Graphite™ Bi440ZX User Guide

System Operation Manual for Quantum3D Graphite Visual Computing System

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2. Quantum3D Graphite Visual Computing Systems

Congratulations for choosing a Quantum3D Graphite Visual Computing Platform for Out-of-Home Entertainment applications. From the motherboard to the graphics accelerator, Graphite represents the latest in low cost ruggedized PC technology. Quantum3D Ventana-3, AArdvark and Voodoo3 graphics systems coupled with Intel Motherboards offer unsurpassed graphics in such a small package.

Graphite models can come equipped with either the Intel BI440ZX or Intel MicroATX Motherboard. The MicroATX motherboard has the primary display controller integrated on the motherboard and is known as **Graphite CA810**. The BI440ZX is known as **Graphite Bi.**

Graphite represents Quantum3D's years of experience in designing industrial, low-cost, high-quality interactive visual computing systems with value-added components that enable you to focus on what you do best – developing and deploying profitable games and applications.

Quantum3D Graphite systems provide the following key system benefits.

- Low purchase and maintenance cost
- Ruggedized chassis designed to withstand extreme vibration, shock, heat, and power-interrupt environments
- Support for a complete variety of graphics, JAMMA I/O, CPU, memory, storage and net-working options to meet your requirements
- Compact size and multiple mounting options - designed to fit into virtually any arcade cabinet
- Support for industry standard Windows® and Linux® operating systems means rapid and easy development, portability, and deployment

3. Unpacking Your Quantum3D Graphite System

3.1. Inspect the Shipment

Graphite systems are packaged to withstand the roughest of treatment during shipping. The box, foam core padding and a static sensitive bag should be kept in case you need to ship the system back to Quantum3D for any reason. Also included in the packaging is an accessory box and a 3 ring binder containing all warranty information, hardware documentation, miscellaneous cables, and software drivers for the computer system. Be sure to place the System Information 3 ring binder in a safe place for future reference.

When you receive your Graphite computer system you should perform a first time inspection to ensure that the newly delivered Graphite product is operating at 100%. Monitored shipping tags have been placed on each box to ensure a safe delivery. Tip and Tell and ShockWatch labels should be inspected at the time of delivery before your signature of acceptance has been given to the delivery driver. Any claims for damages made during shipping depend upon these labels, and must be noted in the deliverers shipping bill immediately upon arrival.

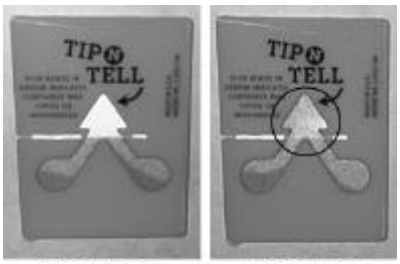
You should be able to lift approximately 26 pounds in order to unpack a Graphite system. If you are unable to lift this weight you should obtain assistance with the first few steps of unpacking the system. You will need the following tools in order to unpack your system:

A Small Knife to cut packing tape

Inspect the cardboard box that your system arrived in. If there is any unusual damage to the box, make note of the damage on the shipping bill.

3.2. Check the Tip and Tell

If Tip and Tell indicators are installed on the outside of the Graphite Box to inform you if your box has been tipped over or mishandled during shipment. If blue beads appear in the tip of the arrow this means the warning label has been activated, make note on the shipping bill and inspect the system closely for any damage due to mishandling during shipment.



Warning Label Not-Activated Warning Label Activated

3.3. Check the ShockWatch

A ShockWatch is installed on the outside of the Graphite box will inform you if you box has had rough handling or has been dropped during shipment. A red mark in between the arrows indicates the warning label has been activated, make note on the shipping bill and inspect the system closely for any damage due to mishandling during shipment.

Warning Label Not-Activated

Warning Label Activated

3.4. Open the box

Carefully cut the tape on the top of the large cardboard box.

3.5. Remove the computer system

The Accessory Box is a thin box packed on top of the computer system within the large box. Remove this box and set it aside. Clear a large area on a desk or table on which to place the computer system. Keeping your back straight, bending at the knees and using your legs as much as possible, place each of your hands directly on the ends of the computer system,. Pull the system and the foam out of the box and place it on the cleared area. Remove each of the foam ends and place back in the box. Remove the plastic static/dust guard from the system and place it in the box.

3.6. Open the smaller Accessory Box

Carefully cut the tape that holds the Accessory Box closed.

3.7. Locate the packing list and confirm contents

Confirm the contents of the Accessory Box. Ensure that each part is free of damage.

3.8. Graphite Bi440ZX Contents

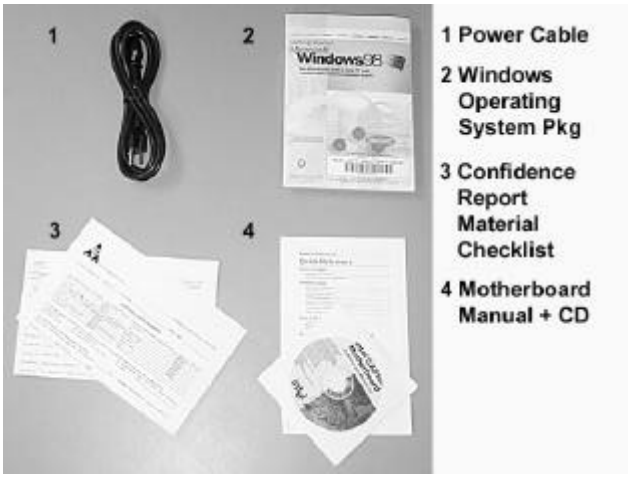


Figure 3-1 Operating system documentation is a purchased option and may not be included with the system.

