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Macintosh® Classic® Computer

Developer Note

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Preface

About this note

This developer note describes the Macintosh Classic computer and emphasizes those features that are new or different from those of other Macintosh-family compact computers. This note assumes that you are already familiar with both the functionality and programming requirements of Apple® Macintosh computers. If you are unfamiliar with the Macintosh computer or would simply like more technical information on the hardware, you may want to obtain copies of related technical manuals, as explained in the following section, "Supplemental Reference Documents."

This developer note does not constitute a manual and is not complete in its present form. While every attempt has been made to verify the accuracy of the information presented, it is subject to change without notice. This developer note may contain information or specifications that are still under consideration by Apple Computer. The primary reason for releasing product information early is to provide the development community with essential product specifications, theory, and application information for the purpose of stimulating work on compatible third-party products.

Supplemental reference documents

To supplement the information in this document, you might wish to obtain related documentation such as *Guide to the Macintosh Family Hardware*, second edition and *Inside Macintosh*, Volumes I through VI. These technical manuals are available through APDA® (Apple Programmers and Developers Association). APDA is an excellent source of technical information for anyone interested in developing Apple-compatible products.

Through APDA you can purchase Apple technical documentation, programming tools, and utilities. For information on available products and prices, contact

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Chapter 1 Hardware Overview

The Macintosh® Classic® computer is a new cost-reduced, compact Macintosh computer that provides Macintosh SE performance. It appeals to a wide range of markets including education, home, and business. This chapter describes old and new features of the Macintosh Classic computer's hardware.

Introduction

The Macintosh Classic computer includes these standard features:

- Microprocessor: MC68000 running at 8 MHz (Macintosh SE performance)

- Read-only memory (ROM): 512 KB in socket; expandable to 1 MB (modified Macintosh SE ROM)

- Random-access memory (RAM): 1 MB soldered to main logic board (expandable to 2 MB, 2.5 MB, or 4 MB via memory expansion card)

- Display: built-in 512 x 342 x 1 monochrome 9-inch monitor

- Floppy disk: internal 1.4 MB SuperDrive™ with Super Woz Integrated Machine (SWIM) interface

- I/O: 1 Small Computer System Interface (SCSI) port, 1 external floppy disk port, 2 serial ports, 1 Apple Desktop Bus™ (ADB) port, 1 audio output port

The following features are new to the Macintosh Classic computer and should appeal to developers of third-party hardware:

- Memory expansion: RAM expandable up to 4 MB by installation of optional RAM expansion card in 44-pin memory expansion connector on main logic board

- Hard drive support: an internal 50-pin SCSI connector that allows the Macintosh Classic computer to support a 1-inch-high, low-power, 3.5-inch hard drive

Design changes

With a few exceptions, features of the Macintosh Classic computer are essentially the same as those of the Macintosh SE computer. However, many design changes have been made to the hardware to reduce cost and ease manufacturing. These changes include

- surface-mount technology to reduce the size of the main logic board

- redesign of the power/sweep board

- replacement of Single In-line Memory Module (SIMM) connectors with 1 MB of on-board RAM (provides lower cost for first 1 MB of RAM)

- addition of 44-pin connector on main logic board for memory expansion

- a single internal 1.4 MB SuperDrive

- low cost ADB (Apple Desktop Bus™) keyboard and mouse

- control Panel brightness control (replaces external brightness control on monitor)

- elimination of Macintosh SE Direct Slot expansion connector

- disconnection of the GPi line eliminating support for synchronous modems

The following sections provide details of the design differences between the Macintosh Classic computer and the Macintosh SE computer.

Main logic board

The Macintosh Classic computer's main logic board is based on the Macintosh SE design. The size, however, is greatly reduced as a result of surface mount technology. The board is 9 inches long by 5 inches wide (about half the size of a Macintosh SE main logic board). The most noticeable new features on the board are the 44-pin connector for memory expansion and the 50-pin SCSI connector for an internal hard drive.

ROM

The Macintosh Classic ROM consists of a 256K x 16 bit (0.5 MB) dual in-line package (DIP) mounted in a 42-pin socket on the main logic board. Although the socket includes two extra pins for ROMs up to 2 MB in size, the Macintosh Classic computer's address map allows only 1 MB of address space for ROM.

