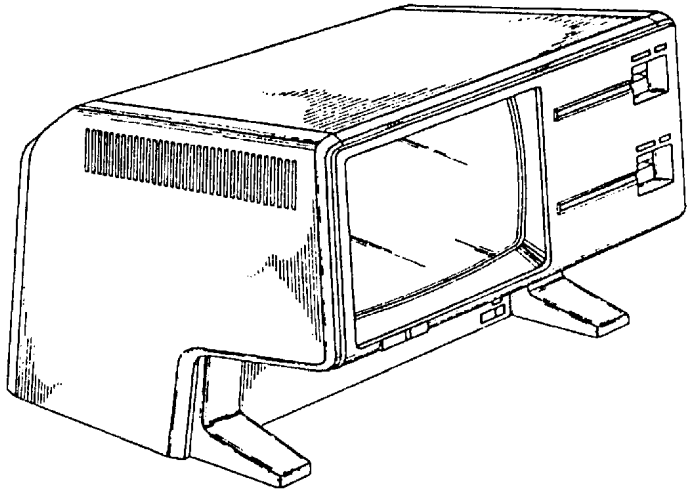
Apple Lisa Computer Technical Information

Lisa Boot ROM Listing



This is the listing of the Lisa's Boot ROM program, version 2.48 (a.k.a. version H). This program was written in 68000 assembly language. This listing was produced by the Lisa 68000 TLA Assembler. At the end of this document appears the hex bytes that this listing produces with some commentary.

```
0000|                    ;       .NOLIST
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     OOOOO     OOOOO    TTTTTTTT      RRRRRR     OOOOO    MMM   MMM   ;
0000|                    ;   BB   BB   OO   OO   OO   OO      TT         RR   RR   OO   OO   MM M M MM   ;
0000|                    ;   BBBBBB    OO   OO   OO   OO      TT         RRRRRR    OO   OO   MM  M  MM   ;
0000|                    ;   BB   BB   OO   OO   OO   OO      TT         RR RR     OO   OO   MM     MM   ;
0000|                    ;   BBBBBB     OOOOO     OOOOO      TT         RR   RR    OOOOO    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 level2 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/O 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/O 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)
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|                           ;
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|                   ;-----------------------------------------------------------------------------------------------
0000|                           .PAGE
0000|                   ;-----------------------------------------------------------------------------------------------
0000|                   ;  Macro definitions
0000|                   ;-----------------------------------------------------------------------------------------------
0000|
0000|                           .MACRO  BSR6
0000|                           LEA     @1,A6
0000|                           BRA     %1
0000|                   @1
0000|                           .ENDM
0000|
0000|                           .MACRO  BSRS6
0000|                           LEA     @1,A6
0000|                           BRA.S   %1
0000|                   @1
0000|                           .ENDM
0000|
0000|                           .MACRO  RTS6
0000|                           JMP     (A6)
0000|                           .ENDM
0000|
0000|                           .MACRO  BSR4
0000|                           LEA     @1,A4
0000|                           BRA     %1
0000|                   @1
0000|                           .ENDM
0000|
0000|                           .MACRO  BSRS4
0000|                           LEA     @1,A4
```

```
0000|                           BRA.S   %1
0000|                   @1
0000|                           .ENDM
0000|
0000|                           .MACRO  RTS4
0000|                           JMP     (A4)
0000|                           .ENDM
0000|
0000|                           .MACRO  BSR2
0000|                           LEA     @1,A2
0000|                           BRA     %1
0000|                   @1
0000|                           .ENDM
0000|
0000|                           .MACRO  BSRS2
0000|                           LEA     @1,A2
0000|                           BRA.S   %1
0000|                   @1
0000|                           .ENDM
0000|
0000|                           .MACRO  RTS2
0000|                           JMP     (A2)
0000|                           .ENDM
0000|
0000|                           .MACRO  DISABLE
0000|                           MOVE    SR,-(SP)
0000|                           ORI     #$0700,SR
0000|                           .ENDM
0000|
0000|                           .MACRO  ENABLE
0000|                           MOVE    (SP)+,SR
0000|                           .ENDM
0000|
0000|                           .PAGE
0000|                   ;---------------------------------------------------------------------------
0000|                   ;       Conditionals for assembly
0000|                   ;---------------------------------------------------------------------------
0000|
0000| 0000 0001         DIAGS           .EQU    1               ;controls assembly of selected diags
0000| 0000 0001         NEWLISA         .EQU    1               ;controls extra code for new LISA's
0000| 0000 0001         BURNIN          .EQU    1               ;controls code for burnin cycling
0000| 0000 0001         NORESET         .EQU    1               ;controls code for reset feature
0000| 0000 0000         EXTERNAL        .EQU    0               ;controls listing of externally
0000|                                                           ; callable routines only (w/ EQU's)
0000| 0000 0001         ROM16K          .EQU    1               ;controls code to be added when 16K
0000|                                                           ; ROM's available
0000| 0000 0001         NEWTWIG         .EQU    1               ;controls code for new Twiggy firmware
