ELSA WINNER™ II

User Manual

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No. 21606/0799

Preface

Thank you for placing your trust in this ELSA product.

With the *ELSA WINNER II* you have selected a graphics board which was designed as an allround product for multimedia computers. The graphics processor on the board ensures high-speed generation of on-screen graphics making this board ideal for fast gaming and visualization. ELSA products are subject to the highest of standards in production and quality control which are the foundation for consistently high product quality *ELSA WINNER II*.

This manual provides all the information you will need to get the best out of your ELSA graphics board. For instance, which resolution is best for which monitor, or how is the board upgraded? The accompanying ELSA utility programs are described, and you will find detailed information about 3D acceleration.

ELSA products are subject to continual further development. It is therefore possible that the information printed in this manual is not current in all respects.

Current information about updates can always be found in the README files on the ELSA CD.

If you have further questions or need additional help, you can rely on our online services which are available to ELSA customers. In very urgent cases the ELSA Hotline can be reached under the following number:

1-800272-6131

or from outside the USA:

+1-408-919-9100

Before you read on...

The installation of the ELSA WINNER II hardware and software drivers is described in full in the Installation Guide which accompanies this manual. You should refer to that document before attempting to install your board, and before reading this manual

Contents

Introduction

ELSA WINNER II highlights

- New S3 Savage 4 Pro graphics processor
- Pixel clock frequency up to 300 MHz
- S3TC texture compression
- 128 bit Windows acceleration
- Video in
- DFP interface for connecting LCD panels
- ELSA drivers for Windows NT, Windows 98 and Windows 95
- Product support via ELSA LocalWeb and Internet WWW site
- Six-year warranty
- This board complies with the CE and FCC rules.

Video in

- Video Recording - Full screen for PAL/NTSC
- Video Editing with bundled Main Actor software including animated GIF and MPEG2 export.
- Internet Videoconferencing with bundled NetMeeting software
- Comfortable Videotext and teletext display (TV tuner required, e.g. VCR)
- S-Video input for VCR, Satellite Tuner and Camera

What's in the box?

You will notice if your graphics board is missing. But you need to check that the box contained all of the following:

- Graphics board
- Installation Guide
- User Manual
- CD-ROM with installation and driver software and utilities
- **Only with video-equipped graphics boards:**
  Video adapter cable from S-Video (Hosiden) to Composite (Cinch)

If any part is missing please contact your dealer. ELSA reserves the right to vary the products supplied without prior notice.

What hardware do I need?

- **Computer:** Minimum requirements are a Pentium II, AMD K6 2 or compatible. The *WINNER II* only really comes to life if your computer has a Pentium II or compatible processor or even better.
- **Bus:** The *WINNER II* is available as an AGP version. Your computer must have an AGP bus.
- **Monitor:** The *WINNER II* works with the standard IBM VGA compatible horizontal scan frequency of 31.5 kHz while booting and in DOS operation.

CE conformity and FCC radiation standard

CE

This equipment has been tested and found to comply with the limits of the European Council Directive on the approximation of the laws of the member states relating to electromagnetic compatibility (89/336/EEC) according to EN 55022 class B.

FCC

This equipment has been tested and found to comply with the limits for a Class B digital device pursuant to Part 15 of the Federal Communications Commission (FCC) Rules.

CE and FCC

These limits are designed to provide reasonable protection against radio frequency interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy. It may interfere with to radio communications if not installed and used in accordance with the instructions. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception (this can be determined by turning this equipment off and on), the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the distance between this equipment and the receiver.
- Connect the equipment to an outlet on a circuit other than that to which the receiver is connected.
- Consult your dealer or an experienced radio/TV technician.
- Caution: To comply with the limits for an FCC Class B computing device, always use a shielded signal cable.

Caution to the user: The Federal Communications Commission warns the user that changes or modifications to the unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

After installing the drivers

In this chapter you will find descriptions of

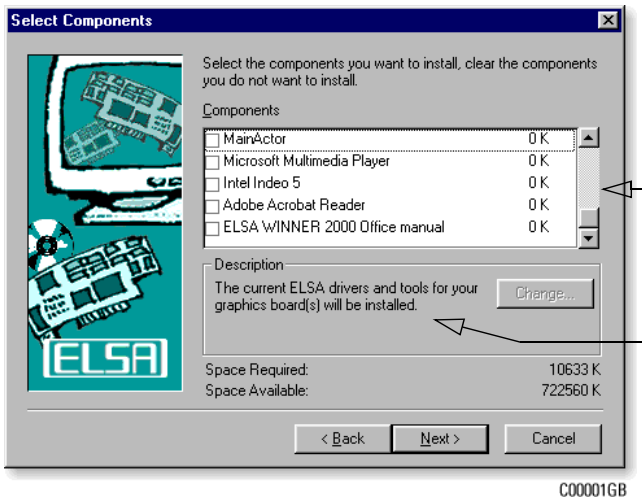
- where you can find the software for operating your ELSA graphics board,
- the performance characteristics of your graphics board, and
- how you can most effectively tuning for the combination of monitor and ELSA graphics board.

Software installation from the CD

The ELSA graphics board is normally supplied with software on a CD-ROM. You will find all the utilities described in this manual on the WINNERware CD – unless they are a component of the operating system.

Once you have successfully completed the steps described in the Installation Guide, your *ELSA WINNER II* is integrated into your computer system with installed drivers. In this way, you have very likely come to know the program ELSA CD setup. This program should start automatically after inserting your *WINNERware* CD, but if not, then you can run the SETUP.EXE from the CD's root directory.

The CD setup recognizes the operating system and the ELSA graphics board. Based on this information, the program displays the driver and the selection of software supported. All of these programs are on the *WINNERware* CD.



The right settings

Our tip is: Invest a little time at this stage and you won't regret it. Take your time to set up your system just right. Your eyes will thank you for it, and you are guaranteed to have more fun in front of your screen.

To set up your system properly, the following questions should be answered:

- What is the maximum resolution I can set on my system?
- Which color depth do I want to use?
- What value should I set for my display refresh rate?

To help you find the answers to these questions, this chapter has been divided according to the operating systems available. Just look for the section about the operating system you use. All the information you need is here and all the software you need, if not already a part of your operating system, is on the *WINNERware* CD.

What are your options?

The tables below show the maximum possible resolutions for the ELSA graphics board. Note that these resolutions cannot be achieved under all operating conditions.

	Max. Refresh Rate (Hz)		
Color depth:	**256 colors (8bit)**	**HighColor (16bit)**	**TrueColor (24bit/32bit)**
1920 x 1440	60 - 75	60 - 75	–
1600 x 1200	60 - 85	60 - 85	–
1280 x 1024	60 - 100	60 - 100	60 - 75
1152 x 864	60 - 100	60 - 100	60 - 100
1024 x 768	60 - 120	60 - 120	60 - 120
800 x 600	60 - 120	60 - 120	60 - 120
640 x 480	60 - 120	60 - 120	60 - 120

HighColor = 65.536 colors, TrueColor = 16,7 million colors

What makes sense?

There are some basic ground rules for you to follow when setting up your graphics system. On the one hand, there are the ergonomic guidelines, although nowadays these are met by most systems, and on the other hand there are limitations inherent to your system, e.g. your monitor. The question of whether your applications need to run using large color depths—perhaps even TrueColor—is also important. This is an important condition for many DTP or CAD workstations. We recommend that games and "normal" Windows applications are operated in HighColor with 65,536 colors.

"More Pixels, more fun"

This is an opinion which is widespread, but which is not entirely true under all circumstances. The general rule is that a refresh rate of 73 Hz meets the minimum ergonomic

requirements. The resolution to be selected also depends on the capabilities of your monitor. The table below is a guide to the resolutions you might select:

Monitor size	Typical image size	Minimum resolution	Maximum resolution	Ergonomic resolution
17“	15.5“- 16“	800 x 600	1024 x 768	1024 x 768
19“	17.5“- 18.1“	1024 x 768	1280 x 1024	1152 x 864
20“/21“	19“- 20“	1024 x 768	1600 x 1200	1280 x 1024
24“	21“- 22.5“	1600 x 1000	1920 x 1200	1600 x 1000

Changing the resolution

You set the resolution of your graphics board in the Control Panel under Windows.

