Apple II
Technical Notes

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Developer Technical Support

Apple IIGS
#26:   ROM Revision Summary

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This Technical Note summarizes revisions to the Apple IIGS ROM.
Changes since November 1988: Revised to cover ROM 3.

Apple currently supports two configurations of the Apple IIGS ROM, ROM 1 and ROM 3. In August 1989, Apple IIGS computers began shipping with a 256K ROM, referred to as version 3 or ROM 3 (ROM 2 was skipped since there was already enough confusion about the first version, ROM 0, and the second version, ROM 1). System Software continues to support ROM 1, but it no longer supports ROM 0. Authorized Apple dealers can upgrade older systems (i.e., machines with serial numbers lower than E704…) to ROM 1 upon request.

ROM 1 requires System Software 2.0 or later, while ROM 3 requires System Software 5.0 or later. Although applications may work using older system software releases, they may not function properly due to the coordination of system software and ROM revisions.

Changes from ROM 0 to ROM 1

ADB

- Absolute ADB devices are now supported correctly.
- ADB fatal system error code is now $0911 instead of $0400.
- `ADBReset` routine now delays about 160 microseconds before reading the buttons.
- `ADBStatus TRUE` is now $FFFF instead of $0001.
- All ADB error codes now include the tool number.
- `SRQrmv` no longer crashes when you make the call with a command pending.

AppleDisk 3.5

- AppleDisk 3.5 Macintosh block reads and writes now work as documented.
- Extended status call now returns bit 0 = 1 if AppleDisk 3.5 media has been switched since the last `READ`, `WRITE`, or `FORMAT`.
- New AppleDisk 3.5 status calls have been implemented to get internal variable and work buffer starting addresses.

AppleTalk

- Link Access Protocol (LAP) inter-packet gap now handles added SCC delay.
- Name Binding Protocol (NBP) now considers uppercase and lowercase characters identical.
- A nonexistent protocol no longer hangs the dispatcher.

Desk Manager

- `SaveScreen` and `RestoreScreen` now work.

Event Manager

- Now auto-key events are not posted in the queue unless the queue is empty.
- `EMStartUp` and `EMShutDown` code has been optimized.
- Event Manager now returns an error instead of crashing when there is an attempt to post an invalid event.

Integer Math

New Changes:
- Optimized the multiply routine.

RAM patches moved to ROM:
- Changes to `FixMul`, `FixRatio`, and `SDivide`.

- `SDivide` recovers from a divide by zero operation.
- New calls: `FracMul, FixDiv, FracDiv, FixRound, FracSqrt, FracCos, FracSin, FixATan2, HiWord, LoWord, Long2Fix, Fix2Long, Fix2Frac, Frac2Fix, Fix2X, Frac2X, X2Fix, X2Frac`.

Memory Manager

- Optimized Purge and Compact for banks 0 and 1 and moved from RAM to ROM.
- RAM patches and enhancements moved to ROM.
- RAMdisk now returns bytes transferred count on DIB call.
- `SetHandleSize` makes a handle temporarily unpurgeable while changing handle size.

Miscellaneous Tools

RAM patches and enhancements moved to ROM:
- `AbsClamp` fixes.
- Battery RAM routines work if data bank is set to a bank other than bank data is in.
- Firmware entry calls now return processor status in high byte instead of low byte.
- `GetAddr` with ref number $000E returns `SerFlag` address for SCC interrupts (useful if not using serial firmware).
- ID manager can reuse discarded IDs.
- Keyboard interrupts now enable VBL interrupts.
- `Munger` now works with 1-char strings and returns with A=0.
- New `SysBeep` call.
- `PackBytes` and `UnpackBytes` return with A=0.
- `ReadBParam` and `ReadBRAM` error codes corrected.
- `WriteBParam` and `WriteBRAM` do not return error codes (this is a documentation change).
- `WriteTimeHex` Bad Parameter error code is now $0301.

Monitor

- 80-column screens maintained if break occurs and Pascal protocol in effect.
- AppleSoft tabbing in 80-column mode now works correctly.
- Control Panel's Maximum RAM Disk Size increased to 8128K instead of 4096K.
- Firmware version number returned is $1 instead of $0.
- Interrupts now disabled during paddle read routines.
- Interrupts re-enabled after fatal system error (for debug DAs).
- Mouse clamps with positive minimum and negative maximum works (e.g., $6000 min, $8000 max).

