* manual).



*LEDs*


The LEDs for the LOCK, NUM LOCK and SCROLL LOCK keys are located next to the function keys in the top row of the keyboard.

If one of these three keys is pressed, the corresponding LED shows the current status of the key.

### 3.5.4
### Special Keys


In most applications the ESC key serves to interrupt and abandon the current function.


Some keyboards (MF II keyboards) are equipped with an additional cursor block. The special FC key next to the tabulator key can be used to switch to this additional cursor block. To do this, press the FC key and one of the cursor keys in the numeric keypad simultaneously. This function is necessary for some user programs.


With the special key PRINT you can output the current contents of the screen on the printer.

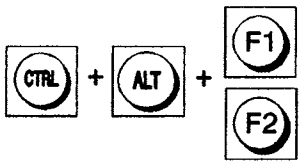

The PAUSE key interrupts the program sequence in most applications.


The END key positions the cursor at the bottom left limit of the screen.


With the HELP key you can call HELP functions in the applications where these functions are provided.

## 3.5.5 Special Key Combinations


Warm restart



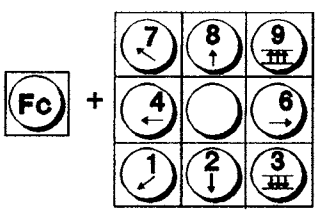

Switch to German character set

Switch to international character set


Starts SETUP program


CPU = fast

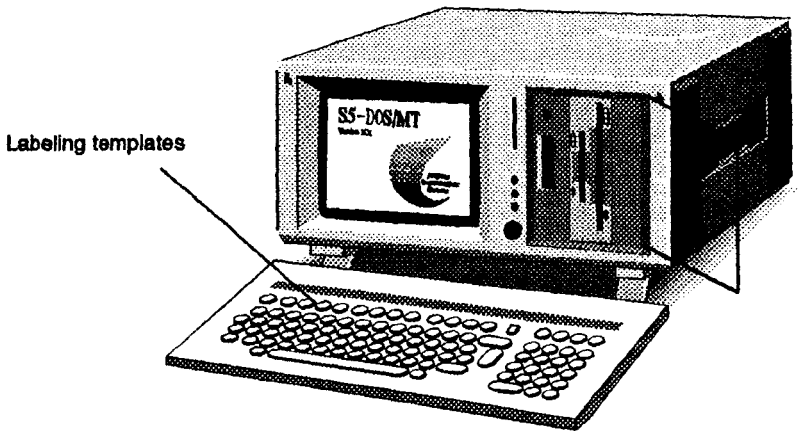

CPU = slow




Press the FC key and one of the cursor keys on the numeric keypad simultaneously to switch to the cursor control function of the respective key.

## 3.6 Labeling Templates

There are recessed areas above the function keys and special keys where you can insert labeling templates.




*Usage*

You can insert current notes, such as key assignments, behind a transparent foil. You can use a foil pen to write on the foils directly. The templates provide you with easy access to information you need and keep you from having to look up the information in other sources.

## 3.7 Mouse

The mouse* serves as an external input device for cursor control and menu selection. By moving the mouse, the cursor can be repositioned on the screen.

By pressing the lefthand button on the mouse, you set a marker. The other mouse buttons are assigned differently according to the application. You can select objects or items in a menu and start functions with the mouse.

*Cleaning the roller ball*

Your mouse has a self-cleaning roller compartment, which is capable, under normal conditions, of preventing dust collecting on the roller ball and on the transfer mechanism. From time to time you should, however, clean the ball. Proceed as follows:

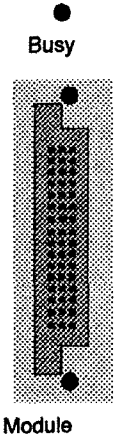
1. *Switch off your PG.*
2. *Turn the mouse over and remove the cover from the roller ball compartment by turning it anticlockwise.*
3. *Allow the ball to drop out into the palm of your hand.*
4. *Wash the ball in tap water to which you can also add a small amount of cleaning agent.*
5. *Blow any remaining dust out of the ball compartment.*
6. *Place the ball back in the compartment in the mouse.*
7. *Replace the cover and tighten it by turning it clockwise.*

* *Some PGs are equipped with an optical mouse. The mouse pad is located in the compartment beneath the unit.*

## 3.8 Submodule Programming Interface

*Programming SIMATIC S5 submodules*

You can use the interface to program SIMATIC S5 submodules. You can use these to program or read EPROMs or EEPROMs. Refer to the STEP 5 manual for more information on using the programming software.




**Caution**
Do not remove the EPROM submodule when the "submodule programming active" LED is lit.
Adhere to the ESD guidelines at the end of this book.
Not observing these guidelines can lead to the submodule being damaged.

Note the following points when using the submodule programming interface:

1. *Do not insert or remove the module when it is being programmed.*
2. *Remove the module after it has been programmed.*

## 3.9 Transport

*Preparing for transport*

The PG 750-486 can be made ready for transportation easily and quickly as follows:

- *If the keyboard has been operated separately from the main unit, refit the keyboard to the unit with the hinges and lock in place.*
- *Insert the transportation 'diskette' or a normal diskette in the 5 1/4-inch floppy disk drive and lock the drive.*
- *The keyboard can now be folded up. The clips lock it in position automtically. The mouse and power cable can be placed in the compartment below the unit.*



*Use original packing*

The PG is now ready for transport and can be carried with the handles on its sides. When transporting the PG over greater distances, the original packing should, if possible, be used.

> **Note**
> When transporting the unit in cold weather, when it may be subjected to large variations in temperature, care must be taken that no condensation is allowed to form on or in the unit. The PG should be allowed to reach room temperature slowly before it is started up. If condensation has formed, the PG should be left for four hours before being switched on (→ chapter 8 "Technical Data").

# Connecting Peripherals

# 4

You can add to the functions of your PG 750-486 by connecting a number of peripheral devices according to your own personal needs.

More exact details (circuit diagrams) on the conenction cables introduced here can be found in → Appendix A.

## 4.1 Connecting Monitors

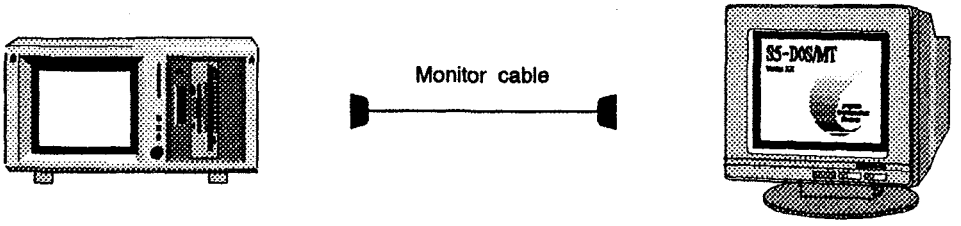
You can connect an external monitor to your PG 750-486.

*Connecting to X4*

The monitor should be connected to the analog interface (X4) on the rear of the device. Do not forget to select the analog interface and the appropriate switch position on the monitor.

The X4 interface on the HIGRAPH module (the preferred choice) is VGA-compatible. In GSP operation (Graphics System Processor (TMS34010)) a maximum resolution of 1024 x 768 pixels is possible with an image refresh rate of 50-70 Hz.

> **Note**
> When buying a monitor, you should ensure that it is a suitable multi-standard monitor. This will enable you to take full advantage of the maximum resolution of the PG 750-486.




The 15-pin socket (X4) is a VGA-compatible connection for a standard VGA monochrome or color monitor. Only plug in the monitor cable when your PG is switched off.

*Pin assignment*

The assignment for the monitor cable can be found in Appendix A.

## 4.2 Recommended Printers

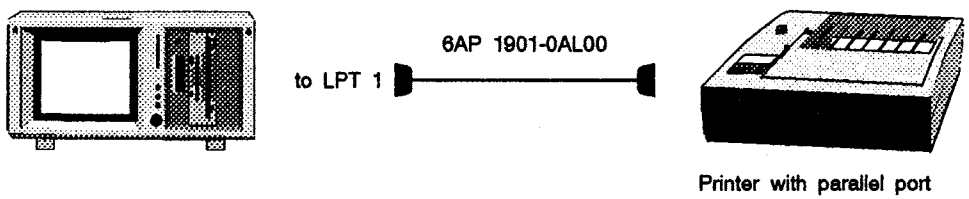
For the PG 750-486 the following printers with a parallel interface and IBM character set are recommended:

- DR 210-N, DR 211-N, DR 230-N and DR 231-N;
- PT10 laser printer;
- all HP Laserjet Series II and Series III-compatible printers.

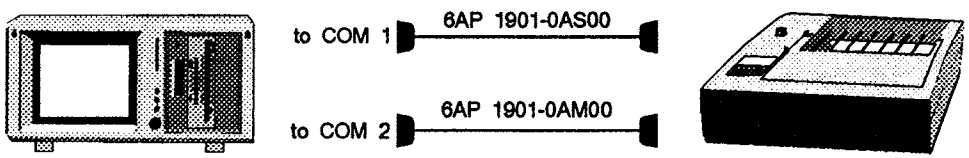


### 4.2.1 Connecting the Printers DR 210-N, DR 211-N, DR 230-N, DR 231-N

To connect the SICOMP printers DR 210-N, DR 211-N, DR 230-N and DR 231-N to the parallel port LPT 1 of the PG 750-486 you will require the connecting cable with the order number 6AP 1901-0AL00.




Printer with parallel port




Printer with V.24 port

**Caution**
Only connect the printer with a parallel port to the LPT 1 port when the PG is switched off (the printer should also be switched off). Otherwise the printer or the PG may be damaged.

*Connection via a serial port*

You can use a serial interface to connect your printer to the PG 750-486. The user's guide for your printer describes the cable you will require and tells you how to set the port to adapt it to your printer.

*Printer output mode*

You must also change the printer output mode on your PG 750-486 before you use the printer. When using the MS-DOS operating system, you must enter the following command sequence for the V.24/V.28 port:

**C:MODE LPT1:=COM1:**
Printer 1 is assigned to serial communications port 1.

**C:MODE COM1:96,n,8,1,p**
Mode: 9600 bps, no parity, 8 data bits, 1 stop bit
P indicates that in case of a "timeout", data transmission is continued until the printer acknowledges it.

The mouse port can, if necessary, be used as a serial port. Use the following command sequence to enter the mouse port:

**C:MODE LPT1:=COM2:**
The mouse port is assigned to serial communications port 2.

**C:MODE COM2:96,n,8,1,p**
Mode: 9600 bps, no parity, 8 data bits, 1 stop bit.

Enter the following command sequence to switch LPT 1 to the parallel port again:

**C:MODE LPT1:**
For further information about the MODE command, refer to the operating system description.

**Note**
To avoid having to enter the command sequence each time the hardware is switched off or reset, write the command sequence in the AUTOEXEC.BAT file or in another BATCH file. If you need additional information, please refer to the S5-DOS/ST or S5-DOS/MT manuals.
If you are using the STEP 5 software package, you must take account of the printer parameters in the menu "Settings". If the COM 2 port is to be used as the printer port, you should also ensure that the mouse driver is not loaded in the files CONFIG.SYS (MS-DOS) or CONFIG.BAT (FlexOS).



### 4.2.2 FASTPRINT Option

The standard graphics interface can be fitted with the option kit FASTPRINT. With the FASTPRINT option high speed printouts are possible via the PT10 laser printer, HP Laserjet Series II and III and compatible printers under the operating system FlexOS, and graphics can be printed 4 to 5 times faster than normal.

A graphics output generated via X/GEM can be printed in a few seconds with a resolution of 300 dpi using the FASTPRINT option.

By pressing the "PRINT" key, you can output a hard copy of the screen contents (including graphics) on a laser printer.

The order no. for the FASTPRINT option is:
6EA9641-1AA00-0AX0.

# Linking your Programmer

# 5

In this chapter the possible ways of linking your PG 750-486 with other programmers or with programmable controllers are described.

More detailed information on the connecting cables introduced here can be found in Appendix A.

## 5.1 Connecting to ARCNET

ARCNET stands for "Attached Resource Computer Network". It can connect computer systems (SIMATIC programmers, SIEMENS PCs and other computers) via fiber optic cables.

The following software is available, for example, to link the programmers in a network via the ARCNET interface

- FTARC for MS-DOS/FlexOS
- FlexNet for FlexOS.

*Fiber optic connection*

As standard, the PG 750-486 is equipped with a plastic fiber optic connection module. The maximum possible length of the fiber optic cable is 25 m. Transmission lines of up to 1000 m can be achieved using fiber optic cable connectors and glass fiber cables via a node switching point (HUB). The main advantage of this system is the complete immunity to electromagnetic influence on the network and the absence of network interference.
The whole network should not exceed an overall distance of 6000 m.

The gross data transfer rate is 2.5 Mbps.

### 5.1.1 Network Structure

ARCNET corresponds to a tree structure. This means that the stations are connected to a common node. If there are more than two stations, a node switching point (HUB) is necessary. Depending on the extent of the network, several node switching points can be linked together. A maximum of 255 stations can be connected to the network.

The "modified token passing" technique used by ARCNET works on the principle that a token is passed from node (RIM = Resource Interface Module) to node. If a node has the token, the network is at its disposal and it can send messages while all other nodes listen and receive. Acknowledgements of transmissions and messages about the status of the receive buffer are recorded. This avoids time being wasted and data being lost. When nodes are switched in or out of the network, it reconfigures itself.

### 5.1.2 Setting the Node Number

You can set the parameters for ARCNET operation in the SETUP program (→ section 6.8). Proceed as follows:

- *Set your chosen node number in the SETUP program.*

After the node number has been set, the interrupt IRQ5 is occupied by ARCNET.

The node number 0 is not available, since this is used for "broadcast messages". Broadcasting allows a station to send data to all other stations simultaneously. If you enter 0 as the node number ARCNET is treated as being "not installed" and the interrupt IRQ5 is free.



### 5.1.3 Setting the Response Time

As standard, a response time of 74.7 µs is set. This setting can be retained in almost all cases. A different response time can be selected with the program SETUP. A change is only required with extremely large networks, in which the token may be significantly delayed. Such networks are those with stations more than 6 km apart or with more than 64 stations. The delay is caused by the transmission medium and the number of HUBs installed.

*Set same delay throughout network*

It is important that all network stations have the same delay set, otherwise the network will continuously attempt to reconfigure itself.

| Response time in µs | Reconfiguration time in µs |
|---|---|
| 74.7 | 840 |
| 283.4 | 1680 |
| 561.8 | 1680 |
| 1186.0 | 1680 |

### 5.1.4 Setting the Address Range

Two address ranges are available for Siemens standard software:

- 0E0000h to 0E07FFh for the message buffer;
- 0E0800h to 0E0FFFh for commands

and for "compatible mode (NOVELL)"

- 0D0000h to 0D07FFh for the message buffer; IO addresses
- 2E0h to 2EFh for commands

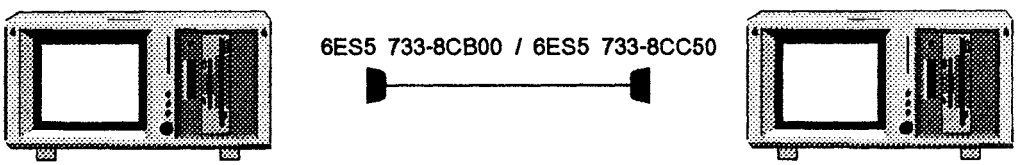
The addresses are selected by means of the SETUP program. The selection of the correct address is dependent on the network driver software used. As standard, the first address range 0E0000h is used (see operating system software).

> **Note**
> When using LIM* EMS drivers, you should ensure that address conflicts with ARCNET in the address ranges E0000h..E0FFF and D0000h..D0FFF do not occur. For information on how to avoid such address conflicts, refer to the documentation for the LIM EMS drivers.

### 5.1.5 Fiber Optic Cable for ARCNET

For transmission with fiber optic cables, lengths of 10 m and 25 m are available.

Order numbers: 10 m 6ES5 733-8CB00
25 m 6ES5 733-8CC50




* Lotus Intel Microsoft

## 5.2 Point-to-Point Link

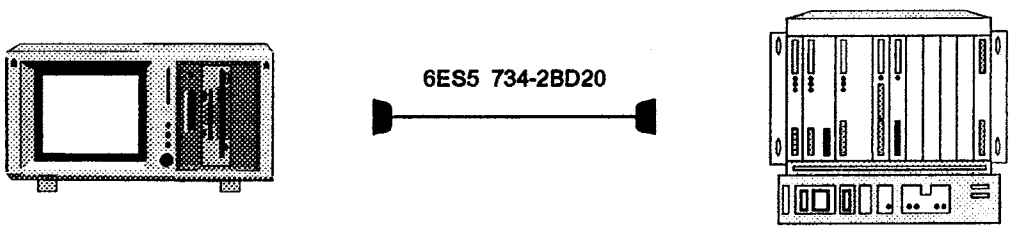
The programmer can be linked via a connecting cable from the COM 1 port directly to a programmable controller or another programmer (so-called point-to-point linking).

**Caution**
Before plugging in the connecting cables you should discharge the electrostatic charge from your body and from the cable by briefly touching a grounded object.
Ensure that the TTY cable is plugged in the COM 1/TTY port on the PG 750-486 and **not** in the LPT 1 port. If the TTY cable is plugged incorrectly, the LPT 1 port can be damaged.

5

### 5.2.1 Linking the PG 750-486 with PLCs

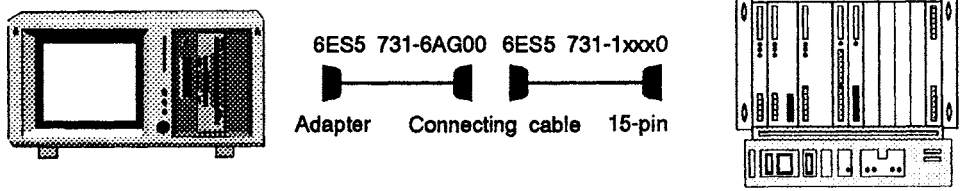
The PG 750-486 can be linked via the TTY port (COM 1) to a SIMATIC S5 programmable controller using the connecting cable (6ES5 734-2BD20) which is included in the scope of delivery of the PG 750-486.




In order to maintain a baud rate of 9600 bps up to a distance of over 1000 m (3300 ft.), the receiving diode is connected via the connecting cable to ground as a reference. Cables of various lengths are available under the order no. 6ES5 734-2xxx0 (xxx stands for the length in metres).

