

GLADIAC™

2000 ELSA AG, Aachen (Germany)

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Preface

Thank you for placing your trust in this ELSA product.

In choosing the *GLADIAC*, you have selected a graphics board which is just as well suited to professional users as to ambitious players. ELSA products are subject to the highest of standards in production and quality control which are the foundation for consistently high product quality.

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 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.

The README files on the *GLADIAC* CD contain the latest information about updates.

Our online services (www.elsa.com) are available to you around the clock should you have any queries regarding the topics discussed in this manual or require any further support. In the Support file section under 'Know-How', you can find answers to frequently asked questions (FAQs). The Knowledge-Base also contains a large pool of information. Current drivers, firmware, tools and manuals can be downloaded at any time.





Before you read on...

The installation of the GLADIAC 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.

Content

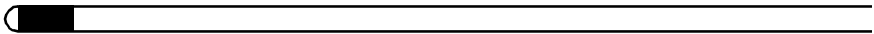
- **Introduction** **9**
 - Highlights of the *ELSA GLADIAC* 9
 - What's in the box? 9
 - What hardware do I need? 10

- **After installing the drivers** **11**
 - Software installation from the CD 11
 - The right settings 11
 - What are your options? 12
 - What is best for what situation? 12
 - Changing the resolution 13
 - Settings for 13

- **Useful stuff and more** **19**
 - The Multimedia Player 19
 - ELSA WINman Suite* 20
 - Fine-tuning for performance freaks 20
 - Overclocking 21
 - ELSAinfo 22

- **Graphics know-how** **23**
 - 3D graphics representation 23
 - The 3D pipeline 23
 - 3D interfaces 26
 - What APIs are available? 26
 - Direct 3D 26
 - OpenGL 27
 - Color palettes, TrueColor and gray scales 28
 - VGA 28
 - DirectColor 29
 - VESA DDC (Display Data Channel) 29
 - DDC2B 30
 - DDC2AB 30

- **Technical data** **31**
 - Characteristics of the graphics board 31



ELSA graphics board addresses	31
Ports on the graphics board	32
The VGA D-shell socket	32
● Appendix	33
CE conformity and FCC radiation standard	33
Declarations of conformity	34
Warranty conditions	35
● Glossary	37
● Index	43

Introduction

"Reading the manual is a waste of time." A prejudice you are proving to be wrong right now by reading this manual. And rightly so. In this case, it is really worth the effort. Because the *ELSA GLADIAC* has some smart features that are only described here in the manual.

So only those who read the manual will truly be taken with this card. We'll make it as short and easy as we can—promise.

Highlights of the *ELSA GLADIAC*

- The latest 3D graphics technology with the NVIDIA GeForce2 GTS processor
- 32-MB DDR RAM give you scope for image processing and huge textures
- 4 HyperTexel pipelines and per-pixel shading for even greater realism
- High-definition picture—high performance with up to 2048x1536 pixels, over 16 million colors and refresh rates of 200Hz provide an astounding picture—ideal for 19" to 24" monitors
- ELSA SmartRefresh and ELSA SmartResolution ensure optimized monitor use by providing the ability to modify resolution and refresh rate separately.
- Supports the *ELSA 3D REVELATOR* 3D shutter glasses
- Support via Internet and hotline
- CE and FCC conformity
- Six-year warranty

What's in the box?

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

- Graphics board
- Installation Guide
- Manual
- CD-ROM with installation and driver software and utilities

- Optionally available:
Video-in/out module for video editing, video chat, video capture or video e-mail

If any part is missing please contact your retailer. ELSA reserves the right to vary the products supplied without prior notice. The current scope of delivery is described on our web site.

What hardware do I need?

- **Computer:** Minimum requirements are a Celeron 300, Pentium II 300 or AMD K6 300 processor.
- **Bus:** The *GLADIAC* is available as an AGP version. Your computer must have an AGP bus.
- **Monitor:** The *GLADIAC* works with the standard IBM VGA compatible horizontal scan frequency of 31.5 kHz while booting and in DOS operation.

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
- the most effective 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 Gladiac CD—unless they are a component of the operating system.

Once you have successfully completed the steps described in the Installation Guide, your graphics board is integrated into your computer system with the installed ELSA driver. You are now likely to be familiar with the program ELSA CD setup. If the autostart function for your CD-ROM drive under Windows has been switched off, the setup program on the Gladiac CD will not start automatically. It can be found and started manually from the root directory of the CD and is called SETUP.EXE.

