

# New Technical Notes

Macintosh

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Developer Support

## HW 14 - Macintosh SE/30 Info Hardware

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June 1989  
April 1989

This Technical Note discusses the Macintosh SE/30, items of interest to developers, and sources for further information.

**Changes since April 1989:** Corrected an error in the addresses of the video display buffers.

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The Macintosh SE/30 is a modification of the original Macintosh SE concept. The SE/30 combines the modularity of the original SE with the capabilities of the larger Macintosh Ix. Although the name implies that the SE/30 borrows many characteristics from the SE, there are actually substantial differences between the two machines, and this Note addresses some of those differences.

### Similarities Between the Macintosh SE and SE/30

The main similarities between the SE and the SE/30 are as follows:

- compact design
- power supply
- analog board
- rear housing
- SCSI support
- ADB support
- nine inch video display

### Differences Between the Macintosh SE and SE/30

There are, however, many differences between the two machines. This section covers those differences with respect to their impact on developers.

#### CPU

The Motorola 68030 on the Macintosh SE/30 is clocked at 15.6672 MHz and provides both 32-bit data and address buses, both 256-byte instruction and data caches, and a built-in Paged Memory Management Unit (PMMU). The 68000 in the Macintosh SE is clocked at 7.83 MHz.

Although the 68030 is capable of a burst mode to more efficiently access contiguous blocks of memory, this feature is not enabled on the Macintosh SE/30. Enabling this feature would require significantly more complex control logic and faster (read “more expensive”) RAM.

## Coprocessor

The Motorola 68882 on the Macintosh SE/30 offers a full implementation of the IEEE Standard for Binary Floating-Point Arithmetic. The 68882 has an optimized MPU interface that provides up to 1.5 times the performance of the 68881. The Macintosh SE does not ship with a coprocessor (although third-party coprocessors are available).

## ROM

The Macintosh SE/30 ROM is identical to that of the Macintosh IIx; it includes Color QuickDraw, the Slot Manager, and other features of the IIx ROM. It is composed of four 512 Kbit ROMs, for a total of 256K, and it is mounted on one ROM SIMM (ROM SIMMs are expandable to 2 MB).

System Software 6.0.3 (and later) patches to the ROM affect the Start Manager, the OS utilities, and the Sony driver.

## RAM

The SE/30 includes eight RAM SIMM slots like the Macintosh II family and supports from 1 MB up to 128 MB (using 16 MB SIMMs), however, the current System Software only supports the first eight megabytes of RAM. The SE/30 also supports 4 MB DRAMs. For more information on memory configuration, see Macintosh Technical Note HW 25 Macintosh Memory Configurations.

## Video

The Macintosh SE/30 video architecture is compatible with the SE: one-bit per pixel monochrome display with 342 lines of 512 pixels each. There is 64K of high-speed video display RAM to maximize video performance. The video provides dual display buffers of 21,888 bytes for fast page switching: the primary buffer starts at \$FEE08040 and ends at \$FEE0D5C0, and the alternate buffer starts at \$FEE00040 and ends at \$FEE055C0. The physical address of the video buffers simulates the NuBus address of slot \$E on the Macintosh II family.

Developers need to be cautious with this video implementation, since a call to `_SysEnviron`s returns true for `hasColorQD` (since Color QuickDraw is implemented in the SE/30 ROM), but the default configuration only includes a single monochrome display.

As with any machine which supports Color QuickDraw, your application should test for the specific functionality which it needs, keeping in mind that different capabilities may be present on devices other than the main display. For example, an application which requires eight or more bits of color may do the following:

```
gotOne := FALSE;                                {Assume we'll fail}
aDevice := GetMainDevice;                       {Get the first device}
WHILE (aDevice <> NIL) AND (NOT gotOne) DO
    IF (aDevice^^.gdPMap^^.pixelSize >= 8) AND {Do we have >= 8 bits?}
        (BitTest(@aDevice^^.gdFlags,15)) THEN {And are we color?}
```

```
        gotOne := TRUE                                {Yes! We're done}
ELSE
    aDevice := GetNextDevice(aDevice); {Try next device}

IF gotOne THEN
    {We have a screen to use. Maybe put our window up
    within aDevice^.gdRect}
```

## Processor Direct Slot Expansion

The Processor Direct Slot (PDS) in the SE/30 is significantly different from the PDS in the SE. The 68000 PDS in the SE provides a 16-bit bus, whereas the 68030 PDS in the SE/30 provides both a 32-bit data bus and a 32-bit address bus. Access to the full 32-bit data bus allows for higher performance expansion cards than the 16-bit bus of the PDS in the SE. In addition, many of the expansion cards built for the PDS in the SE were hard-wired to the 7.83 MHz clock speed. Since the clock speed in the SE/30 is 15.6672 MHz, there are fundamental incompatibilities in clock speed, and therefore expansion card design.

The PDS in the SE/30 is a 120-pin, 32-bit PDS which provides both “common” and “machine-specific” signals. The common signals will be available across all 68030 PDS implementations, while the machine-specific signals will be available on future 68030 PDS implementations and may have new features added. On the SE/30, the machine-specific signals emulate equivalent signals on the NuBus expansion interface. This emulation means that expansion cards on the SE/30 may take advantage of the Slot Manager in ROM to communicate with the bus via a Declaration ROM on the card.