```

```
0000|                                                                   ; interface
0000| 0000 0000          FINLISA         .EQU    0                      ;controls code for final LISA's
0000| 0000 0001          FINKBD          .EQU    1                      ;controls check for final keyboard
0000| 0000 0000          AAPL            .EQU    0                      ;controls Apple monitor code
0000| 0000 0001          USERINT         .EQU    1                      ;controls code for new user interface
0000| 0000 0000          DEBUG           .EQU    0                      ;controls global equate allocation
0000| 0000 0000          ROM4K           .EQU    0                      ;controls code for 2716 version
0000| 0000 0000          ROM8K           .EQU    0                      ;controls code for 2732 version
0000| 0000 0001          BMENU           .EQU    1                      ;controls format of boot menu
0000|                                                                   ;  1 = pull down menu
0000| 0000 0001          FULLSCC         .EQU    1                      ;controls code for SCC tests
0000| 0000 0000          INVERTCK        .EQU    0                      ;controls code for inverse video check          CHG013
0000|
0000|                             .IF     EXTERNAL = 1
0000|                             .ENDC
0000|                             .PAGE
0000|                           ;---------------------------------------------------------------------------
0000|                           ;       GENERAL EQUATES
0000|                           ;---------------------------------------------------------------------------
0000| 00FE 0000          ROMBASE         .EQU    $00FE0000       ;BASE ADDRESS FOR ROM
0000| 0000 00FE          ROMSLCT         .EQU    $00FE           ;MSB'S OF ROM ADDRESS
0000| 00FC 0000          IOSPACE         .EQU    $00FC0000       ;START OF IO SPACE
0000| 00FC E800          VIDLTCH         .EQU    $00FCE800       ;VIDEO ADDRESS LATCH
0000| 0000 002F          DEFVID          .EQU    $2F             ;default setting for video latch
0000|                                                             ; (end of 512K board in slot 1)
0000| 0000 00AF          DEFVID2         .EQU    $AF             ;default video latch setting and LED on
0000|
0000|                             .IF  DEBUG = 0
0000| 0000 0110          SCRNBASE        .EQU    $110            ;ptr to base address for video page
0000|                             .ELSE
0000|                             .ENDC
0000|
0000|                             .IF  USERINT = 0
0000|                             .ELSE
0000| 0000 005A          RBYTES          .EQU    90              ;BYTES FOR EACH DISPLAY ROW
0000|                             .ENDC
0000| 0000 010E          TOPOFFSET       .EQU    270             ;offset for first row from top of screen
0000| 0000 00E1          RLONGS          .EQU    225             ;longs for each row
0000| 0000 0000          R0              .EQU    0               ;ROW 0 OFFSET
0000| 0000 005A          R1              .EQU    R0+90           ;ROW 1 OFFSET, ETC.
0000| 0000 00B4          R2              .EQU    R1+90
0000| 0000 010E          R3              .EQU    R2+90
0000| 0000 0168          R4              .EQU    R3+90
0000| 0000 01C2          R5              .EQU    R4+90
0000| 0000 021C          R6              .EQU    R5+90
0000| 0000 0276          R7              .EQU    R6+90
0000| 0000 0008          BUSVCTR         .EQU    $0008           ;BUS EXCEPTION VECTOR
```

```
0000| 0000 000C           ADRVCTR         .EQU    $000C           ;ADDRESS EXCEPTION VECTOR
0000| 0000 0010           ILLVCTR         .EQU    $0010           ;ILLEGAL INSTRUCTION VECTOR
0000| 0000 0028           L10VCTR         .EQU    $0028           ;line 1010 trap
0000| 0000 002C           L11VCTR         .EQU    $002C           ;line 1111 trap
0000| 0000 007C           NMIVCT          .EQU    $007C           ;NMI VECTOR LOCATION
0000| 0000 0080           TRPVCT0         .EQU    $0080           ; TRAP 0 VECTOR LOCATION
0000| 0020 0000           MAXADR          .EQU    $00200000       ; MAX RAM ADDRESS + 1 (2 meg)
0000| 0010 0000           ONEMEG          .EQU    $00100000       ; 1 meg in hex
0000| 0008 0000           HALFMEG         .EQU    $00080000       ; 1/2 meg
0000| 0004 0000           QTRMEG          .EQU    $00040000       ; 256K
0000| 0002 0000           ROW2ADR         .EQU    $00020000       ; 128K - START OF 2ND MEMORY ROW
0000| 0000 0480           STKBASE         .EQU    $0480           ; DEFAULT BASE FOR STACK
0000| 0000 0480           CALLBASE        .EQU    $0480           ; STACK BASE FOR USE BY CALL ROUTINE
0000| 00FC E012           SETUP           .EQU    $00FCE012       ; ADDRESS TO TURN SETUP BIT OFF
0000| 00FC E010           SETUPON         .EQU    $00FCE010       ; ADDRESS TO TURN SETUP ON