4. First Time Inspection

Ensure the system is on a flat surface. Loosen the thumb screws that secure the lid to the system chassis (black arrows below). Gently lift and remove the lid making sure that the tabs used to hold the lib in place are clear of the slots (white arrows below) Motherboard Layout and Lithium Battery Warning Label are located on the underside of the lid.

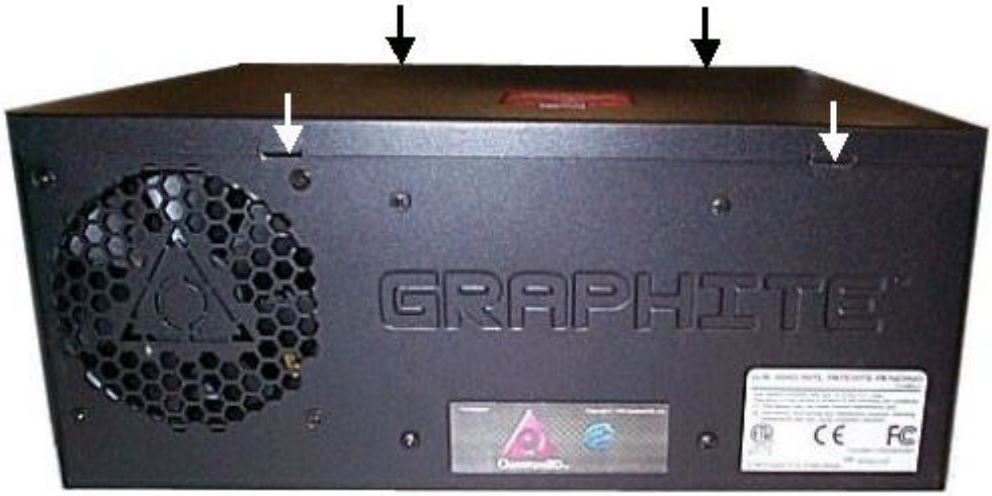


Figure 4-1 Location of the lid screws are marked with black arrows, white arrows mark the location of hold down tabs.

4.1. Confirm the Bill of Materials

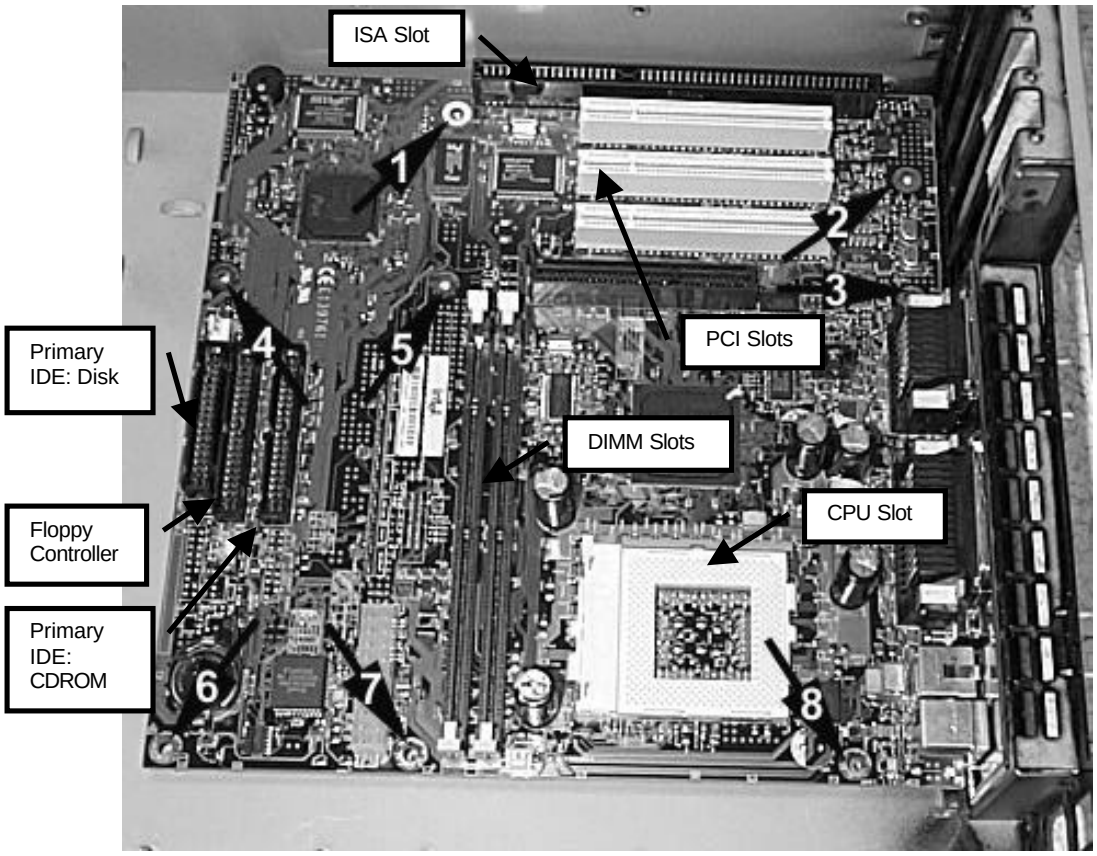
The BOM lists the configuration of the system. It is the specification of individual components within the system. To ensure that your system is configured properly, compare the BOM with the system. While the system is still open, confirm the following components match the BOM.