RAM

The Macintosh Classic computer is equipped with 1 MB of on-board RAM consisting of eight 256K x 4 dynamic random-access memory (DRAM) chips soldered to the main logic board. The RAM is expandable to 2 MB, 2.5 MB, or 4 MB with a memory expansion card. This feature is explained later in the section "Memory Expansion."

Disk drives

The Macintosh Classic computer can be equipped with either of the following internal disk drive configurations:

- 1 floppy disk drive and no hard drive

- 1 floppy disk drive and 1 hard drive

Floppy disk drives

The floppy disk drive configuration of the Macintosh Classic computer consists of one internal 1.4 MB SuperDrive with the option of connecting an external floppy disk drive via the external drive port. A SWIM interface chip controls the internal and external disk drives.

♦ **Important**   Do not attempt to connect 400 KB floppy disk drives to the external drive port; they are not supported by the Macintosh Classic computer and will not work. Earlier Macintosh computers provided a signal that controlled the disk speed of these drives; the Macintosh Classic, however, uses this signal in the power/sweep circuitry to control changes in screen brightness. ♦

Hard disk drives

The hard drive configuration of the Macintosh Classic computer consists of a 1-inch-high, low-power, 3.5-inch, 40 MB hard drive that connects internally to the Macintosh Classic computer via a 50-pin SCSI connector. Table 1-1 gives the pinout of the SCSI hard drive connector.

♦ **Important** The design of the Macintosh Classic computer requires that an internal hard disk implement a 1-second "spin-up delay" after power is applied. This delay allows the floppy disk drive to power up first and prevents possible overloading of the power supply in a Macintosh Classic computer containing both a floppy disk drive and a hard drive. ♦

• **Table 1-1** SCSI connector pinout

Pin number	Signal name	Signal description
1	Gnd	Ground
2	/DB0	Data bit 0
3	Gnd	Ground
4	/DB1	Data bit 1
5	Gnd	Ground
6	/DB2	Data bit 2
7	Gnd	Ground
8	/DB3	Data bit 3
9	Gnd	Ground
10	/DB4	Data bit 4
11	Gnd	Ground
12	/DB5	Data bit 5
13	Gnd	Ground
14	/DB6	Data bit 6
15	Gnd	Ground
16	/DB7	Data bit 7
17	Gnd	Ground
18	/DBP	Data parity bit
19	Gnd	Ground

20	n.c.	Not connected
21	Gnd	Ground
22	n.c.	Not connected

(continued)

Table 1 SCSI connector pinout (continued)

Pin number	Signal name	Signal description
23	Gnd	Ground
24	n.c.	Not connected
25	n.c.	Not connected
26	TPWR	+5 volts termination power
27	Gnd	Ground
28	n.c.	Not connected
29	Gnd	Ground
30	n.c.	Not connected
31	Gnd	Ground
32	/ATN	Indicates attention condition
33	Gnd	Ground
34	n.c.	Not connected
35	Gnd	Ground
36	/BSY	Indicates SCSI data bus is busy
37	Gnd	Ground
38	/ACK	Acknowledge for REQ/ACK data transfer handshake
39	Gnd	Ground
40	/RST	SCSI bus reset
41	Gnd	Ground
42	/MSG	Indicates message phase
43	Gnd	Ground
44	/SEL	Selects target or initiator
45	Gnd	Ground
46	/C/D	Indicates whether control or data is on SCSI bus
47	Gnd	Ground
48	/REQ	Request for REQ/ACK data transfer handshake
49	Gnd	Ground
50	/I/O	Controls direction of data movement

Serial ports

The Macintosh Classic uses 8-pin mini-DIN serial port connectors that are electrically identical to the ports on the Macintosh Plus computer but have been slightly modified with respect to the Macintosh SE computer by disconnecting the GPi input. As a result, support for synchronous modems is limited. Any serial port device that works on a Macintosh Plus computer will also work on the Macintosh Classic computer.

Versatile Interface Adapter

Some of the Versatile Interface Adapter (VIA) signals have been slightly changed to facilitate the other internal design changes to the main logic board. These changes are transparent to third-party developers if they adhere to guidelines and do not attempt to access the hardware directly..

