

# **miroCRYSTAL 20SD twin**

## Hardware Manual



This miro manual is printed on chlorine-free paper.

---

# **miroCRYSTAL 20SD twin Hardware Manual**

---



**miroCRYSTAL 20SD twin**

**Hardware Manual**

Version 1.0/E. August 1994

VDOK-SDTW-100

© miro Computer Products AG 1994

All rights reserved.

No part of this manual may be reproduced or transferred to other media without explicit written permission from miro Computer Products AG, Braunschweig, Germany.

IBM AT® is a trademark of International Business Machines Corp., VGA™ is a trademark of International Business Machines Corp.

miro™ is a registered trademark of miro Computer Products AG.

Pentium™ is a trademark of Intel Corp.

VL Bus™ is a trademark Video Electronics Standards Association.

Windows™ is a trademark of Microsoft Corp., MS-DOS® is a registered trademark of Microsoft Corp.

miro Computer Products AG has written this manual to the best of its knowledge, but does not guarantee that the programs/systems will fulfill the desires of the user.

No warranty is made as to the specifications of features.

miro retains the right to make alterations to the content of the manual without the obligation to inform third parties.

All tenders, sales, supply and manufacturing contracts from miro, including consultancy, installation and other contractual performance are subject exclusively to the General Sales and Delivery Terms of miro.

# Contents

---

|                          |     |
|--------------------------|-----|
| For your own safety      | ii  |
| About the manual         | iii |
| Quick installation chart | iv  |
| Hardware                 | iv  |
| Software                 | iv  |

## 1. Overview 1

|                     |   |
|---------------------|---|
| Features            | 1 |
| System requirements | 2 |
| Package contents    | 2 |

## 2. Hardware installation 3

|                                               |   |
|-----------------------------------------------|---|
| Before you start                              | 3 |
| System configurations                         | 3 |
| VGA in the computer                           | 3 |
| miroCRYSTAL 20SD twin/VL board layout         | 3 |
| miroCRYSTAL 20SD twin/PCI board layout        | 4 |
| Setting the DIP switch                        | 4 |
| Installing miroCRYSTAL 20SD twin              | 5 |
| Connecting the monitor(s)                     | 6 |
| Installing the miroUPGRADE-KIT                |   |
| Upgrading miroCRYSTAL 20SD twin daughterboard | 7 |

## 3. Technical data 8

|                                     |    |
|-------------------------------------|----|
| 15-pin D-type video port            | 10 |
| VESA Standard Feature Connector     | 11 |
| miroCRYSTAL 20SD twin address range | 12 |

## Appendix I

|          |   |
|----------|---|
| Glossary | I |
|----------|---|

## For your own safety

---

In the interest of your own safety and the flawless functioning of your new product and computer system please note the following:

- Before opening the computer make sure that the power plug is disconnected from the main socket.
- Computer components such as graphics boards are sensitive to static charge. Divert any electrostatic charge from your person before touching the components with your hands or any tools.
- Make sure that the components you want to add to the computer are in compliance with the computer's characteristics.
- Only use a shielded cable to connect the monitor to the computer.
- Do not use any cable which connects the monitor to the power supply of your computer.
- If you use a VGA monitor, this monitor must support a 31,5 kHz horizontal scan frequency. The horizontal scan frequency of a multifrequency monitor can range from 35 to 100 kHz. To use the **TrueColor mode** a multifrequency monitor is required.
- Make sure that your graphics board is **in compliance with the slot**.



For changes that have occurred after the manual has been printed, refer to the README file on the disks supplied with your system!



# About the manual

---

This manual explains how to install the miroCRYSTAL 20SD twin in your computer.

The quick installation chart overleaf provides an overview for the hardware and software installation. To ensure the correct installation and correct jumper settings, read the detailed explanations in this manual.

In the margins are subheadings and ideograms to help you quickly find your way through this manual.



Important text passages are marked with the «hand» and this format.

Bullets mark step by step instructions:

- Insert the graphics board into the slot.

All keyboard commands appear in this font:

**install** <↵>

<↵> represents the enter key.

Menus, commands, options or buttons which the user can select are written in *italics*.

# Quick installation chart

---

The following quick installation chart provides a hardware and software installation overview.