- New monitor command, pound sign (#), installs monitor entry and memory peeker classic desk accessories (unless already installed), accessible via the Control Panel. Reinstalled automatically on reset; disabled by power off only.
- New monitor command, Control-N, clears m, e, and x bits for native mode. (Control-R still switches to 8-bit, emulation mode.)
- `RESET` entry point at $00FA62 sets state register to $0C and shadow register to $08.
- Shadowing of the Super Hi-Res area in Bank 1 is no longer enabled automatically.
- `WAIT` routine now always exits with C=1.

QuickDraw II

RAM patches and enhancements moved to ROM:
- 640-mode pen masks now work when `portRect` origin not a multiple of 8.
- Arcs, ovals, and round rects can be drawn across bank boundaries.
- Changes to round drawing routines: `PPToPort`, `GetFontLore`, `GetROMFont`, and `InflateTextBuffer`.
- Current bank bytes 100…106 no longer modified by scaling and mapping calls.
- `FontFlags` 1 and 2 added for pen width and color control.
- `FramePoly` returns with A=0.
- `GetPort` returns all four bytes of `GrafPort`.
- `HideCursor` and `ShowCursor` work correctly with obscured cursor.
- `MapRgn` now works on rectangular regions.
- Pixel painting routines support QuickDraw Auxiliary Tool Set stretching and shrinking.
- `PPToPort` now clips correctly to the current `portRect`.
- `QDStartUp` and `QDShutDown` save and restore the scan line interrupt vector.
- `RectInRgn` bug fixed.
- `ScrollRect` works when the `ClipRgn` and `VisRgn` are not rectangular.
- `SetSysFont` works.
- `StdPixels` now returns with A=0 if the pen is not visible.
- Text underline bug fixed.
- `TextBounds` works.

New QuickDraw changes:
- Busy flag now maintained correctly by `ClosePort`, `OffsetRgn`, `InsetRgn`, `KillPoly`, `FillRect`, `FrameOval`, `PaintOval`, `EraseOval`, `InvertOval`, `FillOval`, `FrameArc`, `PaintArc`, `EraseArc`, `InvertArc`, `FillArc`, `FrameRRect`, `PaintRRect`, `EraseRRect`, `InvertRRect`, and `FillRRect`.
- Cursor appears in correct Super Hi-Res mode as determined by the low byte's bit 7 (320/640) of the `MasterSCB`.

SANE

- `Elems` now can be called from any part of memory.
- `HALT` exception jumping through the incorrect vector fixed.
- Integer overflow during conversion reported.
- `STATUS` call moved to ROM.

Scheduler

- Scheduler now accepts a flush function call.
- Task-handling RAM patch (on System Disk 1.0 and later) moved to ROM.

Serial I/O

- First character after an XON is no longer trashed when buffering is not enabled.
- If serial mode bit 17 = 1, parity and framing error suppression are defeated.
- Parity, baud, and data format commands work with buffering.
- `STATUS` call will not report that a character is ready if the character arrives with a parity or framing error.
- `STATUS` call works correctly with XON/XOFF protocol.

SmartPort

- `PR#5`, following a `PR#5` with I/O error (i.e., no disk in drive), now boots as expected.
- SmartPort manipulates only Slot 6 motor on detect so the IWM can run in fast mode.

Sound

- Fixed bug in `FFStopSound` call.
- Fixed low-level RAM read/write bug.
- Interrupts are disabled when the internal bell is active.
- Interrupts no longer need to be disabled when accessing sound RAM.
- New sound diagnostics with the following error codes: $0C001 = failed RAM data test, $0C002 = RAM address test, $0C003 = register data test, and $0C004 = control register test.
- Sound Manager RAM patches and enhancements moved to ROM.

Text Tools

RAM patches moved to ROM:
- RAM patches moved to ROM for `Writing` and `ErrorWriting` routines.
- `TextInit` Illegal device error now is in 16-bit mode instead of 8.

Tool Locator

- Optimized tool dispatcher.
- ROM tools present on a memory expansion card are installed.

