```
0000|    ;==============================================================================;
0000|    ;                                                                              ;
0000|    ;                     LL        II     SSSSSSS      AAA                         ;
0000|    ;                     LL        II     SS          AA AA                        ;
0000|    ;                     LL        II     SSSSSSS     AAAAAAA                       ;
0000|    ;                     LL        II          SS    AA    AA                       ;
0000|    ;                     LLLLLLL   II     SSSSSSS    AA      AA                      ;
0000|    ;                                                                              ;
0000|    ;                                                                              ;
0000|    ;     BBBBBB    00000    00000    TTTTTTTT    RRRRRR    00000    MMM    MMM      ;
0000|    ;     BB  BB   00  00   00  00       TT       RR  RR   00  00   MM M M MM      ;
0000|    ;     BBBBBB   00  00   00  00       TT       RRRRRR   00  00   MM  M  MM      ;
0000|    ;     BB  BB   00  00   00  00       TT       RR RR    00  00   MM     MM      ;
0000|    ;     BBBBBB    00000    00000       TT       RR  RR    00000    MM     MM      ;
0000|    ;                                                                              ;
0000|    ;                                                                              ;
0000|    ;        Copyright 1983, 1984 Apple Computer Inc.                               ;
0000|    ;        Revision 2H                                                            ;
0000|    ;                                                                              ;
0000|    ;==============================================================================;
0000|    ;
0000|    ;  Filename:   RMXXX.Y.TEXT,  XXX = ROM VERSION # (e.g.,  200 for 2.00)
0000|    ;                             Y = E (equates)
0000|    ;                               = K (kernel tests)
0000|    ;                               = S (secondary tests)
0000|    ;                               = B (bootstrap code)
0000|    ;                               = M (monitor code)
0000|    ;                               = G (graphics, icon and message display)
0000|    ;
0000|    ;  Function:   Initializes LISA system for use and performs preliminary
0000|    ;              diagnostic checks.  If all tests pass, the system then
0000|    ;              does a keyboard scan to check for user input.  If any key
0000|    ;              is hit other than caps lock or the mouse button,
0000|    ;              a menu is displayed on the screen showing the available
0000|    ;              boot devices.  If a valid COMMAND key sequence is detected,
0000|    ;              a boot from an alternate device is attempted (see below).
0000|    ;              If no keyboard input is detected, the system first checks
0000|    ;              parameter memory for a valid boot device and, if none, defaults
0000|    ;              to booting from a Profile attached to the builtin parallel port
0000|    ;              for Lisa 1 systems.
0000|    ;
0000|    ;              For Lisa 2 systems, a check is first made to verify a disk
0000|    ;              (internal or external) is connected before defaulting to the
0000|    ;              hard disk boot.  If no disk is detected, the system defaults
0000|    ;              to booting from the floppy drive.
0000|    ;
0000|    ;
0000|    ;
```

```
0000|                              ; Inputs:    Checks for keyboard input from the user.  Currently, the following
0000|                              ;            key sequences are honored if input after the system "clicks" the
0000|                              ;            speaker (CMD refers to the Apple key on the keyboard):
0000|                              ;
0000|                              ;                CMD/1 - boot from Twiggy drive #1 or integral hard disk
0000|                              ;                CMD/2 - boot from Twiggy drive #2 or SONY drive
0000|                              ;                CMD/3 - boot from Profile attached to parallel port or integral hard disk
0000|                              ;                CMD/4 - boot from I/O slot #1, port 1
0000|                              ;                CMD/5 - boot from I/O slot #1, port 2
0000|                              ;                CMD/6 - boot from I/O slot #2, port 1
0000|                              ;                CMD/7 - boot from I/O slot #2, port 2
0000|                              ;                CMD/8 - boot from I/O slot #3, port 1
0000|                              ;                CMD/9 - boot from I/O slot #3, port 2
0000|                              ;                CMD/ENTER (on key pad) - abort boot, branch to ROM monitor
0000|                              ;                CMD/SHIFT/P - abort boot, do power cycling
0000|                              ;
0000|                              ; OUTPUTS:   Saves various results and contents of system registers in memory
0000|                              ;            for examination by system programs or with the ROM monitor.