- Expansion Cards
- CPU Type and Clock Speed
- Amount and Type of RAM
- Hard Disk Size and Type

Confirm Components are Seated Properly

Look for loose cables, hardware expansion cards unsecured, or loose in their slots, floating nuts and bolts inside the system.

Figure 4-2 Below is a Graphite Bi440ZX system without any expansion cards installed.



4.2. Confirm Installation of Expansion Cards

Confirm that all PCI, AGP, and ISA cards are properly seated in their slots and are secured to the back face using screws on the top of each bracket. These cards usually include NICs, secondary display adapters, GCI-2, Audio and I/O cards. See the previous section for the location of the PCI expansion slots.

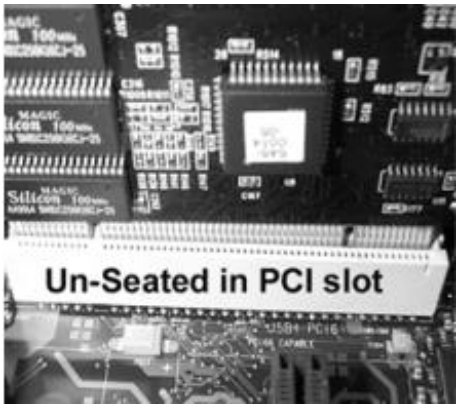


Figure 4-3 The expansion card above is not seated properly in the PCI slot. Note that it is possible to see the pins and the notch more on the right of the card, then on the left.

Figure 4-4 The expansion card above is seated properly in the PCI slot. Note that it is difficult to see the pins in the slot as well as the notch. The card is level in the slot.

4.3. Confirm that the CPU and RAM are seated

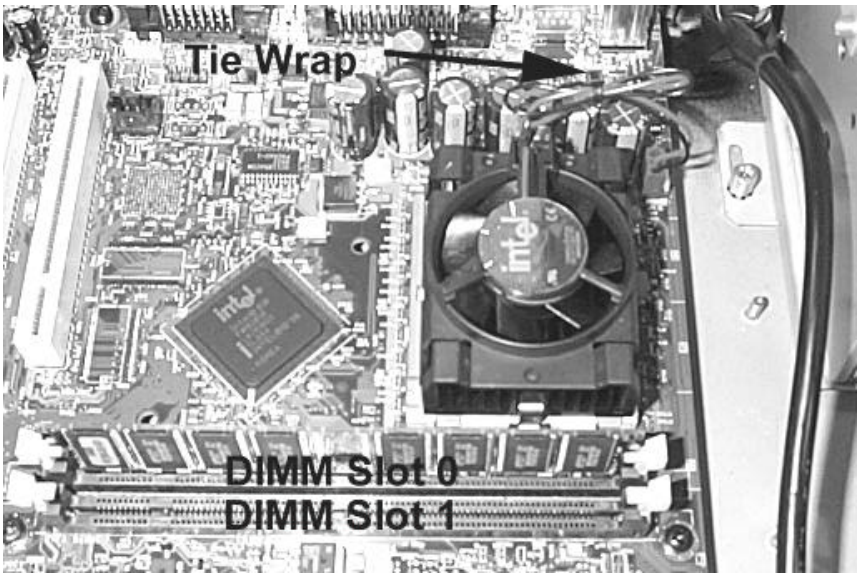


Figure 4-5 Above is a picture of a properly seated CPU and memory module.

4.4. Confirm that the Floppy cable is attached properly

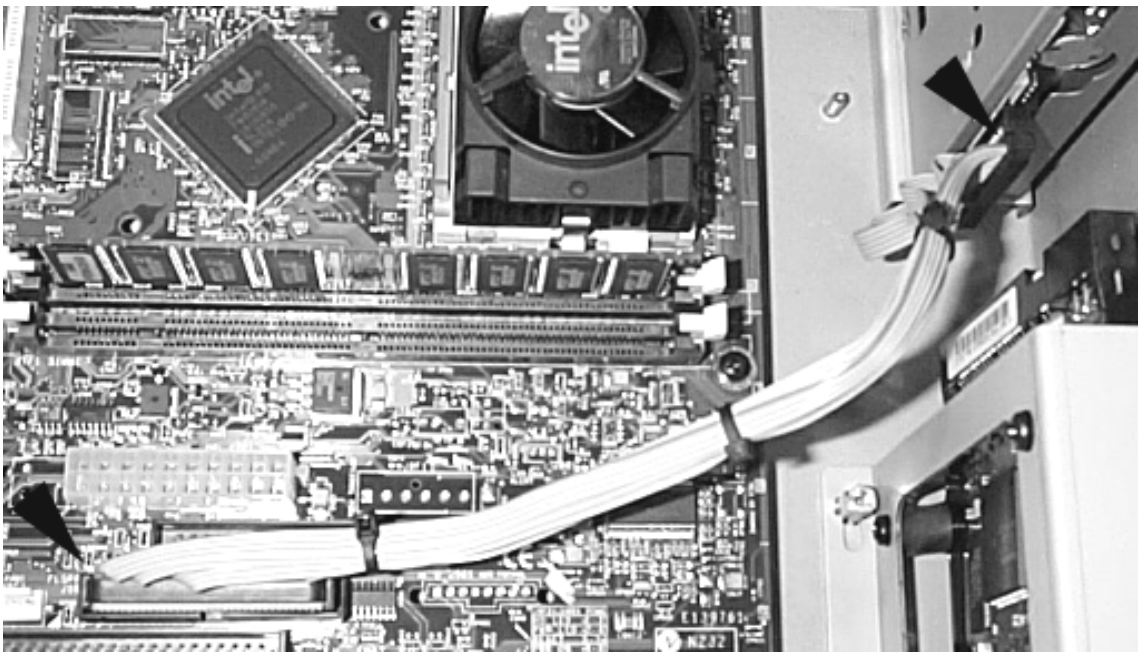


Figure 4-6 Above is a picture of a properly connected Floppy Drive.