The greater part of the installation is automated; ELSA setup detects the installed operating system and ELSA graphics board(s). First of all select the language for the installation and then the components you wish to install.

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?
- How high should the refresh rate be set?

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 you need to know you will

find there. All the software you need, if not already a part of your operating system, is on the Gladiac 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.

Color depth:	Max. refresh rate (Hz)		
	256 colors (8 bit)	HighColor (16 bit)	TrueColor (32 bit)
2048 x 1536	75Hz	—	—
1900 x 1440	60 – 85	60 – 85	60 – 85
1600 x 1200	60 – 120	60 – 120	60 – 100
1280 x 1024	60 – 170	60 – 170	60 – 150
1024 x 768	60 – 200	60 – 200	60 – 200
800 x 600	60 – 200	60 – 200	60 – 200
640 x 480	60 – 200	60 – 200	60 – 200

HighColor = 65,536 colors, TrueColor = 16.7 million colors

What is best for what situation?

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.

“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 85Hz 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.

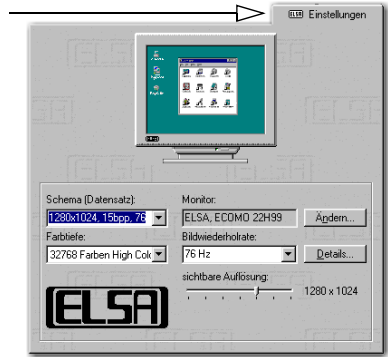
Settings for Windows 95 and Windows 98

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 modify the display settings.
- ③ Here you should click on the ELSA Settings tab.

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



Under Windows 98, you can change the 'ELSA settings' by selecting the 'Settings' tab and pressing the Advanced options... button.

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)
- the color depth, and
- the refresh rate.



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 highest permitted resolution. If you are not sure, select a lower resolution to be safe.

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 regarding 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.



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.

After you have registered and installed the monitor under Windows, you can set the desired color depth, the optimum resolution and an ergonomic refresh rate.

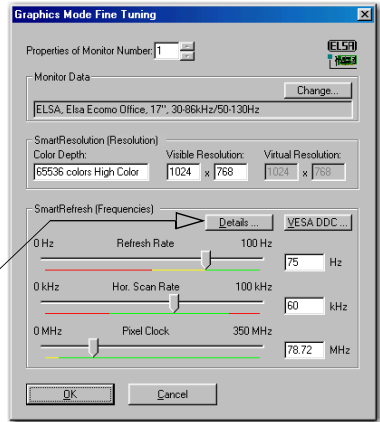
ELSA SmartRefresh and ELSA SmartResolution

Click the **Details** button in the 'Settings' to open a dialog where you can adjust the refresh rates and video timings individually. In addition you can change the resolution in steps of 32 pixels. The graphics mode fine-tuning tool is especially for screens in portrait or wide-angle format, or with the 4:3 aspect ratio. In such cases it is clearly advantageous to have the option of freely-selectable values.

SmartResolution: Allows you to adjust the resolution in steps of 32 pixels.

SmartRefresh: Allows you to accurately adjust the refresh rate.

Note: The settings for the monitor timings should only be changed by specialists.



Windows 2000

The settings for the graphics driver are included in the Control Panel under Windows 2000. 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.

- ① Click on the 'Settings' tab.
- ② Click **Advanced...** in the 'Settings' dialog.
- ③ Select the 'Graphics Board' tab in the dialog that opens.
- ④ A button labeled **Display Mode...** is located in the lower part of the window. Click it to view a list of all configurable combinations of resolution, color depth and refresh rate. The values in the list depend on the capabilities of the monitor and graphics board. Select the desired combination and confirm by pressing **OK**.
- ⑤ When finished, click **Apply...** to check the new settings. You are then given the option of selecting or canceling the chosen settings. If you are satisfied with the new combination, confirm your selection by pressing **OK**.

If using Windows 2000, you will not have to reboot your system.



You will find further information on how to customize your graphics settings under Windows 2000 in your system manual.

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.



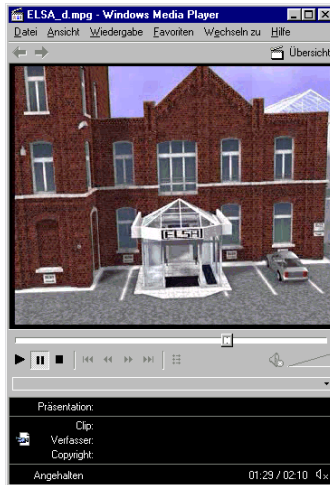
You will find further information on how to customize your graphics settings under Windows NT 4.0 in your system manual.

