Developer Note

Power Macintosh G3 All-in-one

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Technical Publications

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Contents

Figures and Tables

About This Note

This developer note describes the features of the new Power Macintosh G3 All-in-one computer. This note also lists the features that differ from those available in the current Power Macintosh G3 mini-tower and modular desktop computers.

This developer note is intended to help hardware and software developers design products that are compatible with the Macintosh products described here. If you are not already familiar with Macintosh computers or if you would simply like additional technical information, you may wish to read the related technical manuals listed in the section "Supplemental Reference Documents."

This note is published only in electronic form, as an Adobe™ Acrobat™ PDF (portable document file). The file is available from two sources:

- on the World Wide Web at <http://devworld.apple.com/dev/devnotes/dntable1.html>
- on the Reference Library Edition of the Developer CD Series, which is distributed as part of the monthly mailing to registered developers

Contents of This Note

The information consists of one chapter:

Chapter 1, "Introduction," summarizes the features of the logic board in the Power Macintosh G3 All-in-one computer, describes the physical appearance of the supported enclosure, and lists the available configurations and options. This chapter also includes a section that describes the compatibility issues that hardware and software developers need to be aware of to take advantage of the features available with the Power Macintosh G3 All-in-one computer.

Supplemental Reference Documents

Developers should have copies of the appropriate Motorola reference documentation for the PowerPC™ G3 microprocessor. Information about Motorola microprocessors can be found at

<http://www.mot.com/SPS/PowerPC/library/library.html>.

For a description of the version of the Mac OS that comes with the new models, developers should refer to the technote that describes Mac OS 8.1 on the Developer CD Series and on the Technote web site at

<http://devworld.apple.com/dev/technotes.shtml>

For information about PCI expansion cards, refer to *Designing PCI Cards and Drivers for Power Macintosh Computers.*

Developers should also have copies of the relevant books of the *Inside Macintosh* series, available in technical bookstores and on the World Wide Web at

<http://gemma.apple.com/dev/insidemac.shtml>

Developers interested in taking advantage of the 3D graphics acceleration features built into the Power Macintosh G3 logic board should have *3D Graphics Programming With QuickDraw 3D*. To learn more about the features of the ATI RAGE PRO-PCI graphics controller developers should also visit the ATI web page at <http://www.atitech.com/technology/hardware/chiptech.html>

Apple Developer World Web Site

The Apple Developer World Web site is the one-stop source for finding technical and marketing information specifically for developing successful Macintosh-compatible software and hardware products. The Apple Developer web site is dedicated to providing developers with up-to-date Apple documentation for existing and emerging Macintosh technologies. Apple Developer World can be accessed at

<http://www.devworld.apple.com>

Conventions and Abbreviations

This developer note may use the following typographical conventions and abbreviations.

Typographical Conventions

Note
A note like this contains information that is of interest but is not essential for an understanding of the text. ◆

IMPORTANT
A note like this contains important information that you should read before proceeding. ▲

Abbreviations

When unusual abbreviations appear in this developer note, the corresponding terms are also spelled out. Standard units of measure and other widely used abbreviations are not spelled out.

Here are the standard units of measure used in this developer note:

A	amperes	mA	milliamperes
dB	decibels	µA	microamperes
GB	gigabytes	MB	megabytes
Hz	hertz	MHz	megahertz
in.	inches	mm	millimeters
k	1000	ms	milliseconds
K	1024	µs	microseconds
KB	kilobytes	ns	nanoseconds
kg	kilograms	Ω	ohms

kHz	kilohertz	sec.	seconds
kΩ	kilohms	V	volts
lb.	pounds	W	watts

Other abbreviations used in this note may include:

$*n*	hexadecimal value *n*
ADB	Apple Desktop Bus
ATA	advanced technology attachment
ATAPI	advanced technology attachment packet interface
ATX	a compact logic board design
AV	audiovisual
AWACS	audio waveform amplifier and converter for sound
CAS	column address strobe
CD-ROM	compact disc read-only memory
CLUT	color lookup table
DAC	digital to analog converter
DAV	digital audio video
DDC	display data channel
DIMM	dual inline memory module
DIN	Deutsche Industrie Norm
DMA	dynamic memory access
DRAM	dynamic random-access memory
EDO	extended data out DRAM device type
EMI	electromagnetic interference
GCR	group code recording
IC	integrated circuit
IDE	integrated device electronics
IIC	inter-integrated circuit (an internal control bus)
I/O	input/output
IR	infrared
JEDEC	Joint Electronics Devices Engineering Council