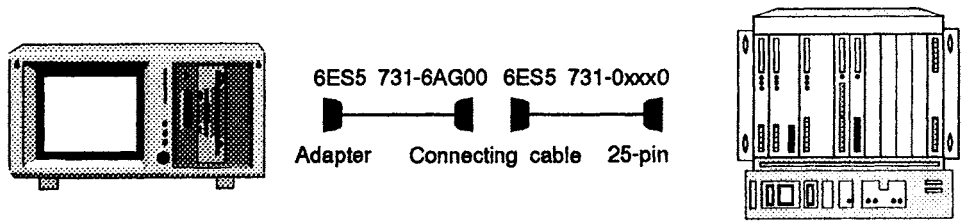
*Connect the PG 750-486 instead of a PG 6xx to a SIMATIC S5 PLC*

If you have already connected a PG 6xx to a programmable controller using the standard connecting cable 6ES5 731-1xxx0 and want to use this cable with a PG 750-486, you need to use an adapter.




*Connecting cable with 25-pin socket*

For the connecting cable 6ES5 731-0xxx0 the adapter 6ES5 731-6AG00 is also required for the link to the PLC.

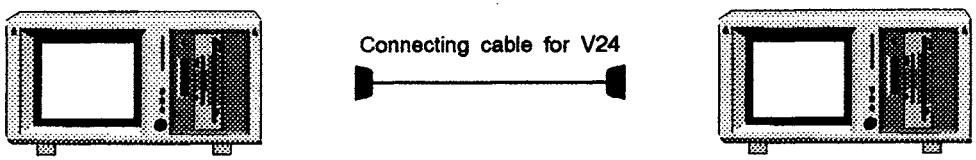


## 5.2.2 Linking the PG 750-486 with other PGs

If you want to link your PG 750-486 to other programmers you can plug the relevant connecting cable into the V24 or the TTY port.

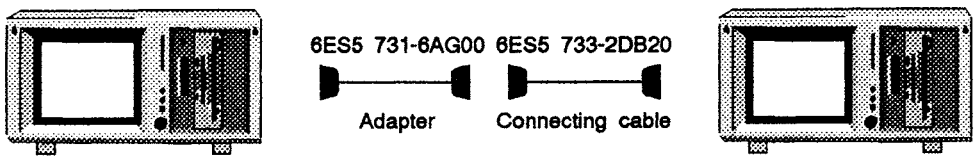
*PG-PG link to the V24 port*

Using the connecting cable for V24, two PG 750's can be linked together for data exchange.




*PG-PG link to the TTY port*

Linking two PGs together via the TTY port requires a few minor changes to the hardware.



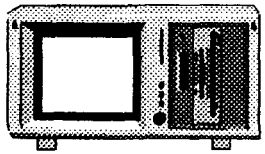

**Note**
You must switch one TTY port to passive for this link by changing the position of a jumper. On delivery this port is always set to active!

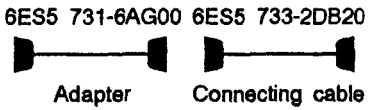
The jumper X45 can be found below the power supply. You will have to remove the power supply in order to remove or plug the jumper. Read more on this topic in → section 6.4.2.

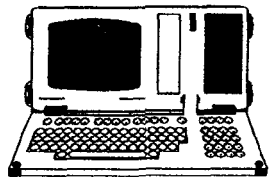
**Note**
The terms "active" and "passive" TTY ports are hardware terms, and should not be confused with the terms "active" and "passive" used in the PG LINK package.

*Linking the PG 750-486 with the PG 6xx*

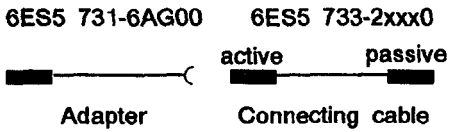
To link the PG 750-486 to other PGs (PG 635, PG 675, PG 685, PG 695 I) the PG 750 must be used as the active PG (state as on delivery). This link is achieved by connecting the cables 6ES5 731-6AG00 and 6ES5 733-2xxx0 in series.





**Caution**
When connecting in series, be sure to connect the lines in the correct direction.



## 5.2.3 Suggestions for Configuring Interfaces with Current Loops (TTY, 20 mA)

Accurate data transfer is dependent on several factors. The data transfer rate you can achieve (baud rate) depends on the distance, the cable type, the interface selection and the interference factors. You can reduce interference by correctly selecting and connecting the transmission cable. Use the following guidelines when selecting and installing the transmission cable:

Use shielded cable with a low line resistance and low capacity. (Note: shielded LiYCY cables with a resistance of 130 ohms/km and a capacity of 90 pF/m work well. Improved performance against inductive interference can be achieved with twisted-pair cables. A low line resistance leads to a low voltage deviation in the cable and causes short load transfer times. As the diameter of the cable increases, the resistance for a given cable length decreases).



*Length of transmission distance*

Use the shortest possible cables. The shorter the transmission distance, the higher the maximum transmission rate possible.

Choose the correct sequence of access priority to the transmission circuit if there is both an active sender and an active receiver on the same transmission side. Do this to achieve the best transmission rate possible.

Signal lines and supply lines **may not** be installed together in a **single** cable string. Signal lines must be installed as far away as possible from strong interference sources (e. g. 400 V three-phase power cable). (Note: the interference field decreases exponentially with the distance).

*Transmission up to 1000 m*

The active TTY interface with 12 V no-load voltage was tested with a cable 1000 m (3300 ft.) long at a transmission rate of 9600 bps in a normal environment (field strength < 3 V/m (1 V/ft.)). If an LiYCY 5 x 1 x 0.14 shielded cable is used, it is possible to have an error-free transmission for up to 1000 m (3300 ft.). The transmission was tested with the AS511 protocol (only one transmitter at a time).

Refer to: SIEMENS standard SN31170 ff (EMC)

## 5.3 Linking the PG 750-486 via SINEC L2 (PROFIBUS)

*Principle*

The SINEC L2 network works on the master-slave principle with "Token Passing" (according to DIN standard 19245) and can be employed in industrial environments. It distinguishes between active and passive participants, an active participant being given a token (right to transmit) which must be passed on to the next participant within a specified time.

*Modules required*

The following modules are required to form a link or network using SINEC L2:

- CP 5412
- RS 485 bus terminal
- RS 485 interface
- twisted, shielded two-wire cable (bus cable).

*Installation*

The user's guide and installation guide for the respective module provides you with information on installation and on any configuration changes necessary.

> **Note**
> Refer to the SINEC catalog IK 10 (order no. E86060-K6710--A101-Ax-7600) for further information on the SINEC modules (SINEC L2 and SINEC H1).

## 5.4 Linking the PG 750-486 via SINEC H1 (ETHERNET)

SINEC H1/H1FO is the most professional product available for networks and network components which work according to the CSMA/CD (Ethernet) principle (IEEE 802-3 standard). SINEC H1 is a network with a bus structure, in which data is transmitted via triaxial cable (H1) and/or fiber optic cable (H1FO).

*Modules*

To form a network using SINEC H1, you require the following modules:

- CP 1413
  or
- CP 141

The installation guide for the respective module provides you with information on installation and on any configuration changes necessary.

> **Note**
> Refer to the SINEC catalog IK 10 (order no. E86060-K6710--A101-Ax-7600) for further information on the SINEC modules (SINEC L2 and SINEC H1).

# Working on the Open Unit

# 6

You can add to the functions of your PG 750-486 by extending the hardware according to your own personal needs.

Maintenance work on an open PG 750-486 should be left to authorized SIEMENS repair centers. These offer you a specialist service.

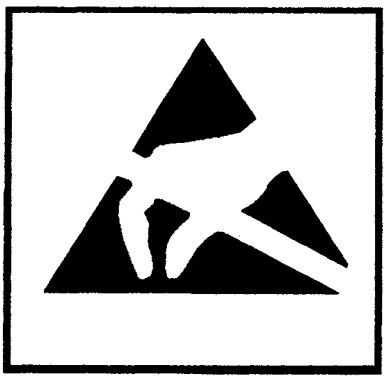
## 6.1 Opening the Unit

*Authorized persons*

The installation of expansions and options as well as repair work on the PG 750-486 should only be done by trained and authorized personnel. The following section is intended for such personnel. The unit is designed for easy maintenance, so that any work can be performed quickly while keeping costs to a minimum.

**Warning**
The electronic components of the printed-circuit boards are extremely sensitive to electrostatic discharge. When handling the boards, you must follow the guidelines for electrostatically sensitive components (ESD guidelines at the end of this book).

All modules and components in the PG 750-486 are electrostatically sensitive. Please read the ESD guidelines at the end of this book carefully. The following sign on cabinets, module racks or packaging warns that electrostatically sensitive modules are present.



*Important*

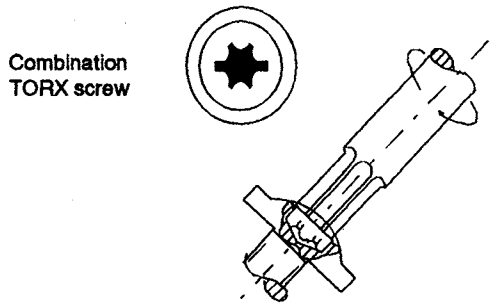
The following information is very important if you are working on an open PG:

- *Discharge any electrostatic charge on your body before you open the unit. You can do this by touching metallic parts on the rear panel of the PG 750-486 before you disconnect the power supply cable.*
- *Discharge any electrostatic charge on tools or units that you use inside the PG 750-486.*
- *Wear a grounding wrist strap if you are handling components.*
- *Leave components and modules in their packing until you are ready to install them.*
- *Plug or unplug components and modules only when no voltage is applied. Disconnect the mains power supply first.*
- *Touch components and modules only on their edges. Above all, do not touch the connecting pins and conductors.*
- *Do not operate the PG 750-486 with the cover open.*

### 6.1.1 How to Open the Unit

In the factory, the PG 750-486 is assembled by machine using combination TORX screws.

To open the unit, you will need the appropriate combination TORX screwdriver. Use a size T10 TORX screwdriver for M3 TORX screws (see below).




To open the PG 750-486, proceed as follows:

1. *Switch off the PG 750-486 and remove all connecting cables from the rear panel.*
2. *Place the PG 750-486 on an even working surface.*
3. *Remove the two screws from the left side and two screws from the right side of the upper casing.*
4. *Push the upper section toward the back and lift it at the front.*

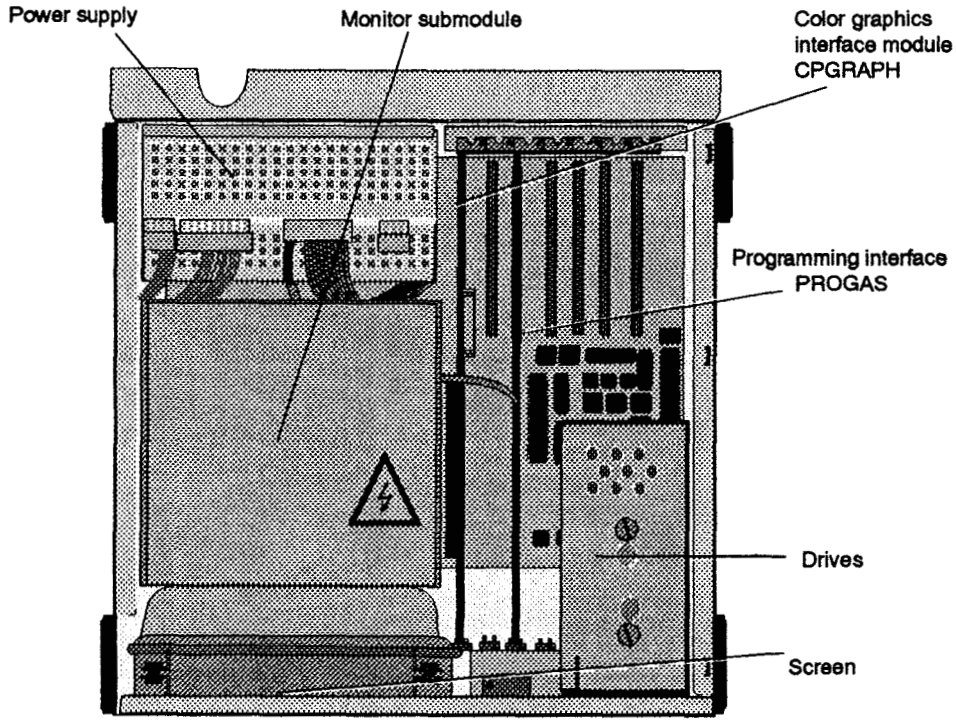
*Removing the metal cover*

Below the raised upper casing there is a second perforated cover. This closes the interior of the unit and supports the fan.

5. *To remove this, remove the screws holding the cover. Make sure that no screws fall inside the unit. The cover can now be lifted off.*
6. *Disconnect the cable for the fan from the power supply and remove the cover. All the components of the PG are now easily accessible.*

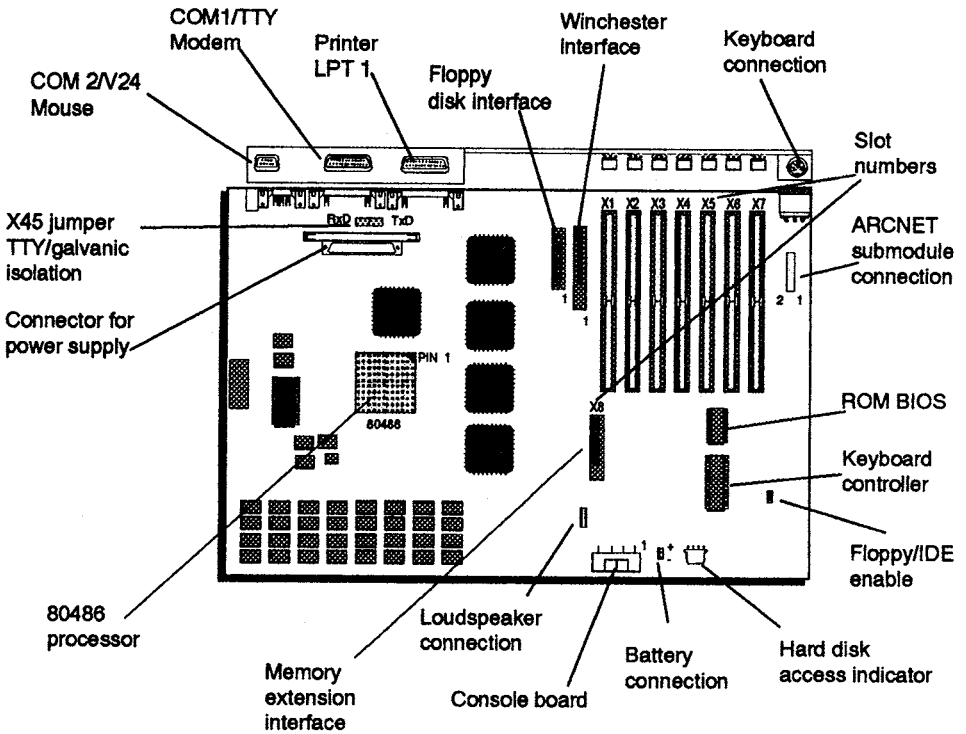
## 6.1.2 Functional Units

Once you have removed the upper section of the device, all of the important functional units are visible.



## 6.1.3 Mother Board

The mother board is the heart of the PG 750-486. From here, data is processed and stored, and interfaces, I/Os, graphics and submodule programming are controlled and managed. The most important signals are fed via the bus of the mother board.



*Components on the mother board*

The following components are mounted on the mother board of the PG 750-486:

- 32-bit microprocessor 80486 as central processor (CPU)
- memory (8 Mbytes DRAM)
- interfaces (2 serial, 1 parallel)
- ARCNET
- 8 slots for expansion modules (4 EISA slots in long format, 3 EISA slots and 1 memory extension 32 bits + 4 bits)
- 2 configuration switches
- slot for 32-bit memory extension.

*Assignment of slots*

The slots X2, X4, X5, X6 and X7 are free for expansion modules, slot X8 is intended for the use of a 32-bit memory extension.

When delivered, slots X1 and X3 are assigned with the following modules:

| | | |
|---|---|---|
| slot X1: | color graphics interface module | HIGRAPH |
| slot X3: | programming interface module | PROGAS |

6

## 6.2 Installing a Memory Extension

*Standard memory*

As standard, the PG 750-486 is equipped with an 8-Mbyte RAM. This memory is 32 bits wide. 640 Kbytes of this are required for the base memory and 384 Kbytes for the background memory (e.g. RAM BIOS). This leaves 7168 Kbytes as expanded memory. In addition to this, 32-bit memory extension modules with capacities of 8 Mbytes and 16 Mbytes are available.

*Installation procedure*

The memory extension module is installed using a 96-pin male multipoint connector at location X8. The unit must be opened as described in → section 6.1.

1. *Before the memory extension can be plugged in, the interface module must be removed from location X1.*
2. *Location X8 is directly beside the monitor submodule. Insert the memory module in location X8 on the mother board.*
3. *Once the memory extension has been inserted, the interface module must once again be plugged in location X1.*
4. *Secure both modules to the monitor submodule with the mounting supplied.*
5. *Close the unit as described in → section 6.7.*

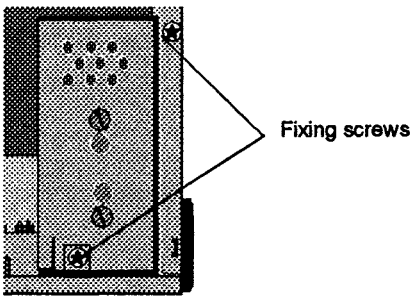
*Installation*

The memory module identifies itself via special signals. When the PG is switched on, the distribution of the "base and extended memory" is displayed. To ensure that your system knows how much memory is available each time it is booted, enter the values displayed on the screen using the SETUP program (see → section 6.8).

## 6.3 Installing and Dismantling Drives

*Drive mounting*

The drives in the PG 750-486 are mounted in a drive cage. This serves to hold the drives and protect them from electrostatic charges and shock.