4.5. Confirm that the Hard Disk cable is attached properly

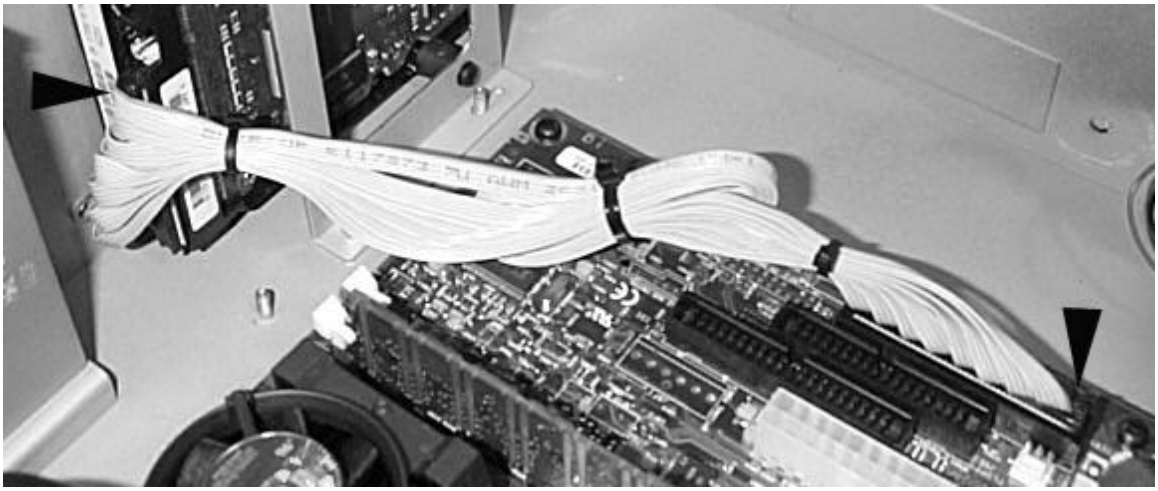


Figure 4-7 Above is a picture of a properly connected Hard Disk Drive.

5. Installation

5.1. Installation of a Graphite system

WARNING: Graphite systems have a manually switched power supply. Before plugging in the system make confirm whether you have an 110vac/60Hz or 220/50Hz power source. **Switch the power supply to the appropriate setting before connecting the power cable.**

5.1.1. You will need the following items that are not supplied with the system.

(1) Multisync monitor capable of at least 640x480@60 Hz operation for the primary Windows Display. You may wish to have a high resolution display if you are using any software that utilizes a GUI for its operation.

(2) 15 Pin Video/Monitor Cables (Transducers are highly recommended).

(1) CAT5 Network Cable and Operating network connection.

5.1.2. You will need the following from your Accessory Box

Keyboard (This is an optional component)

Mouse (This is an optional component)

Power Cord

5.1.3. Power Requirements

The system is equipped with a manually switched power supply that requires a 110vac/60Hz or 220/50Hz power source.

5.1.4. Keyboard, Mouse, Monitor and Network Connectors

Connect a Keyboard and Mouse to the PS2 connections as shown. If you have a Network Interface Card (NIC) gently place the network cable in the RJ45 connector of the expansion card until you hear a slight click.

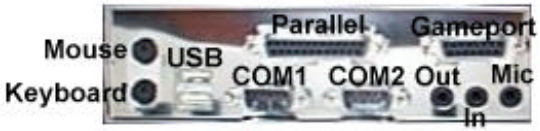


Figure 5-1 Above are the connections for the Graphite Bi440ZX.

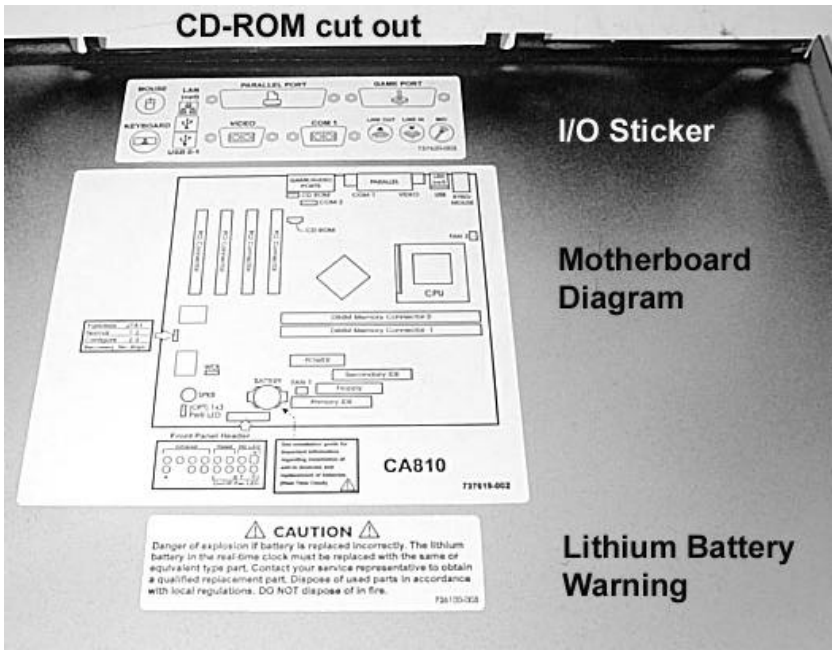


Figure 5-2. A label showing the appropriate connections is on the underside of the lid along with the Motherboard Diagram and Lithium Battery Warning