Useful stuff and more

Apart from the ELSA drivers, the ELSA CD also contains additional programs and utilities for use with the *ELSA GLADIAC*, a selection of which we will introduce 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 playing 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.

ELSA WINman Suite

Installing the ELSA drivers also places the *WINman Suite* in the Windows taskbar. *WINman Suite* provides you with quick access to all ELSA tools, letting you bypass the indirect route to the tools through the Control Panel.



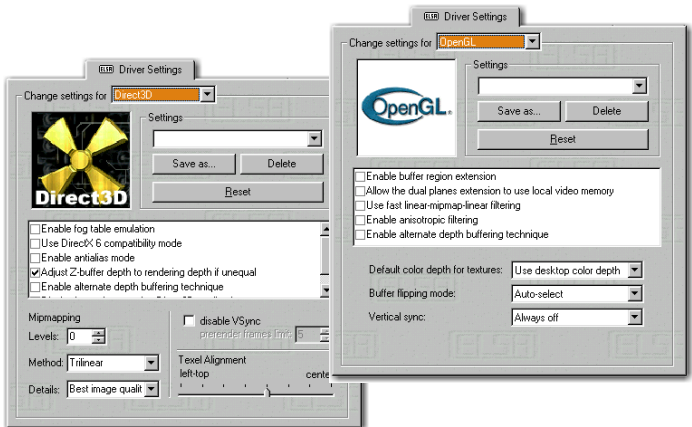
This program is loaded automatically at system startup. If you do not want the *WINman Suite* to load at startup, you can disable this option in the *WINman Suite* menu.

If you want to load the program later, you can call it up by selecting

Start ► Programs ► ELSAware ► WINman Suite.

Fine-tuning for performance freaks

After installing the ELSA graphics drivers under Windows 95 and Windows 98 you will find a new tab in the 'Display Properties': The '**ELSA** 3D Settings'





Because Windows 98 allows the operation of multiple graphics boards, the 3D settings for the ELSA GLADIAC are to be found in another location. Under 'Display Properties' select in turn: 'Settings' ► **Advanced...** ► **ELSA 3D Settings**.

These settings let you set up the optimal games performance on your system. In most cases you don't need to adjust anything. In some cases, for example if you see display errors on screen or if there are problems with the speed, you can adjust the driver settings. The settings which are optimal for any game can be saved under an identifiable name and quickly recalled without having to restart your system.

Experimentation pays! Give your combatant a little extra "zip" and optimize his chances against the competition. If the descriptions here are too cryptic, just take a look at the glossary in this manual or use the comprehensive help system. Simply click on the question mark at the top right-hand corner of the dialog window, and then click on the item in question. If you accidentally dump your system into the crawler-lane, just click on the emergency button **Restore Defaults**. The standard settings will be called into action.



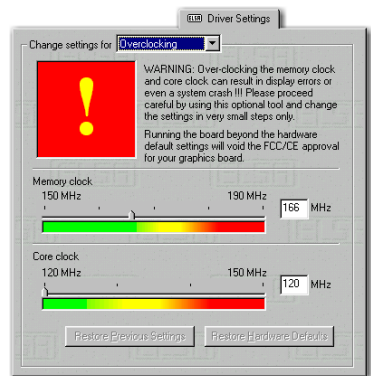
The question mark provides the answers! If you want more information about any setting, just click on this symbol and then select the area in the dialog about which you want to know more.



Overclocking

The overclocking tool enables you to increase the values for memory clock and core clock in order to push the performance of the graphics board

If you like to increase these values please be careful! In any case you should do it in little steps (1 MHz). Changing the settings becomes active when you click the button **Accept**.



The first sign when putting great strain on the graphics board are pixel errors, which you can easily notice on your monitor.

ELSA info

Use ELSA info to investigate your system. In addition to the details about your graphics board you will find information about your computer system, the DirectX and OpenGL driver versions and the ELSA software you have installed. This information provides a basis for generating a report that can be of use in case you require support. This collection of information provides the ELSA Support with all the information they need to guarantee you fast and relevant help.