0000|                              ;
0000|                              ;                $180-183 : Power-up status (x0000000 = ok)
0000|                              ;                $184-185 : Memory sizing error results
0000|                              ;                $186-1A5 : Results of memory read/write tests
0000|                              ;                $1A6-1A9 : Parity error memory address (if error during mem test)
0000|                              ;                $1AA-1AB : Memory error address latch
0000|                              ;                $1AC-1AF : D7 save on exception errors
0000|                              ;                $1B0-1B1 : Results of MMU tests (context/data bits)
0000|                              ;                $1B2     : Keyboard ID (00 = no ID received)
0000|                              ;                $1B3     : Boot device ID
0000|                              ;                $1B4-1B9 : Boot failure data
0000|                              ;                $1BA-1BF : Clock setting (Ey,dd,dh,hm,ms,st)
0000|                              ;                $1C0-1DF : Data reg save area (D0 - D7)
0000|                              ;                $1E0-1FF : Address reg save area (A0 - A7, A7 = USP)
0000|                              ;                $240-260 : System serial #
0000|                              ;                $260-267 : Scratch area
0000|                              ;                $268-26B : Suspected (logical) memory error address for parity error
0000|                              ;                $26C-26F : Save of data written to suspected error address
0000|                              ;                $270-273 : Actual (logical) error address found during search
0000|                              ;                $274-277 : Save of data read during parity error search
0000|                              ;                $278-27B : (Physical) error address read from parity error address latch
0000|                              ;                $27C     : Error row for parity chip failure (0 = first row, 7 = last row)
0000|                              ;                $27D     : Error column for parity chip failure (9 or 14)
0000|                              ;                $27E-280 : Reserved
0000|                              ;                $280-293 : Exception data save area
0000|                              ;                             (FC/EXCADR/IR/SR/PC/EXCTYPE/SSP)
0000|                              ;                             44 = NMI or other interrupt
0000|                              ;                             45 = bus error
0000|                              ;                             46 = address error
0000|                              ;                             47 = other exception/interrupt
0000|                              ;                             48 = illegal instruction error
```

```
0000|                                    ;                                49 = line 1010 or 1111 trap
0000|                                    ;                                50 = bus error accessing keyboard VIA
0000|                                    ;                                51 = bus error accessing parallel port VIA
0000|                                    ;                                57 = bus error accessing disk controller
0000|                                    ;              $294-297 : Maximum physical memory address + 1
0000|                                    ;              $298-299 : I/O slot 1 card id (0 = no card present)
0000|                                    ;              $29A-29B : I/O slot 2 card id
0000|                                    ;              $29C-29D : I/O slot 3 card id
0000|                                    ;              $29E     : Reserved
0000|                                    ;              $29F     : Reserved
0000|                                    ;              $2A0     : Reserved
0000|                                    ;              $2A1     : Disk ROM id
0000|                                    ;              $2A2-2A3 : Reserved
0000|                                    ;              $2A4-2A7 : Minimum physical address
0000|                                    ;              $2A8-2AB : Total memory (Max-Min)
0000|                                    ;              $2AC     : SCC test results
0000|                                    ;              $2AD     : Slot # of memory board if memory error
0000|                                    ;              $2AE     : Result of disk controller self-test
0000|                                    ;              $2AF     : System type (0 = Lisa 1, 1 = Lisa 2, 2 = Lisa 2 with external hard disk,
0000|                                    ;                                     3 = Lisa 2 with internal hard disk)
0000|                                    ;              $2B0-2BF : Keyboard queue (16 bytes)
0000|                                    ;              $2C0-480 : ROM scratchpad/stack area
0000|                                    ;              $480-800 : Reserved for ROM local variable usage
0000|                                    ;
0000|                                    ;          Also saves data in special parameter memory area reserved for boot ROM use if error
0000|                                    ;          encountered.  Usage is as follows:
0000|                                    ;
0000|                                    ;              $FCC161     : Error code
0000|                                    ;              $FCC163-165 : Contents of memory error address latch if parity error
0000|                                    ;              $FCC167     : Memory board slot # if memory error
0000|                                    ;              $FCC169-173 : Last value read from clock
0000|                                    ;              $FCC175-17B : Reserved
0000|                                    ;              $FCC17D-17F : Checksum
0000|                                    ;
0000|                                    ; Originator:  Rich Castro  7/30/81 - Version 0.0 released to manufacturing
0000|                                    ; Modified by: Rich Castro  7/30 - 11/3/81 - Made the following changes:
0000|                                    ;                                  1) Twiggy bootstrap capability
0000|                                    ;                                  2) Initial COPS test and keyboard scan
0000|                                    ;                                  3) Moved parallel card to slot 2
0000|                                    ;                                  4) Changed ROM interrupt/exception vectors,
0000|                                    ;                                  5) Created jump table for ROM routines
0000|                                    ;
0000|                                    ;                     11/3/81  - Version 0.7 released to the world
0000|                                    ;
0000|                                    ;                     11/4/81 - 1/15/82 - Made the following changes:
0000|                                    ;                                  1) Added support for new memory cards
0000|                                    ;                                  2) Added warm-start capability and jump
0000|                                    ;                                     table for ROM subroutine usage
0000|                                    ;                                  3) Modified MMU reset routine to support
```

```
0000|                              ;                            single step board usage
0000|                              ;                        4)  Added full memory initialization
0000|                              ;                        5)  Added 256K memory parity test
0000|                              ;                        6)  Modified COPS initialization so that
0000|                              ;                            keyboard commands can be sensed more
0000|                              ;                            reliably