5.2. Powering on a Graphite System

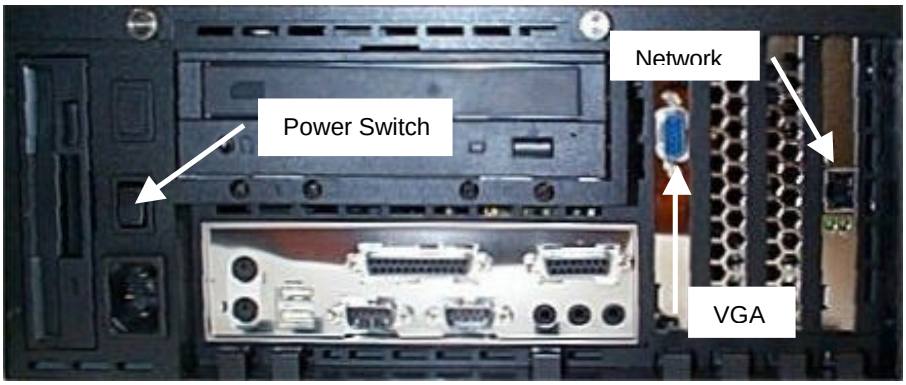


Figure 5-3 The Power Switch toggles like a light switch. Pressing the switch up turns the computer on. Pressing the switch down turns the system off.

5.2.1. Confirm that RAM and CPU are recognized.

As the system boots for the first time, confirm that RAM and CPUs are recognized correctly.

5.2.2. Login to the system

Login to the system by using the Administrator user and pressing the Enter key. We recommend that you change the password the first time you use the system.

Windows 98 Systems automatically logon to the system. This must be changed along with network properties.

5.3. System Shutdown Procedures

Graphite systems can be installed with many different operating environments. If you have Windows installed, you must perform a proper Windows Shutdown, otherwise shutdown the system according to the operating system guidelines. In Windows perform the following steps:

- Logon to the system
- Choose Shutdown from the Start Menu.
- Choose the Shutdown Bubble in the Shutdown Computer Window
- Click OK.

If you are running Windows 95 or Windows 98, the system will automatically shutdown and power will be shutoff.

If you are running Windows NT, a window will appear that will display a Restart Button. At this point it is safe to Press and Hold the Power Switch. When the system power turns off, you may release the power switch.

If the system will not power off, hold the On/Off switch for 5 seconds.

6. Graphite BIOS Settings

This chapter outlines how to setup the BIOS for a Quantum3D Graphite system. There will be more system devices listed in the BIOS than shown here. The only device settings of concern are the system device settings listed in the chart.

At the top edge of the BIOS screen there are six system setting tabs: **MAIN, ADVANCED, SECURIY, POWER, BOOT, EXIT.** You will see each device clearly listed under each tab. Modify each device setting to match the list below.

Verify Bios Revision: Under the **MAIN tab** in the Bios the first setting listed is the BIOS Version: 4S4EB2X0.86A.0017.**P10** The last 3 digits are the version number.

6.1. Confirm the Graphite BIOS Settings for Graphite with a Bi440ZX Motherboard

6.1.1. Entering the BIOS

As the system is booting press the F2 key to enter the BIOS

6.1.2. Entering the Peripheral Configuration Screen

Highlight Peripheral Configuration and Press Enter to Display the Peripheral Configurations Screen

6.1.3. Exiting the BIOS

When exiting the BIOS, perform the following steps.

EXIT-Save the BIOS settings under Save Custom Default first, then **EXIT** and Save Changes

6.2. BIOS Settings

6.2.1. Main Screen

Set Date and Time

6.2.2. Advanced Peripheral Configuration Screen

Audio	Enabled
USB	Auto

6.2.3. Security Screen

Nothing to Set

6.2.4. Power Screen

Power Management	Disabled

6.2.5. Boot Screen

Quiet boot	Enabled

Quick-boot Mode	Enabled
Scan User Flash Area	Disabled
After Power Failure	Power ON
ON Modem Ring	Stay OFF
ON Lan	Power ON
ON PME	Power ON
1st Boot Device	Floppy
2nd Boot Device	Atapi CD-ROM
3rd Boot Device	1st Hard-Drive
4th Boot Device	Disabled

7. System Description

7.1. Base System Description

7.1.1. Industrial Chassis

18 Gauge Steel, Custom "3U" Form Factor Chassis "Single-Side Access" for I/O, cables, and other peripheral devices. Optional Brackets for Shelf/Bulkhead, Tower or Rack mounting NAFTA Power Cable Standard. (others options available)

7.1.2. Custom Power Supply

250W Output Int'l (Manually Switched) Input: 120VAC/240VAC, 50/60Hz, External DC Power available via optional bracket.