Graphics know-how

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

3D graphics representation

Today it is considered de rigueur 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). The basic geometric primitive is the triangle. The corner points of the object's triangles are described using coordinate points (x , y and z), where the 'z' value represents the depth information. Depending on the display representation, these points are assigned additional data regarding material and texture. This conversion of image data immensely increases the amount of data that has to be processed.

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 the following steps:

- **Transformation** – In transformation, the objects are aligned in perspective as seen from the observer's point of view.
- **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.
- **Back face culling** – This process computes hidden surfaces resulting from the observation perspective chosen. Any object having an invisible front surface is omitted.
- **Illumination** – The illumination of the scene by different light sources is calculated.
- **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.

- **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 faceted representation, which requires only short computation times.
 - 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.
- **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 texels) 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. Information concerning the transparency of the texture is carried in the alpha channel. 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.

● **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. The front buffer is the memory area where the image that appears on the monitor is located. This prevents the process of image drawing being visible. The duplicate storage method is also known as double buffering.

Page 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. Unlike double buffering, the contents of the back buffer are not transferred to the front buffer and then output to the display. Instead the display results in alternating between the front and back buffers.

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 24fps.

3D interfaces

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

In simple terms: They make developers' work easier. 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. Your *ELSA GLADIAC* supports the following APIs:

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 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.

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 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. 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 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

Graphics mode			Colors	Max. gray levels
	bpp	bpg	(from palette)	
VGA 0x12	4	6+6+6	16 of 262,144	16
VGA 0x13	8	6+6+6	256 of 262,144	64
Standard	8	6+6+6	256 of 262,144	64
	8	6+6+6	256 of 16.7 million	256
HighColor	15	5+5+5	32,768	32
	16	6+6+4	65,536	16
	16	5+6+5	65,536	32
TrueColor	24	8+8+8	16.7 million	256
	32	8+8+8+8	16.7 million	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 TrueColor 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. An extended monitor cable is used. 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 instructions 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 with a technical interest will find more detailed information regarding the *ELSA GLADIAC* in this chapter. All interfaces and their assignments are described in detail.

Characteristics of the graphics board

	<i>ELSA Gladiac</i>
Graphics processor	GeForce 2 GTS by NVIDIA
RAMDAC pixel timing	350 MHz
On-board memory	32 or 64-MB DDR RAM
BIOS	Flash BIOS with VBE 3.0 support
Bus system	AGP 2.0
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.



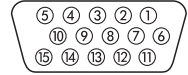
If you come across any address conflicts, try to modify the I/O address of the expansion board causing the conflict. The addresses of the ELSA graphics boards cannot be changed! The ELSA graphics board also requires an interrupt (IRQ) which is free. This may have to be reserved in the computer's BIOS.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



The *GLADIAC* issues analog signals in accordance with the requirements of directive RS-170. The synchronization information is sent separately. If your monitor supports the switching of input impedance, the '75 Ohm' setting (= '75 Ω ') should be chosen for the R, G and B video inputs and the '2 kOhm' setting (= '2k Ω ') should be set for the sync inputs. You should not try other switch settings at the sync inputs unless your monitor expects a sync level that differs from that of most common monitors and does not produce a stabile image. In some cases, the switch settings are labeled only with "Low" and "High." Of this is the case, either you can look up the Ohm values for the switch settings in the user manual provided with your monitor or you can try both settings to see which one produces a stabile image in all of the graphic display modes you require.

Appendix

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 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 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.

Declaration of conformity

ELSA AG GLADIAC GeForce2 GTS



Tested To Comply
With FCC Standards

FOR HOME OR OFFICE USE

Compliance Information Statement (Declaration of Conformity Procedure)

Responsible Party: ELSA Inc.
 Address: 1630 Zanker Road
 San José, CA 95112
 USA
 Phone: +1-408-961-4600
 Type of Equipment: Graphics Board
 Model Name: GLADIAC GeForce2 GTS