*Procedure*

To dismantle the drives, proceed as follows:

1. *Open the unit as described in → section 6.1.*
2. *Dismantle the data cable, power supply cable and ground cable from the rear side of the drives.*
3. *The drive mounting is connected to the cage by two screws. Remove both the screws. You can then push the drive housing with the drives out backwards. The drives are each mounted in the cage on damping elements with four screws (two on the upper side, two on the lower side).*
4. *When installing the drive cage, follow the procedure in the reverse order.*

*Change device configuration*

- *After installing a drive, the device configuration must be reset with the new hardware configuration using the SETUP program (see → section 6.8).*

## 6.4 Reinstalling/Removing the Power Supply Unit

For some maintenance work (e.g. switching the COM 1 port active/passive) the power supply has to be removed.

### 6.4.1 Removing the Power Supply Unit

To remove the power supply, proceed as follows:

1. *Open the unit as described in section 6.1.*
2. *Remove all connecting cables from the device.*
3. *Loosen the four screws on the rear panel marked with a semi-circle.*
4. *Remove all connecting cables to the power supply.*
5. *Lift the power supply upward out of the PG 750-486. You can lift it by holding on to one of the connections.*

**Note**
The cable connections to the power supply are particularly tight for safety reasons. Use a screwdriver to loosen the cables from the power supply.

### 6.4.2 Switching the COM 1 Port Active or Passive

The COM 1 serial port (TTY) is set at the factory to "active" on the PG 750-486 (current loop 20 mA).

When two programmers are being linked together via the serial port, you must set the TTY interface of one of the PGs to "passive". There are two plug-in jumpers above the connector for the power supply on the PG 750-486's mother board for setting interfaces. (You will find further information on linking PGs in → chapter 5.)

*Setting the jumpers*

To change the setting of the jumpers, proceed as follows:

- *Unplug the jumpers X45 (→ section 6.1.3). Plug the jumpers onto one of the open PINs so they do not get lost.*
  - Jumpers plugged:
    The 20 mA transmit and receive current loops are linked to each other and each to an internal power source.
  - Jumpers removed:
    Each transmit and receive current loop is separate from the power source and fully floating. Only passive TTY operation is now possible.

### 6.4.3 Reinstalling the Power Supply Unit

To reinstall the power supply unit, proceed as follows:

1. *Place the power supply on the contact slot on the mother board, holding it by one of the upper connections.*
2. *Press the power unit in firmly.*
3. *Plug the power supply cables into the three connectors.*
4. *Screw the power supply to the rear panel of the programmer.*
5. *Close the unit as described in → section 6.7.*

## 6.5 Backup Battery

*Battery power supply for clock and configuration*

A backup battery (3.6 V lithium battery) supplies the hardware clock with power even when the PG is switched off. All information about the PG 750-486's configuration is stored in RAM as well as the time. If the backup battery fails, or if the battery comes unplugged from its contact, all this data is lost.

Because the clock uses very little power and the lithium batteries have a high charge capacity, the battery can run the clock for several years and will seldom need to be changed.

*Battery power too weak*

If the battery voltage is too low, the current time is lost and the configuration data stored in the RAM is lost. This means the hard disk drive is automatically deleted from the setup configuration and you can no longer boot from the hard disk. If no diskette containing the operating system is inserted, the boot procedure is abandoned after you confirm with the **F1** key.

The following message appears:

```
No boot device available....
```

*Changing the battery*

In this case the backup battery must be changed. The lithium battery is located behind the EPROM programming submodule. The lithium battery may only be changed by qualified service personnel.

**Caution**
Replace the battery only with the same or equivalent type recommended by the manufacturer.
Discard used batteries according to local regulations. On return, the materials in the used battery can be recycled.

*Adjusting SETUP*

Then you should correct your device configuration with the SETUP program (start SETUP with the key combination <**CTRL**><**ALT**>+<**S**>) (→ section 6.8 and chapter 9).

## 6.6 Installing Additional EISA/ISA Boards

*Slot on mother board*

You can expand your PG 750-486 and its connections by adding additional boards. On the mother board there are seven direct connectors (X1 to X7; → section 6.1.3) for the connection of EISA or ISA (XT/AT-compatible) I/O modules.

These connectors are occupied with TTL-compatible system bus signals. Modules connected to these strips must not require more than one low power Schottky load per signal.

*Device configuration*

To ensure that your whole configuration is fully functional, proceed as follows when you install the boards:

1. *Save the existing configuration from the hard disk onto a backup diskette (3 1/2-inch HD diskette) using the following commands, so that you can reconfigure the system as it was, should a system crash or fault occur.*

   *FORMAT A: /S/V*

   *XCOPY C:\DOS\EISA*.* A:*
2. *Copy the configuration file for your new board onto the hard disk into the directory C:\DOS\EISA.*
3. *Configure the system as described at the beginning and install the board.*

*Copying configuration files*

For all EISA boards and for certain ISA boards there are *.CFG configuration files. They are supplied on disk with the board. Copy the *.CFG files of all the boards you wish to operate into the directory on the hard disk in which the !... .CFG files supplied are located.

> **Note**
> If there is no *.CFG file for an ISA board, this board can be configured manually with the configuration utility; the required settings for these boards are to be found in the appropriate operating instructions.

*Changing the configuration with the EISA utility*

To update the configuration data, proceed as follows:

1. *Start the configuration program from the directory in which the *.CFG files are located. The program is self-explanatory.*
2. *Configure your system as described in → chapter 9. The program automatically checks the configuration for conflicts. Problematic boards are marked and, if possible, shut down.*
3. *Save the configuration and print it out, after all conflicts indicated have been resolved. You can find the necessary switch and jumper settings in the printout.*
4. *Switch off your system and correct the switch and jumper settings according to the configuration printout.*

> **Note**
> The interrupts IRQ 3, IRQ 4, IRQ 5 and IRQ 7 on the mother board are used by the mouse, the V.24/Modem, ARCNET and the parallel interface. They can, however, be deactivated in the SETUP program or blocked in the EISA configuration utility and are then available for other boards.

5. *Install the boards in the system as previously set in the configuration (check and, if necessary, correct all board settings, install missing boards, remove faulty boards, and take note of the slot sequence chosen). The device must be open to do this. Refer to → section 6.1.*
6. *Insert the board(s) in the slot suggested by the configuration program.*
7. *Close the unit as described in → section 6.7.*

When the device is switched on again, the system will be started up and parameters assigned according to the conflict-free configuration stored in the CMOS RAM.

*Automatic parameter assignment*

Many EISA boards can be assigned parameters automatically with the help of their *.CFG files. It is therefore important, also for boards that do not have a *.CFG file, that the occupied I/O, memory areas and interrupt/DMA channels are reserved using the configuration program.

> **Note**
> The assignment of memory areas and the interrupt/DMA channels can be found in the documentation supplied by the manufacturer of the boards.

## 6.7 Closing the Unit

To close the PG 750-486, follow the procedure for opening in reverse:

1. *The metal cover with the fan must first be placed against the rear panel and the fan cable connected to the power supply.*
2. *The metal cover can now be fitted in position and screwed down. Make sure that no screws fall inside the casing.*
3. *Once the cover is remounted, the PG 750-486 can be closed. Take the plastic upper casing and push the three studs into the slit in the rear panel.*
4. *Then push the upper casing down and secure it with the four screws; two on the left, two on the right.*

## 6.8 Changing the Device Configuration (SETUP)

The configuration of your PG is preset. If you want to work with your PG 750-486 using the preset configuration, then you can skip this section.

The SETUP program is used to transfer information about the system configuration to the battery-backed memory of the PG 750-486. It is located in the ROM BIOS.

*Changing the hardware*

You only need to make changes using the SETUP program if you change your hardware configuration or if an error occurs when you turn on your PG.

*Giving the system information*

You can use the SETUP program to inform the system about which components, such as memory and drives, have been added to or removed from the configuration. SETUP is also used to reset the date and time in the clock chip. In MS-DOS, this is done using the DATE and TIME commands.



*Starting SETUP*

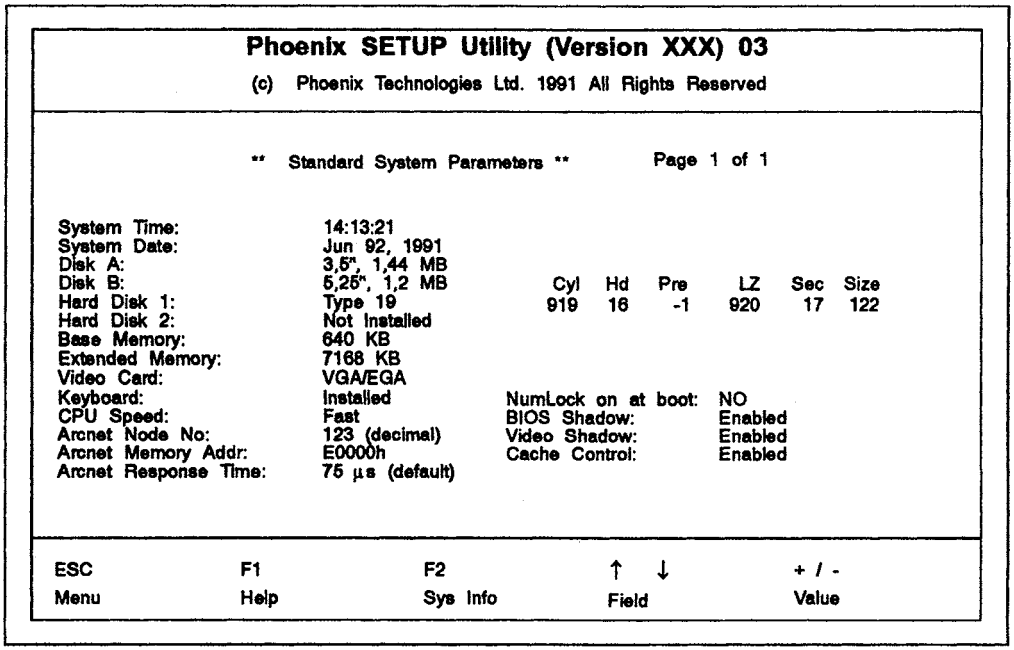
Activate the SETUP program as follows:

1. *Reset your PG 750-486 (warm or cold restart).*
2. *Remain in the MS-DOS command level.*
3. *Press the key combination* **<CTRL><ALT>+<S>.**

The SETUP menu now appears.

> **Note**
> Some operating systems and user programs reject the above key combination.
> Remedy: reset your PG with the keyswitch and wait for the memory test. Abort this test with the space bar. Now, before the operating system is loaded, you can start up the SETUP program resident in the ROM by simultaneously pressing the keys **<CTRL><ALT>+<S>**.

If incorrect SETUP data is recognized during booting, BIOS prompts you to run the SETUP program with **<F2>** or to continue booting with **<F1>**.




*Operation*

Using:

| | |
|---|---|
| <ESC> | you can toggle between an additional menu and the standard menu, |
| <F1> | you can get help screens for the current menu, |
| <F2> | you get information on the current system data, |
| <↑ ↓> | you can jump from one field to the other in the current menu, |
| <+ /-> | changes the values in the fields. |

| | |
|---|---|
| System Time | Here you can enter the correct time and date.<br>System Time: Hour : Minute : Second<br>System Date: Month : Day : Year |
| Diskette A (B) | The possible selections for drive A (B) are as follows:<br><br>Not installed<br>3.5", 720 Kbyte<br>3.5", 1.44 Mbyte — Standard entry for drive A: (compatible with S5 programmers)<br><br>5.25", 360 Kbyte<br>5.25", 1.2 Mbyte — Standard entry for drive B: (compatible with S5 programmers) |
| Hard Disk 1 | Siemens offer the following as hard disk drives:<br>122 Mbyte Winchester = Type 19 (standard entry)<br>200 Mbyte Winchester = Type 30<br>135 Mbyte Winchester = Type 33<br>325 Mbyte Winchester = Type 25 |
| Hard Disk 2 | Not installed |
| Base Memory | The base memory capacity of the PG 750-486 is 640 Kbytes. You must, therefore, enter 640 Kbytes for the "Base Memory" option. |
| Extended Memory | Memory extension boards are available for the PG 750-486. The figure you are required to enter for the "Extended Memory Size" depends on the memory extension already used and its configuration. It is standard for the PG 750-486 to be fitted with an 8 Mbyte RAM. Of this, 640 Kbytes are used as base memory and 384 Kbytes as background memory (e.g. RAM-BIOS). A further 7168 Kbytes remain as extended memory that are entered here.<br><br>If an additional memory extension is incorporated then there remain:<br>8-Mbyte extension 14336 Kbytes<br>16-Mbyte extension 23552 Kbytes<br><br>It is possible to install more than 16 Mbytes of memory. You should, however, note that ISA boards can only be run in the modulo 16 Mbyte address area of the 4 Gbyte address area of a 486 CPU. Modules with a dual-port RAM (e.g. the programming interface module or the CP 1413 EtherNet interface module) must be addressed in a 16-Mbyte block above the main memory. ISA master boards (e.g. CP 141) cannot be run above the 16 Mbyte limit.<br><br>Mathematically 1 Mbyte is missing from the 8-Mbyte extension. It is to be found in the 16th Mbyte which is intended for modules with dual-port memory and is therefore blocked. |

| | |
|---|---|
| Memory self-test | The extended memory ascertained during the memory's internal test must agree with the value set here. |
| Video Card (Monitor) | With the "Prime Monitor" option, you can select one of four permitted types as follows:<br>VGA/EGA high resolution color monitor, standard setting for PG 750-486<br>CGA40 Color Graphic (40 columns; in alphanumeric mode)<br>CGA80 Color Graphic (80 columns, in alphanumeric mode)<br>MONO monochrome<br>Not installed no monitor connection |
| Keyboard | The standard setting is "Installed". You also have the possibility of setting "Not Installed", so that the system runs up without the keyboard.<br>Num Lock on at boot: no: the keypad to the right of the keyboard is switched to the cursor functions before the operating system is started up.<br>yes: the keypad to the right of the keyboard is switched to the number keys before starting up. |
| CPU Speed | There are two settings for the CPU speed:<br>FAST Standard setting - the processor runs at maximum frequency,<br>SLOW This setting is only required when the software does not run correctly owing to fixed programmed time loops. If an error is detected during the self-test following power on, the CPU speed is automatically set to SLOW.<br>This setting only affects the software. The clock frequency of the processor is the same for both settings. |
| BIOS Shadow,<br>Video Shadow,<br>Cache Control<br>(Cache for 80486) | The shadow memory areas for BIOS and graphics can be enabled. The cache function (faster memory access) can be enabled.<br>Enable enables the function<br>Disable disables the function<br>BIOS Shadow BIOS is copied into the 32-bit wide system RAM<br>Video Shadow the memory area 0C0000H to 0CFFFFH is copied into the 32-bit wide system RAM<br>Cache Control the 486 cache is fully enabled |

| | |
|---|---|
| ARCNET Node No. | A decimal number between 0 and 255 is entered here for the ARCNET node number. This number is stored in the ARCNET controller. If '0' is entered, "Not installed" is displayed. In this case the interface is deleted from the configuration and the interrupt and the address area used by the interface is then free.<br>This number must be the same for every participant in the network. |
| ARCNET Memory Address | The ARCNET memory address area can be set here:<br>E0000h — ARCNET message buffer lies in the area E0000h...E07FFh, Memory<br>ARCNET control register lies in the area E0800h...E080Fh, Memory<br>D0000h — ARCNET message buffer lies in the area D0000h...D07FFh, Memory<br>ARCNET control register lies in the I/O area 2E0h...2EFh, IO |
| ARCNET Response Time | The response time for the ARCNET controller is given here. The value set must be the same for every ARCNET controller in the network. In most cases 75 µs is set as the default setting. |

6

*Exiting SETUP*

The SETUP program has its own exit menu, called "Exiting SETUP".

- *To call this menu, press the <**ESC**> key in your SETUP menu.*

| **Exiting SETUP** | |
|---|---|
| <ESC> | Continue with SETUP |
| <F4> | Save values, exit SETUP, and reboot |
| <F5> | Load default values for all pages |
| <F6> | Abort SETUP without saving values |

**Note**
For each module which is added to or removed from the system, the EISA configuration utility must be called.

*Table for your device configuration*

After you have changed your device configuration, you can enter the new SETUP entries in the following table.
If you make any hardware changes at a later date, the preset SETUP entries are then easily and quickly available to you.

| System parameters | Default value | Space for your entries |
|---|---|---|
| Diskette A | 3.5", 1.44 MB | |
| Diskette B | 5.25", 1.2 MB | |
| Hard Disk 1 | Type 19 | |
| Hard Disk 2 | Not Installed | |
| Base Memory | 640 KB | |
| Extended Memory | 7168 KB | |
| Video Card | VGA/EGA | |
| Keyboard | Installed | |
| CPU Speed | Fast | |
| ARCNET Node No. | 123 | |
| ARCNET Memory Address | E0000h | |
| ARCNET Response Time | 75 µs | |
| NUMLOCK on at boot | No | |
| BIOS Shadow | Enabled | |
| Video Shadow | Enabled | |
| Cache Control | Enabled | |

# Error Diagnostics

# 7

If you are experiencing problems with the hardware, this chapter contains information and tips on locating errors and basic troubleshooting.

