Recall!

By Kathy Donina

Editor's Note: The following derives from an Apple press release and technical note received by BCS•Mac shortly before this issue closed (late, as usual). The release and technical note represent all of the information regarding this recent development available to us at press time. More detailed commentary and analysis of the situation will be published in next month's issue of The Active Window.

CUPERTINO—Apple Computer, Inc. announced in an April 1 press release that the company would be recalling all existing Macintosh 512KE, 512, and 128 computers, due to the recent discovery that the computers could represent a possible fire hazard.

In four separate incidents, upgraded Macintosh 512KE, 512, and 128 computers have caused fires that completely consumed the faulty Macintoshes and in one case caused extensive damage to a residential office. The Macintoshes' original motherboards had been given memory upgrades to permit them to run System Software 6.0, and the incidents occurred within two weeks of installing System 6.03 files.

Apple's Technical Support Department, working with members of the original Macintosh development team, has determined that the fires were caused by a long-undiscovered defect in the design of the original Macintoshes' voltage regulation circuitry, interacting with System Software Release 6.03.

Only original Macintosh 128, 512, and 512KE motherboards prior to Revision 42 contain the flawed circuitry. Owners of Macintosh 128, 512, and 512KE computers can determine their motherboard's revision number by pressing the computer's interrupt switch (while in the Finder) and entering **G 41D9A** in the debugging window. The revision number will be displayed in the upper-left corner of the screen.

Apple Computer, Inc. has described the voltage regulator problem as "Uncorrectable." The assembly lines that produced the 128K and 512K motherboards have long since been re-tooled for more modern product lines, and Apple's remaining inventory of 512K motherboards was sold to third-party resellers in the spring of 1987.

Apple has decided to correct the problem with a recall of all existing Macintosh 128, Macintosh 512, and Macintosh 512KE computers containing motherboards produced prior to Revision 42. Owners bringing their machines to their local Macintosh dealer will receive a Replacement Authorization Tag, which can be exchanged for Macintosh SE equipment at the nearest regional Apple corporate office. The replacement SEs will be standard SEs with two of their four SIMM modules removed, leaving the machines with 512K total memory. The owners may purchase additional SIMMs from Apple at a reduced price.

The recall and replacement of the defective Macintoshes will cost Apple Computer roughly $400,000, estimates one local Apple dealer. The decision was made under the auspices of Apple's legal staff, which speculated that the defective Macintosh equipment could represent a potential $32 million in lawsuits against the firm.

Apple has identified the fire hazard as a "potential" hazard and not an "imminent" one. The hazard only exists in those machines that have been upgraded to run System Software version 6.03.

Concurrently with the April 1 press release, Apple released Technical Note #396, which provides a detailed description of the problem. Technical Note #396 (actually an addendum to Technical Note #110) blames the malfunctions on the combination of two factors: major revisions in System 6.03's Disk Driver code and, more important, an undiscovered flaw in the design of the original (i.e., prior to Revision 42) IWM (Integrated Woz Machine) chip. The IWM works in tandem with the Analog Signal Generator (ASG) chip to control the Mac's floppy disk drive; the IWM manages data flow and raw hardware signaling while the ASG controls the amount of electrical current used by the disk drive.

The most recent changes in the Disk Driver (the code that drives the IWM and the rest of the disk hardware) inadvertently access memory addresses that were initially mapped out as "dead spaces." Unfortunately, what Apple engineers believed to be "dead space" actually was a faulty section of the IWM.

In a "typical" overheat, the Disk Driver in System 6.03 attempts to write to the IWM's "Dead Zone." The faulty IWM interprets this write attempt as an unsynchronized stream of incoming data being read from the bitstream. The IWM attempts to correct this "aberration" by signaling the ASG to step up current to the drive motors.

What happens next is a Rube Goldberg-like series of cascading interactions. The ASG attempts to apply +25 volts to the internal drive, but instead a short circuit is created that shunts the voltage to the VIA (Versatile Interface Adapter) chip, blowing the chip instantly and fusing its pins. Since the VIA is directly slaved by the SEP (Someone Else's Problem) chip, the voltage is not sent back to the IWM but rather is passed on to the RVIA (Really Versatile Interface Adapter). The RVIA, showing characteristic one-upmanship, leeches current from the AppleTalk port and the SCSI bus and creates a current field of +400 volts.

This apparent transient, applied across the entire system, is checked by the MMVTTVIABSNQAVATRVIA (Much More Versatile Than The Versatile Interface Adapter But Still Not Quite As Versatile As The Really Versatile Interface Adapter) chip, and all 30,000 volts are channeled directly into the electron gun of the CRT.

Then comes the weird part. The electron gun immediately reverses polarity, and instead of firing forward into the screen, it fires backward into the rear case of the Macintosh. The gun's beam melts off the signatures of Steve Jobs, Steve Wozniak, Andy Hertzfeld, Burrell Smith, and a dozen others, while, oddly enough, surrounding Bill Atkinson's name with an attractive Elizabethan-style filigree.

It's the filigree that causes the trouble. The Elizabethan style, with its focus on tight engraving and the Hovian calligraphic technique, requires more frequent passes of the electron gun and thus causes the fatal overheat. The gasoline-soaked rags (GSRs) underneath the motherboard ignite immediately, causing a fire that soon consumes the entire machine.

The GSRs themselves (Apple part #019-2291) were Wozniak's last contribution to the Mac's design before he resigned from Apple Computer in 1983 and were intended to act as a "vapor barrier" to protect the motherboard from desktop spills of carbonated beverages, specifically Dr. Pepper, an extremely caustic liquid that accumulates in areas where computer equipment is in operation.

Later revisions of the IWM (those found in the Mac Plus, SE, and II product lines) cause a similar sequence of events when running under System 6.03, ending in a Romanesque accent over Bill Atkinson's name. Due to the Romanesque concentration on major geometric forms instead of the Elizabethan attention to detail, the critical temperature of GSR combustion is never reached, and so no safety hazard exists. For additional reference, see Apple Technical Note #132: "System 3.2 Revisions: Using SetPort routines for initializing GrafPorts on Molten Plastic."

Photocopies of Apple's April 1 press release and Technical Notes #110, #132, and #396 are available from BCS•Mac. Send your inquiry accompanied by a self-addressed stamped envelope, so we can steam off the stamps. We request that you enclose only L7 English standard envelopes, because we know you won't be able to find them.

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