0000|                              ;                        7)  Added error code display routines and
0000|                              ;                            display of CPU and IO ROM versions
0000|                              ;                        8)  Added preliminary disk controller test
0000|                              ;                        9)  Updated warm-start check
0000|                              ;                       10)  Modified disk interface test
0000|                              ;                       11)  Changed low memory assignments
0000|                              ;                       12)  Made corrections for no I/O board, disk
0000|                              ;                            interface error and contrast setting
0000|                              ;                       13)  Modified memory sizing routine to
0000|                              ;                            catch memory errors
0000|                              ;                       14)  Modify MMU test to avoid context 0
0000|                              ;                            destruction, add contrast setting for
0000|                              ;                            new machines, correct disk error and
0000|                              ;                            CPU ROM messages
0000|                              ;                       15)  Move stack so old memory test still runs
0000|                              ;
0000|                              ;            1/15/82 - Release version 0.16
0000|                              ;            1/18/82 - Fix stack problem and release vrsn 0.17
0000|                              ;            1/19/82 - Change stack for call routine and version
0000|                              ;                      to 0.18
0000|                              ;            1/27/82 - Change MMU error routine to do address
0000|                              ;                      and data line toggling
0000|                              ;            1/28/82 - Add video circuitry test
0000|                              ;            1/30/82 - Add write wrong parity test
0000|                              ;            1/31/82 - Move run time stack to $180
0000|                              ;            2/6/82  - Add Profile bootstrap with upgrade for
0000|                              ;                      OS use (add jump table entries also)
0000|                              ;            2/15/82 - Update Twiggy bootstrap and add entry
0000|                              ;                      for OS use; also add MMU test to
0000|                              ;                      conditional assembly and add context
0000|                              ;                      saving to MMUTST2 routine
0000|                              ;            2/17/82 - Add correction to memory test for
0000|                              ;                      reboot problem and leave parity on
0000|                              ;            2/24/82 - Add code for clock test and special
0000|                              ;                      burn-in cycling
0000|                              ;            2/25/82 - Add code to simulate soft on switch
0000|                              ;                      pressed for COPS problem
0000|                              ;            3/1/82  - Removed all changes since ROM 0.18
0000|                              ;                      release except for parity enabling,
0000|                              ;                      no reset feature, memory sizing change
0000|                              ;                      and Profile booting
0000|                              ;            3/1/82  - Restore default stack ptr loc to $300
0000|                              ;            3/1/82  - Move default stack to $0400, restore
```

```
0000|                                    ;                      everything except MMU testing
0000|                                    ;      3/4/82  - Add MMU initialization and modify
0000|                                    ;                      Twiggy, Profile boot routines for new
0000|                                    ;                      load point
0000|                                    ;      3/10/82 - Add change for new I/O addresses and
0000|                                    ;                      fix for Twiggy routine
0000|                                    ;      3/10/82 - Change contrast value for new I/O's
0000|                                    ;      3/15/82 - Add correction for Profile and COPS
0000|                                    ;                      routines and display msg when booting
0000|                                    ;      3/17/82 - Restore version # at end of file
0000|                                    ;      3/18/82 - Release version 0.22
0000|                                    ;
0000|                                    ;      4/5/82  - Make initial 2732 version (1.00); add
0000|                                    ;                      following changes:
0000|                                    ;                        1) correct MMU error routine bug
0000|                                    ;                        2) change stack for CALL to $0400
0000|                                    ;                        3) add parity disable to WWP routine
0000|                                    ;                        4) change MMU I/O space code to '9'
0000|                                    ;                        5) add invalid boot code message
0000|                                    ;      4/6/82  - Add speaker click after COPS check
0000|                                    ;      4/7/82  - Add jump table entry for speaker
0000|                                    ;                      routine, 1 second delay before "click"
0000|                                    ;                      and alpha lock key check
0000|                                    ;
0000|                                    ;      4/8/82  - Release version 1.00
0000|                                    ;
0000|                                    ;      5/5/82  - Add I/O slot configuration check and
0000|                                    ;                      I/O slot booting.  Also add change to
0000|                                    ;                      Profile read routine for PCR setting.
0000|                                    ;      5/12/82 - Add burnin power-cycling routine as
0000|                                    ;                      boot option invoked by CMD/P.
0000|                                    ;      5/13/82 - Add changes for COPS command timing,
0000|                                    ;                      Twiggy timeout, Twiggy booting, and
0000|                                    ;                      add power-cycling routine.
0000|                                    ;      5/14/82 - Add fixes for booting via parameter
0000|                                    ;                      memory and COPS timing experiment.
0000|                                    ;      5/17/82 - Add display of loop count and run time,
0000|                                    ;                      and alter parameter memory useage for
0000|                                    ;                      power-cycling option.
0000|                                    ;      5/18/82 - Add display of Twiggy errors, change
0000|                                    ;                      COPS routine for precheck code.
0000|                                    ;      5/20/82 - Add contrast reset for "warm start",
0000|                                    ;                      add cycle value display, restore COPS
0000|                                    ;                      timeout code.
0000|                                    ;
0000|                                    ;      5/21/82 - Release version 1.02
0000|                                    ;
0000|                                    ;      5/26/82 - Begin addition of ROM monitor; set
0000|                                    ;                      default to Apple if PM = 00.