Connectors for the PDS may be obtained from AMP (part number 535022-1).

Prototyping cards for the PDS may be obtained from:

Creative Solutions  
4701 Randolph, Suite 12  
Rockville, Md 20852  
Attn: Chris Colburn  
(301) 984-0262

**Disclaimer:** This listing for Creative Solutions neither implies nor constitutes an endorsement by Apple Computer, Inc. If your company supplies these cards and you would like to be listed, contact us at the address in Technical Note #0.

The chassis design of the SE/30 simplifies expansion card installation as cards may be mounted vertically instead of horizontally, as in the SE. Because of this orientation, expansion cards can be installed without removing the logic board. In addition, there is more room for expansion cards in the SE/30 than in the SE.

## System Software Requirements

The SE/30 requires System Software version 6.0.3 or later. Beginning with version 6.0.3, the installer shipped with the System Software includes a specific script for the SE/30.

## Internal Floppy Drive

All configurations of the Macintosh SE/30 ship with an internal FDHD (Floppy Drive, High Density) floppy drive (a.k.a., SuperDrive) controlled by the SWIM controller chip. The SWIM chip is capable of supporting 720K and 1.44 MB Modified Frequency Modulation (MFM) formats (i.e., MS-DOS 3.5" disks), as well as the 400K and 800K Group Coded Recording (GCR) formats (Macintosh and Apple II 3.5" ProDOS disks) and the 1.4 MB MFM format (Macintosh 3.5" high-density disks). Note that special disks are required to take advantage of the 1.44 MB and 1.4 MB MFM formats. These disks have a square cutout in the top left corner to differentiate them from standard floppy disks. These disks may **not** be used in standard floppy drives (i.e., 400K and 800K) in the Macintosh family.

Although the SE is capable of supporting two internal 800K floppy drives, the SE/30 only supports a single internal FDHD drive.

## External Floppy Drive

The SE/30 provides support for an external 800K floppy drive; it does not support the external 400K floppy drive or the external HD20 hard disk.

## SCSI

The SE/30 uses the same 53C80 and interface logic as the IIX. This combination supports pseudo-DMA burst transfers, and SCSI performance matches that of the IIX.

## \_SysEnviron

On the SE/30, `_SysEnviron` version 2 returns 7 in the `machineType` field and 4 in the `processor` field. For more information about `_SysEnviron`, see Macintosh Technical Note OV 16 - `_Gestalt` & `_SysEnviron` - a Never-Ending Story.

## Sound

The SE/30 uses the Apple Sound Chip, rather than the discrete sound circuitry of the SE. Although the circuitry provides stereo output to the speaker jack, as of System Software 6.0.3, stereo sound is **not** implemented, so true stereo is not yet available. The internal speaker of the SE/30 uses a mixed signal from both channels, whereas a Macintosh II uses a signal from only one channel.

## Clock

The battery is not soldered to the motherboard and is replaceable.

## General

All positive 5.0 volt outputs from the SE/30 (ADB, floppy drive, SCSI) are fuse protected from overloads. The maximum current that an external device connected to these ports can draw is 800 mA.

## Upgrade Kits

Apple will offer several SE-to-SE/30 upgrade kits for current SE owners in the Spring of 1989. However, installation of these upgrade kits will prevent the owner from using any current SE expansion cards.

The first upgrade kit consists of the following:

- Logic board with 1 MB RAM
- Chassis
- EMI shroud
- Ferrite bead for power cable
- SE disk drive slot cover and retainer clip (for second floppy drive, if necessary)
- Owner's Manual

The dealer performing the upgrade is required to return the SE logic board with 1 MB RAM to Apple. A separate upgrade kit is available to upgrade the internal floppy drive to the FDHD. This kit is optional, since the SWIM chip on the SE/30 logic board is capable of controlling the 800K floppy drive of the SE. However, upgraded SEs with two internal floppy drives will **not** be able to access the second drive, since the SE/30 only supports **one** internal floppy drive.

## Software Compatibility

Apple's Product Quality and Support (PQ&S) department has tested over 100 of the most popular software packages on the SE/30 and has found that with the latest versions of these applications, 95% are completely compatible with the SE/30. Apple notified those developers whose tested packages were determined to be incompatible, and they are expected to announce upgrades in the near future.

Information on which packages were and were not compatible is **not** available, however, most of the incompatibilities were determined to be due to an application making assumptions about the hardware which were not true on the SE/30. In general, applications which call `_SysEnviron`s to determine the current hardware configuration are compatible.

## For Further Information...

You can get further information about developing for the SE/30 from APDA. They offer the Macintosh SE/30 Developer Notes (part number M0061LL/A) for developers interested in producing hardware expansion cards, as well as a more general reference, *Designing Cards and Drivers for the Macintosh II and Macintosh SE*, (part number M7075).

## Further Reference:

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- *Inside Macintosh*, Volume V-1, Compatibility Guidelines
- Technical Note OV 16 — Gestalt and SysEnviron: a Never Ending Story
- Technical Note HW 25 — Macintosh Memory Configurations