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, March 30th 2000

Stefan Kriebel
 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 for 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 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 back-ups 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** – A process within geometric transformation in which invisible areas or portions of a 3D object are removed.
- **3DNow!** Extended command set used by AMD in the K6-2, K6-3 and K7 processors. 21 additional commands are intended above all to accelerate the floating-point operations that are especially important for 3D games.
- **3D pipeline** – The sum of all steps required in displaying an imaginary 3D scenario on the monitor. Included in this are →Tessellation, →Geometric transformation and →rendering
- **Aliasing** – The well-known staircase effect. There is often a jagged transition between adjacent pixels when displaying slanted or curved lines. The rough transitions can be smoothed using anti-aliasing.
- **Alpha-blending** – Supplementary information per pixel for generating transparent material.
- **Anisotropic filtering** – This is a mixture of bilinear filtering and MIP mapping. Unlike trilinear filtering, however, the geometry of objects is also taken into consideration, to improve the legibility of text on angled surfaces, for example. In trilinear filtering the filtering action is uneven due to the stronger filtering of foreground pixels because of perspective distortion.
- **Back buffer** – Describes the image area that is constructed in the background within the frame buffer during →double buffering.
- **Back-face culling** – Leaving out invisible areas.
- **Bilinear filtering** – Calculates the average color value on the basis of four neighboring pixels.
- **BIOS** – Abbreviation for basic input/output system. A code stored in the computer's memory (ROM), which carries out the self test and various other functions when the system is started.
- **Bump mapping** – A technique that provides textures with depth information, which can be applied to display relief or embossed structures.
- **Bus system** – A system of parallel conductors for transferring data between individual system components, especially to expansion cards, such as ISA or PCI bus cards.
- **Chrominance** – Black/white information in the transfer of video signals.
- **Clipping** – In clipping, the invisible portions of the polygon are determined for representation. Then, these portions are not displayed.

- **Composite video** – A method of transferring video data signals, where the signals for →chrominance and →luminance are combined (also called FBAS).
- **Cube environment mapping** – In order to represent realistic and undistorted reflections of the environment onto an object, six →Textures are viewed as the surfaces of a cube. The textures show the environment from the perspective of the object. This gives the impression that the environment is being reflected by the object. CEM is an extension of sphere environment mapping. The advantage of CEM is that no new textures need to be calculated when the observer's point of view changes and the texture is not distorted.
- **D/A converter** – Digital/analog converter: A signal converter that converts digital input to analog output.
- **DDC** – Abbreviation for display data channel. A special data channel through which a DDC-capable monitor can send its technical data to the graphics board.
- **DirectColor** – A generic term for →TrueColor, →RealColor and →HighColor. In this case, the value stored in the video RAM 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.
- **Double buffering** – Describes the presence of doubled display memory. This permits the next image to be generated first in the invisible background. As soon as it is completely constructed, the monitor display switches to the image that has been residing in the background and the preparation of the next image begins on the other side.
- **DPMS** – Abbreviation for VESA display power management signalling. This allows several stages of monitor power saving mode. The graphics boards described in this manual support VESA DPMS.
- **DRAM** – Abbreviation for Dynamic Random Access Memory. Dynamic random access memory with direct access.
- **EDO-RAM** – Abbreviation for extended data output random access memory (hyper page mode). EDO-RAM is especially advantageous in graphics boards because the most recently required data remains held in memory. Image rendering involves multiple consecutive read access of similar data, so EDO-RAM results in significantly faster speeds.
- **FBAS** – →Composite video
- **FCC** – The FCC radiation standard states that this device has been tested and meets the requirements for digital class B devices in accordance with section 15 of the guidelines as provided by the American Federal Communications Commission (FCC).
- **FIFO method** – Abbreviation for first in, first out: A system used in batch processing and queues, in which the first arriving signal is processed first.

- **Fixed-frequency monitor** – A monitor that can only be operated with at a specific resolution and refresh rate.
- **Flat-shading** – See Shading.
- **Frame buffer** – A portion of the graphics memory that is used to construct the image that is to appear on the monitor next. The frame buffer is also used to calculate transparency effects.
- **Front buffer** – Refers to the visible image area in the case of →Double buffering.
- **Full-scene anti-aliasing** – Describes a type of anti-aliasing that is applied to a complete frame. Two processes are used in this form of anti-aliasing: 'Super sampling' and 'accumulated buffers'. In the case of super sampling, a much higher resolution is calculated than the one to be displayed and then reduced. With the accumulated-buffer process, several views of a scene are drawn that are then combined to a single image.
- **Geometrical transformation** – The position of the object in space is determined based on the observer.
- **Gouraud shading** – → Shading.
- **Graphics accelerator** – A graphics accelerator card is especially well-suited for the user environment that requires intense graphics.
- **HighColor** – Stands for a 15 or 16-bit-per-pixel-wide graphic display mode (32,768 or 65,536 colors).
- **Horizontal frequency** – The monitor line frequency (horizontal scan frequency) in kHz. This value must be set according to the monitor's requirements to prevent the monitor from being damaged in extreme cases!
- **Horizontal scan frequency** – Horizontal scan frequency, monitor line frequency in kHz. This value must be set according to the monitor's requirements to prevent the monitor from being damaged in extreme cases!
- **Interpolation** – When displayed, video data must be stretched or shrunk to the correct window size. If the individual pixels are simply multiplied when stretched, unwanted blocks (the staircase effect) occur. This can be prevented using a filtering interpolation technique (averaging). While horizontal interpolation is easily accomplished, vertical interpolation is more complicated and requires buffered storage of the most recent image lines.
- **ISSE** – Extended Intel command set currently used in the Pentium III and which will be available in Celeron CPUs in future. 70 additional commands are intended above all to accelerate the floating-point operations that are especially important for 3D games.
- **Luminance** – Color information in the transfer of video signals.
- **MIP mapping** – MIP mapping assigns several textures to an object based on distance. If the observer gets closer to the