L2	level 2, used in reference to level of cache
MESH	Macintosh enhanced SCSI hardware
MMU	memory management unit
MPEG	Motion Picture Experts Group
NTSC	National Television Standards Committee (the standard system used for broadcast TV in North America and Japan)
PAL	Phase Alternating Line system (the standard for broadcast TV in most of Europe, Africa, South America, and southern Asia)
PCI	Peripheral Component Interconnect
PGA	pin grid array
PIO	parallel input output
RAM	random-access memory
RAS	row address strobe
RAVE	Rendering Acceleration Virtual Engine
RGB	a video signal format with separate red, green, and blue components
RISC	reduced instruction set computing
ROM	read-only memory
SCSI	Small Computer System Interface
SCC	serial communications controller
SDRAM	synchronous dynamic random access memory
SECAM	the standard system used for broadcast TV in France and the former Soviet countries
SIMM	single inline memory module
SGRAM	synchronous graphics random access memory
SO-DIMM	small outline dual inline memory module
SRAM	static random access memory
S-video	a type of video connector that keeps luminance and chrominance separate; also called a Y/C connector
SWIM	Super Woz Integrated Machine, a custom IC that controls the floppy disk interface

VRAM	video RAM; used for display buffers
Y/C	a type of video connector that keeps luminance and chrominance separate; also called an S-video connector
YUV	a video signal format with separate luminance and chrominance components

CHAPTER 1

Introduction

The Power Macintosh G3 All-in-one computer incorporates a Power Macintosh G3 logic board with minor modifications to support the features of the new enclosure. The main logic board has the same form factor and on-board expansion options as that of the Power Macintosh G3 computer.

This note provides a description of the features of the Power Macintosh G3 All-in-one computer. The logic board architecture, main RAM, video RAM, and PCI card expansion capabilities are defined in the Power Macintosh G3 Developer Note.

Features

Here is a list of the hardware features of the Power Macintosh G3 All-in-one computer.

- Microprocessor: PowerPC G3 microprocessor running at a clock frequency of 233 MHz or 266 MHz, depending on the configuration.
- System bus speed: 66 MHz Apple RISC system bus
- RAM: 0 MB soldered on the main logic board; expandable to 384 MB using 64-bit (non-parity) 168-pin JEDEC-standard 3.3-volt unbuffered SDRAM (synchronous dynamic access memory) DIMM (dual inline memory module) cards. Three DIMM card slots are provided for DRAM expansion. 32 MB of RAM are installed in one of the DIMM card slots.
- ROM: 4 MB on 160-pin DIMM; 64-bit ROM data bus width.
- Cache: 512 KB back-side second-level(L2) cache on processor module. The cache runs at one half the clock frequency of the microprocessor.
- Video display modes supported on built-in monitor: 640 by 480, 800 by 600, and 832 by 624 at 32 bits per pixel; 1024 by 768 at 16 bits per pixel; 2 MB synchronous graphics RAM (SGRAM) frame buffer on the main logic board. Video memory can be expanded to 4 MB or 6 MB with an optional 2 MB or 4 MB SGRAM graphics memory module. For the complete list of display modes supported with 2 MB, 4 MB, and 6 MB of video memory installed, see Table 1-1 (page 26).
- Built-in 2D and 3D hardware graphics acceleration using the ATI 3D RAGE PRO graphics controller. Software support through Macintosh QuickDraw 3D and QuickDraw 3D RAVE (rendering acceleration virtual engine) APIs.

This graphics controller is an enhanced version of the graphics controller used in the original Power Macintosh G3 computer.