Windows 95 and Windows 98

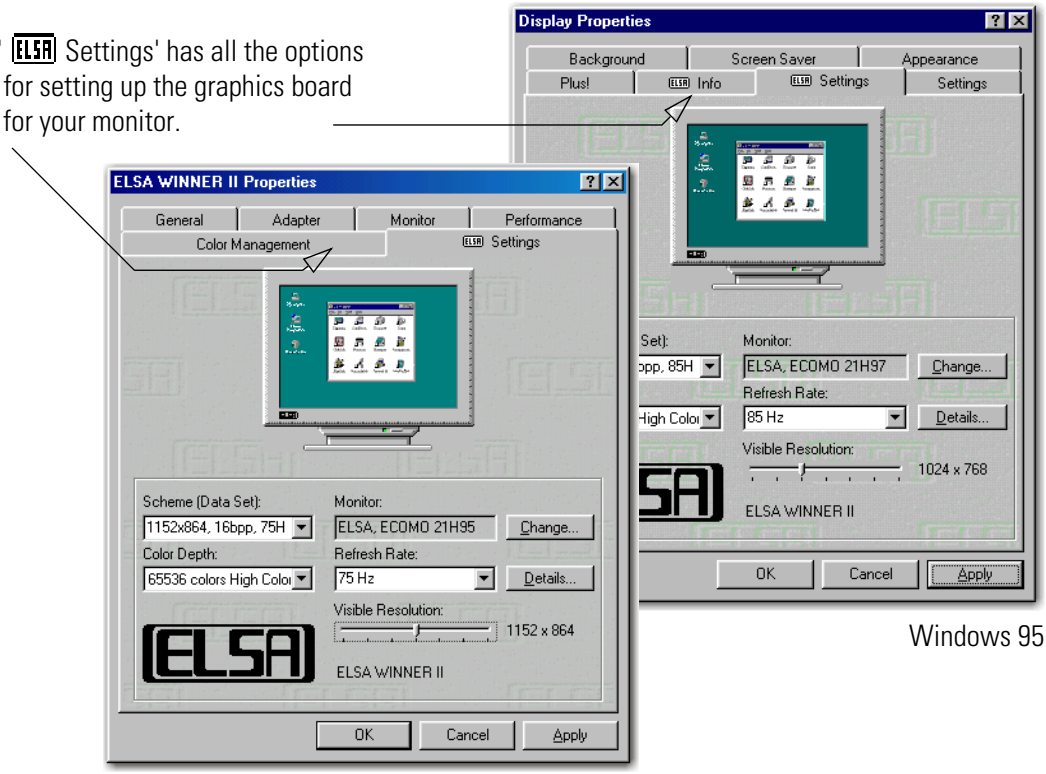
The ' ELSA Settings' are automatically integrated into the Control Panel during the installation of the *WINman Suite*. You can use these Settings to tweak your graphics system for the best performance. The ' ELSA Settings' provide some great features. Once you have specified the graphics board model and the monitor data, the program will automatically detect which settings are possible and which are not. This means, for instance, that it is impossible for you to select an incorrect refresh rate which might damage your monitor.

① Click on **Start**, then select **Settings** ▶ **Control Panel**.

② You will find the **Display** icon in the Control Panel. When you start this program, you are shown a dialog box where you can modified the display settings.

③ Here you should click on the ' Settings' tab.

' Settings' has all the options for setting up the graphics board for your monitor.



Windows 95

Windows 98

Under Windows 98, you can reach the ' Settings' *by selecting the Settings tab and then clicking on the* **Advanced...**.

It is important to carry out the following settings or checks step by step:

- the monitor type
- the resolution of the monitor image (Scheme, Data Set) and
- the color depth
- the refresh rate.

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Choosing the monitor

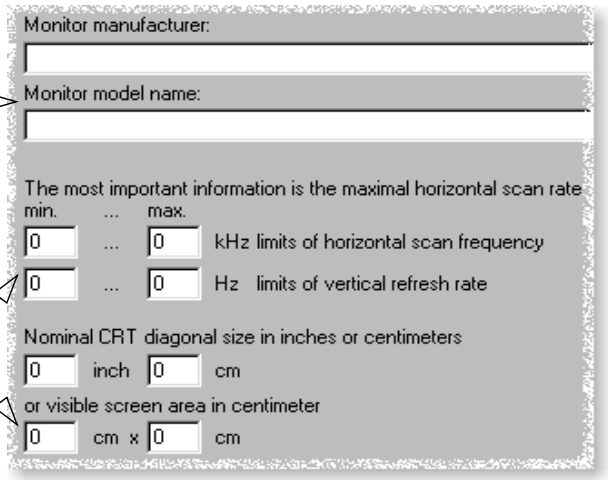
If your monitor supports DDC, the preset values will be displayed under 'Scheme'. If this is not the case, click on **Change...** to call up the database of monitor types. You will be presented with a list of monitor manufacturers and monitor models. If your manufacturer is present, click on the entry and then select your model. If your monitor is not listed, there are two options. One option is to select the '_Standard monitor' from the list of manufacturers and then select the resolution you wish to work with.

A second option requires information about the technical specifications for your monitor. Consult your monitor manual to ensure that you have the correct information. Click on **Change...** in the 'Monitor type database' window. In addition to the information regard-

ing the monitor manufacturer, and the model designation, you will have to enter the frequency ranges for the horizontal and vertical scan frequencies and specify the diagonal size of your monitor.

If your monitor type is not listed in the monitors database you can enter the monitor manufacturer and model type here.

The vertical and horizontal frequency ranges and the diagonal size of the screen are the important settings.



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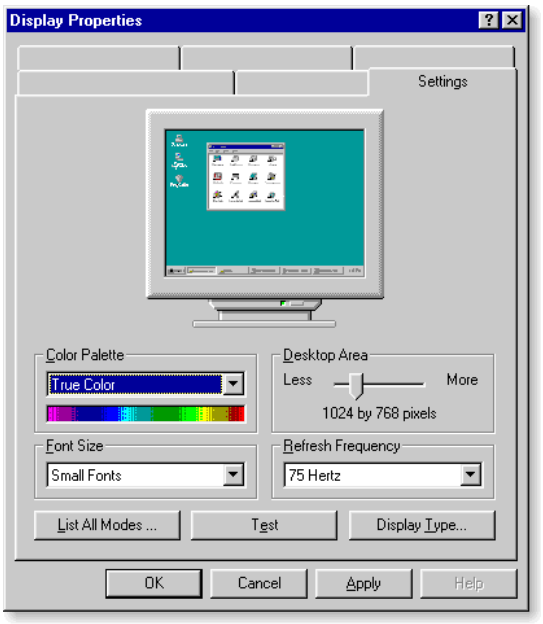
Check your entries for the image frequencies carefully, as otherwise you might damage your monitor. Look these up in your monitor manual or consult the monitor manufacturer.

Windows NT 4.0

The settings for the graphics driver are included in the Control Panel under Windows NT 4.0. Use the command sequence

Start ▶ Settings ▶ Control Panel

to call the dialog window where you should find the icon for **Display**. Double click on this symbol to open the window with its various tabs. Click on the 'Settings' tab.



You can select the possible settings for 'Color palette', 'Font size', 'Resolution' and 'Display frequency' from this dialog box. The available selection is determined by the ELSA driver you have installed. You should always check the configuration you have selected by clicking on the **Test** button.

You will find further information on how to customize your graphics settings under Windows NT 4.0 in your system manual.

ELSA video settings

Video-in

If you have installed the ELSA driver, an ELSA icon will appear in the task bar at the bottom right of your screen ( ). A click on this icon opens up a dialog box from which you can call up the commands for the video settings. Using the ELSA video settings you can set the following options:

- The connector ('Video Capture: Source')
- The video standard ('Video Capture: Source')
- The resolution of the video recording ('Video Capture: Format')
- A preview window for the signal at the video input ('Video and videotext viewer')

If you have connected a video input device to the *ELSA WINNER II*, you will need to change your settings under 'Video capture: Format' and 'Video capture: Source'.