Brightness control

A Control Panel device (cdev) replaces the brightness control on the power/sweep board. A signal (PWM) previously used to control disk speed on 400 KB drives is now routed to the power/sweep board, where variations in duty cycle are converted to changes in screen brightness. Software controls the screen brightness by writing a constant value in the sound buffer on each odd byte. These byte values control the output voltage of the power/sweep board. As the voltage increases, the screen becomes brighter. A voltage of less than 1.4 volts results in a completely dark screen.

ADB

The rear of the Macintosh Classic computer has only one ADB connector.

Sound

The Macintosh Classic computer includes a stereo headphone jack
with both channels connected to the monaural sound output.

Power/sweep connector on main logic board

The 14-pin Molex power/sweep signal connector on the Macintosh Classic computer's main logic board has been gold plated and rotated 180 degrees relative to its position on a Macintosh SE main logic board. This connector receives power and video signals from the power/sweep (analog) board. Table 1-2 gives the pinouts and signal descriptions for the power/sweep connector.

• **Table 1-2** Power/sweep connector signal assignments

Pin number	Signal	Signal description
1	+12V	+12 volts
2	+5V	+5 volts
3	+5V	+5 volts
4	/VSYNC	Vertical synchronization
5	/HSYNC	Horizontal synchronization
6	VIDOUT	Video output
7	SND	Sound signal
8	–12V	–12 volts
9	PWM	Brightness control signal
10	GND	Ground
11	GND	Ground
12	GND	Ground
13	GND	Ground
14	GND	Ground

Power requirements

The Macintosh Classic computer's power supply system consists of elements of both the Macintosh Plus and the Macintosh SE power supply systems. Power supply regulation is as follows:

Supply	Regulation
+5V	4.85 V to 5.20 V
+12V	11.5 V to 12.8 V
−12V	−13.2 V to −10.8 V

Current loading requirements for the power supplies are shown in Table 1-3.

- **Table 1-3** Power supply current loading requirements

| Device	+5 volt (amps)			+12 volt (amps)			−12 volts (amps)		
	Min	Max	Peak	Min	Max	Peak	Min	Max	Peak
Main logic board	0.490	2.100	2.100	0.010	0.065	0.070	0.010	0.060	0.080
Int. HD	0.000	0.500	0.700	0.000	0.300	1.000			
Int/ext. SuperDrive	0.010	0.260	0.260	0.000	0.185	0.650			
2 external HD20s	0.000	0.000	0.000	0.000	0.000	0.000			
Int. SCSI terminator	0.000	0.229	0.257						
Ext. SCSI terminator		0.000	0.400	0.400					
Total	0.500	3.489	3.717	0.010	0.550	1.070	0.010	0.060	0.080

◆ *Note:* The +12 volt peak currents for the hard drive and the floppy disk drive are not added together because the hard drive peak value is for startup only and does not occur at the same time as the floppy disk drive's peak. The maximum duration of the peak current is 2 seconds.

Memory expansion

You can expand the Macintosh Classic computer's RAM by installing an optional memory expansion card in the 44-pin connector on the main logic board. Figure 1-1 is a design guide showing the maximum allowable card size and the location of pin 1 for installing the expansion card's 44-pin connector. Some available 44-pin connectors are

- AMP, Inc., part number 2–532955–4

- Molex, part number 15–44–6044

■ **Figure 1-1** Memory expansion card design guide

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Pin 1

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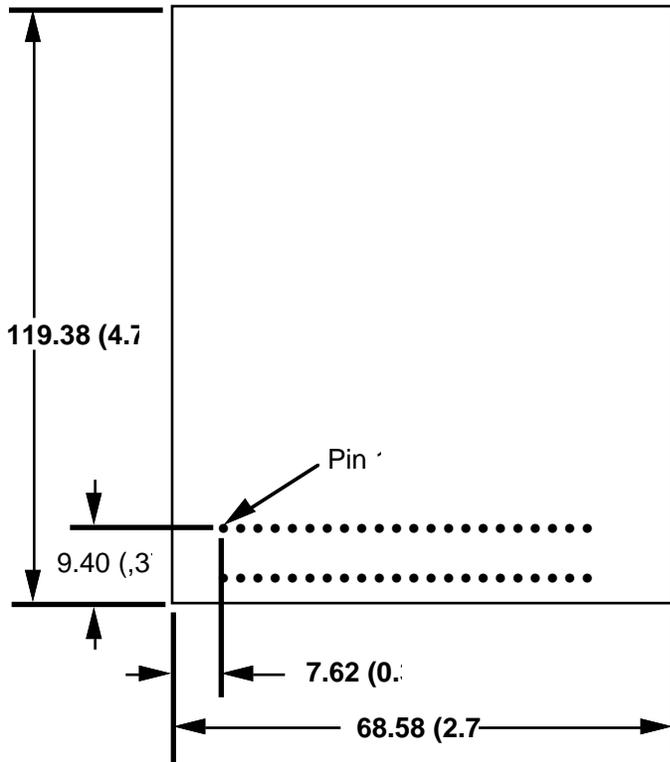
Dimensions are in millime
with inches in parentheses