## Hardware

### Hardware

1. Check the system requirements, make copies of the supplied disks.
2. If necessary, check and/or change the DIP switch and the jumper settings:
3. Open the computer.
4. Depending on its bus type install graphics board into the VL or PCI slot.
5. Connect the monitor.

## Software

### Software

6. Install miro drivers for miroCRYSTAL 20SD twin. The order of the installation is not obligatory.



*miro•win (Windows in the dual-screen configuration)*

The miro•win disks are needed.

Insert *miro•win Dual monitor driver for Windows 1/2* disk.

In the Windows Program Manager in the *File* menu select *Run...*

Depending on your disk drive enter **a:install** or **b:install**.

Follow the instructions given by the installation program.



*miro•win (CAD)*

The miro•win disks are needed.

Insert *miro•win High speed drivers for CAD 1/1* disk.

Depending on your disk drive enter **a:install** or **b:install**.

Follow the instructions given by the installation program.

If necessary, configure installed drivers.

# 1. Overview

---

## Features

---

The miro graphics board miroCRYSTAL 20SD twin was designed especially for professional use under Windows and DOS. This graphics board meets all requirements concerning page layout, illustration and color image editing.

### q **Graphics acceleration**

The operating speed of a graphics system is essential especially for professional purposes.

The miroCRYSTAL 20SD twin graphics board is equipped with a S3 graphics processor to improve the performance of applications running under Windows and DOS. miroCRYSTAL 20SD twin is equipped with the Vision864 graphics processor.

### q **Video memory**

The miroCRYSTAL 20SD twin video memory allows to work efficiently under Windows as well as with CAD applications.

The miroCRYSTAL 20SD twin basic board is equipped with 2MB of High-Speed-DRAM.

### q **Fast bus systems**

miroCRYSTAL 20SD twin is available as a **V**(esa) **L**(ocal) bus and as a **P**(eripheral) **C**(omponent) **I**(nterconnect) version.

### q **Drivers**

The miroCRYSTAL 20SD twin package includes powerful miro drivers and miro tools.

### q **Resolution**

miroCRYSTAL 20SD twin offers resolutions of up to 1408 x 1024 pixels.

### q **Dual-screen configuration**

The high-performance processors on miroCRYSTAL 20SD twin and the miroTWINFACE driver (for Windows) allow to use two monitors while the board occupies only **one** slot. Both screens create one large workspace. You can continue to use an already existing monitor.

### q **Two high-resolution monitors**

When upgrading the miroCRYSTAL 20SD twin daughterboards video memory to 2 MB even two high-resolution monitors can be connected to the graphics board which then offer the whole range of resolutions.

## System requirements

---

To install miroCRYSTAL 20SD twin, your computer system has to meet the following requirements:

### Computer

- for VL bus: a 386, 486, Pentium computer or compatible with a VL Local Bus slot
- for PCI bus: a 486 or Pentium computer or compatible with a PCI slot.

### Monitor

#### *Single-screen configuration:*

Monitor supporting a horizontal scan frequency of at least 31,5 kHz (standard VGA). To receive all the benefits from miroCRYSTAL 20SD twin, you need a high-resolution multifrequency monitor supporting a vertical scan frequency of 64 kHz or more and having separate horizontal and vertical syncs. miro offers suitable monitors.

#### *Dual-screen configuration:*

The minimum requirement is two standard VGA monitors. To receive all the benefits from miroCRYSTAL 20SD twin, you need two multifrequency monitors (specification see above).

## Package contents

---

Before beginning the miroCRYSTAL 20SD twin installation, please make sure your miroCRYSTAL 20SD twin package is complete:

- miroCRYSTAL 20SD twin  
(basic board and daughterboard)
- Installation disk(s)
- Documentation
- *optional*  
Monitor, shielded monitor cable, miroUPGRADE-KIT.



Graphics boards are sensitive to static charge. To avoid damage that may occur by static charge, leave the graphics board in its antistatic packaging until installation. Keep the packaging for possible future transportation.

## 2. Hardware installation

---

### Before you start

---

#### System configurations

miroCRYSTAL 20SD twin consists of a basic board and a daughterboard. miroCRYSTAL 20SD twin can be operated in the single-screen and in the dual-screen configuration.

##### *Single-screen configuration:*

In this configuration miroCRYSTAL 20SD twin usually connects to a multifrequency monitor. The VGA image as well as the high-resolution image are displayed on this monitor.