7.1.3. Forced Air Cooling

Positive Pressure Advanced Cooling System with 50CFM Bezel Fan, 50CFM Power Supply Fan and CPU Fan

7.1.4. Operating Temperature

+10° C to +60° C (50° F-140° F), up to 85% humidity, non-condensing

7.1.5. Retention and Shock Mounting

Cable retention for Power, USB, Audio, I/O Cables. Add-in Board Retention for AGP & PCI Add-in-Boards Optional Shock Mounts for Disk Drive.

7.1.6. Shock & Vibration

Tested to operate in shock environments of ≤ 20 G (Non-operational ≤ 100 G). Tested to operate in vibration environments of ≤1G P-P

7.1.7. Dimensions

Size: 12.5" (31.75cm) W x 13.375" (33.99cm) D x 5.125" (13.03cm) H. Typical Unit Weight:18 lbs (8.2 kg); Shipping Weight: 26 lbs (11.8 kg).

7.1.8. EMI & Safety

FCC Class A, ETL, CE

7.1.9. Audio

Integrated Creative® Labs Sound Blaster® Audio AC'97

7.1.10. Standard

1 floppy drive interface, 2 serial ports, 1 parallel port, I/O Interfaces 1 game port, 2 USB ports, 2 PS/2 ports

7.2. Required Components

7.2.1. Processors

Intel® Celeron™ Processor (PPGA 370-pin socket) 366-500MHz

7.2.2. Memory

32 MB, 64 MB, 128 MB, 256 MB or 512 MB available

7.2.3. Packaging & Docs

Single Unit or 18-Unit "Bulk" Pack-each with Manuals, OS-specific Driver CD's and Recovery Disk, Floppies

7.2.4. Motherboard

Intel BI440ZX MicroATX Motherboard or Intel CA810 MicroATX Motherboard

7.2.5. 2D/3D VGA Graphics Available with Graphite CA810

- Integrated Intel 752-Class Graphics on CA810, integrated on motherboard.

7.2.6. 2D/3D/VGA Graphics Available with Graphite Bi440ZX

- Quantum3D VentanaTM-3
- 3dfx Voodoo3 2000 PCI (16 MB)
- Quantum3D Aardvark
- Quantum3D Obsidian®-3

7.3. System Options

7.3.1. Operating Systems

- Windows 98 SE with QDK
- Windows NT 4.0 Service Pack 5
- Linux(Q499)
- Can be delivered with other operating systems such as embedded operating systems

7.3.2. LAN (Ethernet)

- SMC 10Mbps PCI NIC
- SMC 10/100Mbps PCI NIC
- Intel EtherExpress ™ Pro 100 Mbps PCI NIC

7.3.3. V.90 Modem

- Shark V.90 USB Modem

7.3.4. DVD or CD-ROM

- ATAPI IDE 32X CD-ROM with Black Bezel
- ATAPI IDE DVD/CD-ROM with Black Bezel

7.3.5. Floppy Disk Drive

1.44 MB 3.5" Floppy Disk Drive with Black Bezel

7.3.6. Coin-op & JAMMA I/O

- Quantum3D Jammalinx for coin-op applications with Quantum3D JAMMA Interface for Video and Audio, new wiring harnesses for legacy applications with existing JAMMA wiring harnesses
- AAMP:Internally Mounted, 2-Channel (total) audio

7.3.7. Disk Drives

4.3 GB, 6 GB or 13 GB IDE Ultra DMA/66 Hard Drive (Optional shock mounting available)

7.3.8. Flash Disk

4, 8, 16, 32, 64 or 128 MB Disk On Chip Flash Memory

7.3.9. Keyboard/Mouse Kit (Optional)

- Black 104-key Keyboard PS/2
- 2-Button Mouse PS/2

7.3.10. Power Cable Kits

UK, EU or Japan available optionally (NAFTA Cable Kit included as standard)

8. Trouble Shooting

8.1. Power On Self Text (POST) Beep Codes

These are Basic Beep codes and apply to most PC systems. Please note that BEEP codes may vary dependent upon the revision of BIOS. This list is for reference only.

BEEPS	ERROR DESCRIPTION
1 Short	Successful POST, no errors
2 Short	Initialization Error, DMA, ROM, Floppy, Serial or Parallel
1 Long, 1 Short	System Board
1 Long, 2 Short	Video Adapter or Video Memory
1 Long, 3 Short	Video Adapter
None	Power Supply or System Board
Continuous	Power Supply or System Board
Repeating Short	Power Supply or System Board

Diagnostic Beep codes for Phoenix Bios 4.5 and Above

BEEPS	ERROR DESCRIPTION
1-1-3	CMOS write/read failure.
1-1-4	BIOS ROM checksum error.
1-2-1	System timer failure.
1-2-2	DMA (direct Memory Access) failure.
1-2-3	DMA page register failure.
1-3-1	RAM refresh failure.
1-3-3	64K RAM chip or data line failure.
1-3-4	64K RAM odd/even logic failure.
1-4-1	64K RAM address line failure.
1-4-2	64K RAM parity error.
2-?-?	Any beep series starting with 2 beeps indicates a 64K RAM chip or data line error.
3-1-1	Master DMA register test.
3-1-2	Mslave DMA register failure.
3-1-3	Master interrupt mask register failure.
3-1-4	Slave interrupt mask register failure.
3-2-4	Keyboard controller failure.
3-3-4	Screen (video) memory failure.
3-4-1	Screen initialization failure.
3-4-2	Screen retrace failure.
4-2-1	Timer tick interrupt test failure.
4-2-2	Shutdown test failure.
4-2-4	Unexpected interrupt in protected mode.
4-3-1	RAM test failure above address 0FFFFh (64K +)
4-3-3	Interval timer channel 2 test failure.
4-3-4	Time of day clock failure.
4-4-1	Serial port test failure.
4-4-2	Parallel port test failure.
4-4-3	Math Co-processor failure.