```

```
0000|    ;                              6/1/82  - Make following changes:
0000|    ;                                        1) Memory sizing retry count to 64
0000|    ;                                        2) Save results on memory sizing errors
0000|    ;                                        3) Update NMI routine to check for parity
0000|    ;                                           errors.
0000|    ;                                        4) Restore default NMI vector after
0000|    ;                                           memory test.
0000|    ;                                        5) Create read clock subroutine and call
0000|    ;                                           when doing clock display.
0000|    ;                                        6) Add boot fix to save device id.
0000|    ;                              6/1/82  - Change to new sizing algorithm and retry
0000|    ;                                        count back to 32.
0000|    ;                              6/3/82  - Convert to version 1.03
0000|    ;                              6/3/82  - Made following changes:
0000|    ;                                        1) Localize message display to TSTCHK
0000|    ;                                        2) Do clear screen only in INITVCT and
0000|    ;                                           in TSTCHK and second monitor level.
0000|    ;                                        3) Change default video page to last.
0000|    ;                                        4) Complete first edition of monitor.
0000|    ;                              6/7/82  - Modify monitor level 2 user interface.
0000|    ;                              6/10/82 - Made following changes:
0000|    ;                                        1) Add boot from Apple as CMD/A.
0000|    ;                                        2) Clear screen and display only in
0000|    ;                                           routine TSTCHK.
0000|    ;                                        3) Add ROM checksum error bit.
0000|    ;                                        4) Add exception error check to TSTCHK.
0000|    ;                                        5) Add speaker click just before
0000|    ;                                           keyboard scan.
0000|    ;                                        6) Reset to first video page for boot
0000|    ;                                           from Apple.
0000|    ;                                        7) Merge in changes from 1.03 file.
0000|    ;                                        8) Add parity error check to TSTCHK
0000|    ;                                        9) Change power-cycling so that double
0000|    ;                                           bus fault used to restart diags
0000|    ;                              6/11/82 - Made following changes:
0000|    ;                                        1) Increase Twiggy timeout to 2 mins.
0000|    ;                                        2) Add 5 sec delay in power-cycle mode
0000|    ;                                           before shutting down.
0000|    ;
0000|    ;                              6/14/82 - Release version 1.04
0000|    ;                              6/22/82 - Add loop after COPS test if error
0000|    ;                                        since keyboard not accessible.  Also add
0000|    ;                                        fix for NMI restore after memory test.
0000|    ;                              6/30/82 - Made following changes:
0000|    ;                                        1) Add parameter memory and I/O boot
0000|    ;                                           checksum routines.
0000|    ;                                        2) Remove boot id save to parameter
0000|    ;                                           memory, except for power-cycle.
0000|    ;                                        3) Change to new boot device id's.
```

```
0000|                              ;        7/1/82  -   1) Add changes for new Twiggy firmware.
0000|                              ;                    2) Add fixes for bugs in 1.04:
0000|                              ;                       a) Add row setting before error display
0000|                              ;                          to avoid writing over menu line.
0000|                              ;                       b) Set device codes for Profile and
0000|                              ;                          I/O slots to allow display if error.
0000|                              ;                       c) Enable setting of timeout for Twiggy
0000|                              ;                          reads.
0000|                              ;                       d) Save error codes for I/O boot in
0000|                              ;                          memory.
0000|                              ;                       e) Add option of clearing memory in
0000|                              ;                          INITMON routine.
0000|                              ;        7/7/82  - Made following changes:
0000|                              ;                    1) Modify checksum routines
0000|                              ;                    2) Add keyboard/mouse check/reset code
0000|                              ;        7/13/82 - Add speed parameter for new Twiggy code
0000|                              ;        7/14/82 - Add check for DSKDIAG in disk test,
0000|                              ;                  change to new Twiggy error codes
0000|                              ;        7/15/82 - Made following changes:
0000|                              ;                    1) Add Profile routine updates.
0000|                              ;                    2) Restore old boot id codes - new ones
0000|                              ;                       used only when new Twiggy code
0000|                              ;                       released.
0000|                              ;                    3) Upgrade burnin code for new parameter
0000|                              ;                       memory usage.
0000|                              ;                    4) Attempt to enable keyboard after MMU
0000|                              ;                       errors.
0000|                              ;                    5) Remove I/O boot checksum code until
0000|                              ;                       conversion to new Twiggy code.
0000|                              ;                    6) Add video pattern display code..
0000|                              ;                    7) Remove characters from table and
0000|                              ;                       make other changes to save bytes.
0000|                              ;                    8) Upgrade service mode display option
0000|                              ;                       to handle count up to $FFFF.
0000|                              ;
0000|                              ;        7/16/82 - Create version 1.05
0000|                              ;        7/19/82 - Add bug fixes for MMU testing, power-
0000|                              ;                  cycle memory testing, Profile boot
0000|                              ;                  and service mode display option.