0000| AA55 A55A           PATRN           .EQU    $AA55A55A       ; PATTERN FOR MEMORY TESTING
0000| 0000 A55A           PATRN2          .EQU    $A55A           ; PATTERN FOR MMU TEST
0000| 00FC E01E           PARON           .EQU    $00FCE01E       ;PARITY ENABLE
0000| 00FC E01C           PAROFF          .EQU    $00FCE01C       ;PARITY DISABLE
0000| 00FC F000           MEALTCH         .EQU    $00FCF000       ;MEMORY ERROR ADDRESS LATCH
0000| 00FC F801           STATREG         .EQU    $00FCF801       ;ERROR STATUS REGISTER
0000| 0000 0000           SFER            .EQU    0               ; SOFT ERROR BIT
0000| 0000 0001           PBIT            .EQU    1               ; HARD ERROR (PARITY) BIT
0000| 0000 0002           VRBIT           .EQU    2               ; VR BIT LOCATION
0000| 0000 0004           VIDBIT          .EQU    4               ; VID BIT
0000| 0000 0005           CSBIT           .EQU    5               ; CSYNC BIT
0000| 0000 0006           INVIDBIT        .EQU    6               ; INVERSE VIDEO BIT
0000| 0000 0020           RETRYCNT        .EQU    32              ;RETRY COUNT FOR MEMORY SIZING
0000| 00FC E018           VTIRDIS         .EQU    $00FCE018       ;VERTICAL RETRACE DISABLE
0000| 00FC E01A           VTIRENB         .EQU    $00FCE01A       ;VERTICAL RETRACE ENABLE
0000| 0008 0000           HEX512K         .EQU    $80000          ;512K in hex
0000| 0002 0000           HEX128K         .EQU    $20000          ;128K in hex
0000| 0001 8000           HEX96K          .EQU    $18000          ;96K in hex
0000| 0000 8000           HEX32K          .EQU    $8000           ;32K in hex
0000| 0000 2000           HEX8K           .EQU    $2000           ;8K in hex
0000| 0000 0800           HEX2K           .EQU    $0800           ;2K in hex
0000| 0000 0800           LOMEM           .EQU    HEX2K           ;amount of memory initially tested
0000| 00FC E006           DG2ON           .EQU    $00FCE006       ;WRITE WRONG PARITY ENABLE
0000| 00FC E004           DG2OFF          .EQU    $00FCE004       ;WRITE WRONG PARITY DISABLE
0000| 0003 D090           ONESEC          .EQU    $3D090          ;1 second delay constant
0000| 0007 A120           TWOSEC          .EQU    ONESEC*2        ;2 second delay
0000| 0013 12D0           FIVESEC         .EQU    ONESEC*5        ;5 second delay
0000| 0000 F424           QTRSEC          .EQU    ONESEC/4        ;0.25 second delay
0000| 0000 61A8           TNTHSEC         .EQU    ONESEC/10       ;0.1 second delay
0000| 0006 7C28           KBDDLY          .EQU    <ONESEC*17>/10  ;1.7 second delay
0000| 0001 E848           HALFSEC         .EQU    ONESEC/2        ;0.5 second delay
0000|
```

```
0000|                       ;  Equates for memory parity error routine
0000|
0000| 0000 0040            MSRCHSZ         .EQU    64              ;main memory error range                CHG015
0000| 0000 8000            VSRCHSZ         .EQU    32768           ;video memory error range               CHG015
0000| FFFF 8000            VMSK            .EQU    $FFFF8000       ;mask for video errors                  CHG015
0000| 0000 0003            ADRMSK          .EQU    $03             ;mask for error byte address            CHG015
0000| 0008 0000            PHYTOLOG        .EQU    $80000          ;physical to logical address offset     CHG015
0000|
0000|                               .IF     EXTERNAL = 1
0000|                               .ENDC
0000|
0000|                       ;  Equates for VIA registers (offsets from $XXD181 or $XXD101)
0000|
0000| 00FC DD81            VIA1BASE        .EQU    $00FCDD81       ;BASE ADDRESS FOR COPS 6522
0000| 0000 0000            ORB1            .EQU    $0              ;PORT B OUTPUT REG
0000| 0000 0002            ORA1            .EQU    $2              ;PORT A OUTPUT REG
0000| 0000 0004            DDRB1           .EQU    $4              ;PORT B DATA DIRECTION REG
0000| 0000 0006            DDRA1           .EQU    $6              ;PORT A DATA DIRECTION REG
0000| 0000 000C            T1LL1           .EQU    $C              ;LOW ORDER T1 LATCH
0000| 0000 000E            T1LH1           .EQU    $E              ;HIGH ORDER T1 LATCH
0000| 0000 0010            T2CL1           .EQU    $10             ;LOW ORDER T2 COUNTER
0000| 0000 0012            T2CH1           .EQU    $12             ;HIGH ORDER T2 COUNTER
0000| 0000 0014            SHR1            .EQU    $14             ;SHIFT REG
0000| 0000 0016            ACR1            .EQU    $16             ;AUXILIARY CONTROL REG
0000| 0000 0018            PCR1            .EQU    $18             ;PERIPHERAL CONTROL REG
0000| 0000 001A            IFR1            .EQU    $1A             ;INTERRUPT FLAG REG
0000| 0000 001C            IER1            .EQU    $1C             ;INTRPT ENABLE REG
0000| 0000 001E            PORTA1          .EQU    $1E             ;PORT A WITH NO HANDSHAKE
0000|