- Built-in YUV and MPEG scaler.
- PERCH slot: a 182-pin microchannel connector. The PERCH slot is a superset of the PCI specification, but does not accept standard PCI cards. The PERCH slot supports Apple Audio and AV Personality cards. This note does not provide the electrical specification for the PERCH slot.
- Video input/output: video input and output feature on Apple AV Personality card configurations allows video input and output through RCA composite or S-Video connectors.
- Sound: both Apple Personality card configurations support 16 bits/channel stereo input and output on 3.5mm mini-plug connectors, external jack for sound in, two front jacks for headphones, rear jack for externally powered stereophonic speakers or other stereophonic equipment, stereo speakers.
- Hard disks: one internal ATA hard disk with 4 GB or larger capacity in the standard configuration. PIO, singleword DMA, and multiword DMA data transfers are supported. Build to order (BTO) options include a 2 GB or 6 GB ATA hard disk drive configuration.
- Expansion bays: no internal device expansion bays; optional ZIP drive bay only.
- Floppy disk: one internal 1.4 MB.
- CD-ROM drive: internal 24X-speed ATAPI CD-ROM drive.
- Zip drive: (optional build-to-order (BTO) configuration) 100 MB SCSI Zip drive.
- Standard Macintosh I/O ports: two serial ports, a 10BaseT RJ-45 Ethernet port, a SCSI port, and an ADB port.
- External monitor port: supports external monitors at up to 1024 by 768 pixels in display mirror mode.
- Modem slot: 112-pin connector accepts an optional modem interfac**e**. The interface is the same as that in the Power Macitnosh G3 computer. It is strictly a modem interface and does not carry the PCI signals like the comm-slot II does.
- PCI card expansion slots: accepts three 6.88-inch PCI cards; three 15-watt cards or two 25-watt cards.

- Power switch: soft power controlled from keyboard.
- Fan speed control: The speed of the fan is thermally controlled and is automatically set to the lowest possible speed to minimize noise. The fan speed varies according to the temperature inside the enclosure.
- Energy saving: sleep, startup, and shutdown scheduling can be controlled with an Energy Saver control panel.

Differences From Other Power Macintosh G3 Models

This section lists the feature differences incorporated into the design of the Power Macintosh G3 All-in-one since the first release of the Power Macintosh G3 computer.

The Power Macintosh G3 All-in-one computer is currently available only through the Apple North America Education channel and for distribution only in the United States.

The features introduced with the Power Macintosh G3 All-in-one computer are:

- Mac OS 8.1 system software with extensions to support an all-in-one enclosure.
- New all-in-one enclosure design including tilting base for easy monitor positioning, stereo speakers, two 3.5mm mini-plugs on the front of the enclosure for stereo headphones, 15-inch built-in multisync display with digital geometry controls accessible through the Monitors & Sound control panel, and a front volume control.
- A pull-out tray holding the logic board. See “Access to the Logic Board” (page 20) for additional information about accessing the logic board.
- Support for multifunction PCI cards.
- Support for the ATA device 0/1 specification, which supports two ATA devices on a single ATA channel. Additional information about the ATA device 0/1 specification and the Macintosh APIs that support it, can be found in the ATA Device 0/1 Developer Guide on the Developer CD and at the Apple Developer web site.
- ATI 3D RAGE PRO graphics controller; 100 MHz graphics memory bus.

- Addition of RGB signals on the Audio and AV Personality cards to support the built-in internal monitor. A ribbon cable is connected between the RGB output connector on the card and the internal monitor.
- Display mirror output up to 1024 by 768 at 16 bits per pixel (thousands of colors) is supplied for external monitors on the DB-15 video port connector.