object, the representation of the object becomes more detailed.

- **MMX** – Extended Intel command set used by 166 MHz and higher Pentium processors bearing this designation. 57 additional commands accelerate especially integer operations.
- **Multifrequency/multisync monitor** – A monitor that can be operated using different line frequency ranges and can adjust itself to different image signals (resolutions).
- **OpenGL** – 3D software interface (3D API). Such as implemented in Windows NT and optionally obtainable for Windows 95, this is based on Iris GL from Silicon Graphics and is licensed by Microsoft and ELSA.
- **PCI bus** – Abbreviation for peripheral component interconnect bus. A system of parallel conductors for transferring data between individual system components, especially to expansion cards.
- **Page flipping** – The image prepared in the →back buffer is displayed.
- **Page flipping** – With the fast method of page flipping, only the addresses of the buffer are exchanged. The slower method copies the contents of the →Back buffer to the →Front buffer.
- **Phong shading** – →Shading.
- **Pixel** . A picture element.
- **Pixel frequency** – Pixel cycle frequency: The number of drawn pixels per second in MHz.
- **Primitive element** – A simple, polygonal, geometric object, such as a triangle. In most cases, 3D landscapes are broken down into triangles.
- **RAM** – Abbreviation for Random Access Memory. Main memory and memory expansion in VRAM or DRAM, depending on the graphics board.
- **RAMDAC** – On a graphics board, RAMDAC is responsible for converting digital signals into analog signals. VGA monitors can only process analog signals.
- **RealColor** – In general, stands for a 15 or 16-bit-per-pixel-wide graphic display mode (32,768 or 65,536 colors).
- **Refresh Rate** – Indicates (in Hz) how often the image on the monitor is rebuilt per second.
- **Rendering** – The calculative process for representing 3D scenery, where position and color are determined for each point in space. The depth data are located in the →Z buffer while the color and size data are in the →frame buffer.
- **Resolution** – The number of pixels in both horizontal and vertical directions (e.g. 640 horizontal x 480 vertical pixels).
- **RGB** – Color data stored in red/green/blue format.
- **ROM** – Abbreviation for Read Only Memory. Solid state memory that can be read from only.
- **S-video** – Or S-VHS. A method of transferring video data signals, where the signals for →Chrominance and

→Luminance are separated. This results in improved image quality.

- **Shading** – The shading of curved areas to make them appear as realistic as possible. To do so, the curved areas are divided into many small triangles. The three most important 3D shading methods differ by how the color gradients within the triangles are represented: Flat shading: The triangles are colored uniformly. Gouraud shading: The color gradient is determined by the interpolation of the corner color values. Phong shading: The color gradient is determined by the interpolation of the normal vector plus the calculation of the light incidence for each pixel. These shading methods are not supported directly in the standard OpenGL API.
- **Single buffer** – Unlike the double buffer, where there is doubled display memory, single buffer mode does not allow access to the next prepared image, resulting in animation that is not smooth.
- **Sphere environment mapping** –
→Cube environment mapping.
- **Stencil buffer** – This buffer permits the color information of the pixels to be supplemented with further information. This can be used to create stencils, volumetric shadows and reflective surfaces, for example.
- **Strips and fans** – This is a process to reduce the data volume related to complex 3D objects. Strips are used for objects consisting of several parallel rows of triangles. Rather than calculating each individual triangle, the vertices are transferred only once. A fan object is used when several triangles converge to a single point. In this case, the vertices are also transferred only once. These processes can reduce the data volume by approximately 50%.
- **Tearing** – If there is no synchronization with the monitor when switching between images (pages) in double buffering mode, areas of the images can become offset. To resolve this, the switching between pages is synchronized with the monitor frequency (Wait on Vertical Blank).
- **Tessellation** – Tessellation subdivides objects into polygons (triangles) for 3D rendering. For each triangle, the corner point and color values as well as the transparency value if necessary are determined.
- **Textures** – The overlaying of a surface with a texture with correction for perspective, such as a wood grain or the drawing of a wall with wallpaper in a perspective view. A video, too, can be used as a texture.
- **Transformation & Lighting (T&L)** – Using T&L, the main computer processor is freed up from the consuming task of computing geometric calculations. This computational process, which includes all of the coordinates of a 3D object during rotation, shifting, scaling and color, is taken over by the graphics board processor.