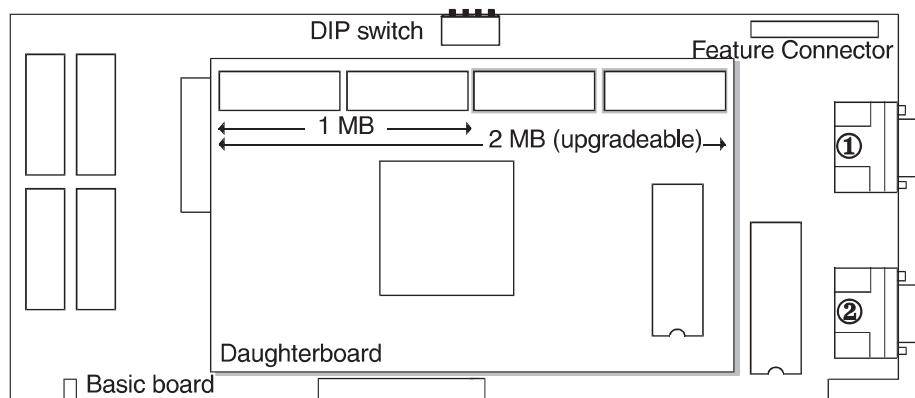
##### *Dual-screen configuration:*

The dual-screen configuration consists of two high-resolution graphics systems or one high-resolution and one VGA graphics system. Both systems have a separate monitor.

#### VGA in the computer

Any existing VGA board or a motherboard VGA have to be removed from the computer or be disabled prior to the installation.

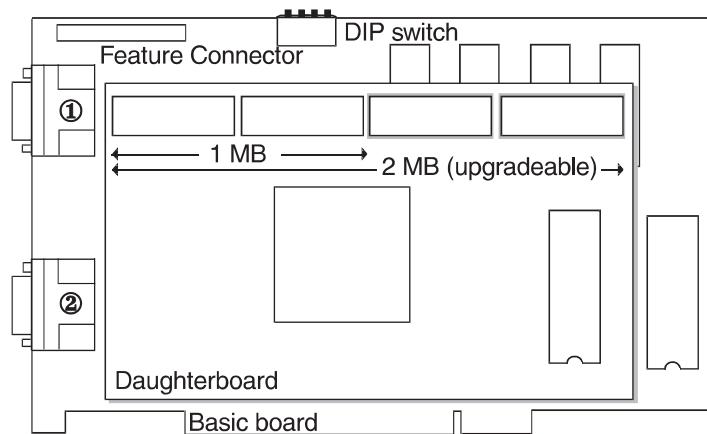
#### miroCRYSTAL 20SD twin/VL board layout



*miroCRYSTAL 20SD twin/VL*

- 15-pin monitor output of the miroCRYSTAL 20SD twin basic board
- 15-pin monitor output of the miroCRYSTAL 20SD twin daughterboard

## miroCRYSTAL 20SD twin/PCI board layout



### *miroCRYSTAL 20SD twin/PCI*

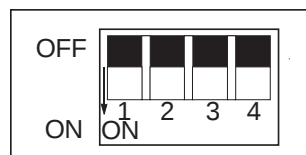
- 15-pin monitor output of the miroCRYSTAL 20SD twin basic board
- 15-pin monitor output of the miroCRYSTAL 20SD twin daughterboard

## Setting the DIP switch

The miroCRYSTAL 20SD twin basic board contains a DIP switch (see board layouts above). The switch setting sets the miroCRYSTAL 20SD twin hardware presetting.

### Default setting

The following illustration shows the default setting done at the factory.



By default, miroCRYSTAL 20SD twin is configured for the **dual-screen configuration**. To use miroCRYSTAL 20SD twin in the **single-screen configuration**, the setting of **switch 2 has to be changed**. Switch 2 specifies, whether the computer boots on the miroCRYSTAL 20SD twin basic board or on the miroCRYSTAL 20SD twin daughterboard.



When setting the DIP switch be very carefully. An incorrect setting can lead to malfunctions of the graphics board and the computer.

#### *DIP switch for the dual-screen configuration:*

In the dual-screen configuration DIP switch 2 has to be in the «OFF» position (default setting): The computer boots on the daughterboard and the monitor connected to this board displays an image after the computer has been switched on.