The Video Picture on the Computer Monitor

It may be enticing to record video material, but... We must remind you that copyright-protected material must not be copied or duplicated without permission. ELSA accepts no responsibility for copyright violations!

You can connect any normal video camera or any video device to the graphics board. Connect the video output on the device to the suitable socket on your graphics board. If you connect a video source with a composite plug, use the composite video adapter.

The video input on the *ELSA WINNER II* is compatible with "Video for Windows". Thus any application that supports this standard should work.

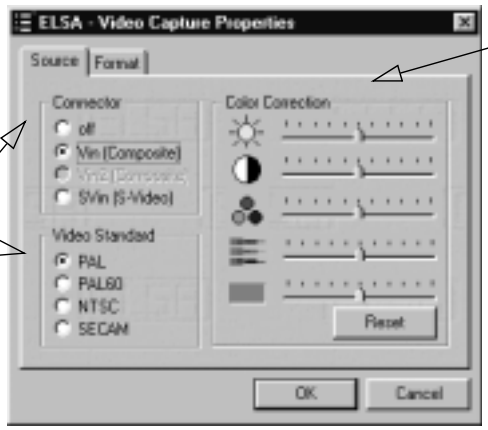
Once you have connected the video source, started your computer and loaded Windows, click on the ELSA symbol in the task bar in the bottom right of the screen and select the **Video Capture: Source** ▶ **Start** command from the dialog box.

Video Capture: Source

Now you should specify which video source you wish to use on the 'ELSA - Video Capture Properties' tab. The color correction options allow you to adapt the input signal. This

covers brightness, contrast, color, image sharpness and hue. The setting for the hue, however, is only effective for NTSC input signals.

If I don't want it in, it's got to stay out. Bide by this motto when deciding which video connector is to be used and the connector's video standard.



The color correction affects the video image only, not the whole screen.

Select **PAL**, **NTSC** or **SECAM** as your video standard. PAL is the normal video standard in Europe. The manual for your video recorder or video camera can help if you have any queries.

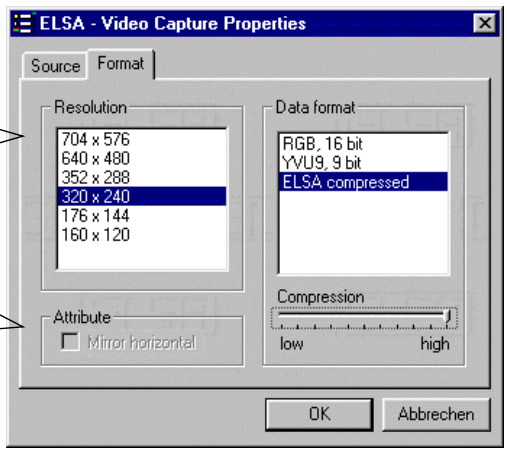
Select which video input you wish to be active from the Connection option group. Clicking on the relevant input determines which video source sends your signal to the *ELSA WINNER II*.

Video Capture: Format

Clicking on the 'Format' tab brings up a selection of possible video resolutions. Select the resolution you require for video display and recording and confirm your settings by clicking **OK**.

You can select the resolutions supported for display on a television from this window.

Turn the picture upside-down if you want to.



It is worth considering the data format for video recordings. The ELSA Codec for video data compression features a highly effective reduction procedure which saves disk space and, depending on your computer system, can work in real time.

Recording video involves very large amounts of data. The following tips will help you to record without frame dropping.

- Close other programs, especially DOS boxes, while recording videos.
- Carry out a hard-disk optimization before recording.
- Use a separate hard disk for recording.
- Use the ELSA video compress.
- Deactivate the audio recording if not required.

AVI files recorded with the ELSA compression require a codec installed in the system for playback. Thus you should follow two steps when recording:

① First record the video with the ELSA compression to benefit from the advantages outlined above.

② Then use 'MainActor' (see page 24) to convert the file into a more common format such as MPEG, Indeo or Cinepak. You could also use any video editing program which supports the "Video for Windows" codec.

If you want to playback video recorded with the ELSA compression, best results are achieved with the Windows Media Player using RealColor or TrueColor modes. A color depth with just 8 bits/pixel (256 colors) can result in poor image quality with coarse color transition.

How Does the Video Image Get Onto the Computer Monitor?

The *WINNERware* CD has programs you can use to display the video image. One particularly exciting application when the video camera is connected is to use Microsoft NetMeeting. You can set up conferences over a TCP/IP network or a telephone connection which will also send video information. For example, you can show on the screen the video image of the participants in a conference. Entire video sequences can be recorded with MainActor, another program on the *WINNERware* CD. Special formats allow linking of animated video sequences to Internet pages.

Overwhelmed?

A whole new world of opportunities opens up with the video interface on the graphics board. If you're too dazzled by the wealth of options available, you might like to look at the tips and ideas listed below.

What's IN

- With your camera, you can
  - Hold Internet video conferences using Microsoft NetMeeting. Your picture adds weight to your opinion. Those taking part in the conference can see each other, and the conference experience is more lifelike.
  - Record videos and compose a multimedia show with the help of MainActor
- With your video recorder, you can
  - Play live video or TV on your desktop. A news ticker or a video clip from your favorite tape will run in an extra window on your monitor.
  - Make recordings of still images or video sequences from the video recorder. Using MainActor you can record and edit your valuable archive material. Digital images can be manipulated as you wish.
- With a cable or TV tuner you can
  - Surf the channels' videotext. Up-to-date, fast and free: The included videotext decoder makes this service to an attractive alternative.

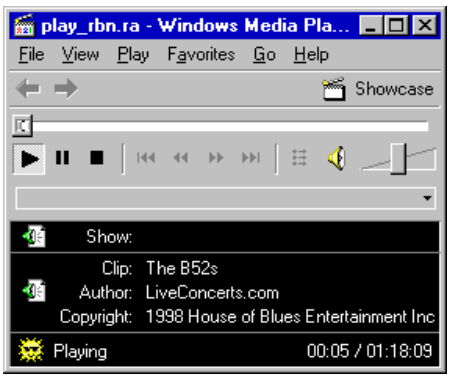
Useful stuff and more

Apart from the ELSA drivers, the *WINNERware* CD also contains additional programs and utilities for use with the *ELSA WINNER II*, a selection of which we will intorduce here. Information about other programs can be taken from the README files on the CD.

The Multimedia Player

Until now, a variety of programs for the playback of CDs, videos and other media was available under Multimedia in the Accessories folder of the Windows start menu. These have now been succeeded by the Microsoft Multimedia Player. It handles the most common multimedia formats, all under one common user interface—regardless of whether the data is coming from the Internet or the local hard disk. The Multimedia Player is responsible for the playback of RealAudio and RealVideo, as well as WAV, AVI and Quicktime files.

Video playback or Internet live radio: The Microsoft Multimedia Player handles all common multimedia formats.



After the installation, the file extensions of media files are permanently associated with the Multimedia Player. You can thus double-click the media files in the Windows Explorer or My Computer folder to conveniently launch the Player and start the playback.

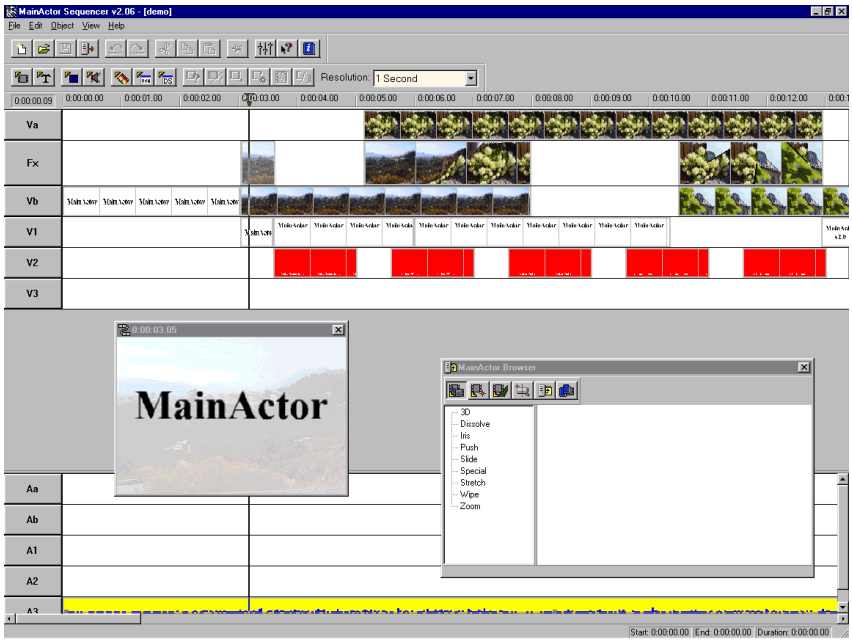
The use of the Multimedia Player is intuitive, and it includes a comprehensive help function to clarify questions or solve problems while working with the program.