0000|                              ;
0000|                              ;        7/19/82 - Create version 1.06
0000|                              ;        7/20/82 - Add fix for MMU testing to properly
0000|                              ;                  record context in error
0000|                              ;
0000|                              ;        7/20/82 - Release version 1.07
0000|                              ;        7/21/82 - Make keyboard/mouse reset code changes
0000|                              ;                  and move check to before first "click"
0000|                              ;        7/23/82 - Add extended memory tests
0000|                              ;        7/27/82 - Add screen memory test and VIA tests.
```

```
0000|                              ;                              Change default boot for new Twiggy code
0000|                              ;                              to upper Twiggy.  Add conditionals for
0000|                              ;                              Apple code.
0000|                              ;              7/29/82 - Add SCC test, optimize code.
0000|                              ;              7/30/82 - Add RAM address uniqueness test.
0000|                              ;              8/4/82  - Added the following:
0000|                              ;                          1)Twiggy mods for interleave
0000|                              ;                          2)Monitor options CONTINUE and LOOP
0000|                              ;                          3)Exception routine for line 1111 and
0000|                              ;                            line 1010 errors.
0000|                              ;              8/9/82  - Add Twiggy mod for disk clamp, add mods
0000|                              ;                              for kernel test failures such as screen
0000|                              ;                              flash on MMU error.
0000|                              ;              8/11/82 - Add memory sizing fix, increase delay
0000|                              ;                              for COPS and change default boot to
0000|                              ;                              TWIGGY!!
0000|                              ;              8/12/82 - Begin code changes for new user interface
0000|                              ;                              and add hooks for icon display.
0000|                              ;              8/14/82 - Add mods for Twiggy changes to monitor
0000|                              ;                              DSKDIAG line and add initial timeout.
0000|                              ;                              Continue user interface changes.
0000|                              ;              8/18/82 - Add mouse, cursor code and changes for
0000|                              ;              8/23/82 - Add controls for 2716 version of ROM.
0000|                              ;                              Add changes for Service mode to use
0000|                              ;                              pull down menu, eliminate keyboard
0000|                              ;                              queuing while awaiting input.
0000|                              ;              8/24/82 - Add dialog box, and window to service
0000|                              ;                              mode with modified scroll and character
0000|                              ;                              output routines.
0000|                              ;              8/25/82 - Add icons along with routines to display
0000|                              ;                              during test and for errors.
0000|                              ;              8/27/82 - Add routines for displaying and using
0000|                              ;                              boot icon menu.
0000|                              ;              8/30/82 - Add auto boot from Applenet.
0000|                              ;              8/31/82 - Add minor additions to Service mode
0000|                              ;                              for Set and Loop options.
0000|                              ;
0000|                              ;              8/31/82 - Create and do internal release of
0000|                              ;                              2716 (0.24), 2732 (1.15) and 2764 (2.00)
0000|                              ;                              ROM versions.
0000|                              ;
0000|                              ;              9/8/82  - Add fixes for I/O slot icon display
0000|                              ;                              and Profile icon display.
0000|                              ;              9/9/82  - Add fix for reboot problem in 2716 ROM.
0000|                              ;                              Add serial # read routine and test for
0000|                              ;                              2732 and 2764 ROM versions.  Expand
0000|                              ;                              stack for serial read routine.
0000|                              ;              9/10/82 - Add fix for device code display for ROM
0000|                              ;                              versions 0.24 and 1.15.
```

```
0000|                            ;
0000|                            ;    9/10/82 - Create and do internal release of new
0000|                            ;              ROM versions 0.25, 1.16 and 2.01.
0000|                            ;
0000|                            ;    9/13/82 - Add fixes for memory sizing and I/O
0000|                            ;              slot booting.
0000|                            ;
0000|                            ;    9/14/82 - Create and release ROM versions 0.26,
0000|                            ;              1.17 and 2.02.
0000|                            ;    9/22/82 - Add fixes and code for:
0000|                            ;              1) Default video latch setting
0000|                            ;              2) Mask for I/O and exception errors
0000|                            ;              3) Message display on external calls
0000|                            ;                 to ROM monitor
0000|                            ;              4) Contrast setting before screen test
0000|                            ;              5) Disable of NMI key on power-up
0000|                            ;              6) Boot failure after first load
0000|                            ;              7) Error tones for failures
0000|                            ;              8) Loop mode setting of NMI key
0000|                            ;    9/23/82 - Add
0000|                            ;              1) Power cycling
0000|                            ;              2) Full service mode menu
0000|                            ;              3) Loop mode test choice display
0000|                            ;    9/24/82 - Add dump memory option to service mode
0000|                            ;    9/25/82 - Modify display memory option to allow
0000|                            ;              count and address data on same line
0000|                            ;    9/29/82 - Add jump table entry for READMMU
0000|                            ;    9/30/82 - Add:
0000|                            ;              1) "No reset" feature
0000|                            ;              2) Verify Disk option for service mode
0000|                            ;              3) Optimize cursor routines and
0000|                            ;                 remove unused CursorShield routine.