#### *DIP switch for the single-screen configuration:*

In the single-screen configuration the computer has to boot on the basic board. Set DIP switch 2 to «ON». The monitor connected to this board displays an image after the computer has been switched on.

|                                                   | Switch 2 |
|---------------------------------------------------|----------|
| Dual-screen mode:<br>Booting on the daughterboard | OFF      |
| Single-screen:<br>Booting on the basic board      | ON       |



Switches 1, 3 and 4 are reserved. Do not change the default setting done at the factory.

## **Installing miroCRYSTAL 20SD twin**

---

After checking and/or changing hardware settings you can install the graphics board.



Never install the miroCRYSTAL 20SD twin board without having checked and, if necessary, changed the hardware settings.

The only tool you need for the installation is a screwdriver. Proceed as follows:

- Turn off your computer and all peripheral devices. Disconnect the computer from the power supply and all other components.
- Loosen the screws of the computer's cover and remove it.
- Discharge yourself of static charge by touching the power unit casing.
- If necessary, remove the VGA board from the computer or disable the motherboard VGA.
- Depending on your graphics board, select a free VL or PCI slot. Remove the slot's cover at the back of the computer. Save the screws of the cover.

- Depending on the bus type, carefully insert the graphics board into the VL or PCI slot by holding the board at the top and gently pushing both ends into the slot at the same time. Press onto the upper edge of the board to make sure it is firmly seated in the slot.



Don't force the board into the slot! You run the risk of bending the contacts. If the board does not fit easily, pull it back out, and try again.

- Fasten the board's bracket at the back of the computer using the screws you saved from the shield.
- Put the cover back on the computer and reconnect the peripheral devices.

## Connecting the monitor(s)

---

miroCRYSTAL 20SD twin has two 15-pin D-type monitor outputs. The outputs are marked (see board layouts p. 3 and 4) with

- $\neg$  (miroCRYSTAL 20SD twin basic board) and
- $\neg$  (miroCRYSTAL 20SD twin daughterboard).

- *Single-screen configuration*  
Connect the monitor to the  $\neg$  monitor output (basic board).
- *Dual-screen configuration*  
Connect one monitor to the  $\neg$  monitor output (basic board), the other to the  $\neg$  monitor output (daughterboard).  
Always connect the monitor with the higher resolution to the basic board.
- Make sure that the computer and the monitor are connected to a power supply.



If you installed miroCRYSTAL 20SD twin for the dual-screen configuration and if you want to use the board in the single-screen configuration, set switch 2 to «ON» and start the installation program. In the installation program install miroCRYSTAL 20SD twin without daughterboard.

### How to go on?

After you have installed your graphics board, you can proceed with the software installation and with the installation and configuration of the application drivers.

For a detailed description of the miro drivers and miro tools please refer to the corresponding Software Manuals.

# Installing the miroUPGRADE-KIT

---

It is possible to equip the miroCRYSTAL 20SD twin daughterboard with additional 1 MB of video memory.

The optional miroUPGRADE-KIT allows to upgrade your graphics board with **fast** video memory. After upgrading the daughterboard the board offers the full miroCRYSTAL 20SD twin function range.

The miroUPGRADE-KIT for miroCRYSTAL 20SD twin consists of two 40-pin High-Speed DRAMs which are inserted into the corresponding sockets.

For the location of the video memory, refer to the board layout on pages 3 and 4.

## Upgrading the miroCRYSTAL 20SD twin daughterboard

- If you have already installed the miroCRYSTAL 20SD twin board in your computer, remove it.
- Disconnect the miroCRYSTAL 20SD twin daughterboard carefully from the basic board.
- Remove the High-Speed-DRAMs from the packaging.



Make sure to align the upgrade components in a line with the memory components already installed. For this purpose, memory components have a small crescent-shaped gap, a round depression or a bevelled edge.

- Align the memory components on the board in a line with the components already installed and insert the memory components carefully into the free sockets.



Make sure that you don't bend the pins of the memory components. The memory components must be firmly seated in their sockets!

- Connect the miroCRYSTAL 20SD twin daughterboard to the basic board.
- Insert the graphics board into the computer. Proceed as described under «Inserting miroCRYSTAL 20SD twin».
- To make use of the additional memory, install and, if necessary, reconfigure the application drivers.

