System 7: MODE32 Technical Information (9/94)

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TOPIC ---

Apple's announcement regarding the licensing of MODE32 from Connectix
prompted a number of questions about how MODE32 works at a technical
level. This document addresses these issues.

DISCUSSION --

MODE32 is system-level software designed for Macintosh II class systems with
ROMs that aren't 32-bit clean (Macintosh II, Macintosh IIx, Macintosh IIcx, and
Macintosh SE/30). This became an issue with the release of System 7, because
these computers can't run in 32-bit mode. MODE32 allows these computers to run
in 32-bit mode.

When installed, MODE32 directly modifies the System file. Virus utilities
report this, and may interfere with installation. Turn virus utilities off for
the installation.

Modifications to the System file involve:

1) Total replacement of the Memory Manager with a 32-bit clean Memory
   Manager. This is the biggest change made. Without a 32-bit clean
   Memory Manager, you can't use 32-bit addressing.

2) Minor patches to certain ROM routines that aren't 32-bit clean. This
   involves patching specific routines in some managers, not replacing the
   entire manager as is the case with the Memory Manager.

NOTE: The MODE32 Control Panel (not the Memory Control Panel) can remove most of
the resources it installed in the System file . The only portion MODE32 can't
remove is a "ptch" resource in the System file, modified to allow 32-bit
addressing on older Macintosh computers. To return to a golden master version
of System 7, you must reinstall it from Master disks. This should not be an
issue, as the updated "ptch" resource works in both 24-bit and 32-bit mode. We
aren't aware of any problems when using this modified resource instead of the
original.

When you turn your Macintosh on (or restart it), MODE32 executes at the earliest
point possible in the startup process. Here is the sequence of events:

1) The Macintosh starts up in 24-bit mode.

2) Drivers load into 24-bit space from each of the installed NuBus cards
   and from any attached hard drive.

3) MODE32 executes.

4) MODE32 issues a close call to open drivers, switches in the 32-bit
   Memory Manager, and then reloads the drivers into 32-bit space. We
   call this process the "stutter start."

5) System start up proceeds normally from this point, and includes loading
   the other MODE32 patches to specific ROM routines.

NOTE: Some third-party NuBus cards don't have 32-bit clean drivers in their
ROMs. Computers with these cards installed, and 32-bit addressing turned on,
will fail to start up. The symptom you are most likely to see is repeated
unsuccessful attempts to start up. Many manufacturers of cards that aren't
32-bit clean have ROM upgrades that resolve this issue. Disk drivers that are
not 32-bit clean are also an issue. Contact the vendor of your drive software
and obtain a vendor-certified 32-bit clean version.

Hardware Issues

The main benefit of 32-bit addressing is the ability to address more than 8MB of
physical RAM. Even with 8MB of RAM you gain access to more virtual memory,
assuming you have either a 68030-based Macintosh or a Macintosh II with a PMMU
installed. A side benefit of 32-bit addressing when using virtual memory is
that your address space is contiguous. This isn't true in 24-bit mode since ROM
is mapped directly above the 8MB allocated for RAM. In 24-bit mode, any virtual
memory allocated beyond 8MB is not contiguous with the first 8MB.

Macintosh II and Macintosh IIx computers require special 4MB SIMMs to give you
more than 8MB of RAM. You should specifically request these SIMMs, and the
vendor you purchase RAM from should be aware of the difference.

NOTE: To take advantage of more than 8MB of physical RAM in a Macintosh II, you
must have a PMMU installed. When a Macintosh II starts up, MODE32 uses the PMMU
to give you access to the additional RAM. Also, a Macintosh II won't start up
if you have 4MB SIMMs in bank A. You'll hear chimes, indicating a hardware
failure. However, you can install the 4MB SIMMs in bank B with 1MB or 256K
SIMMs in bank A. The Macintosh II then starts up, and MODE32 uses the PMMU to
give you access to the additional RAM.

When you turn the power on (not restart from the Special menu), your Macintosh
performs a RAM test. However, older systems only check up to 8MB of RAM, so
anything beyond this isn't tested. MODE32 resolves this by checking anything
greater than 8MB at the "happy Macintosh" screen. With large amounts of RAM,
this can take a long time, and your computer can appear to freeze at this
point.

Software Compatibility

We have no reports of 32-bit clean software incompatibilities with MODE32. In a few instances, problems with programs surfaced after installing MODE32.

NOTE: There is a version of Adobe Type Manager (2.0.2 or later) that is 32-bit clean. Be sure to use this version. The symptoms of a Macintosh running older versions of ATM make it appear as if applications may not be 32-bit clean, when the problem is actually an old version of ATM.

Article Change History
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27 Mar 1992 - Updated to change Mode 32 to MODE32.

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