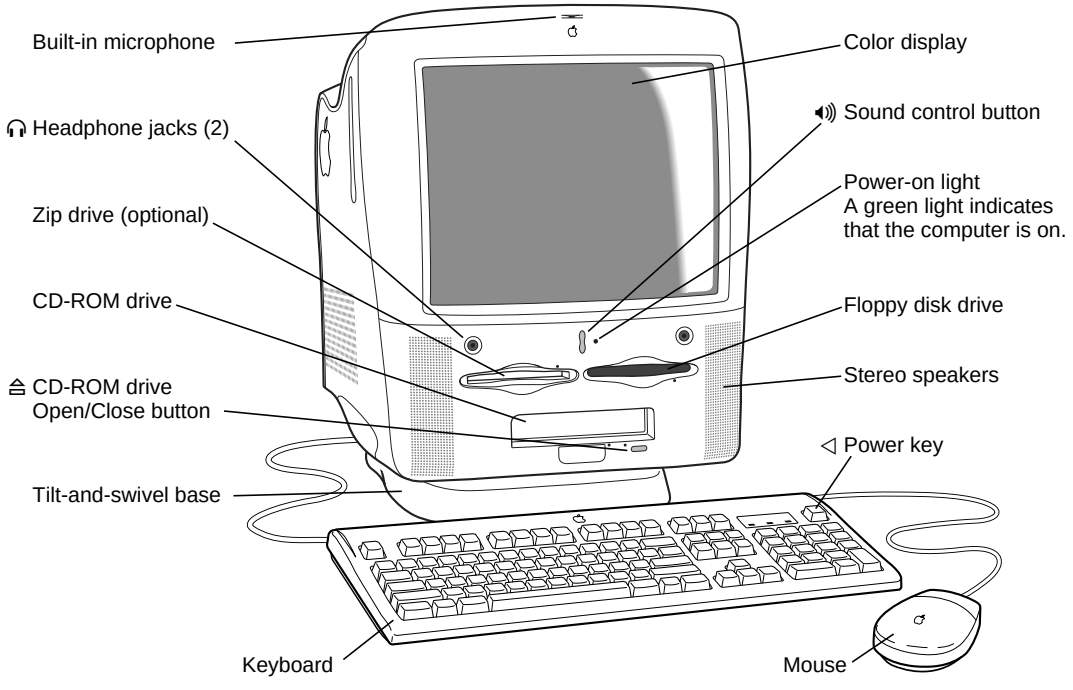
External Features

The Power Macintosh G3 All-in-one computer has a new all-in-one enclosure design.

Front View of the Enclosure

Figure 1-1 is a front view of the Power Macintosh G3 All-in-one enclosure. The front view shows the location of the openings for the CD-ROM drive, floppy disk, and optional ZIP drive, the built-in monitor, the built-in microphone, the stereo speakers, the sound control button (with integrated power-on light), and the headphone jacks.

Figure 1-1 Front view of the enclosure

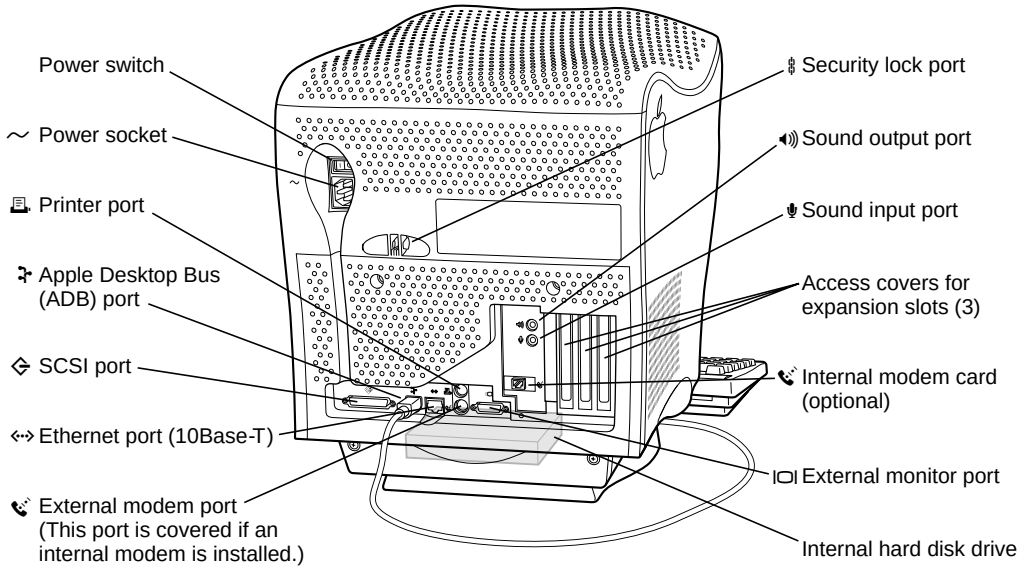


Back View of the Enclosure

The back panel includes the power input socket, the power switch, the I/O ports, the openings for PCI cards, and the opening for I/O access to the expansion features of the Personality cards in the PERCH slot.