### 3. Technical data

---

#### Bus system

- miroCRYSTAL 20SD twin for VESA Local Bus:  
VESA Local Bus
- miroCRYSTAL 20SD twin for PCI Local Bus:  
PCI Local Bus

#### Compatibility

- VGA register-compatible
- CGA register-compatible
- HGC register-compatible
- MDA register-compatible

#### Graphics processor

For 55 MHz system clock frequency:

- S3 VISION 864 for VESA Local Bus  
max. 40 MHz bus clock frequency
- S3 VISION 864 for PCI Local Bus  
33 MHz bus clock frequency

#### Video memory

- miroCRYSTAL 20SD twin basic board  
2 MB DRAM
- miroCRYSTAL 20SD twin daughterboard  
1 MB DRAM (upgradeable to 2 MB)

#### Power supply

- +5 V, max. 1 A
- +12 V, max. 0.01 A

## Video modes

| Resolution  | Maximum horizontal scan rate |        |        |        |        |         |
|-------------|------------------------------|--------|--------|--------|--------|---------|
|             | 100 kHz                      | 85 kHz | 64 kHz | 58 kHz | 48 kHz | 35 kHz  |
| 1408 x 1024 | 70 Hz                        | 70 Hz  | 60 Hz  | –      | –      | –       |
| 1280 x 1024 | 75 Hz                        | 75 Hz  | 60 Hz  |        |        | –       |
| 1152 x 864  | 94 Hz                        | 90 Hz  | 70 Hz  | –      | –      | –       |
| 1024 x 768  | 100 Hz                       | 100 Hz | 75 Hz  | 70 Hz  | 60 Hz  | 43 Hz i |
| 800 x 600   | 100 Hz                       | 100 Hz | 77 Hz  | 77 Hz  | 77 Hz  | 56 Hz   |
| 768 x 576   | 100 Hz                       | 100 Hz | 100 Hz | 80 Hz  | 80 Hz  | 60 Hz   |
| 640 x 480   | 100 Hz                       | 100 Hz | 100 Hz | 89 Hz  | 89 Hz  | 70 Hz   |

*i* = This resolution is only possible in the interlaced mode.

Some resolutions are not available for the miroCRYSTAL 20SD twin daughterboard with 1 MB.

## Video timings

- Horizontal scan frequency:  
31 kHz to 100 kHz, depending on operating mode
- Vertical scan frequency:  
60 Hz to 100 Hz, non interlaced, depending on operating mode
- Pixel frequency:  
14.75 MHz to 135 MHz, depending on operating mode

## Options

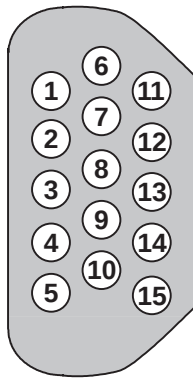
- Monitor, shielded monitor cable
- miroUPGRADE-KIT (*only miroCRYSTAL 20SD twin daughterboard*)

## 15-pin D-type video port

---

The miroCRYSTAL 20SD twin graphics board is equipped with two 15-pin D-type connectors to which the video cable attaches. The other end of the video cable connects to the monitors.

The following illustration and the table show the video output and the corresponding pin allocation:



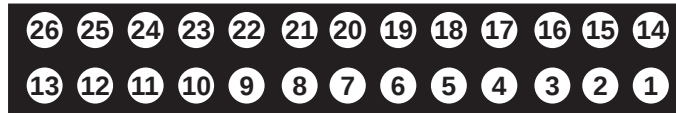
*15-pin D-type connector*

| Pin No. | Pin Allocation   |
|---------|------------------|
| 1       | Red              |
| 2       | Green            |
| 3       | Blue             |
| 4       | Monitor ID bit 2 |
| 5       | Ground (analog)  |
| 6       | Ground (red)     |
| 7       | Ground (green)   |
| 8       | Ground (blue)    |
| 9       | Free             |
| 10      | Ground (sync.)   |
| 11      | Monitor ID bit 0 |
| 12      | Monitor ID bit 1 |
| 13      | HSync            |
| 14      | VSynC            |
| 15      | Free             |

# VESA Standard Feature Connector

The miroCRYSTAL 20SD twin graphics board can be used together with a video overlay board. Therefore you need the VESA Standard Feature Connector.