0000| 0000 0004            FDIR            .EQU    4               ;PORT B, BIT 4 HAS FDIR STATE
0000| 00FC D901            VIA2BASE        .EQU    $00FCD901       ;BASE ADDRESS FOR OTHER 6522
0000| 0000 0000            ORB2            .EQU    $0              ;PORT B OUTPUT REG
0000| 0000 0000            IRB2            .EQU    $0              ;PORT B INPUT REG
0000| 0000 0008            ORA2            .EQU    $8              ;PORT A OUTPUT REG
0000| 0000 0008            IRA2            .EQU    $8              ;PORT A INPUT REG
0000| 0000 0010            DDRB2           .EQU    $10             ;PORT B DATA DIRECTION REG
0000| 0000 0018            DDRA2           .EQU    $18             ;PORT A DATA DIRECTION REG
0000| 0000 0030            T1LL2           .EQU    $30             ;LOW ORDER T1 LATCH
0000| 0000 0038            T1LH2           .EQU    $38             ;HIGH ORDER T1 LATCH
0000| 0000 0040            T2CL2           .EQU    $40             ;LOW ORDER T2 COUNTER
0000| 0000 0048            T2CH2           .EQU    $48             ;HIGH ORDER T2 COUNTER
0000| 0000 0060            PCR2            .EQU    $60             ;PERIPHERAL CONTROL REG
0000| 0000 0078            PORTA2          .EQU    $78             ;PORT A WITH NO HANDSHAKE
0000|
0000| 0000 0006            DSKDIAG         .EQU    6               ;port B, bit 6 is disk alive indicator
0000|
0000| 00FC D01C            CSTRB           .EQU    $00FCD01C       ;STROBE FOR CONTRAST LATCH
```

```
0000|                   ;  Equates for PIA registers (offsets from $XXA001) (SLOT 2)
0000| 00FC A001        PIABASE         .EQU    $00FCA001       ;BASE ADDRESS FOR PIA CARD IN SLOT 2
0000| 0000 0000        INDATA          .EQU    $0
0000| 0000 0002        OUTDATA         .EQU    $2
0000| 0000 0004        INCSR           .EQU    $4
0000| 0000 0006        OUTCSR          .EQU    $6
0000|
0000|                   ;  Equates for SCC
0000|
0000| 00FC D241        SCCBCTL         .EQU    $FCD241         ;SCC channel B control
0000| 0000 0002        ACTL            .EQU    2               ;offset to SCC channel A control
0000| 0000 0004        SCCDATA         .EQU    4               ;offset to SCC data regs
0000| 0000 0000        RXBF            .EQU    0               ;receive buffer full bit
0000| 0000 0002        TXBE            .EQU    2               ;transmit buffer empty bit
0000|
0000|                           .PAGE
0000|                           .IF  USERINT = 0
0000|                           .ELSE
0000| 0000 0000        MMU             .EQU    0               ;MMU ERROR
0000| 0000 0001        CPUSEL          .EQU    1               ;CPU selection logic error
0000| 0000 0002        VID             .EQU    2               ;CPU VIDEO LOGIC ERROR
0000| 0000 0003        PAR             .EQU    3               ;CPU PARITY LOGIC ERROR
0000| 0000 0004        CPUINTR         .EQU    4               ;UNEXPECTED INTERRUPT OCCURRED
0000| 0000 0005        BUSEXCP         .EQU    5               ;BUS ERROR
0000| 0000 0006        ADREXCP         .EQU    6               ;ADDRESS ERROR
0000| 0000 0007        MISEXCP         .EQU    7               ;MISC EXCEPTION
0000| 0000 0008        ILLEXCP         .EQU    8               ;ILLEGAL INSTRUCTION ERROR
0000| 0000 0009        TRPEXCP         .EQU    9               ;line 1111 or 1010 trap
0000|
0000| 0000 000A        VIA1            .EQU    10              ;COPS VIA ERROR
0000| 0000 000B        VIA2            .EQU    11              ;PARALLEL PORT VIA ERROR
0000| 0000 000C        IOCOPS          .EQU    12              ;IO BOARD COPS ERROR
0000| 0000 000D        KBDCOPS         .EQU    13              ;KEYBOARD COPS ERROR
0000| 0000 000E        CLK             .EQU    14              ;CLOCK ERROR
0000| 0000 000F        RS232A          .EQU    15              ;RS232 PORT A ERROR
0000| 0000 0010        RS232B          .EQU    16              ;RS232 PORT B ERROR
0000| 0000 0011        DISK            .EQU    17              ;DISK ERROR
0000| 0000 0012        IOEXCP          .EQU    18              ;UNEXPECTED IO EXCEPTION OCCURRED
0000| 0000 0013        IOCOPS2         .EQU    19              ;COPS reset code error
0000| 0000 0014        IOKBD           .EQU    20              ;I/O or keyboard failure
0000|
0000| 0000 0015        MEM             .EQU    21              ;MEMORY ERROR
0000| 0000 0016        MPAR            .EQU    22              ;memory parity error
0000|
0000| 0000 0017        KBDOUT          .EQU    23              ;KEYBOARD DISCONNECTED
0000| 0000 0018        MOUSOUT         .EQU    24              ;MOUSE DISCONNECTED
0000| 0000 0019        IO1ERR          .EQU    25              ;I/O slot 1 failure
```

```
0000| 0000 001A           IO2ERR          .EQU    26              ;I/O slot 2 failure
0000| 0000 001B           IO3ERR          .EQU    27              ;I/O slot 3 failure