MainActor—the principal performer

You will find MainActor on the CD. The program consists of three modules with which you are able to create sophisticated video productions.

The sequencer

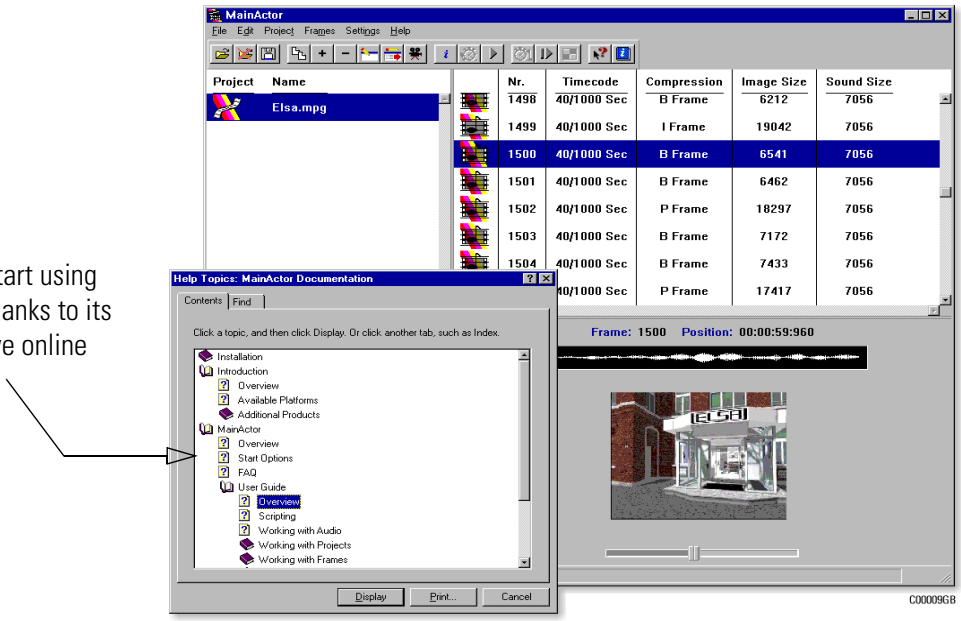
MainActor sequencer is a professional video sequencer that allows you to produce videos with sound, animations, titles and videoclips. Additional effects and filters give you the ability to easy manipulate your video material.



The video editor

MainActor sequencer allows you to load, edit, and playback any animations, images and sounds; you can also convert these to a wide variety of formats. Edited projects may be stored as new animations or images.

It is easy to start using MainActor, thanks to its comprehensive online help.



The Viewer

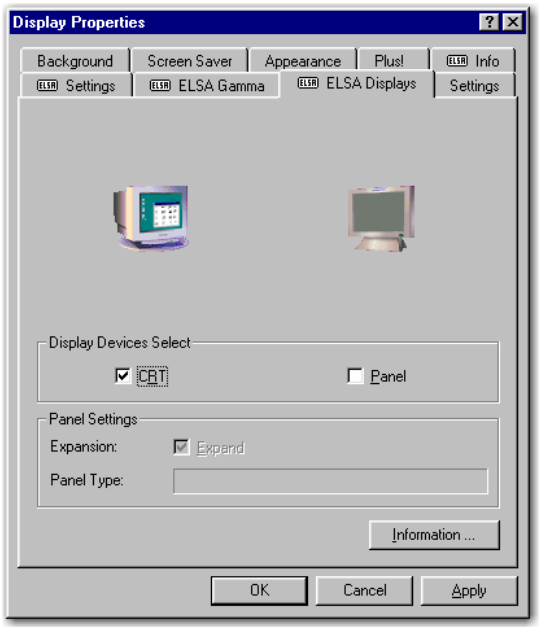
MainView is the external player for MainActor. It is used if you only wish to playback videos, without having to load them into MainActor. MainView can also be called from other programs.

Open MainActor's online help by pressing F1 or selecting Help from the menu bar. You will find more information about the program here.

ELSA Switch

The ELSA Switch tool allows you to run a VGA monitor (CRT) and an LCD panel (Panel) together, or one at a time. The CRT is connected to the analog VGA D-shell socket, and the Panel is connected to the digital mini D-ribbon socket of the <ProNameShort>.

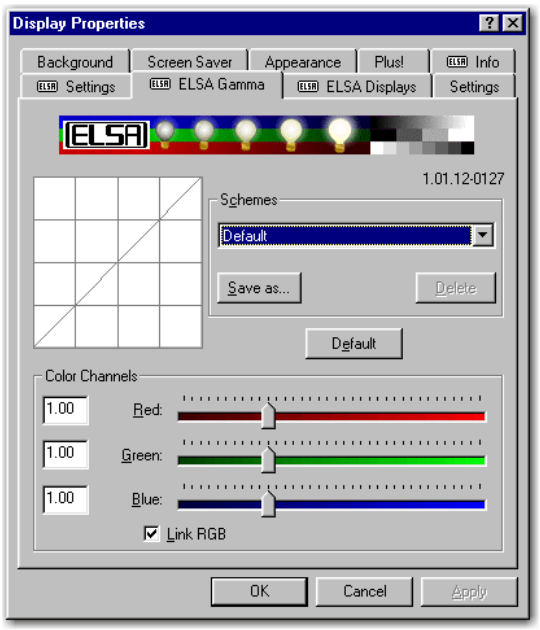
If the two displays are operated in parallel, the CRT monitor will display the same picture as the LCD panel at 60 Hz, and at the maximum Panel resolution. The maximum panel resolution is automatically read by means of the EDID function (→"Technical data" section).



ELSA Gamma correction

Gamma correction allows you to precisely adjust your monitor's color hue. Color-sensitive DTP and graphics work both depend on achieving an exact match between the colors as seen on the monitor, and the printer output.

For the three RGB colors (red, green, and blue), you can define the color space either by using a slider, or by entering the individual values. Each setting can be saved as a scheme that you can later call up.



All about graphics

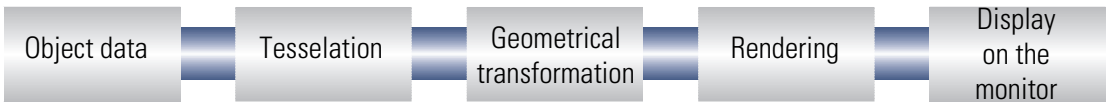
This is the chapter where we really get stuck in. Anyone who wants to know more about graphics—especially in connection with the *ELSA WINNER II*—will finde a whole load of technical stuff right here.

3D graphics representation

Today it is considered de rigeur to know all about 3D. Your curiosity will be aroused as soon as you experience the first visual wizardry generated by your new graphics board. Two features of the 3D display will leap out at you: it's both realistic and fast. The amount of work required here is known only to the processor, but we will describe it in detail to you below.

The 3D pipeline

What actually happens when a monitor displays a 3D object? The data describing the 3D object are passed through what is known as the 3D pipeline, in which the mathematical calculations for its representation in space and perspective on the monitor are carried out. What happens in detail?



Start: The object data

The pipeline starts at the object. The object description is made up of the data (points).