The following table provides a pin allocation overview.



*VESA Standard Feature Connector*

| Pin No. | Pin Allocation  |
|---------|-----------------|
| 1       | Pixel data P0   |
| 2       | Pixel data P1   |
| 3       | Pixel data P2   |
| 4       | Pixel data P3   |
| 5       | Pixel data P4   |
| 6       | Pixel data P5   |
| 7       | Pixel data P6   |
| 8       | Pixel data P7   |
| 9       | Clock           |
| 10      | Reserved        |
| 11      | HSync           |
| 12      | VSynC           |
| 13      | Ground          |
| 14      | Ground          |
| 15      | Ground          |
| 16      | Ground          |
| 17      | Enabling signal |
| 18      | Enabling signal |
| 19      | Enabling signal |
| 20      | Free            |
| 21      | Ground          |
| 22      | Ground          |
| 23      | Ground          |
| 24      | Ground          |
| 25      | Free            |
| 26      | Free            |



The pin allocation of the VESA Standard Feature Connector has been adjusted for all *miroCRYSTAL 20SD twin PCI boards*, so that these boards can be connected 1:1 to another graphics board via a flat ribbon cable.

## miroCRYSTAL 20SD twin address range

For the miroCRYSTAL 20SD twin graphics board to run without problems you have to avoid address conflicts. Make sure that the addresses used by miroCRYSTAL 20SD twin are not also assigned to other components of your computer system.

### – I/O address range

miroCRYSTAL 20SD twin occupies the address range of standard VGA **03B0h-03DFh** and parts of the 8514/A I/O address range.

These address ranges are normally not used by standard system hardware and therefore address conflicts are unlikely to happen.

The following table shows the I/O address areas that can be selected and used by miroCRYSTAL 20SD twin.

|        |        |
|--------|--------|
| 0E2E8h | 04AE8h |
| 042E8h | 08AE8h |
| 082E8h | 09AE8h |
| 092E8h | 0AAE8h |
| 0A2E8h | 0BAE8h |
| 0B2E8h | 04EE8h |
| 046E8h | 08EE8h |
| 086E8h | 09EE8h |
| 096E8h | 0AEE8h |
| 0A6E8h | 0BEE8h |
| 0B6E8h | 73C8h  |

### – Additional VGA addresses

In addition the following addresses are used:

| VGA video memory  | VGA BIOS          |
|-------------------|-------------------|
| 0A0000h - 0BFFFFh | 0C0000h - 0C7FFFh |

# Appendix

---

## Glossary

---

This glossary contains the most important concepts from the field of computer hardware. Cross-references are marked by this symbol .

|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Address</b>      | All memory positions in a computer have numbers (addresses). Through these addresses each memory position can be addressed directly. Some addresses are reserved for certain  hardware components and must not be used. If two hardware components use the same address, there is a address conflict.                                                                                                                                                                                                        |
| <b>ANSI</b>         | American National Standards Institute. ANSI character set (  Font): used by Microsoft Windows and Windows applications. The character assignation only differs slightly from the assignation of the  ASCII character set.                                                                                                                                                                                               |
| <b>ASCII</b>        | American Standards Committee of Information Interchange. ASCII character set (  Font): standard character set used by IBM and compatible computers. The ASCII character set consists of 256 characters, the first 128 of which are standardized.                                                                                                                                                                                                                                                          |
| <b>Autoexec.bat</b> | A special DOS  batch file which is processed automatically after the computer has been started. The file contains among other things commands which load the country-specific keyboard driver (  Driver), set the time or load programs automatically.                                                                                                                                                                |
| <b>Batch file</b>   | A  DOS file where a sequence of commands is processed one after the other.                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>BIOS</b>         | Basic Input Output System. Number of basic input and output commands stored in a  ROM, PROM or EPROM. The  operating system uses these commands. The basic task of the BIOS is to control the data input and output. After starting the system the ROM BIOS performs some tests (checking the  interfaces, the disk drives, etc.). |
| <b>Bit</b>          | <b>Binary Digit.</b> Smallest information unit in a computer. One bit can take on two states: «0» and «1», two bits can take on $2^2=4$ states and three bits $2^3=8$ , etc. In a computer those states are realized by «0 V» (no current = 0) and «5 V» (current = 1). To display a character (letter, number etc.), 8 bits = 1  byte are required.                                                                                                                                                       |
| <b>Bus</b>          | In a computer, buses provide for the communication between the  processor and the installed hardware (hard disk, graphics board, etc.). Depending on the bus width, the bus transfers a different amount of information. An 8-bit bus can transfer 8  bits (=  byte = one character) at a time.                                    |