## 7.1 Fault, Cause, Remedy

| Error | Cause | Remedy |
|---|---|---|
| On/off switch does not illuminate | PG is switched off | Switch on the on/off switch |
| | Power supply connection is incorrect. | Check the power supply/mains cable and connector |
| The screen remains dark after switching on | 3 - 6 seconds are needed for the warm-up phase of the monitor, before characters are displayed on the screen | Move the brightness control upwards |
| | Internal monitor connection is not plugged in | Check the connections inside the device |
| | Keyswitch is set to Reset | Return the keyswitch to the middle position |
| External monitor remains dark | No Sync signal | Check configuration, select Sync in color channel |
| | Incorrect monitor connection cable | Use VGA cable |
| The message: "Invalid configuration information... Press the F1 key for continue, F2 to run Setup utility" appears on the screen | Configuration data is faulty | Press "F2", check the configuration data in the SETUP menu, and if necessary, enter the default settings |
| The same message appears after SETUP has been checked | EISA configuration is faulty | Press "F1", load the MS-DOS operating system utility and call the configuration utility (→ chapter 9) |
| The message: "No boot device available" appears on the screen | Backup battery empty | Replace battery |
| | Incorrect hard disk type entered in the SETUP | Select:<br>Type 30 for 200 MB<br>Type 19 for 122 MB<br>Type 33 for 100 MB<br>Type 25 for 325 MB |
| | Diskette in drive A: is not a boot diskette | Remove diskette |
| | Boot sector on the Winchester has been deleted | Copy system to Winchester or format hard disk again |
| Message: "Keyboard stuck key failure" | A key was blocked during the internal self-test for the keyboard | Check keyboard, restart system |
| Message: "Keyboard is locked, please unlock" | The keyswitch is in the locked position | Return keyswitch to middle position |

| Error | Cause | Remedy |
|---|---|---|
| Message:<br>"Keyboard failure" | A keyboard is not connected | Connect keyboard, or correct setting in SETUP |
| The running up of the PG was aborted after several beeps | An error was detected during the power-on self-test | Check hardware,<br>see "Acoustic Signals" |
| Every time you try to press a key, a beep is heard and no characters appear | The keyboard buffer is overloaded | <CTRL><PAUSE> |
| No reaction to inputs via keyboard | The keyswitch is in the locked position | Return keyswitch to middle position |
| Not-ready error when trying to read a diskette | No diskette has been inserted | Insert diskette |
| | Diskette is not formatted | Format diskette |
| | A 5.25" diskette has been inserted incorrectly | Insert diskette correctly |
| Write-protection error when you try to write on a diskette | The diskette is write-protected;<br>for a 3.5" diskette, the hole is open,<br>for a 5.25" diskette, a label is covering the hole | Remove the write-protection |
| Keyboard does not have the correct character set | The wrong character set is loaded | Change the current character set with the keyboard sequences <CTRL><ALT><F1> for the international character set and <CTRL><ALT><F2>for the German character set |
| <\>key not available | Incorrect keyboard driver being used | Use the correct keyboard driver.<br>With German keyboard driver: <ALTGR><ß>,<br>with international keyboard driver: <\>key |
| Mouse not working correctly | The mouse is connected to the wrong interface | Use the COM 2 interface |
| | The mouse driver is not installed for applications which do not run under FlexOS/GEM | Refer to your software description |
| | Roller ball in mouse is dirty | Clean the ball |
| | Mouse pad is positioned wrongly (only relevant for optical mouse) | Position pad with blue stripes vertically, gray stripes horizontally |

## 7.2 Acoustic Signals

*POST (self-test)*

After the PG 750-486 is switched on, the BIOS firmware carries out a Power-On-Self-Test (POST). If a fatal error occurs at the beginning of the self-test, you hear a sequence of "beeps" and the screen remains dark. In some cases when the self-test has progressed sufficiently, an error message appears on the screen in addition to the beep sequence.

If a non-fatal error is detected, an error message always appears on the screen and you will be prompted to acknowledge the error by pressing F1.

| | |
|---|---|
| 1 short beep | POST terminated |
| 2 short beeps* | Error, acknowledgment required<br>- hard disk error<br>- SETUP or EISA configuration error<br>- non-fatal error |
| 1 short, 1 short, 1 long, 1 short | defective or missing monitor interface |

*Pattern for signal sequences*

The signal sequences in the table on the next page are given as follows:
e.g. 1-1-3 means: one beep is followed by another single beep and three more beeps. No signal sequence ("none") means that the POST was aborted, in which case no acoustic signal will sound.

* *If the keyboard is not connected or if it has been removed from the SETUP, this signal sequence will be suppressed.*

| Signal sequence | Port 80H | Error description |
|---|---|---|
| none | 01H | CPU register test running |
| 1-1-3 | 02H | CMOS write/read error |
| 1-1-4 | 03H | ROM BIOS checksum error |
| 1-2-1 | 04H | Programmable timer interval error |
| 1-2-2 | 05H | DMA initialization error |
| 1-2-3 | 06H | DMA page register write/read error |
| 1-3-1 | 08H | Error in checking RAM refresh |
| none | 09H | First 64K RAM test running |
| 1-3-3 | 0AH | 64K RAM chip or data transmission error (multi-bit error) |
| 1-3-4 | 0BH | 64K RAM odd/even logic error |
| 1-4-1 | 0CH | 64K RAM address transmission error |
| 1-4-2 | 0DH | 64K RAM parity error |
| 1-4-3 | 0EH | Fail-safe timer error |
| 1-4-4 | 0FH | Software NMI + port error |
| 2-1-1 | 10H | 64K RAM error bit 0 |
| 2-1-2 | 11H | 64K RAM error bit 1 |
| 2-1-3 | 12H | 64K RAM error bit 2 |
| 2-1-4 | 13H | 64K RAM error bit 3 |
| 2-2-1 | 14H | 64K RAM error bit 4 |
| 2-2-2 | 15H | 64K RAM error bit 5 |
| 2-2-3 | 16H | 64K RAM error bit 6 |
| 2-2-4 | 17H | 64K RAM error bit 7 |
| 2-3-1 | 18H | 64K RAM error bit 8 |
| 2-3-2 | 19H | 64K RAM error bit 9 |
| 2-3-3 | 1AH | 64K RAM error bit A |
| 2-3-4 | 1BH | 64K RAM error bit B |

| Signal sequence | Port 80H | Error description |
|---|---|---|
| 2-4-1 | 1CH | 64K RAM error bit C |
| 2-4-2 | 1DH | 64K RAM error bit D |
| 2-4-3 | 1EH | 64K RAM error bit E |
| 2-4-4 | 1FH | 64K RAM error bit F |
| 3-1-1 | 20H | Slave DMA register error |
| 3-1-2 | 21H | Master DMA register error |
| 3-1-3 | 22H | Master interrupt register error |
| 3-1-4 | 23H | Slave interrupt register error |
| none | 25H | Interrupt vector not loaded |
| 3-2-4 | 27H | Error in keyboard controller test |
| none | 28H | CMOS error, checksum being formed |
| none | 29H | CMOS being configured |
| 3-3-4 | 2BH | Error in initialization of the screen |
| 3-4-1 | 2CH | Error in picture repetition test |
| 3-4-2 | 2DH | Check video-ROM is available |
| none | 2EH | Video-ROM has started up |
| none | 30H | Assumes that screen is ready |
| none | 31H | Assumes that monochrome screen is ready |
| none | 32H | Assumes that color monitor (40 columns) is ready |
| none | 33H | Assumes that color monitor (80 columns) is ready |

| Non-fatal errors Signal sequence | Port 80H | Error description |
|---|---|---|
| 4-2-1 | 34H | Time not being counted |
| 4-2-2 | 35H | Software reset (shut-down) |
| 4-2-3 | 36H | Gate A20 error |
| 4-2-4 | 37H | Unexpected interrupt in protected mode |
| 4-3-1 | 38H | Error in address transmission in memory address >FFFFH |
| 4-3-3 | 3AH | Faulty timer chip counter 2 |
| 4-3-4 | 3BH | Time clock not running |
| 4-4-1 | 3CH | Serial port error |
| 4-4-2 | 3DH | Parallel port error |
| 4-4-3 | 3EH | Arithmetic processor error |
| 1-1-1-1 | | Graphics interface module defective or not available |
| 1-1 | | Error, acknowledgement expected<br>- SETUP error<br>- non-fatal error<br>- hard disk error |
| 1 | | Test result good |

# 8 Technical Data

| **Technical data for the PG 750-486** | |
|---|---|
| Measurements (hxwxd) | 470 x 215 x 500 mm |
| Weight | approx. 16 kg (35.2 lbs) |
| Degree of protection | IP 30 |
| **Power supply unit** | |
| Power consumption | max. 250 VA |
| Power supply | 230 V, +10%/-15%<br>48 Hz to 63 Hz<br>or<br>115 V, +10%/-15%<br>48 Hz to 63 Hz (automatic switchover) |
| Current output * | +5 V, +12 V, -12 V, +24 V, +28 V, -5 V, +100 V<br>5-20 A, 1.4-3 A, 0.3 A, 0.2 A, 0.3 A, 0.3 A, 0.4 A |
| Safety standards | IEC 950 / EN 60950 / VDE 0805 |
| **Mother board** | |
| Central processor | 80486-33DX (33.3 MHz) |
| Main memory | 8 Mbytes |
| Slots | 7 expansion modules, (slots 1 and 3 occupied)<br>(EISA-compatible, 32-bit data bus, 32-bit address bus) |
| Expanded memory | slot for 32-bit memory expansion module<br>(8 Mbyte, 16 Mbyte or 64 Mbyte) |

**Warning**
For operation in Canada and the USA, a CSA or UL listed power supply cable must be used.
The unit is intended for operation with normal grounded power supply networks (referred to as TN systems according to IEC 364-3).
The unit is not intended for operation with non-grounded or impedance-grounded networks (referred to as IT systems).

* *If you change the hardware configuration of the PG and the minimum current output values are not maintained, the PG may be damaged.*

| | | |
|---|---|---|
| **Interfaces** | | |
| | COM 1:<br>COM 2:<br>LPT 1:<br>ARCNET:<br><br>EPROM:<br><br>VGA: | V24/V28 or 20 mA (TTY) active or passive<br>V24 primarily for the mouse<br>Centronics primarily for a printer (parallel)<br>for fiber optic cable (2.5 Mbit/s) for PG link and networking<br>programming interface for SIMATIC submodules,<br>connection for a monitor (max. resolution 1024 x 786)<br>keyboard connection |
| **Disk drives** | | |
| Double floppy disk drive<br>Hard disk drive | 3 1/2"; 1.44 MB and 5 1/4"; 1.2 MB<br>122 MB, (Type 19) | |
| **Integrated monitor** | | |
| Tube | 10", high resolution, self-converging, directly etched 0.26 mm triad spacing, inline cathode, delta shadow mask | |
| Contrast | adjustable using control on the front of the PG (control voltage: -12 V to +12 V) | |
| Colors:<br>RGB analog VGA<br>RGB digital | <br>unlimited<br>maximum 64 | |
| Picture resolution | 640 x 480 analog (16 of 256 K colors)<br>640 x 480 digital (16 of 64 colors/EGA+)<br>640 x 350 digital (16 of 64 colors/EGA)<br>640 x 200 digital (16 colors/CGA)<br>320 x 200 digital (16 colors/CGA)<br>automatic switchover to the various resolutions | |
| Horizontal frequency | 15/21/31 kHz | |
| Vertical frequency | 60/70 Hz | |
| Video band width | 30 MHz (+3/-6 dB) | |
| Video connection | via ribbon cable to color graphics interface | |
| Color graphics interface module | VGA-compatible with a resolution of up to 640 x 480 pixels,<br>Graphics processor TMS 34010 with resolutions of 640 x 480 pixels via the internal monitor and 1024 x 468 via an external monitor,<br>Line scanning frequency 30 - 37 kHz,<br>Image refresh rate 50 - 70 Hz | |

| Environmental conditions | during operation | during storage and transport |
|---|---|---|
| Temperature | + 5 °C to 40 °C<br>(+41 °F to 104 °F) | - 20 °C to + 60 °C<br>(-4 °F to +140 °F) |
| Relative humidity | 8 % to 80 %<br>(no condensation) | 5 % to 95 %<br>(no condensation) |
| Speed of temperature change | 10 K/h | 10 K/h |
| Oscillation load | 10 - 60 Hz:<br>0.035 mm excursion<br>60 - 500 Hz:<br>3 $m/s^2$ acceleration | |
| Shock resistance | < 5 g (1 g ≈ 10 $m/s^2$)<br>at 10 ms pulse duration | < 50 g (1 g ≈ 10 $m/s^2$) |
| Approvals | - radio interference suppression according to VDE 0871<br>- limit value class B<br>- the radiation produced in this device is adequately shielded by an intrinsically safe cathode ray tube | |
| Degree of protection | IP 30 | |
| Noise emission values | 45 dB(A) | |

| EMC specifications | |
|---|---|
| Power interruption | up to 20 ms without effect |
| High-energy pulses | ± 2 kV asymmetric; ± 1 kV symmetric |
| Pulse bursts on mains | ± 2 kV unsymmetric |
| Static discharge at casing | ± 8 kV (with relay) |

*RI specifications*

**Certificate of the Manufacturer/Importer**

This is to certify that the
**PG 750-486 Programmer**, 6EA1750-2AG01-XXA1

meets the RI specifications in accordance with the Provision 1046/1984 and 483/1986 and
DIN VDE 0871/6.78 limit value class B.

Operation with components or devices which do not meet the Federal German Post and Telecommunications authority (BAPT) provisions can lead to interference of radio and television reception.

The German post office has been informed of the placing on the market of this device and is authorized to inspect the product range for compliance with the provisions.

SIEMENS AG



*Additional note on radio interference*

Any other devices which are connected to the PG 750-486 must also be radio interference suppressed according to the German telecommunications authority provision 1046/84 and 243/91. Products which fulfil these specifications are approved and carry the corresponding BZT (German government body for telecommunications approvals) certificate. Products which do not fulfil these requirements may only be employed with special permission from the BAPT.

If the unit is operated in a system as a peripheral, then to qualify for the "general operating license" according to the German telecommunications authority provision 1046/1984, the whole system must correspond to limit value class B according to DIN VDE 0871/6.78[1], the prerequisites stated in paragraph 2 and

1 *corresponds to CISPR (International Special Committee for Radio Interference), Publication No. 11 and CENELEC, HD 344.*

the conditions stated in paragraph 3 of the German telecommunications authority provision 1046/1984.

These prerequisites are usually only met if the units operate in a system that is type-tested and approved with:

- BZT approval number (Germany) or local regulations
- radio interference suppression label
- manufacturer's conformity certificate.

*Further approvals*

**Important for USA and Canada**
If the unit carries one of the following symbols it has been approved by the corresponding body:

Underwriters Laboratories (UL)
to Standard UL 1950, Report E11 5352

UL Recognition Mark

Canadian Standards Association (CSA)
to Standard C 22.2 No. 950 or C 22.2 No. 220,
Report LR 81690

# Configuring your Programmer

# 9

In this chapter you will learn how you can use the EISA configuration utility to configure your PG having changed your system configuration, for example, when you add, remove or exchange an adapter card or replace a system board.

## 9.1 Features of the EISA Configuration Program

The PG 750/770 is an "EISA" device (EISA = Extended Industry Standard) conforming to the EISA specification V 3.11 *.

*Configurability*

Apart from its - in contrast to ISA - double bus width, increased performance and an expanded address volume of 4 Gbytes (compared to 16 Mbytes), the EISA offers improved configurability. The aim here is to avoid faults which arise from boards being incorrectly configured. In addition, the operating software can access the configuration files and activate the correct drivers, offering the user optimal support as well as reducing the possible causes of errors.

*Profile of system configuration*

The EISA configuration utility automatically configures the EISA system boards and EISA adapter cards for use by the system's BIOS. The utility also allows for configuration of ISA cards with a minimum of manual intervention. In addition, it displays the configuration of the system hardware and can print a complete profile of the system configuration.

Configuration information, stored in the EISA CMOS RAM, is used to initialize system resources at start-up.

* *EISA Specification © BCPR Services, Inc.*

*Use*

You should use the EISA configuration program

- if you have modified your system by adding, removing or exchanging an adapter card or replacing a system board,
- if you receive an error message on start-up indicating the configuration information stored in the non-volatile CMOS RAM has become corrupted,
- if you wish to view the current configuration data,
- if you wish to reconfigure a defective system.

## 9.1.1 Configuring a New System

In this section you will learn how you can use the EISA configuration utility to configure your EISA system. In principle you run the utility program in the system which you wish to configure.

If you select HELP in the main menu or one of the following menus - general information on using the EISA utility is given.

- *Press F1 or [RETURN] to start the Help information.*
- *Use F10 or [ESC] to quit the Help menu.*

*CMOS RAM non-volatile memory*

On start-up the system reads the configuration information stored in the non-volatile CMOS RAM. You can use the EISA configuration utility to define a start-up configuration for a new system and store this information in the CMOS RAM for further use.

### 9.1.2 Software Requirements

To configure your PG 750/770 you will need the following software:

- operating system MS-DOS 3.3 onwards
- the EISA configuration utility EISA.EXE with all necessary files
- the configuration files !... .CFG for all boards which you wish to configure

Examples:

| | |
|---|---|
| !SIE 1001.CFG | (system board) |
| !SIE 4000.CFG | (CPGRAPH) |
| !SIE E010.CFG | (8 MB expanded memory) |
| !SIE E020.CFG | (16 MB expanded memory) |
| !SIE E030.CFG | (64 MB expanded memory) |
| !SIE F020.CFG | (Ethernet interface module CP 141) |
| !SIE F040.CFG | (HIGRAPH II) |
| !SIE F080.CFG | (PROGAS) |
| !SIE F0A0.CFG | (DF 20G/AT) |
| !ISA 0000.CFG | (standard ISA adapter) |
| !ADP 0001.CFG | (SCSI host adapter) |
| !WDC 2001.CFG | (SCSI host bus adapter) |

On delivery, all the above files are installed on the hard disk in the directory C:\DOS\EISA.

If you wish to add more boards, you should copy the corresponding CFG files to the C:\DOS\EISA directory.

The configuration utility must be called from this directory as follows:

```
C:\DOS\EISA>EISA
```

The files SYSTEM.SCI and DEFAULT.SCI are also located in the C:\DOS\EISA directory. If the system start-up reports that the EISA CMOS RAM contains invalid data, you should call up the EISA configuration program. You are then given the message that

the EISA CMOS data are faulty and the file SYSTEM.SCI is available.

If you wish to recreate the original state, instruct the program to use this file using [RETURN]. If you want to create a new configuration, [ESC] allows you to start the configuration routine.

The EISA program generates an up-to-date SYSTEM.SCI file for every configuration which you quit having saved the data you entered. The DEFAULT.SCI file contains the configuration information for the standard version of your PG 750/770 on delivery. If you want to reactivate this standard configuration you should copy the DEFAULT.SCI file to SYSTEM.SCI.

*Installing the EISA boards*

To install the boards, power down your system and install all the EISA boards physically. Since the EISA configuration utility allocates system resources beginning with the system board in slot 0, it is wise to install boards in descending order of importance (e.g. the most critical board in slot 1, the next most critical in slot 2 etc.).