0000| 0000 001C           ALTBOOT         .EQU    28              ;alternate boot key request
0000| 0000 001D           BTMENU          .EQU    29              ;boot menu request
0000| 0000 001E           WRMSTRT         .EQU    30              ;warm-start indicator
0000|
0000| 0000 001F           LOOP            .EQU    31              ;loop on test
0000| 0E7F FFFF           ERRMSK          .EQU    $0E7FFFFF       ;MASK FOR ERROR CHECKING
0000| 0000 000F           CPUMSK          .EQU    $0000000F       ;MASK FOR CPU ERROR CHECKING
0000| 0000 03F0           EXMSK           .EQU    $000003F0       ;mask for exception error checking
0000| 001F DC00           IOMSK           .EQU    $001FDC00       ;MASK FOR I/O ERROR CHECKING
0000| 0060 0000           MEMMSK          .EQU    $00600000       ;mask for memory error checking
0000| 0180 0000           OTHRMSK         .EQU    $01800000       ;mask for keyboard/mouse check
0000| 0E00 0000           IOSMSK          .EQU    $0E000000       ;mask for I/O slot error checking
0000| 001E 3FFA           CONTMSK         .EQU    $001E3FFA       ;mask for CONTINUE option - allow continue
0000|                                               ; for MMU,VIDEO,CLK,RS232,MEM,MPAR,KBDOUT,
0000|                                               ; MOUSOUT,and IO slot errors
0000| 0018 3000           SCANMSK         .EQU    $00183000       ;mask for results of initial keyboard scan
0000| 7000 0000           ALTBMSK         .EQU    $70000000       ;mask for D7 when CONTINUE option invoked
0000| 008F FFFF           BOOTMSK         .EQU    $008FFFFF       ;mask for errors that continue to boot attempt
0000| 001F FFFF           CPIOMSK         .EQU    $001FFFFF       ;mask for checking for CPU and IO errors
0000|                               .ENDC
0000|
0000|                       ;  Equates for error codes displayed to user
0000|
0000|                               .IF  NEWTWIG = 0
0000|                               .ELSE
0000| 0000 0028           EMMU            .EQU    40              ;MMU ERROR
0000| 0000 0029           ECPUSEL         .EQU    41              ;CPU selection logic error
0000| 0000 002A           EVID            .EQU    42              ;CPU VIDEO LOGIC ERROR
0000| 0000 002B           ECPAR           .EQU    43              ;CPU PARITY LOGIC ERROR
0000| 0000 002C           ECPUINTR        .EQU    44              ;UNEXPECTED INTERRUPT OCCURRED
0000| 0000 002D           EBUSEXCP        .EQU    45              ;BUS ERROR
0000| 0000 002E           EADREXCP        .EQU    46              ;ADDRESS ERROR
0000| 0000 002F           EMISEXCP        .EQU    47              ;MISC EXCEPTION
0000| 0000 0030           EILLEXCP        .EQU    48              ;ILLEGAL INSTRUCTION ERROR
0000| 0000 0031           ETRPEXCP        .EQU    49              ;line 1111 or 1010 trap
0000|
0000| 0000 0032           EVIA1           .EQU    50              ;COPS VIA ERROR
0000| 0000 0033           EVIA2           .EQU    51              ;PARALLEL PORT VIA ERROR
0000| 0000 0034           EIOCOP          .EQU    52              ;IO BOARD COPS ERROR
0000| 0000 0035           EKBDCOP         .EQU    53              ;KEYBOARD COPS ERROR
0000| 0000 0036           ECLK            .EQU    54              ;CLOCK ERROR
0000| 0000 0037           ERS232A         .EQU    55              ;RS232 PORT A ERROR
0000| 0000 0038           ERS232B         .EQU    56              ;RS232 PORT B ERROR
0000| 0000 0039           EDISK           .EQU    57              ;DISK ERROR
0000| 0000 003A           EIOEXCP         .EQU    58              ;UNEXPECTED IO EXCEPTION OCCURRED
```

```
0000| 0000 003B            EIOCOP2         .EQU    59              ;IO board COPS code error
0000| 0000 003C            EIOKBD          .EQU    60              ;I/O or keyboard error
0000|
0000| 0000 0046            EMEM            .EQU    70              ;R/W MEMORY ERROR
0000| 0000 0047            EPAR            .EQU    71              ;PARITY ERROR
0000| 0000 004B            EBOOT           .EQU    75              ;general boot failure error code
0000|                      ;  Special COPS error codes for burnin cycling
0000|
0000| 0000 003D            SERR1           .EQU    61              ;error setting initial time
0000| 0000 003E            SERR2           .EQU    62              ;error setting alarm
0000|                              .ENDC
0000|                      ;  Secondary status flag (STATFLGS) equates
0000| 0000 0000            NORSTRT         .EQU    0               ;governs display of restart button
0000| 0000 0001            NOCONT          .EQU    1               ;error disallows Monitor CONTINUE option
0000| 0000 0002            MSBUTN          .EQU    2               ;mouse button detected
0000| 0000 0003            CMDFLG          .EQU    3               ;cmd button up/down
0000| 0000 0004            MOUSE           .EQU    4               ;mouse button up/down