Tesselation

In the first step, the object is broken down into a number of polygons or triangles. The vertices of the triangles are described by coordinate points (x, y and z) with the 'z' value containing the depth information. Depending on the representation, these vertices also contain information concerning the material and texture. The volume of data to be processed increases enormously because of this conversion of the image information.

Geometrical transformation

This part of the 3D pipeline is very processor-intensive, as all the calculations for the 3D scene are carried out at this stage. Simplified, it comprises of the following steps:

- **Illumination** – The illumination of the scene by different light sources is calculated.
- **Transformation** – In transformation, the objects are aligned in perspective as seen from the observer's point of view.
- **Back face culling** – This process computes hidden surfaces resulting from the observation perspective chosen. Any object having an invisible front surface is omitted.
- **3D clipping** – In this process, each polygon is checked to determine whether it is partially or fully invisible. The invisible faces or parts of objects will be removed.
- **Scaling on the screen** – The above steps are now calculated for three-dimensional space using normalized coordinates. The on-screen image coordinates will only now be computed.

Rendering

At this stage, the 3D scene is filled with color shades and textures are applied. Different processes and methods are also applied here.

- **Texture mapping** – At this stage, the 3D object undergoes a sort of "face lift". The materials and textures are assigned. Different methods are used here to make the textures appear realistic, even when enlarged or reduced. As a first step, the textures are computed:
  - Point sampling is the simplest method. A pixel-by-pixel comparison is made between the texture template and the surface to be filled. This method leads to a very coarse representation, especially when enlarged.
  - In linear mapping, a new color value is interpolated from the adjacent pixels (or telexes) of a texture. This gives better results than point sampling, as the hard boundary between the coarse pixels is blurred.
  - The MIP mapping method stores a large number of enlargement stages for the texture. The depth information of a primitive is then used to determine which enlargement stages of the texture will be used in drawing. Normal textures seldom contain more than 256 colors.
    The first 15 bits of a 16-bit wide color representation are reserved for the colors (5/5/5 > R/G/B). Information concerning the transparency of the texture is carried in the alpha channel. The last bit is reserved for this information. Finally, a distinction is made in MIP mapping between bilinear and trilinear filtering. Bilinear filtering interpolates between two pixels of two textures, trilinear filtering interpolates between four pixels for each of two textures.
  - Bump mapping introduces a new dimension. Relief or raised textures can only be generated with the other methods in two dimensions using light and shadow effects. In bump mapping, the texture is additionally assigned height information, which allows very realistic three-dimensional effects to be created.

The staircase effect is corrected by anti-aliasing. This is either done by interpolating mixed pixels, in which a new color value is computed from two adjacent color values, or by using transparent pixels of the same color which are overlaid over adjacent pixels.

- **Shading** – Shading takes account of the effects created by different light sources on the 3D object and provide for a very realistic overall impression. Here, too, there are different methods which are more or less processor-intensive:
  - Flat shading assigns a color value to each polygon. This results in a mosaic-like, jagged representation, which demands only a short processing time.
  - In Gouraud shading, all the vertices of the polygons are assigned a color value. The remaining pixel information for the polygon is interpolated. This method gives a very gentle color transition, even with fewer polygons than are required for flat shading.
  - The Phong shading method additionally takes a normal vector of reflectivity into consideration when interpolating. An even more realistic impression is generated by the representation of reflections and mirror images.
  - Certain applications use ray tracing methods. This is a very computer-intensive and time-consuming process in which each individual pixel and its reflection in 3D space is calculated.
- **The frame buffer**

  The finished image will not be written to the frame buffer until this complex sequence of steps is completed. The frame buffer is made up of front and back buffer. The back buffer acts as a buffer page, in which the next image to be displayed is built up. This prevents the process of image drawing being visible. The duplicate storage method is also known as double buffering.

Flipping: Display on the monitor

The content of the front buffer is displayed on the monitor. When the drawing process in the back buffer is completed, this image is then passed to the front buffer in a process known as flipping.

The next image will only ever be displayed once the image drawing process in the back buffer is completed. This procedure should be repeated at least 20 times a second to give a smooth representation of 3D scenarios. In this context, we speak of frames per second (fops), a very important value for 3D applications. A cinema film runs at 24 fps.

3D interfaces

Software interfaces, including 3D interfaces, are known as APIs (Application Program Interface). The question is what are these interfaces used for, and how do they work.

In simple terms: They make developers' work easier. The methods by which the various interfaces function, are comparable: In the past it was necessary to address the various hardware components directly in programming if you wanted to exploit their capabilities to the full. The APIs are a kind of translator operating between the hardware and the software.

The specification of standard definitions was the precondition for the proper function of these translation routines. These definitions are implemented by the hardware manufacturers during development and optimized for the hardware concerned. Developers can implement complex procedures relatively easily by using these definitions. They can use a uniform command set when programming and do not need to know the characteristics specific to the hardware.

What APIs are available?

There are a good dozen more or less commonly found 3D APIs. However, in recent years, two formats have established themselves as the favorites: Direct 3D and OpenGL. ELSA graphics boards support these commonly found 3D interfaces. The functional differences between the interfaces are slight. The decisive questions for the user concern extensibility, flexibility and possible portability to existing applications.

Direct 3D

As a development of Mode X and DirectDraw under Windows 3.1x, Direct 3D is a branch of the DirectX multimedia family which was developed directly for Windows 95 to accelerate the slow 3D display characteristics of the operating system. Direct 3D is based on Microsoft's Common Object Model (COM), which is also used as the foundation to OLE technology (Object Linking and Embedding). Direct 3D cooperates with Direct Draw in two-dimensional display. A typical situation would be, for instance, rendering a 3D object while Direct Draw is placing a two-dimensional background bitmap. Microsoft claims to have corrected some of the weaknesses of the old version in the most recent version 5.0.

Immediate mode and retained mode

As can be assumed from the two terms, immediate mode is a programming mode that is close to the hardware. Retained mode, on the other hand, is a programming mode that is largely predefined through an API interface. What does this mean in detail? Looking at the two systems hierarchically, the immediate mode is also known as the low-level mode. The programming interface level is close to the hardware level and permits the programmer direct access to special functions in the hardware component concerned. The retained mode (high-level mode) makes it possible, for example, to load a defined 3D object with textures into a Windows application. Here it can be manipulated and moved using simple API commands. Translation takes place in real time, without the need to know the technical structure of the object.

For further information see the Internet WWW site http://www.microsoft.com

OpenGL

Following its success in gaining a good reputation amongst professionals using CAD/CAM programs, OpenGL is now increasingly penetrating the PC market. OpenGL is platform-independent and makes a distinction between immediate and display list modes. A display list stores specific sequences that can be recalled again later. The object descriptions can then be taken directly from the list, resulting in very high performance. However, if objects need to be manipulated frequently, the display list will have to be generated again from new. In this case, the speed advantage is lost. OpenGL provides a wide range of graphics features, from rendering a simple geometric point, line, or filled polygon, to the most sophisticated representations of curved surfaces with lighting and texture mapping. The some 330 routines of OpenGL provide software developers access to these graphics capabilities:

For further information see the Internet WWW site http://www.sgi.com

Color Palettes, TrueColor and Gray Scales

Common graphics modes are listed in the following table. Not all graphics modes are available on the *ELSA WINNER II* boards.

Graphics mode	bpp	bpg	Colors (from palette)	Max. gray levels
VGA 0x12 VGA 0x13	4 8	6+6+6 6+6+6	16 of 262,144 256 of 262,144	16 64
Standard	8 8	6+6+6 6+6+6	256 of 262,144 256 of 16.7 million	64 256
HighColor	15 16 16	5+5+5 6+6+4 5+6+5	32,768 65,536 65,536	32 16 32
TrueColor	24 32	8+8+8 8+8+8+8	16.7 million 16.7 million	256 256

(bpp = bits per pixel; bpg = bits per gun)

VGA

In VGA graphics adapters, the digital color information stored in the video memory (4 bits for 16 colors or 8 bits for 256 colors) is converted into a digital 18-bit value in the graphics adapter in a CLUT (ColorLookUpTable). The 3 x 6 bits are converted separately for R/G/B (red/green/blue) in the RAMDAC (D/A converter) and transferred to the monitor as analog signals on just three lines (plus sync lines). The original color values are converted into completely different values by means of a translation table. The value stored in the

video memory is thus not a color value, but only a pointer to a table in which the actual color value is found. The advantage of this method: Only 8 bits need to be stored for each pixel, although the color values are 18 bits wide; the disadvantage: Only 256 colors can be displayed simultaneously from a palette of 262,144 possible colors.