0000|                            ;              4) Invert rectangles when selected from
0000|                            ;                 keyboard.
0000|                            ;              5) Display boot menu only if down keycode
0000|                            ;                 detected.
0000|                            ;    10/5/82 - Add:
0000|                            ;              1) Memory error decoding to board level
0000|                            ;              2) New size and position for alert box
0000|                            ;              3) New test icon display
0000|                            ;              4) Diskette # for Twiggy errors
0000|                            ;    10/6/82 - Add:
0000|                            ;              1) Continue keyboard scan after COPS
0000|                            ;                 errors
0000|                            ;              2) Set extended memory test bit for
0000|                            ;                 loop on memory test option
0000|                            ;              3) Display I/O slot card # on errors
0000|                            ;              4) Change boot menu to "pull-down" format
0000|                            ;              5) Change to new icons
```

```
0000|    ;                                 10/7/82  - Add:
0000|    ;                                             1) SCC test
0000|    ;                                             2) Error if no serial # (allow continue)
0000|    ;                                             3) Two passes of memory tests for extended
0000|    ;                                                mode, one for regular mode
0000|    ;                                 10/9/82  - Create version 2.03
0000|    ;                                 10/10/82 - Add bug fixes and I/O slot ROM check in
0000|    ;                                             config scan.
0000|    ;
0000|    ;                                 10/12/82 - Create and release version 2.04.
0000|    ;
0000|    ;                                 10/13/82 - Make following changes:
0000|    ;                                             1) Add keyboard reset code
0000|    ;                                             2) Remove SCC test
0000|    ;                                             3) Add bug fixes for making alert box
0000|    ;                                                and displaying bad keyboard
0000|    ;                                 10/14/82 - Add display of check marks for test icons
0000|    ;                                 10/18/82 - Add fixes for Monitor entry, Profile boot,
0000|    ;                                             looping on diag tests
0000|    ;                                 10/20/82 - Add message translations
0000|    ;                                 10/21/82 - 1) Adjust alert box and button dimensions
0000|    ;                                             2) Add boot from all ports on I/O slots
0000|    ;                                             3) Add fix for CMD key detection in monitor
0000|    ;                                             4) Change powercycle window to alert box
0000|    ;                                             5) Extend verify timeout to 4 minutes
0000|    ;                                 10/22/82 - 1) Add keyboard reset on external entry to ROM
0000|    ;                                                monitor
0000|    ;                                             2) Make Dump Memory routine conditional on
0000|    ;                                                final LISA ROM
0000|    ;                                 10/25/82 - 1) Change wait for disk error to branch to
0000|    ;                                                monitor - CONTINUE option then continues
0000|    ;                                                with the same boot device
0000|    ;                                             2) Change RETRY phrase to RESTART
0000|    ;                                 10/27/82 - Made following changes:
0000|    ;                                             1) RESET instruction on startup
0000|    ;                                             2) Jump table entries for access to memory
0000|    ;                                                test and display decimal routines
0000|    ;                                             3) Optimize warm start reset check and
0000|    ;                                                MMU error loop routines
0000|    ;                                             4) Change default video page to $2F for
0000|    ;                                                no memory found.
0000|    ;                                             5) Rewrite screen memory test. Change main
0000|    ;                                                memory test to go from low memory
0000|    ;                                                to base of screen memory.
0000|    ;                                             6) Move inverse video check to after screen
0000|    ;                                                test, doing rewrite only of screen page.
0000|    ;                                             7) Add new boot failure code, with hooks to
0000|    ;                                                catch booting errors after ROM has
0000|    ;                                                released control to boot loader for Twiggy
```

```
0000|                                    ;                                    and Profile booting.
0000|                                    ;                        10/29/82 -  Add display for uncompressed slot card icons.
0000|                                    ;                                    Modify TONE routine to init PCR reg.
0000|                                    ;                        11/1/82  -  Change external entry to monitor interface
0000|                                    ;                                    so that error code displayed on same line as
0000|                                    ;                                    message if no icon displayed
0000|                                    ;                        11/3/82  -  Made following changes:
0000|                                    ;                                     1) Move creation of test icon display till
0000|                                    ;                                        after keyboard reset so translation can
0000|                                    ;                                        be done if necessary
0000|                                    ;                                     2) Do cursor, mouse init only once so
0000|                                    ;                                        cursor posn not reset
0000|                                    ;                                     3) Optimize mouse, cursor routines
0000|                                    ;                                     4) Correct COPSCMD routine
0000|                                    ;                                     5) Upgrade check for Profile routine and
0000|                                    ;                                        optimize Profile read code
0000|                                    ;                        11/8/82  -  Conditionally add check for keyboard connected
0000|                                    ;                                    routine.