0000| 0000 0005            CHKCMD          .EQU    5               ;if =1 user input from keyboard must
0000|                                                               ; be prefaced by CMD key
0000| 0000 0006            BTN             .EQU    6               ;flag for button use
0000| 0000 0007            MENU            .EQU    7               ;flag for menu use
0000|
0000|                      ;  MMU equates
0000|
0000| 0000 8000            MMUSADRL        .EQU    $00008000       ;STARTING MMU LIMIT ADDRESS
0000| 0000 8008            MMUSADRB        .EQU    $00008008       ;STARTING MMU BASE ADDRESS
0000| 00FE 8000            MMUEADRL        .EQU    $00FE8000       ;ENDING MMU LIMIT ADDRESS
0000| 00FE 8008            MMUEADRB        .EQU    $00FE8008       ;ENDING MMU BASE ADDRESS
0000| 0002 0000            ADR128K         .EQU    $00020000       ;128K IN HEX - INCR FOR MMU REGS PTRS
0000| 0000 0100            PAG128K         .EQU    $00000100       ;128K PAGE INCREMENT FOR ORG REGS
0000| 0000 0700            MEMLMT          .EQU    $0700           ;LIMIT VALUE FOR MEMORY SEGMENTS
0000| 0000 08FF            NMEMLMT         .EQU    $08FF           ;INVERSE OF VALUE (HIGH NIBBLE IGNORED)
0000|
0000|                              .IF  ROM4K = 0
0000| 0000 0900            IOLMT           .EQU    $0900           ;LIMIT VALUE FOR I/O SEGMENT
0000| 0000 06FF            NIOLMT          .EQU    $06FF           ;INVERSE
0000| 0000 0901            IOLMT2          .EQU    $0901           ;limit value for no reset feature
0000| 0000 0FFE            RSTLMT          .EQU    $0FFE           ;inverse mask for no reset feature
0000|                              .ELSE
0000|                              .ENDC
0000| 0000 0F00            SPLMT           .EQU    $0F00           ;LIMIT VALUE FOR SPECIAL I/O SPACE
0000| 0000 00FF            NSPLMT          .EQU    $00FF           ;INVERSE
0000| 0000 0C00            INVPAG          .EQU    $0C00           ;INVALID PAGE LIMIT
0000| 0000 8008            MMU0B           .EQU    $00008008       ;ADRESS OF ORG REG 0 (FOR LOW MEMORY)
0000| 0000 8000            MMU0L           .EQU    $00008000       ;ADDRESS OF LIMIT REG 0
0000| 00FC 8008            MMU126B         .EQU    $00FC8008       ;ADDRESS OF ORG REG 126 (FOR I/O SPACE)
0000| 00FC 8000            MMU126L         .EQU    $00FC8000       ;ADDRESS OF LIMIT REG 126
```

```
0000| 00FE 8008           MMU127B         .EQU    $00FE8008       ;ADDRESS OF BASE REG 127 (FOR ROM SPACE)
0000| 00FE 8000           MMU127L         .EQU    $00FE8000       ;ADDRESS OF LIMIT REG 127
0000| 00FC E00A           SEG1ON          .EQU    $00FCE00A       ;CONTEXT SELECTION BIT 1 ENABLE
0000| 00FC E008           SEG1OFF         .EQU    $00FCE008       ;CONTEXT SELECTION BIT 1 DISABLE
0000| 00FC E00E           SEG2ON          .EQU    $00FCE00E       ;CONTEXT SELECTION BIT 2 ENABLE
0000| 00FC E00C           SEG2OFF         .EQU    $00FCE00C       ;CONTEXT SELECTION BIT 2 DISABLE
0000|
0000|                     ; Equates for serial number read routine
0000|
0000| 0000 0009           Dlycnst         .equ    9               ;constant for delay loop
0000| 0000 00AC           TKiller         .equ    172             ;time killer constant
0000| 0000 0007           BytesPerRead    .equ    7               ;bytes per read
0000| 0000 000E           WordsPerRead    .equ    BytesPerRead*2  ;during reading one byte fits into one word
0000| 0000 0070           HalfSize        .equ    WordsPerRead*8  ;half the size of ScrachSize
0000| 0000 00E0           ScrachSize      .equ    HalfSize*2      ;size of the scrach array
0000|                                               ;I/O segment 126
0000| 00FE 8000           Snum            .equ    $0fe8000        ;location of SN1 & SN2
0000|                                               ;special I/O segment 127
0000| FFFF FFFC           dLcnt           .equ    -4              ;displacement for local variable LOOP COUNTER
0000| FFFF FFF8           dSavArry        .equ    dLcnt-4         ;disp. for Save Array pointer
0000| FFFF FF18           dScrach         .equ    dSavArry-ScrachSize
0000|                                               ;disp. for pointer to local array SCRACH
0000| FFFF FF18           dStack          .equ    dScrach         ;disp. for the Link
0000|
0000|                     ; Equates for COPS and keyboard scan
0000|
0000| 0000 0086           MOUSDWN         .EQU    $86             ;MOUSE BUTTON PRESSED
0000| 0000 00FF           CMDKEY          .EQU    $FF             ;LEFT COMMAND KEY
0000| 0000 00FD           ALPHKEY         .EQU    $FD             ;ALPHA LOCK KEY "DOWN"
0000|
0000|                             .IF NEWTWIG = 0
0000|                             .ELSE
0000| 0000 00F4           KEY1            .EQU    $F4             ;'1' key - for Twiggy #1 boot
0000| 0000 00F1           KEY2            .EQU    $F1             ;'2' key - for Twiggy #2 boot