- **Trilinear filtering** – This is a mixture of bilinear filtering and MIP mapping.
- **TrueColor** – A graphic display mode with 16.7 Mill. colors (24 or 32-bits per pixel). The value stored in the video RAM 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.
- **VESA** – Abbreviation for Video Electronics Standards Association. A consortium for standardizing computer graphics.
- **VRAM** – Abbreviation for Video RAM. A module for upgrading the memory on a graphics board to display higher resolutions and color depths.
- **Z-buffer** – The 3D depth information of a pixel (the position in the 3rd dimension).

Index

- **I**
 - 3D clipping 24, 37
 - 3D pipeline 23, 37
 - 3D Settings 20
 - 3DNow! 37

- **A**
 - AGP 10
 - Alpha-blending 37
 - Anisotropic filtering 37
 - Anti-aliasing 25
 - API 26

- **B**
 - Back buffer 25, 37
 - Back face culling 24
 - Back-face culling 37
 - BIOS 31, 37
 - Bump mapping 25
 - Bump-mapping 37
 - Bus 10, 31

- **C**
 - CE 33
 - Chrominance 37
 - Clipping 37
 - Color palettes 28
 - Composite video 38
 - Computer 10
 - Cube environment mapping 38

- **D**
 - D socket 32
 - DDC 29, 38
 - Direct 3D 26
 - Direct3D 21
 - DirectColor 29, 38
 - DirectDraw 26
 - DirectX 22
 - Double-buffering 38
 - Driver versions 22

- **F**
 - Fans 41
 - FCC 33, 38
 - Filtering 25
 - Flat Shading 24
 - Flat-shading 39
 - Flipping 25, 39
 - Frame buffer 25, 39
 - Front buffer 25, 39
 - Full-scene anti-aliasing 39

- **G**
 - Geometrical transformation 23, 39
 - Gouraud shading 24, 39
 - Graphics accelerator 39
 - Grey scales 28

- **H**
 - HighColor 29, 39
 - Horizontal frequency 42

- **I**
 - Immediate mode 26
 - Interpolation 39
 - ISSE 39

- **L**
 - Lighting 41
 - Luminance 39

- **M**
 - media playback 19
 - Memory 31
 - Memory addresses 31
 - MIP mapping 25, 39
 - MMX 39
 - Mode X 26
 - Monitor 10
- **O**
 - OpenGL 22, 27, 40
- **P**
 - Page flipping 25, 40
 - PCI bus 40
 - Performance 21
 - Phong shading 40
 - Point sampling 24
 - Primitive 25
 - Primitive element 40
 - Products supplied 9
- **R**
 - RAMDAC 31, 40
 - RealColor 29, 40
 - Refresh Rate 37
 - Rendering 24, 40
 - Resolution 13
 - Retained mode 26
- **S**
 - Shading 24, 40
 - Single buffer 41
 - SmartRefresh 9
 - SmartResolution 9
 - Sphere environment mapping 41
 - Stencil buffer 41
 - Strips 41
 - Support 9
 - S-video 40
- System Requirements 10
- **T**
 - T-buffer 41
 - Tearing 41
 - Tesselation 41
 - Texture 23, 41
 - Texture mapping 24
 - Transformation 24, 41
 - Trilinear filtering 41
 - TrueColor 28, 29, 41
- **V**
 - VESA 42
 - VESA DDC 29, 31
 - VGA 28
- **W**
 - Warranty 9
- **Z**
 - Z-buffer 42