*Gathering the ISA boards*

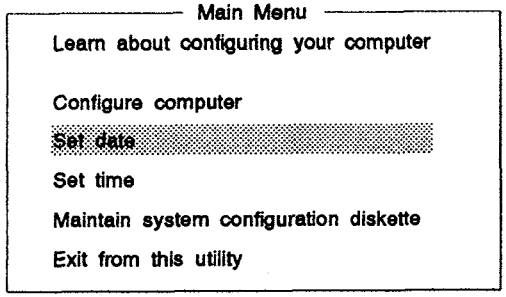
Since the EISA configuration utility has no way of recognizing whether ISA boards are present, they cannot be configured automatically. You need to set switches and jumpers manually and, in some cases, add software initialization statements to the AUTOEXEC.BAT or CONFIG.SYS file. So, gather, but do not install the ISA boards.

> **Note**
> If ISA boards are already physically installed in the system, there is no need to remove them at this time.

## 9.2 Constructing the System Configuration

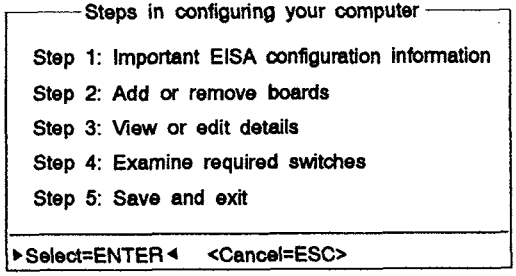
*Checking the slot overview*

On starting the EISA configuration utility the following screen should appear:




1. *Select "Configure computer" in the main menu and press [RETURN].*

   The following screen appears:



*Important information*

2. *If you require information on the EISA configuration utility, press "Step 1: Important EISA configuration information" and [RETURN].*
3. *Read the information and then press [F10].*

*Examine switches*

4. *Select "Step 4: Examine required switches" and press [RETURN].*
5. *Look out for the boards marked with an arrow on this screen. The arrow indicates that the boards in your PG may have jumpers and switches defined which need to be physically checked, or that there is a software statement with additional information regarding the board. The EISA configuration program displays the current configuration information on the slot overview screen.*
6. *Check whether all EISA boards are displayed.*
7. *If not, check whether all the necessary .CFG files have been copied to the directory C:\DOS\EISA. The working directory is the subdirectory from which you called the EISA program.*

*Conflicts between boards*

8. *Check also whether the EISA program has found conflicts between boards.*

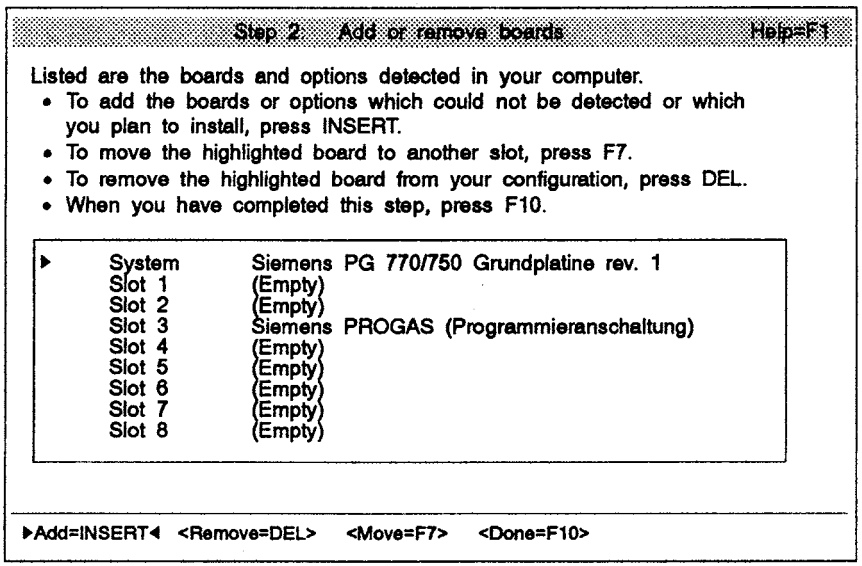
If it has found conflicts, the EISA configuration program will have displayed a message warning you of the conflict and telling you that the board in conflict will be disabled; also the symbol "<>" appears in the status column next to that board.

If all the EISA boards are listed, there are no conflicts. If you have no other boards to install, you need only to save the configuration and exit the program. Proceed directly to "*Save results*" later in this section.

## 9.2.1 Adding Boards

1. *Select "Step 2: Add or remove boards" and press [RETURN].*

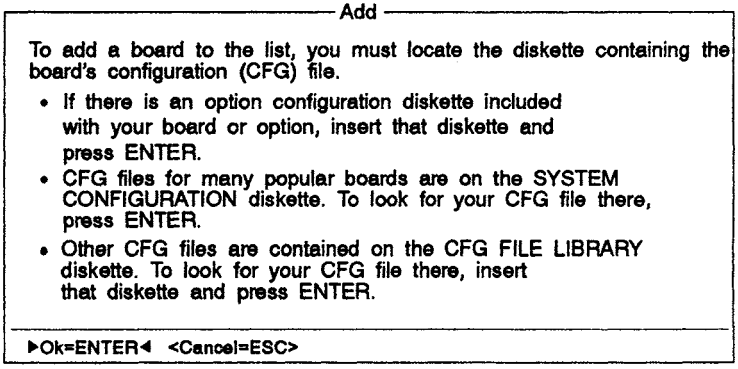
A screen like the following should appear:



*Locate the diskette*

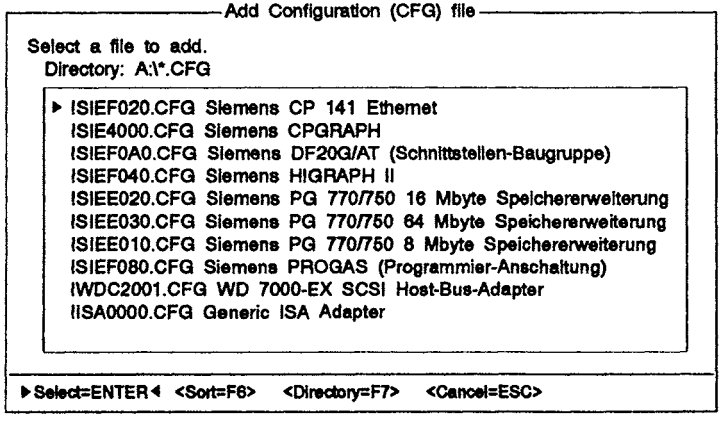
*2. Select "Add" using the [INSERT] key.*

The "Add" screen appears. In the PG 750/770 the CFG files for the boards contained in the scope of supply can be found in the directory C:\DOS\EISA.




*3. Press [RETURN].*

The screen "Add Configuration (CFG) file" appears, for example:




A list of the CFG files in the C:\DOS\EISA directory appears on the screen (see section 9.1.2).

*Select a board*

4. *Select a board you wish to install (you are advised to start with the most important board) and press [RETURN].*

   The "Add confirmation" screen appears, as follows:

```
Add confirmation
Board Name: Siemens HIGRAPH II

Manufacturer's Comments:
VGA und TMS Graphikanschaltung. Beide Anschaltungen sind zwei
unabhängig voneinander arbeitende Graphikteile, von denen jede den
externen Monitor ansteuern kann. Der VGA-Teil für Standardanwendungen,
der GSP-Teil für anspruchsvolle Graphikanwendungen.

▶Ok=ENTER◀  <Cancel=ESC>
```

(Manufacturer's Comments:
VGA and TMS graphics module. Both interface modules are 2 independent parts, each of which can control an external monitor. The VGA part is for standard applications, the GSP part for complex graphics applications.)

5. *Read the manufacturer's comments and then press [RETURN].*

   The "Add" screen appears which will look something like this for your PG 750/770:

```
Add
Select an acceptable slot for the board and press ENTER.
    System    Siemens PG 770750 Grundplatine rev. 1
▶ -> Slot 1   (Empty)
  -> Slot 2   (Empty)
     Slot 3   Siemens PROGAS
  -> Slot 4   (Empty)
  -> VIDEO    (Empty)
  -> Slot 6   (Empty)
  -> Slot 7   (Empty)
  -> Slot 8   (Empty)
The (->) indicates an acceptable slot for the board.
▶Ok=ENTER◀  <Cancel=ESC>
```

*Check the slot numbers*

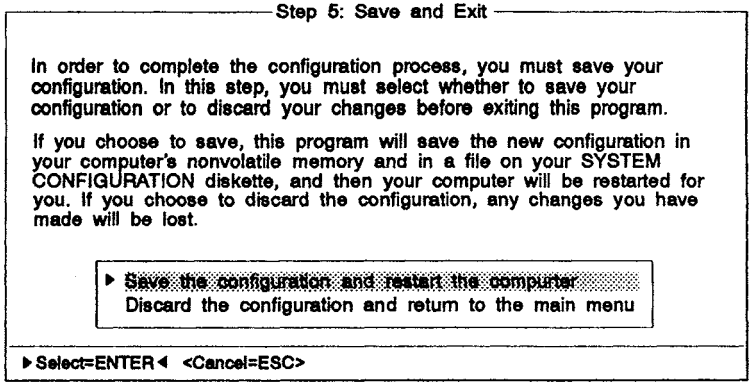
6. *Select the slot suggested or another slot. Check that the slot numbers in the slot screen agree with the actual slot numbers for the board which you have physically installed.*
7. *Press [RETURN] (or click on [DONE]) if you wish to include a board in the configuration.*
8. *Once you have included all the boards you require, press F10.*

*Save results*

Save the new system configuration as follows:

9. *Select from the menu "Steps in configuring your computer"*
   *"Step 3: View or edit details" and*
   *"Step 4: Examine your required switches"*
   *to check all the settings.*
10. *Select "Step 5: Save and exit" and press [RETURN].*

    The following screen appears:




11. *Select "Save the configuration and restart the computer".*
12. *Press [RETURN].*
13. *Press [RETURN] when the "Reboot" screen appears.*

*Set switches and jumpers, initialize software*

After the boards have been entered in the slot screen, the ISA board switches and jumpers are set and the software initialization statements added.

If your configuration contains ISA boards, you should use the options Step 3 and Step 4 to set the correct switch and jumper settings and to check the software initialization statements (if included) for these boards.

*Print settings*

Use the function F7 = Print (print configuration) in Step 4 to print out the switch and jumper settings before you switch off your system.

*View statements*

Use the function F7 = Advanced in Step 3 to view all software initialization statements (e.g. a "DEVICE" statement) which must be made in the AUTOEXEC.BAT or CONFIG.SYS files.

*Complete the configuration*

Exit the configuration program using "Step 5: Save and exit" (return to MS-DOS). Complete the configuration as follows:

1. *Edit the AUTOEXEC.BAT and/or CONFIG.SYS to add any software initialization statements required.*
2. *Switch off your computer (power down).*
3. *Set the switches and jumpers on uninstalled ISA boards and install them in the slots you have specified in your configuration.*
4. *Remove any installed ISA boards from the system and set the necessary switches and jumpers.*
5. *Reinstall the boards.*

*Reboot the system*

6. *Switch your computer on again.*

The configuration information data in the non-volatile CMOS RAM are checked during booting and the different boards are automatically initialized as required.

## 9.3 Additional Functions

### 9.3.1 Manual Configuration

Manual configuration is generally only necessary if the automatic configuration (as described in the previous section) was not successful.

In section 9.2 the EISA configuration utility configured the system automatically. However, you can also select resources manually.

*Activate/deactivate functions*

1. *Use the options F6 and F7 in "Step 3 View or edit details" to specify which functions on a board should be activated or deactivated.*

For example, you might want to configure a system manually to

- enable or disable printer or communication ports,
- indicate the size of the memory chips installed, or
- specify the amount of memory installed on system or adapter boards.

*Begin manual configuration*

2. *Begin manual configuration according to the instructions in paragraph 3:*

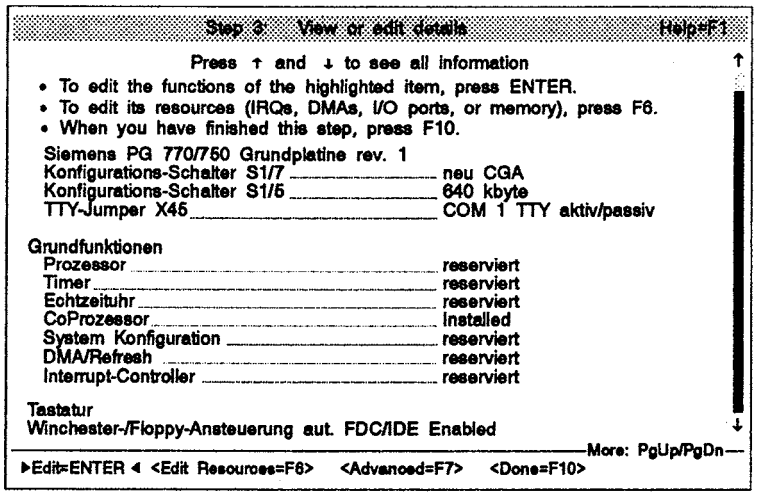
- physically install all EISA boards,
- copy the configuration files required and
- call the EISA configuration program.

3. *Select "Configure computer" from the main menu and press [RETURN].*

   The "Steps in configuring your computer" screen appears.

4. *Select "Step 3: View or edit details" and press [RETURN].*

   A screen like the following appears:




*Manual changes*

5. *Move from field to field with the help of the cursor keys. Press [RETURN] or [ENTER] and you switch to the edit mode, in which you can select between preset choices. With F6 you enter an edit mode in which you can select further options in the fields marked with +/- using the "+" and "-" keys.*

*Confirm changes*

6. *Press F10 to confirm the changes you have made or select Cancel with [ESC] to exit the screen without making the changes.*

7. *Repeat this procedure for any board in the configuration whose resources you want to change.*

**Note**

Use the "PgUp" and "PgDn" keys on the numeric keypad to move quickly to the choices for the next or previous installed board.

## 9.4 Board Conflicts

### 9.4.1 Missing ISA Configuration (.CFG) Files

Conflicts can arise if you are missing any of the configuration files for ISA adapters. Use the adapter's manual to supply the missing configuration data.

*Define the board*

1. *Start by selecting "Step 2: Add or remove boards", press [INSERT] (= Add) and select the Generic ISA Adapter from the list of boards.*
2. *Select a free slot to install the board and complete the step with F10.*

*Edit function*

3. *Now switch to "Step 3: View or edit details". A list of all resources for each board installed appears on the screen.*
4. *You are shown four fields in which you can enter resources occupied by the board. Select the required field with the cursor keys and press [RETURN].*

   The following function screen appears if you select the ISA I/O port:

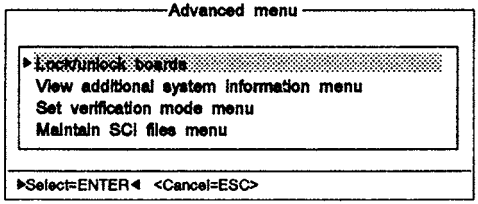
```
ISA I/O Port Resource Allocation
Consult the board manufacturer's documentation for specific
information concerning I/O port allocation.

    ( ) No I/O Ports Required
    ( ) Range of 8 Port Addresses Required
    ( ) Range of 16 Port Addresses Required
    ( ) Range of 32 Port Addresses Required

To edit the resources (IRQs, DMAs, I/O ports, or memory) of the
highlighted setting, press F6.

▶Done=F10◀  <Edit Resources=F6>  <Cancel=ESC>
```

5. *Select the respective field using the cursor keys, then*
6. *Select F6 to edit the resources for the board. Follow the manufacturer's instructions.*
7. *After you have finished editing, press F10.*
8. *Repeat steps 5 to 8 to set the interrupt channels (IRQ), the DMA channels and the required memory address area in the same way as for the I/O addresses.*

*Lock generic adapter board*

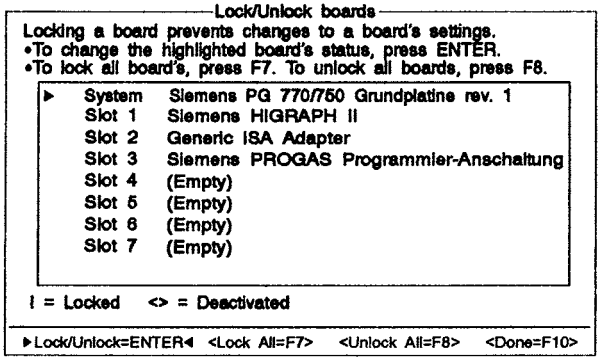
9. *Once you have edited the functions and resources of the board, press F7.*

   The "Advanced menu" appears:




10. *Select "Lock/unlock boards" and press [RETURN].*

    A screen appears similar to the following:




11. *Select the Generic ISA Adapter and press [RETURN]. An exclamation mark next to the board indicates that it is locked.*

**Note**

The Generic ISA Adapter board must be locked to reserve the system resources selected and to prevent the utility from using them to resolve conflicts.

*12. Select "Done" with [F10].*

The "Advanced menu" appears.

*13. Select "Done" with [F10].*

The "Step 3: View or edit details" screen appears.

*14. Select "Cancel" with [ESC].*

The "Steps in configuring your computer" screen appears.

*Examine switches*

*15. Select "Step 4: Examine required switches" and press [RETURN].*

*16. Look out for the boards marked with an arrow on this screen. The arrow indicates that the boards in your PG may have jumpers and switches defined which need to be physically checked, or that there is a software statement with additional information regarding the board.*

## 9.4.2 Resolving Configuration Conflicts

Any conflicting boards are automatically deactivated and removed from the configuration.

However, you may need to resolve conflicts that arise when two boards try to share the resources that cannot be shared, e.g. an address area and a DMA channel or an interrupt. Conflict arises most often when the system attempts to configure two boards that were never intended to function together in the same system.

*Deactivate automatically*

A conflicting board is displayed with a "<>" in the status column next to the name of the board in "Step 4: Examine required switches"; "<>" means that the board is deactivated. In the case of two identical boards, the one in the higher numbered slot is deactivated.

*System board conflicts*

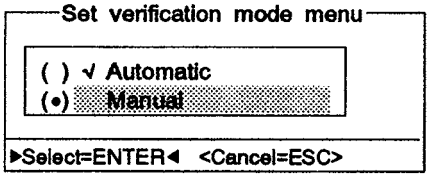
Because the system board is critical to the operation of the system, it can never be deactivated. If the system board is faulty, the EISA configuration program refuses to install it, and the configuration is aborted.

*Adapter board conflicts*

Conflicts between adapter boards must be resolved manually.