Figure 1-2 shows the back view of the enclosure for the Power Macintosh G3 All-in-one computer.

Figure 1-2 Back view of the enclosure



Access to the Logic Board

You can access the logic board to add expansion DRAM, expansion graphics memory, or PCI expansion cards by removing four captive screws and pulling the logic board tray out, as shown in Figure 1-3 and Figure 1-4.

Figure 1-3 Accessing the main logic board in pull-out tray

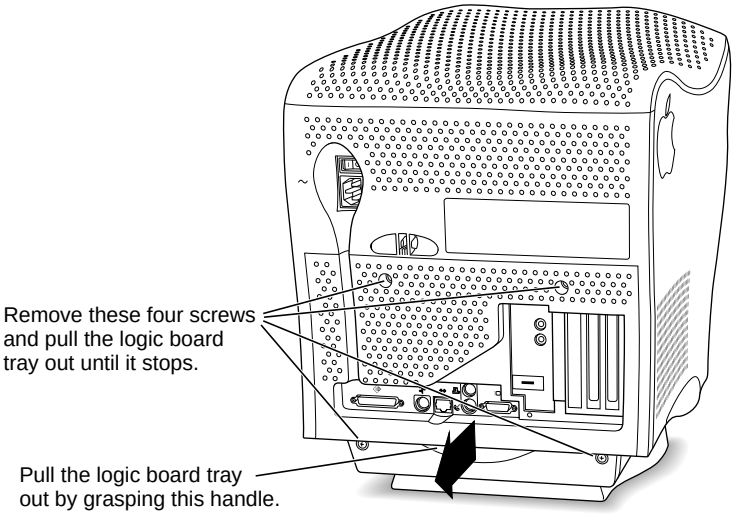
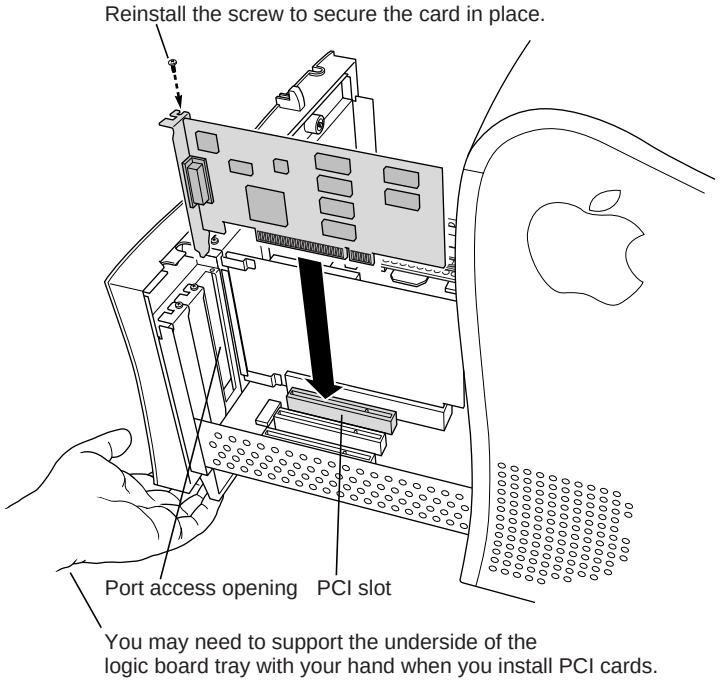


Figure 1-4 Logic board tray open



Optional Features

Several features designed into the logic board are implemented as plug-in modules available as a configuration option at the time of purchase. The Apple Audio and AV Personality cards and modem plug-in module options that extend the logic board functionality are described in the Power Macintosh G3 Developer Note.