DirectColor

The situation is different in the case of DirectColor (TrueColor, RealColor and HighColor). In this case, the value stored in the video memory is not translated but is passed directly to the D/A converter. This means that the full color information must be saved for each pixel. The meanings of the terms RealColor, TrueColor, and HighColor can be confused, as they are not always used unambiguously.

HighColor and RealColor

HighColor and RealColor usually describe a 15 or 16-bit wide graphics mode, while True-Color should only be used for the more professional 24-bit mode (or 32-bit) mode.

15 bits provide 5 bits each for the red, green and blue values, resulting in 32 levels per RGB component and thus 32,768 (= 32 x 32 x 32) different color hues.

The 16-bit graphics modes are organized differently. Most common are (R-G-B) 5-6-5 (e.g. XGA) and 6-6-4 (e.g. i860). 5-6-5 means that 5 bits are used for each of red and blue and 6 bits are used for green. In the case of 6-6-4, 6 bits are used for red and green and 4 bits for blue. Both ways of assigning the bits correspond to the color sensitivity of the human eye: this is highest for green and lowest for blue. 65,536 different colors can be displayed.

TrueColor

The TrueColor mode is more complex, using 24 bits per pixel. Here, 8 bits are available for each color component (256 levels), resulting in 16.7 million different color hues. There are more colors available than pixels on the screen (1.3 million pixels at a resolution of 1280 x 1024).

VESA DDC (Display Data Channel)

The Display Data Channel provides a serial data channel between the monitor and the graphics board, as long as both support DDC and the monitor cable includes the additional DDC wire. This feature allows the monitor data to be sent automatically to the graphics board (e.g. name, type, max. horizontal frequency, timing definitions etc.) or even for the graphics board to send instruction to the monitor.

There are various standards; DDC2B and DDC2AB.

DDC2B

A bi-directional data channel based on the I2C access-bus protocol is used for the communication between monitor and graphics board. In the case of a standard IBM VGA compatible 15-pin monitor connector, pin 12 (formerly used as monitor ID bit 1) is used for data transmission (SDA), and the pin 15 (formerly used as monitor ID bit 3) is used as transmission clock (SCL). The graphics board can request the short EDID information (see DDC1) as well as the more comprehensive VDIF information (VESA Display Identification File).

DDC2AB

With DDC2AB additional to DDC2B, the computer can send commands for controlling the monitor, e.g. for adjusting the screen position or the brightness (similar to ACCESS bus). Modern monitors and graphics boards no longer use this standard.

The pin assignment of the VGA D-shell socket can be found in the chapter 'Technical data'.

Technical data

Those of you with a technical bent will find more detailed information regarding the *ELSA WINNER II* in this chapter. All interfaces and their assignments are described in detail.

Characteristics of the graphics board

	ELSA WINNER II
Graphics processor	Savage 4 Pro (125 MHz)
RAMDAC pixel timing	300 MHz
On-board memory	*ELSA WINNER II* without video: 16 MB SyncRAM (125 MHz) *ELSA WINNER II* with video: 32 MB SyncRAM (143 MHz)
BIOS	Flash-BIOS with VBE-3.0-Support
Bus system	AGP, 2x and 4x
VESA DDC	DDC2B

ELSA graphics board addresses

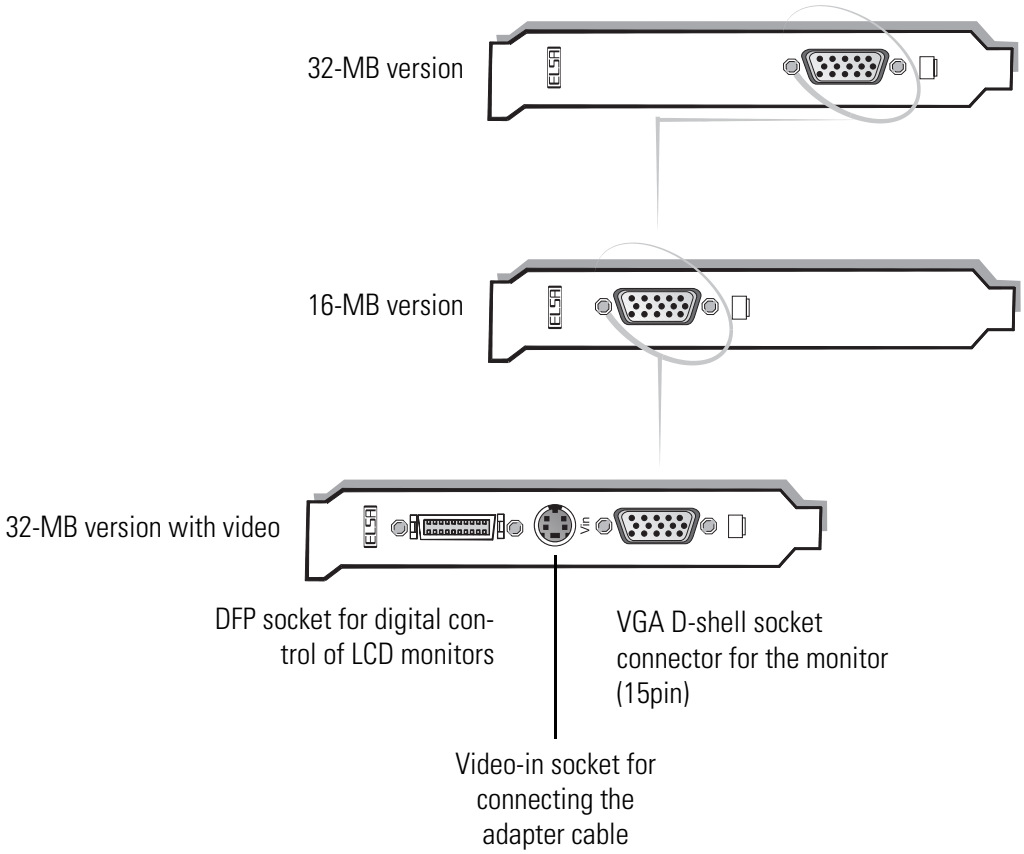
The ELSA graphics boards are 100% IBM VGA compatible and occupy the same memory area and specific addresses in the I/O range. The memory range above 1 MB is automatically assigned through the PCI BIOS interface.

If you come across any address conflicts, try to modify the I/O address of the expansion board causing the conflict. The addresses of the ELSA graphics boards cannot be changed! The WINNER II also requires an interrupt (IRQ) which is free. This may have to be reserved in the computer's BIOS. For help with this theme, refer to the manual for your mainboard.

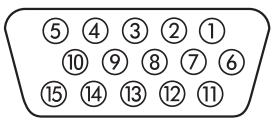
To ensure that your system functions properly, the addresses and ranges occupied by the ELSA graphics board must not be accessed simultaneously by other hardware components. The following addresses are assigned:

- **I/O addresses:**
  Standard VGA I/O (3B0-3DF)
- **Memory addresses:**
  Video RAM (A0000-BFFFF)
  Video BIOS-ROM (C0000-C7FFF)

Ports on the graphics board



The VGA D-shell socket



Pin assignment

Connection	Signal	Connection	Signal
1	Red	9	+5 V
2	Green	10	Sync ground
3	Blue	11	Monitor ID2
4	Monitor ID0	12	Bidirectional data (SDA, DDC1/2B)
5	DDC ground	13	Horizontal synchronization
6	Red ground	14	Vertical synchronization
7	Green ground	15	Data timing (SCL, DDC2B)
8	Blue ground		

The *ELSA WINNER II* issues analog signals in accordance with the requirements of Guideline RS-170. The synchronization information is sent separately. If your monitor provides a switch for the input impedance, you should select '75 Ohms' (= '75 Ω') for the R, G and B video inputs and '2 kOhm' (= '2 kΩ') for the sync inputs. You should only try

other switch settings at the sync inputs if your monitor expects sync levels other than those used by normal monitors and does not produce a stable display. The switches are labeled “Low” and “High” only on some monitors. You can then refer to your monitor manual to find out what input impedance level this refers to, or you can experiment to find a position in which a stable image appears in all graphics modes.