1. *Go to the "Step 3" menu, select the "Advanced menu" with F7 and activate "Set verification mode".*

   The following screen appears:



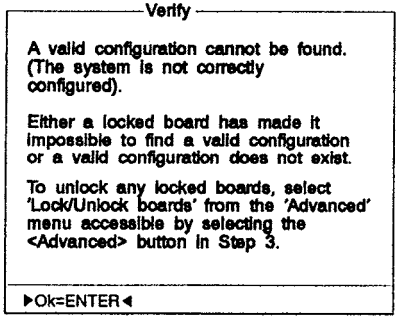

*Resolve conflict manually*

2. *Select "Manual" and press [RETURN].*

3. *By pressing [RETURN] again you arrive at the "Advanced" menu, then press [ESC] to quit the "Advanced menu".*

4. *When "Step 3: View or edit details" appears, select "Verify" with F8.*

   The following screen appears:




5. *Go back to Step 3. Functions with conflicts are indicated by an asterisk.*

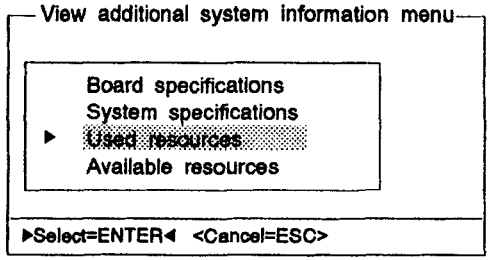
6. *Select "Advanced" with F7 if you want to know which resources are involved in conflicts before you make any changes.*

9

*Resource conflicts*

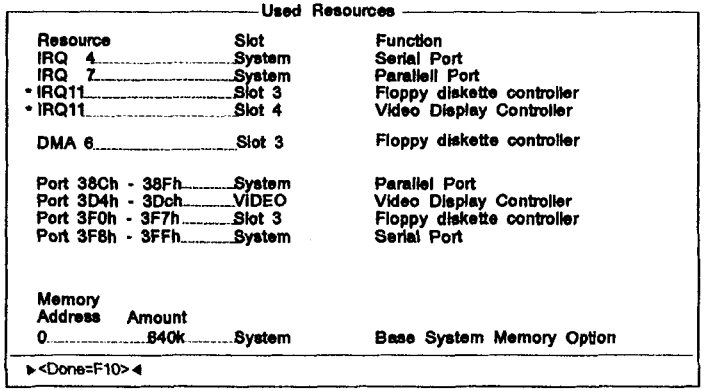
7. *When the "Advanced menu" appears, select the "View additional system information" menu and press [RETURN].*

   The following screen appears:




8. *Select "Used Resources" and press [RETURN].*

   A screen appears similar to the following:




9. *Look carefully at the screen to find the conflicting resources. These are marked with an asterisk "*". In the above example the IRQ 11 is being used by a floppy diskette controller in slot 3 and a video display controller in slot 4.*

10. *Press F10.*

*Available resources*

*11. When the "View additional system information menu" appears, select "Available Resources" and press [RETURN].*

The following screen then appears:

Available Resources

| IRQs | DMAs | ISA I/O Ports | Memory Amount | Memory Address |
|---|---|---|---|---|
| 3 | 0 | 100h - 3BBh | 64k | 0A0000h |
| 5 | 1 | 3C0h - 3F7h | 64k | 0B0000h |
| 6 | 2 | | 64k | 0C0000h |
| 2(9) | 3 | | 56k | 0D0000h |
| 10 | 5 | | 15m | 1M |
| 12 | 6 | | | |
| 14 | 7 | | | |
| 15 | | | | |

▶<Done=F10>◀

You can now determine which resources are available for the conflicting boards.

*12. Press F10 after you have read the information.*

*13. Press [ESC] when the "View additional system information menu" screen appears.*

*Exchange resources*

*14. When the "Step 3: View or edit details" screen appears, exchange the resource causing the conflict on a board for an available resource. When the conflict is resolved, the asterisks on the screen "Step 3: View or edit details" disappear.*

*15. Press F8 = Verify.*

The following screen appears:

Verify

System has been correctly configured.

▶Ok=ENTER◀

9

Occasionally the system will be unable to resolve a conflict, and configuration under those conditions will be impossible without removing the board from the configuration.

**Further information**

You will find further information in the EISA Specification.

This can be obtained from:

BCPR Services, inc.
A Delaware Corporation
1400 L Street, N.W., Suite 700
Washington D.C. 20005-3502
U.S.A.
(202) 371-5921

# Appendix A: Connecting Cables

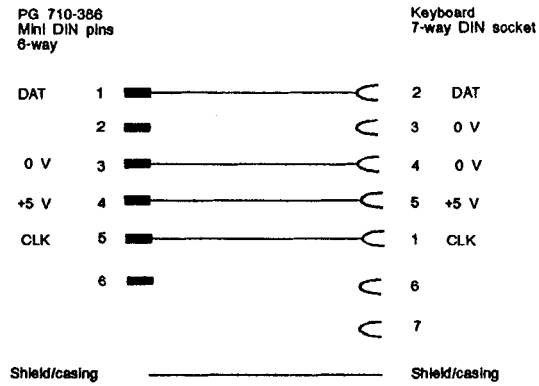
# 10

In Appendix A you will find more detailed information on most of the connecting cables introduced in chapters 4 and 5.

## 10.1 Connecting the PG to External Devices

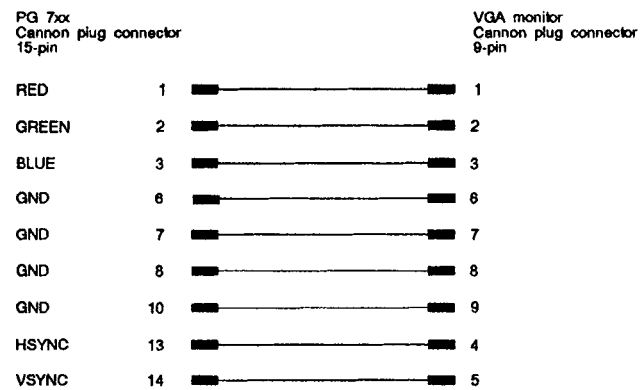
*Keyboard adapter for PG 710-386 (option)*

To connect an external keyboard to the PG 710-386, an optional adapter is available as an option.



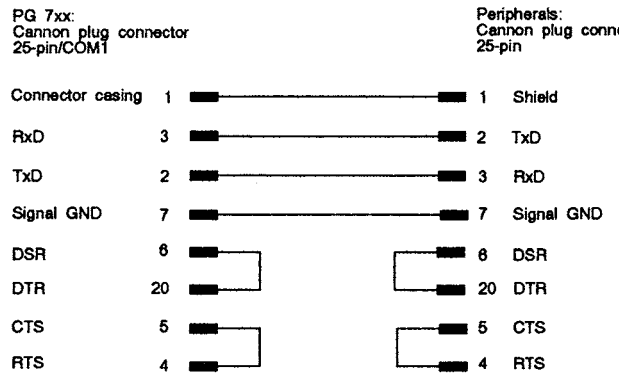

*Monitor cable*

The monitor cable is part of the scope of supply for the monitor. The connection is via a socket on the backplane.



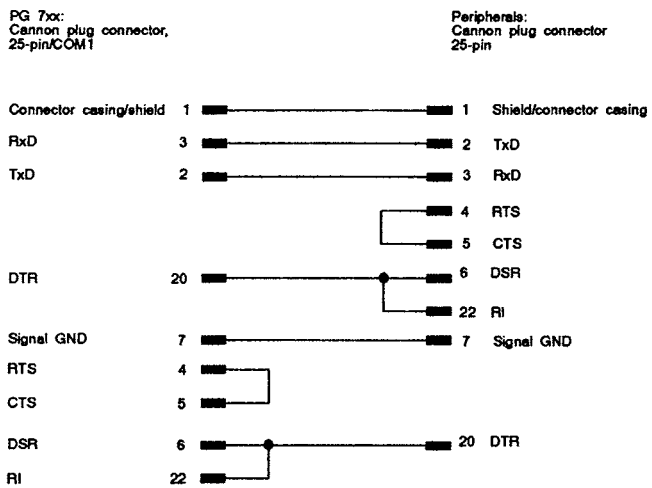
*Connection to the serial port*

Example of a simple connection from the I/O to the V24/modem port on the PG (xon, xoff protocol):




*V.24 modem*

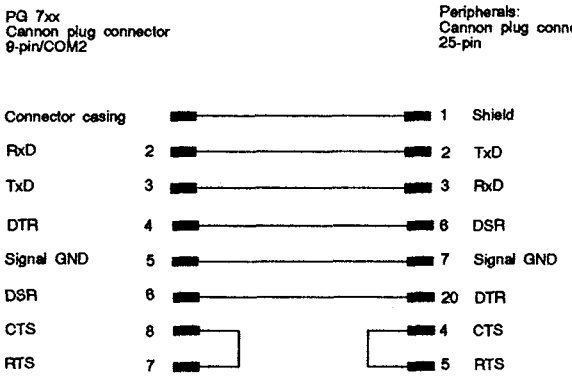
Example of a simple null modem cable connection to the V24/modem port:




10

## COM 2

Example of a simple cable connection to the COM 2 serial port of the PG:

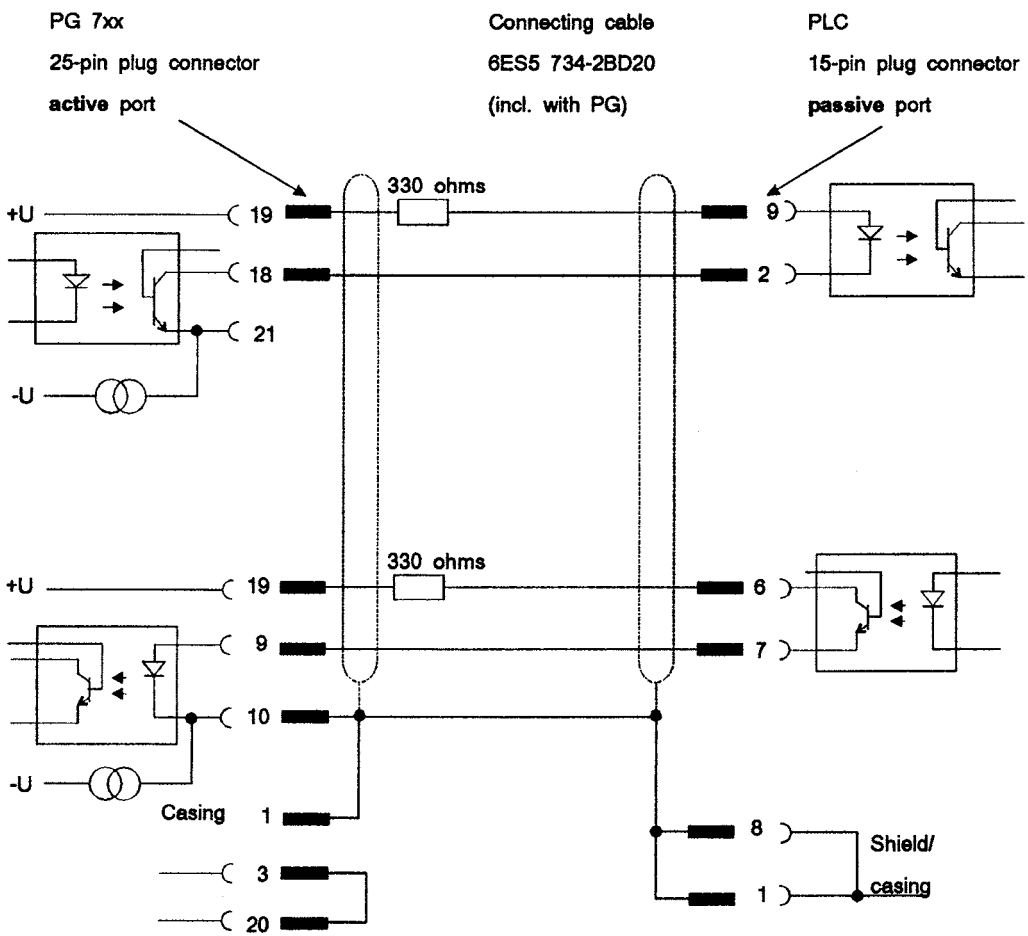


## 10.2 Connecting the PG to a Programmable Controller

*Standard cable*

You can use the standard connecting cable (supplied with your PG) to connect your PG to a SIMATIC programmable controller.

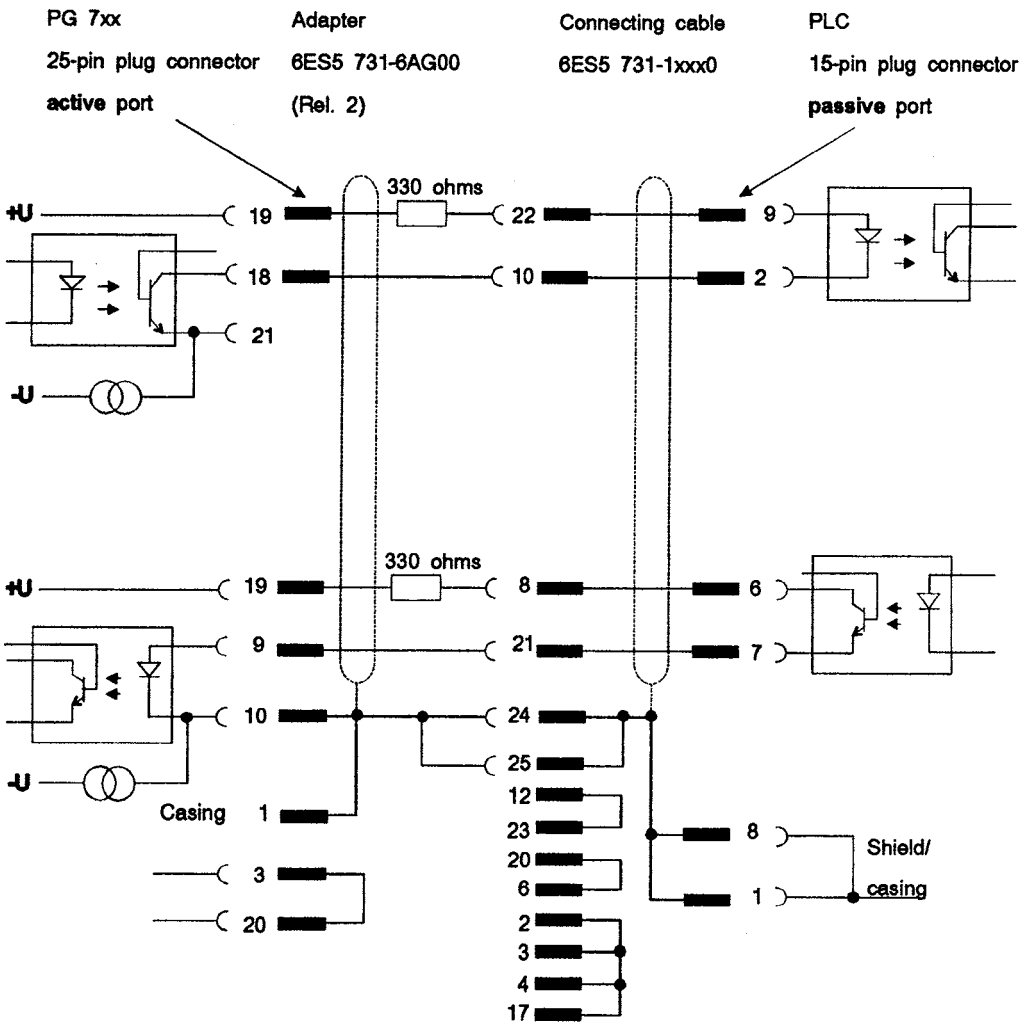
Please read the notes in chapters 5 and 6 on active/passive switching of the TTY/COM 1 port.



*Adapter for linking to PG 6xx*

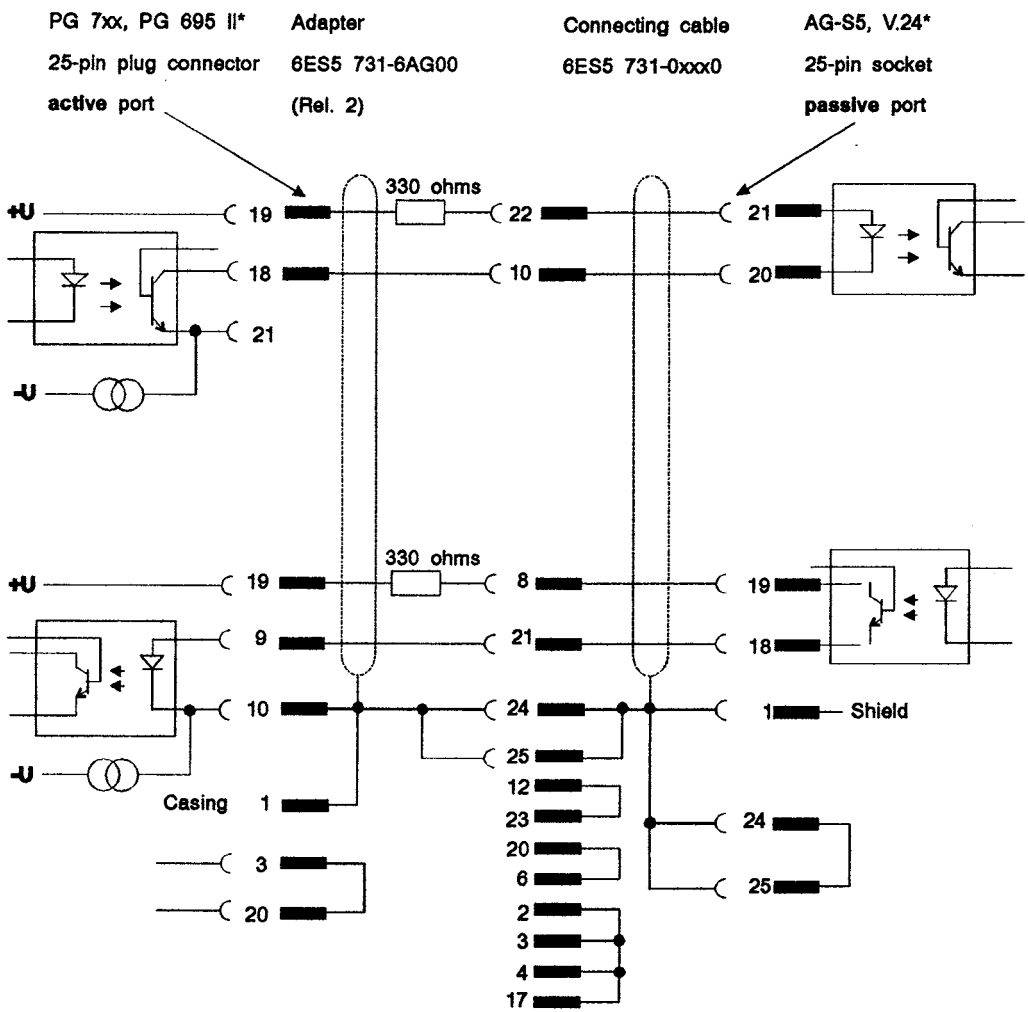
If you want to connect your PG to a PLC via the standard connecting cable for a PG 6xx, you will need an adapter.