0000|                                    ;                        11/9/82  -  Create version 2.07
0000|                                    ;                        11/11/82 -  Modify ROM checksum algorithm
0000|                                    ;                        11/12/82 -  Add diskette eject on power-off
0000|                                    ;                        11/13/82 -  1) Remove Dump Memory/Verify Disk from Service
0000|                                    ;                                       mode menu
0000|                                    ;                                    2) Add speaker beep and specific read/write
0000|                                    ;                                       loop for memory sizing and lo mem errors
0000|                                    ;                        11/15/82 -  1) Add keyboard/mouse disconnect check
0000|                                    ;                                    2) Remove memory "clear" from sizing test - now
0000|                                    ;                                       done after memory testing
0000|                                    ;                        11/16/82 -  1) Change power-cycle invoking to CMD/SHIFT/P
0000|                                    ;                                       key sequence.
0000|                                    ;                                    2) Change customer monitor mode invoking to
0000|                                    ;                                       CMD/ENTER (on key pad) key sequence.
0000|                                    ;                                    3) Add wait for profile loop in boot menu
0000|                                    ;                                       display routine
0000|                                    ;                                    4) Add timeout to general wait for clock
0000|                                    ;                                       input routine
0000|                                    ;                                    5) Increase delay for poweroff wait loop
0000|                                    ;                                    6) Optimize character display routine
0000|                                    ;                        11/18/82 -  1) Add save of error code to special parameter
0000|                                    ;                                       memory area for use during burnin.
0000|                                    ;                                    2) Add context check for MMU testing
0000|                                    ;                                    3) Create version 2.08 for internal release
0000|                                    ;                        11/19/82 -  1) Change initial position of cursor to center
0000|                                    ;                                       of screen.
0000|                                    ;
0000|                                    ;                        11/19/82 -  Release versions 2.08 (internal) and
0000|                                    ;                                    2.09 (for manufacturing)
0000|                                    ;
0000|                                    ;                        12/15/82 -  Add:
```

```
0000|                        ;                                      1)Setting of VIA PCR reg for later use
0000|                        ;                                      2)Reset of keyboard before boot
0000|                        ;                                      3)Fix for slot 3 card check for boot menu
0000|                        ;                           12/16/82 - Add:
0000|                        ;                                      1)Move Profile cmd buffer to location $304
0000|                        ;                                      2)Change default boot device to Profile
0000|                        ;                                      3)Remove support for third boot port on
0000|                        ;                                         each slot
0000|                        ;                                      4)Expand id range for test card search
0000|                        ;                                      5)Don't display Restart button after boot
0000|                        ;                                         error
0000|                        ;                                      6)New icons
0000|                        ;                           12/18/82 - Fix memory test bug
0000|                        ;
0000|                        ;                            1/3/83  - Fix bug in reporting parity circuitry
0000|                        ;                                      failure.   Change version to 2.10.
0000|                        ;                            1/7/83  - Make following changes:
0000|                        ;                                      1)Change keyboard sequences for I/0 slot
0000|                        ;                                         booting
0000|                        ;                                      2)Extend timeout for inital Profile check
0000|                        ;                           1/11/83 -  Change SCC test to use max baud rate for
0000|                        ;                                      loopback test
0000|                        ;                           1/12/83 -  Add running of expansion card status routines
0000|                        ;                                      when configuration check is done
0000|                        ;                           1/18/83 -  Add fixes for:
0000|                        ;                                      1)Continuing after memory error
0000|                        ;                                      2)Checking for no reset function
0000|                        ;                                      4)Read of I/0 slot ROM for icon data -le 2 meg
0000|                        ;                                         ensure odd address for icon count
0000|                        ;                                      5)Default boot setting when loop on memory
0000|                        ;                                         test selected
0000|                        ;                           1/21/83 -  Add save of disk controller self-test status
0000|                        ;
0000|                        ;                           1/28/83 -  Create and release ROM version 2.11
0000|                        ;
0000|                        ;                           3/15/83 -  Extend Profile timeout for case where drive
0000|                        ;                                      may be parking head. (bug RM016)
0000|                        ;                           4/20/83 -  Add fixes for:
0000|                        ;                                      1)Memory sizing (bug RM015).
0000|                        ;                                      2)Garbage sent out serial port (RM014).
0000|                        ;                                      3)Removed 6504 (bug RM013).
0000|                        ;                                      4)Never ready Profile (bug RM011).
0000|                        ;                                      Also do some code optimization in icon
0000|                        ;                                      routines to make room for fixes. (RM000)
0000|                        ;                           4/22/83 -  Do code optimization for setting bus error
0000|                        ;                                      vector (labeled as RM000).
0000|                        ;                                      Add changes for following requests:
0000|                        ;                                      1)Display ROM id's on bootup  (CHG001)
0000|                        ;                                      2)Loop on address 1Meg-2 if sizing error  (CHG002)
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0000|  ;                                                    3) Turn off contrast before doing poweroff (CHG003)
0000|  ;                                                    4) Change copyright notice.   (CHG005)
0000|  ;                                                       Also modify alert msg display routine (CHG005).
0000|  ;                                       4/26/83 -  Add loop on CPU diags if no memory or I/O
0000|  ;                                                  board installed.  Also toggle LED. (CHG004)
0000|  ;                                       4/27/83 -  Do only basic memory test on warm-start. (CHG006)
0000|  ;                                                  Add fix for NMI bug (RM010).