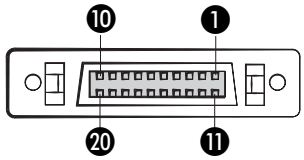
The DFP interface

The digital flat panel (DFP) interface allows an LCD monitor to be connected directly to the digital output of the graphics card. This prevents unnecessary signal conversion from digital to analog and back again, thus preserving output quality.

NoteTo use the DFP output, the monitor must be equipped with a corresponding connector, and must conform to the VESA DDC/EDID standard. A non-conforming monitor will not produce a picture on the screen.

Connector layout

The *WINNER II* has a 20-pin mini D-ribbon connector with the following layout:



	Signal	Description		Signal	Description
1	TX1+	TMDS positive differential output, channel 1	11	TX2+	TMDS positive differential output, channel 2
2	TX1-	TMDS negative differential output, channel 1	12	TX2-	TMDS negative differential output, channel 2
3	SHLD1	Shield for TMDS channel 1	13	SHLD2	Shield for TMDS channel 2
4	SHLDC	Shield for TMDS clock	14	SHLD0	Shield for TMDS channel 0
5	TXC+	TMDS positive differential output, reference clock	15	TX0+	TMDS positive differential output, channel 0
6	TXC-	TMDS negative differential output, reference clock	16	TX0-	TMDS negative differential output, channel 0
7	GND	Logic ground	17	–	Reserved
8	+5 V	Logic +5 V supply	18	HPD	Hot plug detection
9	–	Reserved (USB)	19	DDC_DAT	DDC2B Data
10	–	Reserved (USB)	20	DDC_CLK	DDC2B clock

TMDS == Transition Minimized Differential Signalling

The S-Video connector

Pin assignment

Pin	Signal	Pin	Signal
1	GND, ground (Y)	2	GND, ground (C)
3	Y, intensity (luminance)	4	C, color (chrominance)

Appendix

DOC–Declaration of Conformity

ELSA AG **WINNER II**

Tested To Comply With FCC Standards

FOR HOME OR OFFICE USE

Compliance Information Statement
(Declaration of Conformity Procedure)

Responsible Party:	ELSA Inc.
Address:	2231 Calle De Luna Santa Clara, CA 95054 USA
Phone:	+1-408-919-9100
Type of Equipment:	Graphics Board
Model Name:	WINNER II

This device complies with Part 15 of the FCC rules.
Operation is subject to the following two conditions:
(1) this device may not cause harmful interference, and
(2) this device must accept any interference received, including interference that may cause undesired operation.
See user manual instructions if interference to radio reception is suspected.

On behalf of the manufacturer / importer
this declaration is submitted by

Aachen, April 14th 1999

Peter Wieninger
VP Engineering
ELSA AG, Germany

Warranty conditions

The ELSA AG warranty, valid as of June 01, 1998, is given to purchasers of ELSA products in addition to the warranty conditions provided by law and in accordance with the following conditions:

1 Warranty coverage

a) The warranty covers the equipment delivered and all its parts. Parts will, at our sole discretion, be replaced or repaired free of charge if, despite proven proper handling and adherence to the operating instructions, these parts became defective due to fabrication and/or material defects. Also we reserve the right to replace the defective product by a successor product or repay the original purchase price to the buyer in exchange to the defective product. Operating manuals and possibly supplied software are excluded from the warranty.

b) Material and service charges shall be covered by us, but not shipping and handling costs involved in transport from the buyer to the service station and/or to us.

c) Replaced parts become property of ELSA.

d) ELSA are authorized to carry out technical changes (e.g. firmware updates) beyond repair and replacement of defective parts in order to bring the equipment up to the current technical state. This does not result in any additional charge for the customer. A legal claim to this service does not exist.

2 Warranty period

The warranty period for ELSA products is six years. Excepted from this warranty period are ELSA color monitors and ELSA videoconferencing systems with a warranty period of 3 years. This period begins at the day of delivery from the ELSA dealer. Warranty services do not result in an extension of the warranty period nor do they initiate a new warranty period. The warranty period for installed replacement parts ends with the warranty period of the device as a whole.

3 Warranty procedure

a) If defects appear during the warranty period, the warranty claims must be made immediately, at the latest within a period of 7 days.

b) In the case of any externally visible damage arising from transport (e.g. damage to the housing), the transport company representative and ELSA should be informed immediately. On discovery of damage which is not externally visible, the transport company and ELSA are to be immediately informed in writing, at the latest within 7 days of delivery.

c) Transport to and from the location where the warranty claim is accepted and/or the repaired device is exchanged, is at the purchaser's own risk and cost.

d) Warranty claims are only valid if the original purchase receipt is returned with the device.

4 Suspension of the warranty

All warranty claims will be deemed invalid

a) if the device is damaged or destroyed as a result of acts of nature or by environmental influences (moisture, electric shock, dust, etc.),

b) if the device was stored or operated under conditions not in compliance with the technical specifications,

c) if the damage occurred due to incorrect handling, especially to non-observance of the system description and the operating instructions,

d) if the device was opened, repaired or modified by persons not authorized by ELSA,

e) if the device shows any kind of mechanical damage,

f) if in the case of an ELSA Monitor, damage to the cathode ray tube (CRT) has been caused especially by mechanical load (e.g. from shock to the pitch mask assembly or damage to the glass tube), by strong magnetic fields near the CRT (colored dots on the screen), or through the permanent display of an unchanging image (phosphor burnt),

g) if, and in as far as, the luminance of the TFT panel backlighting gradually decreases with time, or

h) if the warranty claim has not been reported in accordance with 3a) or 3b).

5 Operating mistakes

If it becomes apparent that the reported malfunction of the device has been caused by unsuitable software, hardware, installation or operation, ELSA reserves the right to charge the purchaser for the resulting testing costs.

6 Additional regulations

a) The above conditions define the complete scope of ELSA's legal liability.

b) The warranty gives no entitlement to additional claims, such as any refund in full or in part. Compensation claims, regardless of the legal basis, are excluded. This does not apply if e.g. injury to persons or damage to private property are specifically covered by the product liability law, or in cases of intentional act or culpable negligence.

c) Claims for compensation of lost profits, indirect or consequential detriments, are excluded.

d) ELSA is not liable for lost data or retrieval of lost data in cases of slight and ordinary negligence.

e) In the case that the intentional or culpable negligence of ELSA employees has caused a loss of data, ELSA will be liable for those costs typical to the recovery of data where periodic security data backups have been made.

f) The warranty is valid only for the first purchaser and is not transferable.

g) The court of jurisdiction is located in Aachen, Germany in the case that the purchaser is a merchant. If the purchaser does not have a court of jurisdiction in the Federal Republic of Germany or if he moves his domicile out of Germany after conclusion of the contract, ELSA's court of jurisdiction applies. This is also applicable if the purchaser's domicile is not known at the time of institution of proceedings.

h) The law of the Federal Republic of Germany is applicable. The UN commercial law does not apply to dealings between ELSA and the purchaser.