Please read the notes in chapters 5 and 6 on active/passive switching of the TTY/COM 1 port.



*Connecting cable with 25-pin socket*

Please read the notes in chapters 5 and 6 on active/passive switching of the TTY/COM 1 port.

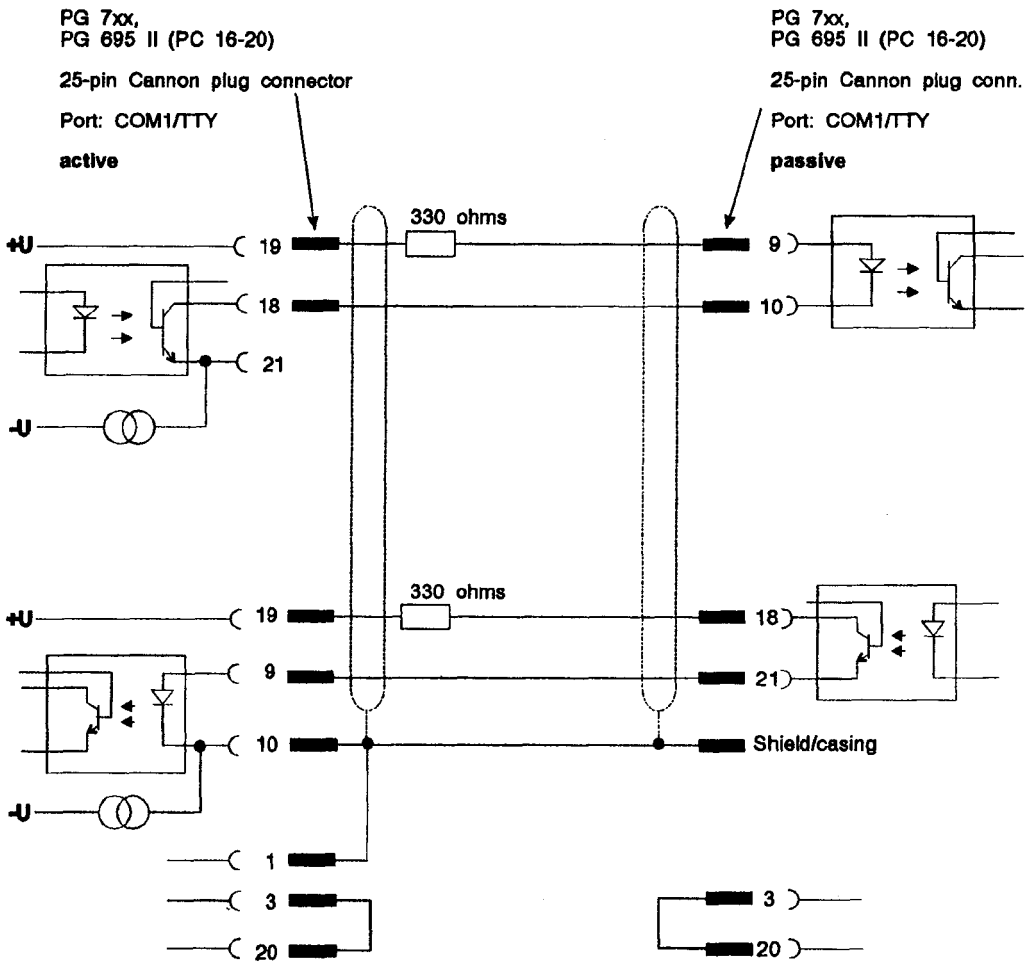



* Label on the casing of the connector

## 10.3 Connecting the PG to Other Programmers

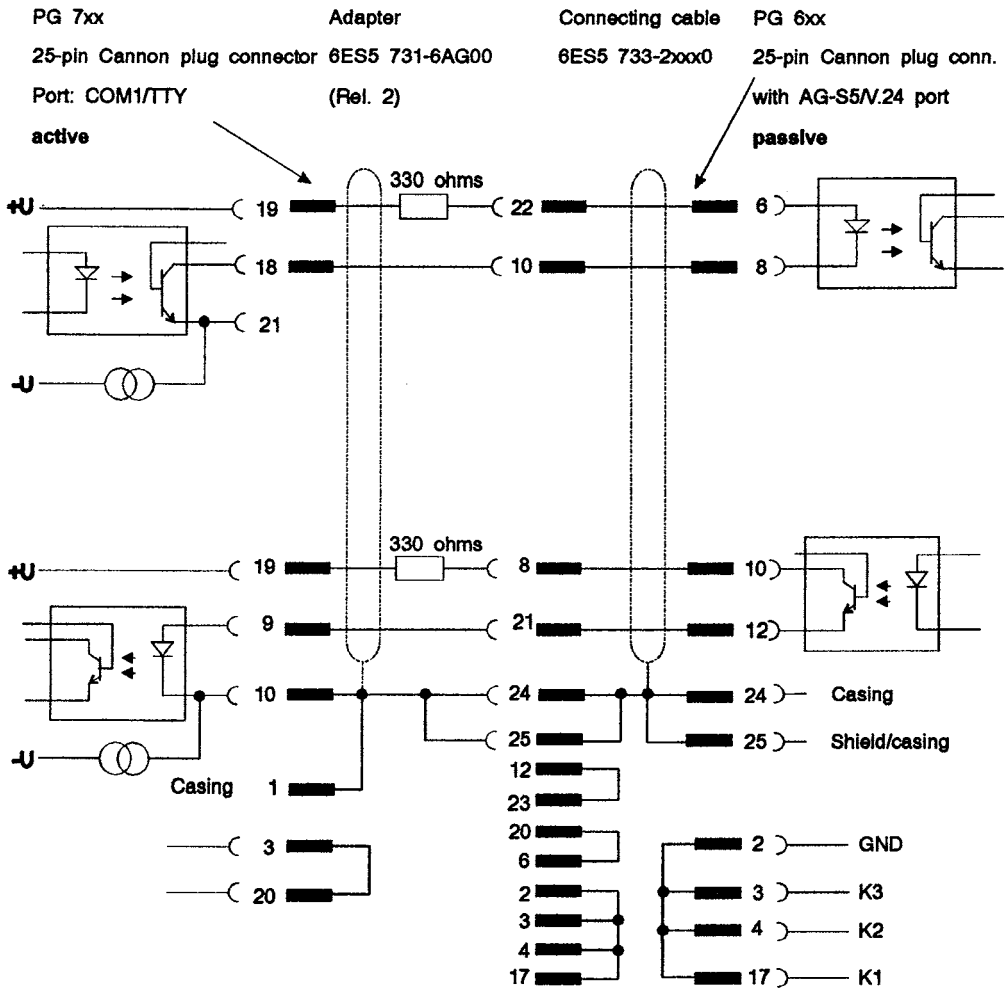
*Connection via TTY/COM 1*

You can connect your PG to other PGs via the TTY/COM 1 port. No order number is available for this cable. Please read the notes in chapters 5 and 6 on active/passive switching of the TTY/COM 1 port.



*Connection to AG-S5/V.24 and COM 1/TTY*

If you want to connect your PG to the AG-S5/V.24 port of a PG 6xx, you will need an adapter. The PG must be the active programmer in this case. Please read the notes in chapters 5 and 6 on active/passive switching of the TTY/COM 1 port.




10

# Appendix B: Glossary

# 11

Appendix B contains a glossary in which you will find a list of the terminology used in conjunction with the Siemens range of programmers and a brief explanation of each of the terms.

# A

**Access protection**

In a multi-user system it is clearly defined who can have access to which files and how (read, write, delete, execute). Every user is allocated a user name, a password, a user ID, a group ID, a "home" directory and access rights in the network by the system manager. In his "home" directory, a user has all access rights to his files.

**Acoustic signals**

When you switch on your PG, the BIOS firmware performs a self-test. If a serious fault occurs at the beginning of this self-test, a series of acoustic signals (beeps) are sounded to enable you to identify the fault. In some cases, an error message will be displayed on the screen in addition to the acoustic signals.

**Application**

An application is a program which lies directly on the operating system. The operator (user) is able to work with this program. Applications on your PG are the STEP 5 Basic Package, GRAPH 5 etc.

**ASCII editor**

With an ASCII editor you can process (i.e. edit) text files which are stored in ASCII code (American Standard Code of Information Interchange).

# B

**Base memory**

The base memory is a part of the main memory. It is 640 Kbytes for all programmers. This size is entered in the SETUP menu under the entry "Base Memory" and this entry is not changed even if the memory is extended. The operating system, drivers, utilities and network software are stored in the base memory.

**Basic Package STEP 5**

This is a software package which represents the basis for all other STEP 5 software packages. With the programmer (PG) this package is used to program PLCs. The language used is known as → STEP 5.

**Boot diskette** — A diskette which includes a boot sector, enabling it to load the operating system.

**Booting** — A loading operation which transfers the operating system to the system memory.

## C

**CGA** — Resolution of 640 x 200 pixels.

**Click** — Pressing and immediately releasing the left mouse button; this selects objects or commands.

**COM 1 port** — The COM 1 port is a serial V24/modem interface. This interface is suitable for asynchronous data transmission. It can also be used to connect printers with a serial interface.

**COM 2 port** — The COM 2 port is a serial → V.24 interface which can be used to connect a → mouse or a printer.

**Configuration files** — These are files which define the configuration after booting. These files are e.g. CONFIG.BAT, CONFIG.SYS and AUTOEXEC.BAT.

**Configuration software** — The configuration software brings the device configuration up to date when modules are installed. This is done either by copying the configuration files supplied with the module or by manual configuration using the configuration utility.

**Coprocessor**

In the SETUP menu under "Coprocessor" the system indicates automatically whether the 80387 arithmetic processor is present or absent. The arithmetic processor allows faster and more accurate calculation of arithmetic, logarithmic and trigonometric operations.

**CPU**

→ Microprocessor

**Cursor**

Collective term for mouse pointer and → text cursor.

## D

**Device configuration**

The device configuration of a programmer contains information on the hardware and options of the PG, such as;
- memory configuration
- drive types
- monitor
- network address etc.

The data are stored in a configuration file and enable the operating system to load the correct device drivers and assign the correct device parameters.

If changes are made to the hardware configuration, the user can change the entries in the configuration file using the → SETUP program.

**Directory**

A directory is a list where the names of and references to files and to subdirectories are stored.

**Diskette**

The diskette (floppy disk) is an external direct access memory on which all types of files and programs can be stored. The storage medium is a round magnetic disk in a plastic cover to protect it from getting scratched.

**Display** — Communication between the PG and the user runs via the display (screen). There are a number of types of display; the type you are using must be entered in the device configuration (SETUP).

**Double-click** — Pressing and releasing the left mouse button very quickly twice in succession without moving the mouse. This action is usually used to open an object.

**Drives** — The programmers are usually equipped with one hard disk drive and one or two floppy disk drives.

**Drivers** — These are programs which are part of the operating system. They adapt the data from user programs to the specific formats required by the external devices such as hard disk, printers and monitors.

**Drop-down menu** — In graphics-supported programs (e.g. PlantTop) a menu line is positioned on the top edge of the screen. The menu titles contained in this line can be set either as drop-down or pull-down menus. Drop-down menus "roll" down as soon as the mouse pointer passes over a menu title. Pull-down menus only "roll" down when the menu title is clicked on. Different functions can then be called from these menus by moving the mouse and clicking on an item in a menu.



## E

**Editing** — Processing texts and/or graphics using an editor.

**Editor** — The component of a data processing system for the processing of texts and/or graphics in a dialog. Texts can be figures, programs, correspondence, tables, documents and any other types of data.

**EGA**

(Enhanced Graphics Adapter)
Graphics interface module which considerably improves the resolution of graphics.

**EISA bus system**

The EISA bus system has a bus width of 32 bits and can address 4 Gbytes of memory.

**EISA module**

EISA (Extended Industry Standard Architecture) is the standard for 32-bit computers.

**Emulator**

A microprogram for the STEP 5 software for adaptation to the operating system MS-DOS.

**EPROM/EEPROM submodules**

These are printed circuit boards which can be plugged in, with ROM memory submodules. S5 user programs can be stored on them. These programmed submodules are then plugged in specially designed slots in the programmable controller.

**Extended memory**

The extended memory is the memory which lies beyond the 1 Mbyte memory limit. The size of the extended memory must be entered in the SETUP menu and is compared with the existing extended memory.
A memory extension can be installed in a PG to increase the size of the memory. The entry in the SETUP must, however, be changed if a memory extension is added.

## F

**Fiber optic cable**

This is a medium for transmitting electronic data on the basis of fiberglass cables. Fiber optic cables are interference-free and allow extremely fast data transmission using modulated light.

**File**

A file is the collection of data under one name.

**Floppy disk drive**

The floppy disk drive is used to store programs and data on diskette (write access) or to load from diskette to the computer (read access).

**Formatting**

Formatting divides the memory area on a magnetic data medium into tracks and sectors. Formatting deletes all the data on a data medium. Every data medium must be formatted before it is used for the first time.

**Function keys**

Function keys can be divided into two different types: the normal function keys which are assigned a particular function of the computer (e.g. delete key), and programmable function keys (softkeys).

## G

**GSP part**

(Graphics System Processor)
Screen graphics controller.

## H

**Hard copy**

The output of the complete contents of the screen on a printer is called a hard copy.

**Hard disk drive**

Hard disk drives (Winchester drives) are a form of magnetic disk memory where the magnetic disks are permanently built into the drive.

## I

**Interface**

a) An interface is the connection between individual hardware elements such as PLC, PG, printer or monitor via physical connections (cables).

b) An interface is also the connection between different programs, to enable them to work together.

**Interface module**

Module which controls and extends the hardware periphery.

**Interrupt**

The interruption of program processing in the processor of a programmable controller by an interrupt event.

**I/O modules**

Input/output modules

## J

**Jokers**

→ Wildcards

# K

**Keyboard**

The keyboard is the collection of keys which are used to input data, text, characters, letters, numbers and special characters and control commands in a computer. The keyboard forms the input interface between the user and the computer.

# L

**Logging off**

The process of interrupting the logical connection for a network user between the PG and the → server is known as logging off. The user can then no longer access the → drives and the printer of the server.

**Logging on**

A user must log on in a network in order to establish the logical connection to another computer within that network.

# M

**Main memory**

The main memory is the complete physical memory of the CPU in a computer.

**Microprocessor**

This term describes a complete central processing unit (CPU) as regards its functions, but without any register array in the form of a chip. In the programmers the 80x86 microprocessors made by Intel are used.

**Modem**

Modulator and demodulator of a signal transmission facility. It converts the digital pulses from a computer into analog signals (and vice versa).

**Module**

Modules are boards (printed circuit boards) which can be slotted into a programmable controller or programmer. They are available as e.g. central modules, interface modules or as memory modules.

**Monitor**

The monitor or screen is a visual display unit via which the computer communicates with the user. Because there are different types of monitor, the type in use in your configuration must be entered in the device configuration (SETUP).

**Mother board**

The mother board is the core of the programmer. From here data are processed and stored, interfaces and device peripherals are controlled and managed. The most important components on the mother board are:

- the central processor (CPU),
- RAM memory and
- interfaces for I/O devices and interface modules.

**Mouse**

The mouse is an input device, with which the user inputs coordinates (x,y). By moving the mouse, the mouse pointer can be moved at will around the screen. By pressing the left mouse button, the position is marked. The other mouse keys may have different assignments according to the application. With the mouse, objects can be selected, menus processed and functions started.

**Mouse pointer**

The mouse pointer is a control. It is moved across the worktop (screen) by means of the mouse. The mouse pointer selects, for example, objects which are to be processed.

**MS-DOS** (Microsoft Disk Operating System) is one of the standard operating systems for personal computers. It is a single user system and is supplied installed on all our PGs.

**Multitasking operating system** An operating system (e.g. S5-DOS/MT on the basis of FlexOS) in which a user can have several applications running at once in real time.

## N

**Network** Link between computers and end devices (PC, PG, PLC) by means of interface modules, physical cables and the corresponding software to allow data exchange between the devices.

**Network address** → Node address

**Network nodes** → Nodes

**Nodes** Nodes are participants which are connected to a network, e.g. server, requester, spooler. They must be easy to identify by an unambiguous node address.

**Node address** Each participant (node) in a network is allocated a node address (network address), e.g. 01::, 07::. The colon is included as part of the node address.

# O

**Operating system**

Collective term for all programs which, in conjunction with the
→ hardware, control and monitor
- the execution of the user programs,
- the distribution of the operational equipment among the individual user programs
- and the maintenance of the operating mode.

# P

**Parallel interface**

Information is transmitted a byte at a time via a parallel interface (port). This means that the transmission rate is very fast. The programmers have one parallel interface (LPT 1).

**Partition**

A partition is a formatted area on a storage medium.

**Password**

→ Access protection

**PC**

Personal computer

**PG**

Programmer

**PG LINK**

Linking two programmers directly via a special connecting cable is known as PG LINK.

**PG-NET**

A software package for SIMATIC S5 programmers; it allows programmers access to the operational equipment of the server via the networks SINEC H1 (ETHERNET) or ARCNET.

**PLC** → Programmable controller

**Pointer** → Mouse pointer

**Printer** Output device for data, texts and graphics. Several printers are defined as standard printers for PGs. These are, for example, the Siemens printers DR 201, DR 202 and DR 203 and the PT10 Laserjet.

**Programmable controller** The programmable logical controllers (PLC) of the SIMATIC S5 system consist of one central controller, one or more → CPUs and various I/O modules.