Changes from ROM 1 to ROM 3

ROM 3 is 256K (double the size of ROM 1) and contains several tools which do not exist in ROM 1. The patch file TS3 fixes known bugs in ROM 3 which were discovered after it was frozen. ROM 3 tools are basically System Software 5.0 tools, and the System Software 5.0 documentation covers these tools in detail. This Note only documents non-tool changes.

AppleDisk 3.5 and SmartPort

- Use new routines for all block reads to fast RAM to eliminate double buffering.
- The extended DIB status call returns the device subtype byte $C1.
- Fixed anomalies described in SmartPort Technical Note #6, Apple IIGS SmartPort Errata.
- Fixed a ROM 1 bug that caused `Write Protected` to be returned with higher priority than `Device Offline` for the ProDOS `STATUS` call.

AppleTalk

- AppleTalk moved to slots 1 and 2 from slot 7.

Control Panel CDA

- The original Options menu is now the Keyboard menu and does not contain mouse parameters.
- A new Mouse menu is present. The new keyboard microcontroller allows finer control of mouse tracking, so a selection procedure better than yes or no is present. Parameters are also available to set the keyboard mouse feature, which allows the numeric keypad to emulate a mouse.
- Added an option to resize the RAM disk on the next reset in the RAM Disk menu. This option resets to No after one reboot and resizing so the RAM disk is not accidently reformatted on every boot thereafter.
- If slot 7 is set to AppleTalk, the Control Panel displays a warning if neither slot 1

nor slot 2 is similarly set.
- The Printer Port and Modem Port menus now display only those parameters that may be changed if AppleTalk is the selection for those ports.
- The RAM disk no longer has minimum and maximum settings, but rather one RAM disk size setting.

Monitor

- Enhanced memory searching commands to automatically cross bank boundaries.
- Added Step and Trace debugging functions.
- Now provide vectors for the same functionality as the GS/OS System Service calls `MEMORY_MOVER`, `DYN_SLOT_ARBITER` and `SET_SYS_SPEED` in bank $E1.
- Now resize the RAM disk when the system is rebooted with the Control-Open Apple-Shift-Reset key combination.
- Handle text page 2 shadowing and power-up bits in the new CYA chip.
- Flash the border if the sound volume is set to zero and a beep is necessary.
- In ROM 1 and earlier, the Miscellaneous Tools mouse firmware called the 8-bit mouse routines in the $C400 space to do the work. In ROM 3, the 8-bit routines call the 16-bit routines to read the hardware. This change effectively means those programs which use 16-bit mouse calls (including desktop applications through the Event Manager) may use the mouse when slot 4 is set to Your Card.
- Slots 1 and 2 may now be set to Printer, Modem, AppleTalk, or Your Card. With System Software 5.0, slot 7 does not need to be set to AppleTalk to use an AppleTalk network, although one can do it for compatibility. There is no transparent printing firmware in slot 7.
- The Alternate Display Mode CDA no longer sets the system to fast speed when normal speed is selected in the Control Panel.
- Added a new command, `{val}=V`, to set the video screen display I/O switches when resuming a program.
- Control-T command now works as a toggle—executing it once changes to text mode, but now executing it again switches back to the previous video mode You may change this saved video mode with the `=V` command.
- Battery RAM value $59 now controls the presence of the Visit Monitor and Memory Peeker CDAs. If this byte has the high bit set at boot time, the CDAs are automatically installed.
- The Monitor and Memory Peeker both allow the use of Control-X to terminate a long display (i.e., a handle list or memory dump).

Serial I/O

- XON and XOFF are no longer sent with the high bit set when buffering is enabled.
- Terminal mode cursor is more consistent with the rest of the system.

- Extended Interface calls now return errors in the carry and the accumulator.

Toolbox

The following tools are now in ROM:

- Window Manager
- Menu Manager
- Control Manager
- Line Edit
- Dialog Manager
- Scrap Manager
- Font Manager
- List Manager

Further Reference

- *Apple IIGS Firmware Reference*
- *Apple IIGS Toolbox Reference*
- Apple IIGS Technical Note #52, Loading and Special Memory
- SmartPort Technical Note #6, Apple IIGS SmartPort Errata