0000| 0000 00F2           KEY3            .EQU    $F2             ;'3' key - for Profile boot
0000| 0000 00F0           AKEY            .EQU    $F0             ;'A' key - for I/O slot #3, port 1
0000| 0000 00EE           BKEY            .EQU    $EE             ;'B' key - for I/O slot #3, port 2
0000| 0000 00ED           CKEY            .EQU    $ED             ;'C' key - for I/O slot #3, port 3
0000|                     ;DKEY            .EQU    $FB             ;'D' key - for I/O slot #1, port 4
0000|                     ;EKEY            .EQU    $E0             ;'E' key - for I/O slot #2, port 4
0000|                     ;FKEY            .EQU    $E9             ;'F' key - for I/O slot #3, port 4
0000| 0000 00AF           ENTRKEY         .EQU    $AF             ;Right ENTER key - for Monitor invoking
0000| 0000 00FE           SHFTKEY         .EQU    $FE             ;Shift key - used for power-cycling
0000| 0000 00C4           PKEY            .EQU    $C4             ;'P' key - for Power-cycling
0000|                             .ENDC
0000|
0000| 0000 0080           RSTCODE         .EQU    $80             ;reset code
```

```
0000| 0000 00FD            KUNPLG          .EQU    $FD             ;keyboard unplugged
0000| 0000 00FE            ICERR           .EQU    $FE             ;I/O board COPS RAM error
0000| 0000 00FF            KCERR           .EQU    $FF             ;keyboard COPS RAM error
0000| 0000 0007            MSUNPLG         .EQU    $07             ;mouse unplugged
0000| 0000 0087            MSPLG           .EQU    $87             ;mouse plugged in
0000|
0000|                               .IF     EXTERNAL = 1
0000|                               .ENDC
0000|
0000|                       ; Equates for Boot device id's
0000|                               .IF     NEWTWIG = 0
0000|                               .ELSE
0000| 0000 0000            TWIG1           .EQU    $0              ;TWIGGY DRIVE #1
0000| 0000 0001            TWIG2           .EQU    $1              ;TWIGGY DRIVE #2
0000| 0000 0002            PROFILE         .EQU    $2              ;PROFILE HARD DISK
0000| 0000 0003            IO1PORT1        .EQU    $3              ;I/O SLOT 1, port 1
0000| 0000 0004            IO1PORT2        .EQU    $4              ;I/O SLOT 1, port 2
0000| 0000 0006            IO2PORT1        .EQU    $6              ;I/O SLOT 2, port 1
0000| 0000 0007            IO2PORT2        .EQU    $7              ;I/O SLOT 2, port 2
0000| 0000 0009            IO3PORT1        .EQU    $9              ;I/O SLOT 3, port 1
0000| 0000 000A            IO3PORT2        .EQU    $A              ;I/O SLOT 3, port 2
0000| 0000 000F            PC              .EQU    $F              ;power cycle mode
0000| 0000 0010            MON             .EQU    $10             ;abort boot, go to monitor id
0000|
0000|                               .ENDC
0000|                               .IF USERINT = 0
0000|                               .ENDC
0000|
0000|                       ; Equates for device code display (ASCII codes)
0000|
0000|                               .IF  NEWTWIG = 0
0000|                               .ELSE
0000| 0000 0031            TWG1            .EQU    $31             ;Twiggy drive #1
0000| 0000 0032            TWG2            .EQU    $32             ;Twiggy drive #2
0000| 0000 0033            PRO             .EQU    $33             ;Profile
0000| 0000 0034            IOS1            .EQU    $34             ;I/O slot 1
0000| 0000 0037            IOS2            .EQU    $37             ;I/O slot 2
0000| 0000 0041            IOS3            .EQU    $41             ;I/O slot 3
0000|                               .ENDC
0000|
0000|                       ;---------------------------------------------------------------------------
0000|                       ; Equates for Disk controller shared memory/Twiggy boot
0000|                       ;---------------------------------------------------------------------------
0000|
0000| 0000 0001            TWIGGY          .EQU    1               ;controls Twiggy code assembly (1 = YES)
0000| 00FC C001            DISKMEM         .EQU    $00FCC001       ;base address of shared memory
0000| 0000 0002            CMD             .EQU    2               ;offset for command byte
```

```
0000| 0000 0004            DRV             .EQU    CMD+2           ;offset for drive #
0000| 0000 0006            SIDE            .EQU    DRV+2           ;side #
0000| 0000 0008            SCTR            .EQU    SIDE+2          ;sector #
0000| 0000 000A            TRAK            .EQU    SCTR+2          ;track #
0000|
0000|                              .IF  NEWTWIG = 0
0000|                              .ENDC
0000|                              .IF  NEWTWIG = 1
0000| 0000 000C            SPEED           .EQU    TRAK+2          ;motor speed control
0000| 0000 000E            CNFRM           .EQU    SPEED+2         ;confirm for format cmd