|                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Byte</b>                    | One byte consists of eight  bits. One byte represents exactly one character (letter, number etc.). The characters are binary-coded with «zero» (0) and «one» (1). The character «E» has the  ASCII code «01000101» or «45h» (hexadecimal).                                                                                                                                                                                                                                                                                                                                                                               |
| <b>CGA</b>                     | <b>C</b> olor <b>G</b> raphics <b>A</b> dapter (IBM). Graphics board which displays four colors in the graphics mode.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Clock frequency</b>         | Rate at which individual commands are processed in a processor. The higher the  clock frequency, the quicker the commands are processed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>CLUT</b>                    | <b>C</b> olor <b>L</b> ook <b>U</b> p <b>T</b> able. Color table which contains all indexed color values.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Color depth</b>             | Number of  bits used to represent the color information for each  pixel. At a black and white display 1 bit color depth displays $2^1=2$ colors. At a color depth of 8 bits $2^8=256$ colors are available and at 24 bits $2^{24}=16,777,216$ (  TrueColor) colors are available.                                                                                                                                                                                                                                                     |
| <b>Config.sys</b>              | A  DOS configuration file which is processed automatically when the system starts. The Config.sys file includes  drivers which control the output to the monitor and the keyboard and the mouse.                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>DIP switch</b>              | <b>D</b> ual <b>I</b> ndependent <b>P</b> ackage switch. A row of small switches designed to make certain hardware presettings.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>DOS</b>                     | <b>D</b> isk <b>O</b> perating <b>S</b> ystem. The most common  operating system for PCs ( <b>P</b> ersonal <b>C</b> omputer). MS DOS is the <b>M</b> icrosoft version of DOS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Driver</b>                  | Programs which integrate the hardware (e.g. driver for a CD-ROM drive) in the computer and which adapt the software to the hardware (e.g. driver for a graphical user interface, such as Microsoft Windows). The software then uses the features of the graphics board.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>EGA</b>                     | <b>E</b> nhanced <b>G</b> raphics <b>A</b> dapter (IBM), graphics board which displays 16 colors in the graphics mode.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>EISA bus</b>                | <b>E</b> xtended <b>I</b> ndustry <b>S</b> tandard <b>A</b> rchitecture. 32-bit bus: The EISA bus can transfer an amount of data of 33  MB per second at a  clock frequency of 8.33 MHz.                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Fixed-frequency monitor</b> | Monitor operating at a very small frequency range (  multifrequency monitor).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Font</b>                    | Character set in a certain type, size and style, e.g. Times New Roman 11, normal; Times New Roman 11, italics; Times New Roman 11, bold; Times New Roman 11, bold, italics.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Graphics board</b>          | Graphics boards are the «link» between the computer and the monitor. Without a graphics board no image appears on the screen. Graphics boards operate in two modes: the text mode and the graphics mode. In the text mode only  ASCII characters are displayed. The ASCII character set includes some simple «graphical» characters to display simple graphics. The graphics mode uses individual  pixels. The more pixels are available (the higher the  resolution) the more detailed characters and graphics can be displayed. |