Table 1-4 provides the pinout and signal descriptions of the memory expansion connector. A Programmed Array Logic (PAL) integrated circuit on the main logic board sends the necessary column address strobe (CAS) signals to the expansion connector. Pins 12 and 11 on the connector indicate to the PAL whether an expansion card is installed and, if one is, whether it contains SIMMs. Pin 12 (/EXP.IN) is the expansion input pin. This pin must be grounded to indicate that a memory expansion card is installed. Pin 11 (/SIMM.IN) is the SIMM input pin. If a memory card is installed, this pin must be grounded to indicate that SIMMs are plugged into the card. The status of the/EXP.IN and /SIMM.IN signals also determines which CAS lines are active. Input signals on the expansion connector do not have to be pulled high.

- **Table 1-4** Memory expansion connector pinout

Pin number	Name	Description
1	Gnd	Ground
2	Gnd	Ground
3	+5V	+5 volt power
4	+5V	+5 volt power
5	/CASCH	Bank C high-byte column address strobe
6	/CASCL	Bank C low-byte column address strobe
7	/CASEL	Bank E low-byte column address strobe
8	/CASEH	Bank E high-byte column address strobe
9	/CASDH	Bank D high-byte column address strobe
10	/CASDL	Bank D low-byte column address strobe
11	/SIMM.IN	SIMM input indicator
12	/EXP.IN	Expansion input indicator
13	RD(3)	Data bit 3
14	RD(2)	Data bit 2
15	RD(0)	Data bit 0
16	RD(1)	Data bit 1
17	RD(7)	Data bit 7
18	RD(6)	Data bit 6
19	RD(4)	Data bit 4
20	RD(5)	Data bit 5
21	RD(11)	Data bit 11
22	RD(10)	Data bit 10
23	RD(8)	Data bit 8
24	RD(9)	Data bit 9
25	FRA(9)	Address bit 9
26	FRA(4)	Address bit 4
27	FRA(3)	Address bit 3
28	FRA(5)	Address bit 5
29	FRA(2)	Address bit 2
30	FRA(6)	Address bit 6
31	FRA(1)	Address bit 1
32	FRA(7)	Address bit 7
33	FRA(0)	Address bit 0

(continued)

• **Table 1-4** Memory expansion connector pinout (continued)

Pin number	Name	Description
34	FRA(8)	Address bit 8
35	/FRAS	Row address strobe
36	/FRMRW	Read/write
37	RD(15)	Data bit 15
38	RD(13)	Data bit 13
39	RD(14)	Data bit 14
40	RD(12)	Data bit 12
41	+5V	+5 volt power
42	+5V	+5 volt power
43	Gnd	Ground
44	Gnd	Ground

Apple Computer has developed its own unique memory expansion card for the Macintosh Classic. Figure 1-2 provides details of the Apple memory expansion card's configuration . The standard configuration of this memory expansion card consists of 1 MB of additional RAM, a 44-pin connector that mates with the connector on the main logic board, and two SIMM connectors. The 1 MB of additional memory is provided by a bank of eight 256K x 4 DRAMs soldered onto the expansion card.

Installing 256 KB SIMMs in the two SIMM connectors increases total memory to 2.5 MB; installing 1 MB SIMMs increases total memory to 4 MB. A jumper block on the expansion card is used to indicate whether SIMMs are installed.