Glossary

- **3D** – Three-dimensional
- **3D clipping** – Process in geometric transformation in which invisible surfaces or parts of a 3D object are removed.
- **3D pipeline** – Sum of all steps required for the representation of virtual 3D scene on the monitor. These include →tesselation, →geometrical transformation and →rendering.
- **AGP** – stands for Accelerated Graphics Port and is a further development by INTEL based on the PCI bus. The AGP bus provides a greater bandwidth for data transmission and communicates directly with main memory. The bus is primarily intended for 3D graphics boards.
- **Aliasing** – the familiar "staircase effect". Jagged transitions are often formed between adjacent pixels in the representation of diagonals or curves. These "jaggies" can be smoothed out by anti-aliasing.
- **Alpha blending** – Additional information for each pixel for creating transparent materials.
- **Back buffer** – is the name for the image region built up in the background in the frame buffer during →double buffering.
- **Back face culling** – Method used to calculate the hidden faces of a 3D object.
- **BIOS** – Abbreviation of Basic Input/Output System. A program code in the read-only memory (ROM) of a computer which performs the self-test and several other functions during system startup.
- **Bump mapping** – Process by which textures are assigned depth information which allows the display of relief or raised structures.
- **Bus system** – A system of parallel data lines for the transfer of information between individual system components, especially to expansion boards (e.g. PCI bus).
- **Chrominance** – Color information in the video signal.
- **Clipping** – parts of polygons invisible to the representation are determined in clipping. These parts are then not displayed.
- **D/A converter** – Digital/Analog converter: A signal converter which converts a digital input signal to an analog output signal.
- **DCC** – (Digital Content Creation) DCC is the computer-based production of professional visualizations and animations for the field of digital media and the entertainment industry.
- **DDC** – stands for Display Data Channel. A special data channel through which a DDC-capable monitor can send its technical data to the graphics board.
- **DirectColor** – Generic term for TrueColor, RealColor and HighColor. The value that is stored in the video RAM is not translated but transferred directly to the D/A converter. This means that the full color information must be saved for each pixel.
- **Double buffering** – means that there are two display buffers. This means that the next image can be drawn in the page of the display buffer, which is initially invisible. This image will be displayed once it is ready and the next image will be prepared in the other page of the buffer. Animations and games can be made to look more realistic with this technique than with simple single buffer.

- **DPMS** – Abbreviation of VESA Display Power Management Signaling. This standard allows an energy-saving operation of monitors in several steps. The graphics boards described in this manual support VESA DPMS.
- **DRAM** – Abbreviation of Dynamic Random Access Memory. Volatile memory for read and write operations.
- **EDO-RAM** – Abbreviation for Extended Data Output Random Access Memory (Hyper Page Mode). EDO-RAM is very common on graphics boards, as the most recently used data persist in memory. A number of read accesses to similar data occur during the generation of an image, so that use of EDO-RAM gives a significant speed advantage.
- **FCC** – FCC compliance means that a device has been tested and found to comply with the limits for a Class B digital device pursuant to Part 15 of the FCC Rules, designed to provide reasonable protection against harmful interference in a residential installation.
- **FIFO method** – (first in, first out) a system used in batch processing and queues in which the first signal to arrive is processed first.
- **Fixed-frequency monitor** – A monitor that can only be operated at a specific resolution and refresh rate.
- **Flat shading** – →'Shading'.
- **Flipping** – The image generated in the →back buffer is displayed.
- **Frame buffer** – Part of the graphics memory in which the image next to be displayed on the screen is generated. In addition, transparency effects are calculated in the frame buffer.
- **Front buffer** – is the name for the visible image page in →double buffering.
- **Geometrical transformation** – The position of the object in space is determined from the observer's point of view.
- **Gouraud shading** – → 'Shading'.
- **Graphics accelerator** – refers to a graphics accelerator board, i.e a board particularly suited for graphics intensive user environments.
- **HighColor** – designates a 15-bpp or 16-bpp (bits per pixel) graphics mode, i. e. 32,768 or 65,536 colors.
- **Horizontal frequency** – The horizontal frequency (scan frequency) of a monitor in kHz. This value must be set in accordance with the operating limits of the monitor, otherwise the monitor might be damaged in extreme cases.
- **Horizontal scan frequency** – The horizontal scan frequency of a monitor in kHz. This value must be set in accordance with the operating limits of the monitor, otherwise the monitor might be damaged in extreme cases.
- **Interpolation** – A video image must be stretched or shrunk in order to fit into the display window. If pixels are simply multiplied (for example, a block of four equally colored pixels represents the original pixel), aliasing effects ("blocks" and "stairs") will occur. This can be avoided by interpolation procedures (using average colors for inserted pixels). Horizontal interpolation is relatively easy to perform, since the pixels are drawn to the screen in lines. Vertical interpolation is more difficult and requires a complete pixel line to be buffered.
- **MIP mapping** – In MIP mapping a number of textures are assigned to an object depending on distance. The representation of the object becomes more detailed as the observer approaches the object.

- **Multifrequency/Multisync monitor** – A monitor that can be operated at various horizontal scan frequencies, or that automatically adapts itself to different video signals (resolutions).
- **OpenGL** – 3D software interface (3D API). E.g. implemented in Windows NT and available for Windows 95. Based on Iris GL from Silicon Graphics and licensed from Microsoft.
- **Page Flipping** – The image generated in the →back buffer is displayed
- **PCI bus** – Abbreviation of Peripheral Component Interconnect Bus. An advanced bus system, i.e. a system of parallel data lines to transfer information between individual system components, especially to expansion boards.
- **Phong shading** – → 'Shading'.
- **Pixel** – Picture element. Dot in the image.
- **Pixel frequency** – Pixel clock frequency (number of pixels drawn per second in MHz).
- **Primitive** – Simple, polygonal geometrical object, such as a triangle. 3D landscapes are generally broken down into triangles.
- **RAM** – Abbreviation of Random Access Memory. Chip memory of a computer or expansion board that can be read from and written to (unlike ROM = Read Only Memory).
- **RAMDAC** – The RAMDAC converts the digital signals to analog signals on a graphics board. VGA monitors are only capable of processing analog signals.
- **RealColor** – RealColor normally designates a 15-bpp or 16-bpp (bits per pixel) graphics mode, i.e. 32,768 or 65,536 colors).
- **Refresh rate** – or image refresh frequency (in Hz) indicates how many times per second an image on the monitor is refreshed.
- **Rendering** – Process for calculating the representation of a 3D scene, in which the position and color of each point in space is determined. The depth information is held in the →Z buffer, the color and size information is held in the →frame buffer.
- **Resolution** – The number of pixels in horizontal and vertical direction on the screen, for example 640 horizontal by 480 vertical pixels (640 x 480).
- **RGB** – Color information is saved in the Red/Green/Blue color format.
- **ROM** – Abbreviation of Read Only Memory. Semiconductor memory that can only be read and not written to.
- S-Video – or S-VHS. Signal transmission of video information, where the signals for →chrominance and →luminance are separated. This results in a higher picture quality.
- **Shading** – Shading or rendering is a way to define the colors on curved surfaces in order to give an object a natural appearance. To achieve this, the surfaces are subdivided into many small triangles. The three most important 3D shading methods differ in the algorithm used to apply colors to these triangles:
  Flat shading: the triangles are uniformly colored.
  Gouraud shading: The color shades on a triangle are calculated by interpolating the vertex colors, resulting in a smooth appearance of the surface.
  Phong shading: the color shades on a triangle are calculated by interpolating the normal vector.
- **Shutter glasses** – Goggles which use stereoscopic LCD projection of 3D scenery to give the observer a strong impression of space.

- **Single buffer** – By contrast with double buffering, where the image buffer is duplicated, the single buffering mode is not able to access the next image, which has already been calculated. This means that animations will run jerkily.
- **Tearing** – A distinction is made in double buffering between the front buffer and the back buffer. The image change between the front buffer and the back buffer is synchronized in tearing.
- **Tesselation** – The objects for 3D calculations are divided up into polygons (triangles) in tesselation. The vertices, color and, if required, transparency values, are determined for the triangles.
- **Textures** – Wrapping a bitmap around an object, including perspective correction, for example wallpaper on a wall or a wood texture on furniture. Even a video can be used as a texture map.
- **TrueColor** – Graphics mode with 16.7 million colors (24 or 32 bits per pixel). In this mode, the color information saved in the display memory is not translated by a look-up table, but passed directly to the D/A converter. This means that the full color information must be saved for each pixel.
- **VESA** – Abbreviation of Video Electronics Standards Association. A consortium for the standardization of computer graphics.
- **VRAM** – Abbreviation for video RAM. Memory chip for fast graphics boards.
- **Z buffer** – 3D depth information (position in the third dimension) for each pixel.

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