**Programming** For SIMATIC S5 the term programming means generating a STEP 5 program using the STEP 5 Basic Package.

**P Tools** These are utilities which allow STEP 5 user programs/files, which were generated under S5-DOS/MT (or S5-DOS/ST), to be copied to the PCP/M partition and vice versa.

**Pull-down menu** → Drop-down menu

## R

**RAM** RAM (Random Access Memory) is a read/write memory in which every memory location can be addressed individually and its contents be changed. RAM is used to store data and programs.

**Remote device** Remote devices are devices, e.g. printers or computers, which can be accessed via a network. They differ from local devices in the network address which must be entered when the device is installed.

**ROM**

ROM (**R**ead **O**nly **M**emory) is a memory in which every memory location can be addressed individually. The stored programs and data have been programmed at the factory before delivery and cannot be changed by the user.

## S

**Serial interface**

Data is transmitted one bit at a time via a serial interface (port), therefore serial interfaces are slower than parallel interfaces.

**Server**

The server is a node in the network which processes the requests from other nodes (requesters) and provides specific services for these nodes, e.g. storing data or printing files.

**SETUP**

This is a program for transferring information about the device configuration (i.e. the configuration of the PG hardware) to the battery-backed memory. The device configuration of the PG is preset with defaults. Changes must therefore be entered in the SETUP if a memory extension, modules, a new drive or a coprocessor are added to the hardware configuration or if the ARCNET interface is to be activated.

**Sliders**

Sliders are input/output elements on a window-oriented user interface. The sliders are positioned at the bottom and on the right-hand side of each window. You can use them to move the contents of the window if it is not possible to see all icons and objects in the window simultaneously. From the relationship of the white slider to the black scroll bar it is possible to see what proportion of the contents of the window is displayed and which part this is.

**Software**

The collective term for all programs which are used on a computer. The operating system, the firmware (resident parts of the operating system), the user programs and also any online documentation belonging to the programs are all part of the concept "software".

**STEP 5**

The programming language STEP 5 with the types of representation ladder diagram, control system flowchart and statement list is part of the STEP 5 Basic Package. Programs can be generated offline at the PG and transferred to the PLC memory online and tested. User programs can be transferred to EPROM/EEPROM submodules via an EPROM programming interface module. Programs and plant statuses can be documented via the printer and the user programs stored on diskette or hard disk.

**Super user**

→ System manager

**System manager**

The system manager controls the write protection of files and the allocation of passwords in a multi-user system. He enters registered users in the user table and allocates every user his own working directory.

# T

**Text cursor**

The cursor shows where text may be entered, e.g. in text editors and in dialog windows. In many applications the position of the cursor can be changed by moving and clicking the mouse pointer or with the cursor keys.

**Title bar**

The title bar is found across the top edge of each window. It informs you of the path of the drives and directories opened and of the files which can be selected. In this line you can specify which file names or which types of files (according to their extension) are to be displayed. The title bar is also used to move the position of the window.

**Token**

The token is used to control access to the network in a computer bus system in the form of a ring or a tree. In ARCNET a token is passed from node to node. If one node has possession of the token, it has active control of the network and can transmit information while the other nodes have to listen and receive.

**Top**

By clicking on a any point within a window, this window is activated and can be processed.

# U

**User interface**

A user interface is the collective term for the points where the user comes in direct contact with the system he is working with (i.e. an interface between user and computer). This means specifically the operation of the computer using commands which are displayed on the screen.

**User level**

An area on diskette or hard disk under the operating system PCP/M-86.

**User program**

A collection of all the instructions and arrangements for signal processing, by which a system (or process) is controlled or influenced.

**Utility**

Utilities belong to the operating system of the computer. They mainly serve to make working with the computer easier, faster or more comfortable for the user, e.g. formatting diskettes, copying files, outputting the contents of directories/disk drives.

## V

**V.24 interface**

The V.24 interface is a standardized interface for data transmission. Printers, modems and other hardware modules can be connected to a V.24 interface.

**VGA**

(Video Graphics Array)
Color graphics control mode

**Virtual devices**

Devices which are not physically connected to the computer (e.g. printers), but which can be addressed via the network.

**Virtual drive**

A part of the memory of a computer (RAM) which can be compared to a very fast disk. Files can be saved on it as on a physical hard disk. Any data stored on a virtual drive are lost when the computer is switched off or the operating system restarted. The virtual drive is also described as a RAM drive.

→ Virtual devices

# W

**Warm restart**

A warm start is a restart after a program has been aborted. The operating system is reloaded and restarted. A warm start is performed with the key combination CTRL+ ALT+ DEL.

**Wildcards**

Wildcards or jokers are: ? and *. These characters can be used to represent one or more characters in a file name, in order to list a particular group of files. The question mark ? stands for one character at that position in a file name, the asterisk * stands for any number of characters at that position in a file name.

**Window**

A window is a square field on the screen, in which related information has been collected. In PlantTop, for example, there are windows for the device park, for drive contents or for directories. Their contents is displayed in the form of icons or in text form. The windows can be moved around the screen and their size can be set as required. Only the active window can be worked on (→ Top).

**Working directory**

In a multiuser system each user is allocated a working directory by the → system manager, in which only that user can work. User access to → directories and → files is controlled by directory and file attributes, the group ID and the respective user access rights which the system manager has allocated to each user.

**Working memory**

The memory in which a program is stored which can be processed. The working memory is a direct access memory.

**Write protection**

a) Write protection for files; this type of write protection is stored in the computer and is allocated by the system manager.

b) Diskette write protection; for 5 1/4" diskettes by blanking out the hole on the right-hand edge with a sticky label, for 3 1/2" diskettes or EOD disks by opening the write protection hole.

# Appendix C: Index

# 12

# Index


## A

Acoustic signals ..... 2-10, 7-4
Adapter ..... 5-6
Adapter board
  lock ..... 9-17
ARCNET ..... 5-2, 6-21
  address area ..... 5-4
  network ..... 5-2
  node number ..... 5-3, 6-21
  response time ..... 5-3, 6-21
AUTOEXEC.BAT ..... 9-6, 9-13

## B

Backspace key ..... 3-11
Backup battery ..... 6-12
Battery ..... 6-12
Board
  add ..... 9-9
  conflicts ..... 9-8
  select ..... 9-11
Board conflicts ..... 9-16
Brightness control ..... 3-3
Broadcast messages ..... 5-3

## C

Central processor ..... 8-2
CFG files ..... 9-4, 9-10, 9-16
Closing the PG ..... 6-16
Color graphics interface module ..... 3-9
COM 1 port ..... 2-9, 5-5, 6-10
COM 2 port ..... 2-9
Communication ports ..... 9-14
CONFIG.SYS ..... 9-6, 9-13
Configuration conflicts ..... 9-18
Configuration files ..... 9-4
Configuration information ..... 9-3
Configuration utility, EISA ..... 9-4
Conflicts
  adapter board ..... 9-19
  resolve manually ..... 9-19
  system board ..... 9-18
Connecting cable
  to PG ..... 10-8 - 10-9
  to PLC ..... 10-5, 10-7
  to printer ..... 10-3 - 10-4
Connecting in series ..... 5-8
Connections
  ARCNET ..... 5-2
  external monitor ..... 2-9, 4-2
  mouse ..... 2-9
  power supply ..... 2-7
  printer ..... 2-9, 4-3, 10-3
  SIMATIC S5 PLCs ..... 2-9
CPGRAPH ..... 9-4
CPU speed ..... 6-20
Cursor
  control keys ..... 3-13

## D

Deactivate board ..... 9-18
DEFAULT.SCI ..... 9-4
Device configuration ..... 6-22
DF 20G/AT ..... 9-4
Diskette
  locate ..... 9-10
Drives ..... 3-5, 8-3
  dismantling ..... 6-9
  floppy ..... 3-6
  hard disk ..... 3-7, 6-19
  installing ..... 6-9

## E

EISA adapter cards ..... 9-2
EISA boards ..... 9-8
  install ..... 9-6
EISA CMOS data ..... 9-5

EISA CMOS RAM ..... 9-2
EISA configuration
complete ..... 9-13
manual ..... 9-14
EISA configuration program ..... 9-2
EISA HELP ..... 9-3
EISA main menu ..... 9-3
EISA system boards ..... 9-2
EISA utility
save results ..... 9-12
EPROM programming
submodule ..... 3-3, 3-20
ESD guidelines ..... 6-2
Ethernet ..... 5-11
Ethernet interface module ..... 9-4
Expanded memory ..... 6-8, 9-4

## F

FASTPRINT ..... 4-5
Fiber optic cable ..... 5-2, 5-4
Fiber optic module ..... 5-2
Floppy disk drive ..... 3-6
Function keys ..... 3-15
Functional units ..... 6-5
Functions
activate ..... 9-14
deactivate ..... 9-14

## G

GSP ..... 3-9

## H

Handles ..... 3-4
Hard disk drive ..... 3-7, 6-19
Hardware test, internal ..... 2-10
HIGRAPH II ..... 9-4
Humidity ..... 8-4

## I

I/O modules ..... 6-13
Initialize software ..... 9-13
Interfaces ..... 8-3
Interrupt IRQ5 ..... 5-3
ISA adapter ..... 9-4
ISA boards ..... 9-6, 9-13
ISA cards ..... 9-2

## J

Jumper ..... 6-11
Jumper settings ..... 9-13

## K

Key combinations ..... 3-17
Keyboard ..... 3-10 - 3-11, 6-21
function keys ..... 3-15
numeric keypad ..... 3-13
removing ..... 2-4
special keys ..... 3-16
Keys
ALT GR key ..... 3-12
ALT key ..... 3-12
backspace key ..... 3-11
CTRL key ..... 3-12
enter key ..... 3-11
FC key ..... 3-12
NUM LOCK key ..... 3-13
return key ..... 3-11
TAB ..... 3-12
Keyswitch ..... 3-3

## L

LIM EMS driver ..... 5-4
Linking the programmer
connecting in series ..... 5-8
to other PGs ..... 5-7
with ARCNET ..... 5-2

with PLCs ..... 5-5
with SINEC H1 ..... 5-11
with SINEC L2 ..... 5-10
Linking your programmer ..... 5-1
Lithium battery ..... 6-12
LPT 1 port ..... 2-9, 4-3, 5-5

## M

Main memory ..... 8-2
Memory chips ..... 9-14
Memory extension ..... 6-8
Microprocessor ..... 6-7
Modules
installing ..... 6-13
Monitor ..... 3-9, 6-20, 8-3
connection ..... 4-2
demagnetize ..... 3-9
external ..... 2-9
Mother board ..... 6-6, 8-2
Mouse
cleaning roller ball ..... 3-19
connecting ..... 2-9
port ..... 2-9

## N

Network ..... 5-2 - 5-3
Network drivers ..... 5-2
Node ..... 5-2

## O

On/off switch ..... 2-8
Opening the PG ..... 6-2
Optical indicators ..... 2-10, 3-8
Overview of contents ..... 1-2

## P

Power supply
connecting ..... 2-7
installing ..... 6-11
removing ..... 6-10
Printer connection ..... 2-9
Profibus ..... 5-10
PROGAS ..... 9-4

## R

Reboot system ..... 9-13
Resources
available ..... 9-21
exchange ..... 9-21
RI specifications ..... 8-4

## S

Scope of supply ..... 2-2
SCSI host adapter ..... 9-4
SCSI host bus adapter ..... 9-4
Self-test ..... 7-4
Setting the jumpers ..... 6-11, 9-13
Setting up the PG ..... 2-3
SETUP ..... 6-17, 6-22
Shock protection plates ..... 3-4
Shock resistance ..... 8-4
SINEC H1 ..... 5-11
SINEC L2 ..... 5-10
Slot ..... 6-13, 8-2, 9-12
Slot number ..... 9-12
Slot overview ..... 9-7
Special keys ..... 3-16
FC ..... 3-16
Submodule programming interface ..3-20
Switch settings ..... 9-13
Switching on ..... 2-10
System board ..... 9-3 - 9-4
System configuration ..... 9-7
System start-up ..... 9-2
SYSTEM.SCI ..... 9-4

## T

Technical data ..... 8-2
Token ..... 5-2
Token passing ..... 5-10
TORX screw ..... 6-4
Transport ..... 3-21
  protection ..... 2-6
Troubleshooting ..... 7-2
  cause of fault ..... 7-2 - 7-3
  remedy ..... 7-2 - 7-3
TTY port
  active ..... 6-11
  passive ..... 6-11

## U

Unit
  closing ..... 6-16
  opening ..... 6-2 - 6-5, 6-7
Unpacking the PG ..... 2-2

## V

Ventilation grille ..... 3-2
VGA ..... 3-9
Voltage switchover ..... 2-7

## W

Working directory ..... 9-8

# Guidelines for Handling Electrostatically Sensitive Devices (ESD)

## 1 What is ESD?

VSLI chips (MOS technology) are used in practically all SIMATIC S5 and TELEPERM M modules. These VLSI components are, by their nature, very sensitive to overvoltage and thus to electrostatic discharge:

They are therefore defined as
"Electrostatically Sensitive Devices".

"ESD" is the abbreviation used internationally.

The following warning label on the cabinets, subracks and packing indicates that electrostatically sensitive components have been used and that the modules concerned are susceptible to touch:

ESDs can be destroyed by voltage and energy levels which are far below the level perceptible to human beings. Such voltages already occur when a component or a module is touched by a person who has not been electrostatically discharged. Components which have been subjected to such overvoltages cannot, in most cases, be immediately detected as faulty; the fault occurs only after a long period in operation.

An electrostatic discharge
- of 3500 V can be felt
- of 4500 V can be heard
- must take place at a minimum of 5000 V to be seen.

**But** just a fraction of this voltage can already damage or destroy an electronic component.

The typical data of a component can suffer due to damage, overstressing or weakening caused by electrostatic discharge; this can result in temporary fault behavior, e.g. in the case of

- temperature variations,
- mechanical shocks,
- vibrations,
- change of load.

Only the consequent use of protective equipment and careful observance of the precautions for handling such components can effectively prevent functional disturbances and failures of ESD modules.

## 2 When is a Static Charge Formed?

One can never be sure that the human body or the material and tools which one is using are not electrostatically charged.

Small charges up to 100 V are very common; these can, however, very quickly rise up to 35 000 V!

Examples of static charge:

| | | |
|---|---|---|
| – Walking on a carpet | up to | 35 000 V |
| – Walking on a PVC flooring | up to | 12 000 V |
| – Sitting on a cushioned chair | up to | 18 000 V |
| – Plastic desoldering unit | up to | 8 000 V |
| – Books etc. with a plastic binding | up to | 8 000 V |
| – Plastic bags | up to | 5 000 V |
| – Plastic coffee cup | up to | 5 000 V |

## 3 Important Protective Measures against Static Charge

- Most plastic materials are highly susceptible to static charge and must therefore be kept as far away as possible from ESDs!
- Personnel who handle ESDs, the work table and the packing must all be carefully grounded!

# 4 Handling of ESD Modules

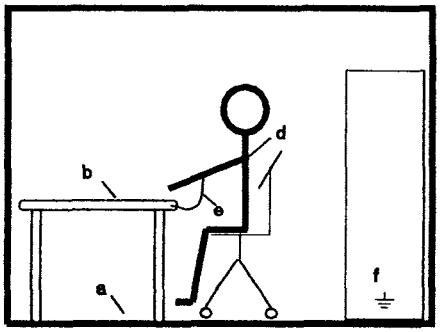
- One basic rule to be observed is that electronic modules should be touched by hand only if this is necessary for any work to be done on them. Do not touch the component pins or the conductors.
- Touch components only if
  - the person is grounded at all times by means of a wrist strap

  or
  - the person is wearing special anti-static shoes or shoes with a grounding strip.
- Before touching an electronic module, the person concerned must ensure that (s)he is not carrying any static charge. The simplest way is to touch a conductive, grounded item of equipment (e.g. a blank metallic cabinet part, water pipe, etc.) before touching the module.
- Modules should not be brought into contact with insulating materials or materials which take up a static charge, e.g. plastic foil, insulating table tops, synthetic clothing, etc.
- Modules should only be placed on conductive surfaces (table with anti-static table top, conductive foam material, anti-static plastic bag, anti-static transport container.)
- Modules should not be placed in the vicinity of visual display units, monitors or TV sets (minimum distance from screen > 10 cm).

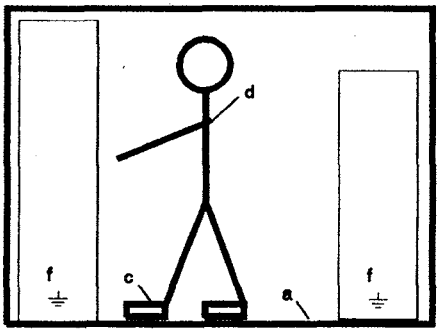
The diagram on the next page shows the required protective measures against elecrostatic discharge.

# 5 Measurements and Modification to ESD Modules

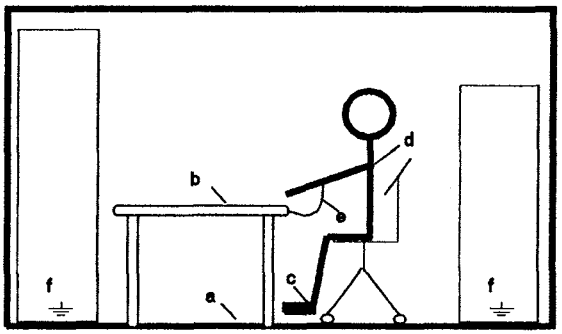
- Measurements on modules may only be carried out under the following conditions:
  - the measuring equipment is grounded (e.g. via the PE conductor of the power supply system) or
  - when electrically isolated measuring equipment is used, the probe must be discharged (e.g. by touching the metallic casing of the equipment) before beginning measurements.
- Only grounded soldering irons may be used.




Sitting position




Standing position




Standing/sitting position

a Conductive flooring
b Anti-static table
c Anti-static shoes
d Anti-static coat
e Grounding wrist strap
f Grounding connection of the cabinets

# 6 Shipping of ESD Modules

Anti-static packing material must always be used for modules and components, e.g. metalized plastic boxes, metal boxes, etc. for storing and dispatch of modules and components.

If the container itself is not conductive, the modules must be wrapped in a conductive material such as conductive foam, anti-static plastic bag, aluminium foil or paper. Normal plastic bags or foils should not be used under any circumstances.

For modules with built-in batteries ensure that the conductive packing does not touch or short-circuit the battery connections; if necessary cover the connections with insulating tape or material.