Build To Order (BTO) Options

In addition to the plug-in modules that extend the designed-in features of the Power Macintosh G3 All-in-one logic board, there are several BTO options that can be installed when the system is purchased. The BTO options are:

- Hard disk drive: The standard configuration includes a 4 GB hard disk drive. The size of the hard disk drive can be changed to either a 2 GB or 6 GB.
- ZIP Disk Drive: The standard configuration of Power Macintosh G3 All-in-one computer does not include a ZIP drive. A ZIP drive can be added to the standard configuration.
- 10/100BaseT Ethernet Card: A 10/100Base-T Ethernet card that supports Open Transport: Mac OS 7.5.2 or later, AppleShare, AppleTalk, NetWare for Macintosh, and TCP-IP can be installed. The specifications for the card are as follows:
  - Connector: RJ-45 (for 10Base-T and 100Base-T)
  - Media, 10Base-T: Cat 3, 4, or 5 UTP on 2 pairs up to 100M
  - Media, 100Base-T: Cat 5 UTP on 2 pairs up to 100M
  - Bus interface: PCI revision 2.0 and 2.1, share interrupt A
  - Channel speeds: IEEE Auto Negotiation of 10Base-T and 100Base-TX
  - Communications: IEEE 802.3u 100Base-TX; IEEE 802.3i 10Base-T
  - Controllers: DECchip 21140, 32-bit internal processor per channel
  - Power: 1.2A @ 5V typical
- RAM Expansion: A 96 MB system memory configuration is available.
- Software: Educational and multimedia content creation software packages are available.

Compatibility Issues

The Power Macintosh G3 All-in-one computer incorporates changes from earlier Power Macintosh G3 computers. This section describes key issues you should be aware of to ensure that your hardware and software work properly.

Machine Identification

The Power Macintosh G3 All-in-one computer a machine ID value of 510 (hexadecimal 1FE). This is the same machine ID value as that of the tower and modular desktop Power Macintosh G3 computers. Applications can find out which computer they are running on by using the Gestalt Manager routines. *Inside Macintosh: Overview* describes the Gestalt Manager and tells how to use the `gestaltMachineType` value to obtain the machine name string.

Internal Device Expansion Bays

An optional 100 MB SCSI ZIP drive can be placed in the left-hand bay above the CD-ROM drive. There are no additional bays for device expansion available inside the enclosure.

Modem Slot

The modem slot in the Power Macintosh G3 All-in-one computer is not a PCI bus compatible communications slot (comm slot II) like the comm slot in the Power Macintosh 5500 and 6500 computers. The modem slot is strictly for modem cards that do not require the use of the PCI signals. The modem slot is located on the Apple Audio and AV Personality cards rather than on the main logic board.

Expansion Slots

The three I/O expansion slots are PCI expansion slots that conform to the PCI V2.1 specification. The enclosure supports PCI expansion cards with a maximum length of 6.88 inches.

RAM Expansion

The logic board uses JEDEC-standard 64-bit (non-parity) 168-pin 3.3-volt unbuffered SDRAM DIMM cards with a speed of 100 MHz / 10ns or faster. For additional information about the SDRAM DIMM configurations supported on the Power Macintosh G3 All-in-one logic board, see the Power Macintosh G3 Developer Note.

RAM DIMM Height Dimensions

The maximum supported height of RAM DIMM cards is 1.5 inches.

L2 Cache Expansion

The back-side L2 cache in the Power Macintosh G3 All-in-one computer is integrated into the design of the microprocessor module. No cache expansion is possible.

CD-ROM Drive

The CD-ROM drive is an ATAPI CD-ROM drive, rather than a SCSI drive. The system software release includes version 4.0 of the ATA Manager and supports PIO, singleword DMA, and multiword DMA data transfers.

Power Supply

The power supply is not self-configuring for different input voltages. The voltage switch is delivered preconfigured for the input voltage of the region in which the unit is originally purchased.

Video RAM Expansion

The Power Macintosh G3 computers include 2 MB of SGRAM on the main logic board. The video RAM can be expanded to 4 MB or 6 MB with an additional 2 MB or 4 MB of SGRAM on a 144-pin SO-DIMM (small outline dual inline memory module). The difference between supported display modes when using 4 MB or 6 MB of video memory is minimal, see Table 1-1 (page 26). However, 6 MB of SGRAM provides additional memory for storing 3D textures.