|                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Hardware</b>               | The hardware includes all computer components which are «hard», such as the monitor, the hard disk, the keyboard, the mouse and the printer.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>HGC</b>                    | <b>H</b> ercules <b>G</b> raphics <b>C</b> ard, monochrome (black and white) graphics board.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Horizontal scan rate</b>   | Number of horizontal scans of the electron beam per second required to create a new line. The higher the  resolution the higher the required horizontal scan rate.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Interface</b>              | Link between two parts of a system or between two systems where information, pulses and signals are adapted in a way that the receiving part can understand the sending part. For example, signals which the computer sends to the printer have to be adapted by an interface so that the printer «understands» what it has to print.                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Interlaced</b>             | Image refreshing technique: the screen is subdivided into lines. When refreshing the image first all even lines and then all odd lines are refreshed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>ISA bus</b>                | <b>I</b> nternational <b>S</b> tandard <b>A</b> rchitecture. 16-bit bus which transfers 8  MB of data per second at a  clock frequency of 8 MHz.                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Jumper</b>                 | Jumpers can set up or interrupt electrical leads. To establish electrical leads with a jumper, the jumper has to be mounted, to interrupt the lead the jumper has to be removed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>KB</b>                     | 1 KB (Kilobyte) is equal to 1024  bytes. Here «K» (kilo) is always equal to «1024».                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>MB</b>                     | 1 MB (Megabyte) equals 1024  KB.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>MDA</b>                    | <b>M</b> onochrome <b>D</b> isplay <b>A</b> dapter. Monochrome (black and white) graphics board.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Multifrequency monitor</b> | A multifrequency monitor adapts itself automatically to different frequencies supplied by the graphics board (  fixed-frequency monitor) and can display different  resolutions.                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Operating system</b>       | The operating system provides for the communication between  hardware,  software and the user. The tasks of the operating system are among others the file and the program management.                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Parallel interface</b>     | The parallel or Centronics  interface transfers data through an 8-bit data line. This means that 8  bits (1  byte) can be transferred at a time. The transfer through the parallel interface is considerably faster than the transfer through the  serial interface, over long distances the parallel data transfer is, however, more susceptible to interference. Parallel interfaces are designated by LPT and a number (e.g. LPT1). |
| <b>PCI Local Bus</b>          | <b>P</b> eripheral <b>C</b> omponent <b>I</b> nterconnect. Local Bus concept by IBM: 32-bit bus, a PCI bus can transfer 132 MB per second at a  clock frequency of 33 MHz.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Pixel</b>                  | Picture element. Pixels are the smallest elements of a monitor image (  resolution).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>RAM</b>                    | <b>R</b> andom <b>A</b> ccess <b>M</b> emory. An RAM is a read-write memory component from which data can be read and to which data can be written any time. The                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

computer memory is equipped with RAM components. The memory is a so-called «volatile» memory meaning that the memory contents are removed as soon as the computer is switched off.

|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Refresh rate</b>     | Also vertical scan rate. Number of image refreshes per second measured in Hertz (Hz). The higher the vertical scan rate the less flicker.                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Resolution</b>       | Number of  horizontal and vertical pixels. 1408 x 1024 means that 1408 horizontal pixels and 1024 vertical pixels are displayed on the monitor. The higher the resolution the more details the monitor can display.                                                                                                                                                                                                                                                                                            |
| <b>ROM</b>              | <b>Read Only Memory.</b> A ROM is a memory component which can only be read but which cannot be modified. The ROM's contents remain in the component also after the computer has been switched off. All functions which have to be available immediately after switching the computer on, e.g. the data for the system test, the character output on the screen, etc. are stored in ROM components. There are also PROMs ( <b>P</b> rogrammable <b>R</b> OM) EPROMs ( <b>E</b> rasable <b>P</b> ROM) and EEPROMs ( <b>E</b> lectric <b>E</b> PROM).                                             |
| <b>Serial interface</b> | Also RS232. The serial interface transfers data through a data line bit by bit (all  bits of a  byte one after the other). The serial data transfer is considerably slower than the transfer through the  parallel interface but it is less susceptible to interference. Serial interfaces are designated by COM and a number (e.g. COM1). |
| <b>Software</b>         | General term for all programs a computer can run (system programs, application programs,  drivers etc.) and files.                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>TrueColor</b>        | 16.7 million colors can be displayed at a time (  color depth).                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>VESA</b>             | <b>V</b> ideo <b>E</b> lectronic Standards Association. Committee founded in 1988 in the USA which establishes common standards for the computer technology.                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>VESA Local Bus</b>   | Bus concept defined by the  VESA committee: 32-bit bus operating at a  clock frequency of up to 50 MHz. At a clock frequency of 33 MHz the VL bus transfers up to 132  MB per second.                                                                                                                                                |
| <b>VGA</b>              | <b>V</b> ideo <b>G</b> raphics <b>A</b> rray (IBM), graphics board which displays 256 colors in the graphics mode.                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