8.2. Power on issues

The following problems can occur during startup of the system. If you experience any of these problems, follow the defined procedures to diagnose and fix the problem. The primary resource for the problems below is the motherboard documentation. However, Quantum3D Technical Support, the Quantum3D website, and component manufacturers documents are excellent technical resources.

8.2.1. System Beeps

Beeps during system startup usually indicate a problem with the Primary Display Adapter, Memory, or CPUs. Consult the motherboard documentation or the POST Beep codes list above.

8.2.2. No Video Signal

If there is no video signal and you hear beeps during the POST, you should look in the Motherboard documentation listed in the previous section. If no beeps are heard and if everything else appears normal, check to make sure that your monitor cable connections are to the Primary Display Device. If you are operating with a single monitor, confirm connections of the Monitor Pass Through (Medusa) cable.

8.2.3. Processor Fails Test

Check for proper CPU seating onto the motherboard.

8.2.4. Boot device not found

This could be the result of a device failure, power connection, device cabling, or improper BIOS settings. Confirm that the device is found by the BIOS by checking the peripheral settings. The BIOS should find IDE CDROM, Floppy Drive, and Hard Disk drives. The BIOS should also specify device boot order. If the BIOS does not find a device, it may not have the ribbon cable or power cable connected properly.

8.2.5. Where to find additional information

Additional information may be found in the motherboard documentation, FAQs on the web or through Quantum3D Technical Support.

8.3. Systems Operation Problems

Below are some basic problems that can happen while operating the system. If you experience a problem, are unable to resolve it contact Quantum3D Technical Support.

8.3.1. Blue Screen of Death (BSOD) with Stack Dump

Typically BSODs are the result of a software bug or hardware problem. Try first to reproduce the problem. If the problem is reproducible, you should provide this information to the appropriate software vendor for the application being use. If the problem appears to be related to hardware contact the appropriate hardware vendor or Quantum3D Technical Support.

8.3.2. Cannot Login to Administrator Account

The Administrator Account has been provided without a password. To login, type Administrator in the user name field and press the enter key. If this does not work, contact Quantum3D Technical Support.

8.3.3. Problem starting some services

It is normal for the system to fail to start network services. After connecting your network and specifying the proper network properties this message will go away. If it continues, the Windows NT Event Log to determine the source of the problem.

8.3.4. Where to find additional information

Additional information may be found in the motherboard documentation, FAQs on the web or through Quantum3D Technical Support.

8.4. Graphics Issues

8.4.1. Black Screen on 3D Device

Confirm that a monitor cable is connected to the monitor and video adapter. Confirm that the monitor is operating and is capable of the resolution and refresh rate as it is specified in the Display Properties.

8.4.2. Flashing and Tearing on the 3D Device

The Wait for Vertical Retrace Flag is turned off in the Display Properties or FX_GLIDE_SWAPINTERVAL is set to 0.

8.4.3. Mutual Exclusion Error

Another application is already using the Graphics Accelerator or did not complete successfully. Close all windows and use the Task Manager to kill any stray applications that are using Glide or any rundll processes.

8.4.4. Where to Find Additional Information

Additional trouble shooting information can be found with the supplemental FAQ documents, or at the Quantum3D web site.

8.5. 2D Output and Windows Operation

If the system powers on normally and displays Windows correctly, this is proof that 2D is working properly. If you are unable to logon, if there is no keyboard, mouse, or video output then you should contact Quantum3D Technical Support. If everything is operating well proceed to test 3D video output.

8.6. 3D Output

To confirm 3D output is operating run a Direct3D, Glide or OpenGL application. Alternatively OpenGVS RWB can be run as described below.

8.6.1. Running the OpenGVS Realworld Benchmarks

Some Graphite systems are supplied with the OpenGVS Realworld Benchmarks. OpenGVS Realworld Benchmark Demonstrations are found in the following menu:

StartMenu/Programs/OpenGVS RWB 2.3/Glide3/Demo/1024x768

All of the demonstrations under the above menu should operate as expected.

Use the F1 key for help while running using these demonstrations.

8.6.2. OpenGVS Realworld Benchmark Help

Use the F1 key for help while running these demonstrations. Below are summaries of some of the most valuable control keys that are shared between all demo applications.

F1 **Help**
Display the help screen over the 3D Output

TAB **Toggle Frame Rate Statistics**
Display the Frame Rate in the upper left of the window

F3 **Toggle More Detailed Statistics**
Display the number of polygons, objects, fill rate and other vital information. This can help locate performance issues like a high ratio of culled objects to examined object ratios.

F4 **Reset to Initial States and Position**

F5 **Toggle Mercury Anti-aliasing**
Toggle AA on and off with no performance change.

F7 **Toggle Wireframe**
Turn solid fill on/off. Useful for viewing where individual polygons are.

F8 **Pause**
Pause Autopilot

F9 **Toggle Texture Mapping**
Toggle textures on/off. Useful to see how unrealistic scenes are without textures.

