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Macintosh IIX: General Description (Discontinued)

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TOPIC -----

This article describes the Macintosh IIX.

DISCUSSION -----

The Macintosh IIX computer is a modification of the Macintosh II design that uses a Motorola MC68030 microprocessor and a MC68882 numerics coprocessor. The Macintosh IIX uses the new Apple SuperDrive (formerly Apple FDHD) 1440K floppy drive. Upgrades for the Macintosh II will be available for both the drive and the logic board.

MC68030

The Macintosh IIX uses the Motorola MC68030 at 15.6672 MHz, the same speed as the existing Macintosh II. The MC68030 is Motorola's second-generation 32-bit microprocessor, and combines a central processing unit, a data cache, an instruction cache, an enhanced bus controller, and a memory management unit into a single VLSI device. Internal function blocks of the microprocessor are designed to operate in parallel, allowing instruction execution to be overlapped.

The MC68030 integrates the functionality of the MC68020 32-bit microprocessor with a subset of the MC68851 Paged Memory Management Unit (PMMU). Commonly called the 030 (pronounced "oh-three-oh"), the MC68030 is compatible with Macintosh II timing and software.

MC68882

The MC68882 numerics coprocessor (also called the Floating Point Unit, or FPU) provides high speed, extremely accurate floating point computation to IEEE standards.

The processor operates in parallel with the MC68030, and is clocked at 15.6672 MHz using the same clock signal as the MC68030. Calls to the Apple SANE routines will use the MC68882. The MC68882, also called the 882 (pronounced "eight-eighty two"), is pin- and electrically-compatible with

the MC68881 coprocessor in the Macintosh II.

Both processors use the same base instruction set -- the major advantage of the MC68882 is increased speed. With the MC68882, you can perform both memory moves and chip operations in parallel -- as long as they don't conflict -- thus boosting floating point performance by about 15%.

Memory Management

Macintosh IIX can support the A/UX operating system without adding the PMMU, thanks to on-chip memory management by the MC68030. The MC68030 allows true 32-bit address translation with hardware page replacement. The built-in memory unit is also capable of ignoring the high 8-bits of the address to allow Macintosh software to run in 24-bit mode.

(NOTE: The MC68030 PMMU is a subset of the MC68851 PMMU, rather than an exact replacement.)

Wait States

- The Macintosh IIX uses one wait state to access the RAM.
- The Macintosh II has two wait states, one for RAM, and one for the HMMU or PMMU.

Given the CPU clock speed, you need one wait state to make sure you read from RAM at 120ns. The 15.6672 clock frequency has an active period of 63.8276ns. If the CPU reads without wait states, you would need 60ns RAM. Given the limited availability of these 60ns chips, Apple has chosen one wait state and 120ns RAM chips.

Apple SuperDrive (formerly Apple FDHD)

The Apple SuperDrive can read and write to any of the major 3.5-inch disk formats, including Macintosh (GCR 400K, 800K, and MFM 1.44MB), Apple II (800K), MS-DOS and OS/2 (MFM 720 and 1.44MB).

GCR stands for Group Code Recording; MFM stands for Modified Frequency Modulation. MFM and GCR only effect how the bits are placed on the disk, not the directory structure. The drive is supported by the SWIM (Sander, Woz Integrated Machine) chip.

(NOTE: There is special 1.44MB media that should NOT be used in the older 400K or 800K drives.)

SWIM Chip

The SWIM chip is a single-chip combination MFM/GCR controller for internal and external floppy drives. It was designed for the SuperDrive, but is compatible with the current 400K and 800K drives. The SWIM chip

replaces the IWM chip, and is pin- and function-compatible with that device.

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