■ **Figure 1-2**   Memory expansion card configuration

Jumper bl

SIMM
(Two 256 I
or two 1 M

1 MB soldered-or

Memory expansio

44-pin conne

Main logic bo
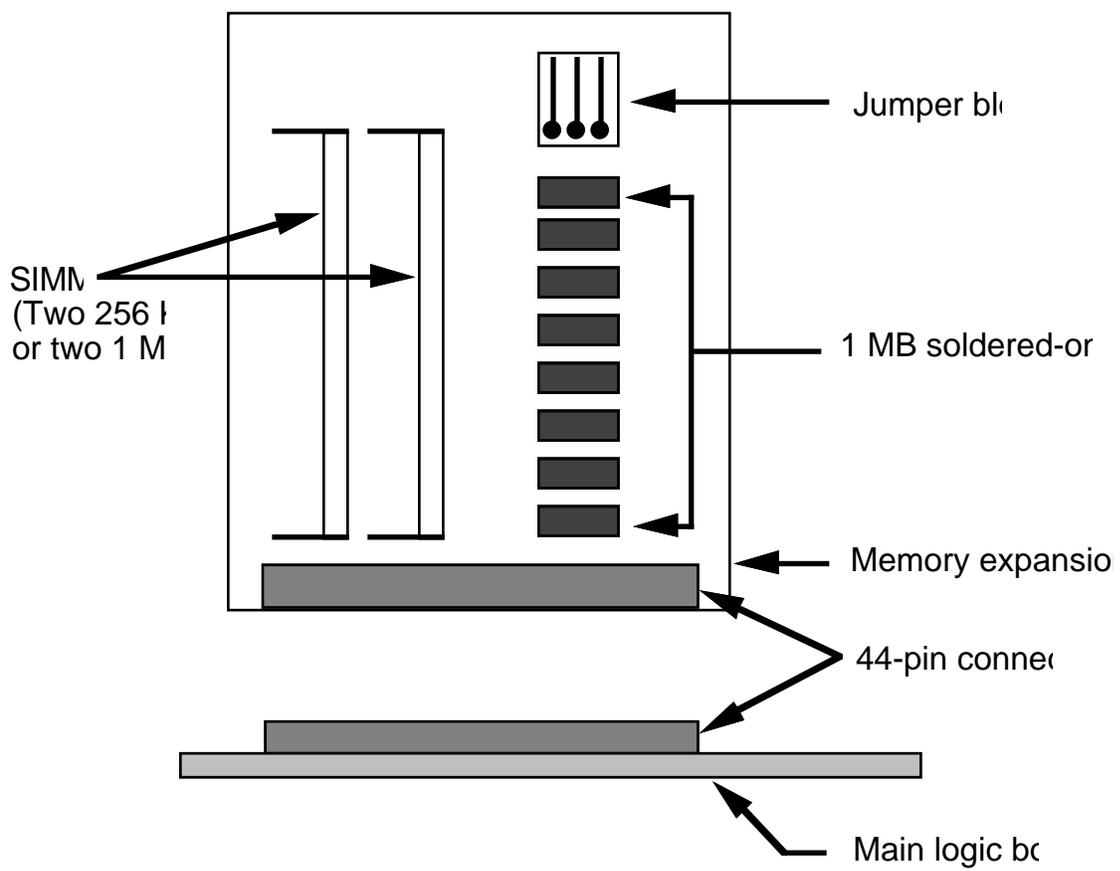
Chapter 2   Software Overview

This chapter briefly describes the ROM and defines the
system software used by the Macintosh Classic
computer.

The Macintosh Classic ROM

The Macintosh Classic computer's ROM is based on the ROM used in the Macintosh SE. The Macintosh Classic ROM includes a new feature, a brightness driver, that is used by the brightness cdev to control the brightness of the display screen.

System software

The Macintosh Classic computer will ship with system software version 6.0.6. This version of the system software includes the new brightness cdev and necessary patches to support the Macintosh Classic computer. When system software version 7.0 ships, it will also support the Macintosh Classic ROM.

Appendix A **Keyboards**

The Macintosh Classic is equipped with a new keyboard
called the Apple Keyboard II. The domestic ANSI layout
(with US legends) and the ISO layout (with
International Z legends) of the Apple Keyboard II are
shown in Figures A-1 and A-2, respectively. As shown
in Figure A-1, the major differences in layout, when
compared with the standard Macintosh keyboard, are in
the positioning of the esc, caps lock, ctrl, and tilde keys.

- **Figure A-1** Apple Keyboard II, ANSI layout (US legends)

- **Figure A-2** Apple Keyboard II, ISO layout (International Z legends)