F11 **Texture Minification**
Toggle between point samples, Mipmapped Bilinear and Mipmapped trilinear. These forms of texture minification filters are used to anti-alias textures. To turn off all AA first turn off Mercury AA with F5 then use F11 to change to point sampling. All AA is free with Mercury.

F12 **Screen Capture**
Capture the 3D view to a snapXX.tif file in the local directory.

a/A **Toggle Autopilot**
Toggle between mouse fly and auto pilot fly.

,/< **Autopilot Playback Speed**
Decrease/Increase Playback speed of autopilot.

c/C **Change Camera**
Cycle through predefined cameras

l/L **Sun Direction**
Decrease/Increase the sun elevation angle

t/T **Time of Day**
Cycle through predefined time of day settings

f/F **Fog Thickness**
Decrease/increase fog thickness

o/O **Record Ownship Position & Rotation Toggle**

Start and Stop Recording the Ownship

9. Recovering Your System

In the event that you have a software configuration issue or failed hard disk, you may need to restore the original hard disk image. To do this you will use a bootable CD that is supplied by Quantum3D. This process will destroy all contents of the disk as well as assign a new System ID#. You should backup all user data on the C: Drive, since you will restore the image onto this drive. Restart the system, enter the BIOS and confirm that the boot checks the CD drive before the hard disk (change if necessary). Place the Recovery CD in the drive and Save and/or Exit the BIOS to continue booting.

The system will boot to a stripped down version of Windows 95. Partition Quest Restore Image will enable you to recover your system to a base configuration. To recover perform the following steps.

1) Click on the Restore Image Button
2) Click the Browse Button
3) Choose the .PQI file for your licensed Operating System, Click OK, Click Next
4) Select the Destination Partition or Free Space
5) The software will notify you that it will delete this partition in order to restore
6) Click OK to confirm that the new partition will be automatically resized
7) Choose Fast Mode, Click OK, then Finish
8) Click No to view results
9) Click the exit button
10) Press and release the reset button on the computer

After completing these steps your system will be configured as follows

a. System Drivers are installed (i.e. IDE, CDROM)
b. Video Drivers are installed (Viper 770)

Your system will require a new SID or obtain the SID from your DNS server. You need to configure the network protocol to work on your LAN.

10. Warranty

10.1. General Warranty Information

Quantum3D, Inc. warrants to the original purchaser that the product purchased from Quantum3D, Inc. or from an authorized Quantum3D, Inc. re-seller, excluding software, disks and drivers, compact discs, documentation and related information, is free from defects in parts and/or workmanship for one year from the date of purchase. During this year of warranty period Quantum3D, Inc. or an authorized agent of Quantum3D, Inc. will correct any defects in parts and workmanship at no charge for labor and materials. This warranty is limited to parts and products sold on the original purchase of the system. Add on parts and failures directly caused due to add-on cards or peripherals are not covered in this warranty.

You are responsible for prepaying shipping and insurance expenses incurred in returning the defective product or products. Quantum3D, Inc. is not liable for loss or damage during shipment of your returned system or part. For international shipping, you must prepay export taxes, custom duties and taxes or any other charges associated with return shipment of the product. Replacement products shall be new or serviceable used products, and are warranted for the remainder of the warranty period or 30 days, whichever is longer.

10.2. Warranty Service

If at some point you require Warranty Service, you must contact Quantum3D Technical Support at **408-361-9998**. If technical support staff determine that a Quantum3D product is defective, a Return Merchandize Authorization (RMA) number will be issued.

A replacement product will be sent to you within 10 business days after Quantum3D, Inc. receives the defective part. Quantum3D will replace using the same part or a compatible part of equal capability and performance. Quantum3D is not liable for delays due to the availability of replacement parts.

Advance replacement RMA can be done at the purchasers expense (PO or Credit Card). Quantum3D reserves the right to charge purchaser for replacement parts or return the product at purchaser expense, if it is determined that the product is not defective in workmanship.

10.3. Quantum3D Extended Warranty Coverage

Extended warranty coverage can be purchased for 10% of the MRSP per additional year if ordered within 90 days of purchase date.

10.4. Quantum3D Express Warranty Coverage

Quantum3D Express Warranty Coverage covers advance replacement shipping. Quantum3D will priority ship, next business day replacement product when given a valid Federal Express, DHL or UPS tracking number of the part being returned. Extended Express warranty coverage can be purchased for 5% of the MRSP per additional year if ordered within 30 days of purchase date. Express is free for those products registered and purchased in the Quantum3D Partners plan.

11. Technical Support

Free telephone, email and online support are provided for Graphite systems during the warranty period. In addition to helping with trouble shooting and diagnosing defective parts technical support is prepared to help you with questions about the operation of Quantum3D products.

When you contact technical support Quantum3D might need some background information about the product that you are calling about. Please have the following available to aid our technical support process.

Your Mailing Address and telephone number

The name of the product that you are contacting technical support about

A summary of the question or a description of the problem and, if necessary a method of reproducing the problem

Software used on the system and software added to the system after purchase

Cards added after the original purchase of the system

Technical Support is available from **8:00-5:00PST**. Call **408-361-9998** to reach a technical support staff member. Email support is available if you email to **support@quantum3d.com.** Quantum3D has online technical support resources including FAQs, White Papers and Downloads at http://www.quantum3d.com.

Priority Technical Support is available for products registered in the Quantum3D Partners Plan. Registered partners receive a personal, experienced single point of contact in technical support. Access to advanced releases of hardware and software enable you to be prepared for future products. For more information about Quantum3D Partner plans contact info@quantum3d.com.