0000|  ;                                       5/9/83  -  Made following changes:
0000|  ;                                                    1) Change ROM id display to rev # (D) (CHG001)
0000|  ;                                                    2) Change ROM test failure to loop at fixed address
0000|  ;                                                       $00FE00C8  (end of jump table)  (CHG007)
0000|  ;                                                    3) Make correction for screen not cleared when
0000|  ;                                                       continuing from I/O slot error to boot menu.
0000|  ;                                                       (CHG008)
0000|  ;                                       5/10/83 -  Add change to enable display of uncompressed icons
0000|  ;                                                  upon external entry to ROM Monitor (CHG008).
0000|  ;
0000|  ;                                       5/12/83 -  Create and release rev D of boot ROM.
0000|  ;
0000|  ;                                       8/8/83  -  Add changes for Pepsi system:   (CHG009)
0000|  ;                                                  1) New icons.
0000|  ;                                                  2) Display of icons with id #'s.
0000|  ;                                       8/9/83  -  Add save of disk ROM id in low memory. (CHG010)
0000|  ;                                                  Add fixes for:
0000|  ;                                                  1) SCC init for Applebus.   (CHG011)
0000|  ;                                                  2) Test card boot search.   (CHG012)
0000|  ;                                       8/10/83 -  Delete inverse video check. (CHG013)
0000|  ;                                                  Add fix to beep routine.    (CHG014)
0000|  ;                                       8/16/83 -  Delete memory address and ping pong routines,
0000|  ;                                                  add routines to decode parity error to
0000|  ;                                                  chip.       (CHG015)
0000|  ;                                       9/1/83  -  Add retry for hard disk booting.   (CHG016)
0000|  ;                                                  Add jump table entry for write to
0000|  ;                                                  parameter memory routine.   (CHG017)
0000|  ;                                       9/2/83  -  Add new font, modify display routines. (CHG018)
0000|  ;                                                  Add wait for hard disk ready when
0000|  ;                                                  power-cycling.  (CHG019)
0000|  ;                                       9/6/83  -  Add setting of video latch whenever boot
0000|  ;                                                  error causes jump to ROM low memory default
0000|  ;                                                  vectors. (CHG020)
0000|  ;                                                  Add fix for memory test/initialization
0000|  ;                                                  bug. (CHG021)
0000|  ;                                       9/7/83  -  Add read of disk controller ROM self-test
0000|  ;                                                  results.  (CHG022)
0000|  ;                                                  Add skip of disk eject on power-off if any
0000|  ;                                                  disk controller errors occurred.   (CHG023)
0000|  ;
0000|  ;                                       9/8/83  -  Release for testing (rev 3B) with Pepsi systems.
0000|  ;
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0000|                          ; 10/10/83 - 1) Make Pepsi icon changes.   (CHG024)
0000|                          ;            2) Add fix for proper setting of carry bit
0000|                          ;               on floppy or hard disk boots. (CHG025)
0000|                          ;            3) Add fix for video reset on boot from not ready
0000|                          ;               Profile. (CHG026)
0000|                          ; 10/12/83 - Add change to reset SCC for Applebus before
0000|                          ;            doing memory test.   (CHG027)
0000|                          ; 10/20/83 - Add fix for service mode bus error problem. (CHG028)
0000|                          ;
0000|                          ;
0000|                          ; 10/20/83 - Release as rev E for Lisa and Pepsi systems.
0000|                          ;
0000|                          ; 12/15/83 - 1) Add new code to determine system type. (CHG029)
0000|                          ;            2) Change default boot device for Lisa 2
0000|                          ;                system if no hard disk connected. (CHG030)
0000|                          ;            3) Extend timeout for hard disk ready. (CHG031)
0000|                          ;            4) Add bug fix for wrong icon display on Lisa 2.
0000|                          ;               (CHG032)
0000|                          ;            5) Add bug fix for menu display when mouse or
0000|                          ;               keyboard not connected. (CHG033)
0000|                          ;            6) Remove save of error code in parameter memory.
0000|                          ;               (CHG034)
0000|                          ; 12/16/83 - Release as rev 'X' for testing
0000|                          ;
0000|                          ; 12/21/83 - Release as official rev 'F' for all systems
0000|                          ;
0000|                          ; 1/25/84  - 1) Add code to properly initialize Profile-reset
0000|                          ;               and parity-reset lines for Profile booting   (CHG036)
0000|                          ; 2/7/84   - 1) Extend hard disk default read timeout to 16
0000|                          ;               seconds for Widget systems. (CHG037)
0000|                          ;            2) Add delay after hard disk reset for Widget
0000|                          ;               systems. (CHG038)
0000|                          ; 2/8/84   - Release as rev G for testing
0000|                          ;
0000|                          ; 2/24/84  - Release as official rev H
0000|                          ;
0000|                          ;-----------------------------------------------------------------------------

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