The additional memory allocated for 3D texture storage results in increased 3D graphics performance for QuickDraw 3D aware applications.

The mechanical characteristics of the SGRAM expansion DIMM are given in the JEDEC specification for the 144-pin 8-byte graphics SO-DIMM. The devices on the DIMM must be 3.3 V, 100 MHz / 10ns or faster, SGRAM devices. Additional information about memory devices and 144-pin SGRAM SO-DIMMs can be found at

<http: / / www.eia.org / jedec / download / freestd / pub21 / >

Built-in Video and Graphics Features

The Power Macintosh G3 computers have the following built-in video and graphics capabilities:

- ATI 3D RAGE PRO 64-bit graphics and multimedia accelerator
- 2 MB of synchronous graphic RAM (SGRAM)
- Hardware acceleration of 2D QuickDraw graphics and video to speed up scrolling text and graphics and screen redraw operations
- Hardware acceleration of video for full screen, full motion, TV-quality playback of Cinepak and MPEG1 QuickTime movies
- Bilinear hardware interpolation and scaling
- Accelerates 3D QuickDraw rendering up to 6 times that of software-only rendering
- Real-time 3D shaded object manipulation, animation, and virtual world navigation
- Includes 16-bit Z buffer for hidden texture surface removal
- Provides six perspectively correct texture mapping functions
- Alpha blending, transparency, and fog effects
- Flat and Gouraud shading
- Video textures and video lighting

The graphics acceleration features enhance the realism of 3D interactive application software and games.

Supported Display Modes

The built-in video circuitry supports pixel display sizes of 512 by 384, 640 by 480, 800 by 600, 832 by 624, and 1024 by 768. When power is applied, the built-in monitor is initially set for a display size of 640 by 480 pixels. The user can switch the monitor resolution on the fly from the Monitor BitDepth and Monitor Resolution modules in the Control Strip or from the Monitors & Sound control panel.

External Video Connector

The cable from an external monitor plugs into a DB-15 video port located on the enclosure's rear panel. The pin assignments for the external video connector are the same as those for the Power Macintosh G3 computers. The external monitor connector only provides an internal display mirroring feature. The image on the internal monitor is duplicated on the external display.

External Video Monitors

The Power Macintosh G3 All-in-one can drive several sizes of external video monitors in display mirror mode. Table 1-1 shows the display resolution, vertical refresh, horizontal refresh, and maximum pixel depths supported by the Power Macintosh G3 All-in-one display graphics subsystem.

Table 1-1 Maximum pixel depths for supported display resolutions

Display resolution	Vertical refresh	Horizontal refresh	Maximum pixel depth 2 MB	Maximum pixel depth 4 MB	Maximum pixel depth 6 MB
512 by 384	70 Hz	31.488 kHz	32	32	32
640 by 480	60 Hz	31.469 kHz	32	32	32
640 by 480	67 Hz	35.00 kHz	32	32	32
640 by 480	72 Hz	37.861 kHz	32	32	32
640 by 480	75 Hz	37.500 kHz	32	32	32

continued

Table 1-1 Maximum pixel depths for supported display resolutions (continued)

Display resolution	Vertical refresh	Horizontal refresh	Maximum pixel depth 2 MB	Maximum pixel depth 4 MB	Maximum pixel depth 6 MB
640 by 480	85 Hz	43.269 kHz	32	32	32
640 by 870	75 Hz	68.85 kHz	16	32	32
800 by 600	56 Hz	35.156 kHz	32	32	32
800 by 600	60 Hz	37.879 kHz	32	32	32
800 by 600	72 Hz	48.077 kHz	32	32	32
800 by 600	75 Hz	46.875 kHz	32	32	32
800 by 600	85 Hz	53.674 kHz	32	32	32
832 by 624	74.5 Hz	49.725 kHz	32	32	32
1024 by 768	60 Hz	48.363 kHz	16	32	32
1024 by 768	70 Hz	56.476 kHz	16	32	32

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