0000| 0000 0010            STAT            .EQU    CNFRM+2         ;error status
0000| 0000 0012            INTLV           .EQU    STAT+2          ;interleave factor                      CHG022
0000| 0000 0014            TYPE            .EQU    INTLV+2         ;drive type id                          CHG009
0000| 0000 0016            STST            .EQU    TYPE+2          ;self-test result                       CHG022
0000| 0000 0030            ROMV            .EQU    $30             ;ROM version #
0000| 0000 0058            RTRYCNT         .EQU    $58             ;retry count
0000| 0000 005E            INTSTAT         .EQU    $5E             ;interrupt status
0000| 0000 00BA            CHKCNT          .EQU    $BA             ;data checksum error count
0000| 0000 00C4            CHKCNT2         .EQU    $C4             ;address checksum error count
0000| 0000 03E8            DSKBUFF         .EQU    $3E8            ;start of disk buffer
0000| 0000 0400            DSKDATA         .EQU    DSKBUFF+24      ;first 12 bytes are header
0000| 00FC C031            DISKROM         .EQU    $FCC031         ;absoulte address for disk ROM id
0000| 0000 0005            SLOTMR          .EQU    5               ;id bit for slow timers                 CHG029
0000| 0000 0006            FASTMR          .EQU    6               ;id bit for fast timers                 CHG029
0000|
0000| 0000 0000            READS           .EQU    0               ;read sector w/checksum
0000| 0000 0001            WRT             .EQU    1
0000| 0000 0002            UNCLAMP         .EQU    2               ;unclamp diskette
0000| 0000 0003            FMT             .EQU    3
0000| 0000 0004            VFY             .EQU    4               ;verify disk
0000| 0000 0009            CLAMP           .EQU    9               ;clamp disk
0000| 0000 00FF            OK              .EQU    $FF             ;confirmation for format
0000|
0000| 0000 0083            SEEK            .EQU    $83             ;seek cmd
0000|                              .ENDC
0000|
0000| 0000 0081            EXRW            .EQU    $81             ;execute cmd
0000| 0000 0085            CLRSTAT         .EQU    $85             ;clear status cmd
0000| 0000 0086            ENBLINT         .EQU    $86             ;enable intrpt
0000| 0000 0087            DSABLINT        .EQU    $87             ;disable intrpt
0000| 0000 0088            SLEEP           .EQU    $88             ;loop in RAM cmd
0000| 0000 0089            DIE             .EQU    $89             ;loop in ROM cmd
0000|
0000| 0000 0000            DRV1            .EQU    0               ;drive #1 ID
0000| 0000 0080            DRV2            .EQU    $80             ;drive #2 ID
0000| 0000 0001            TRK1            .EQU    1               ;track 1
0000| 0000 0000            TOPSIDE         .EQU    0               ;top side of disk
```

```
0000| 0000 0001             BOTSIDE         .EQU    1               ;bottom side of disk
0000|
0000|                               .IF NEWTWIG = 0
0000|                               .ENDC
0000|                               .IF NEWTWIG = 1
0000| 0000 000C             HDRLEN          .EQU    12              ;length of Twiggy header
0000| 0000 0200             SECLEN          .EQU    512             ;length of one sector
0000| 0001 FFF4             TWGHDR          .EQU    $1FFF4          ;address to load boot header
0000| 0002 0000             TWGDATA         .EQU    $20000          ;address to load boot data
0000| 0000 06A6             LASTBLK         .EQU    1702            ;last block #
0000| 0000 06A6             DSKSIZE         .EQU    1702            ;total amount of blocks
0000|                               .ENDC
0000|
0000|                       ;  Equates for parameter memory used by boot ROM
0000|
0000| 00FC C161             STATSTRT        .EQU    $FCC161         ;start of special parameter memory area for boot ROM
0000| 00FC C161             STATSAV         .EQU    STATSTRT        ;save of error code
0000| 00FC C17D             STATSUM         .EQU    $FCC17D         ;checksum word for special area
0000| 0000 0008             STATWRDS        .EQU    8               ;length in words (16 bytes)
0000|
0000| 00FC C181             PMSTRT          .EQU    $FCC181         ;start of system paramter memory
0000| 00FC C189             DVCCODE         .EQU    $FCC189         ;boot device code
0000| 00FC C18D             MEMCODE         .EQU    $FCC18D         ;mouse/memory test indicator byte
0000| 0000 0007             MOUSEON         .EQU    7               ;bit for mouse attached (1=yes)
0000| 0000 0006             EXMEM           .EQU    6               ;bit for extended memory test (1=yes)
0000| 00FC C1FD             PMCHKSM         .EQU    $FCC1FD         ;checksum word
0000| 0000 0020             PMWRDS          .EQU    32              ;length in words (64 bytes)
0000|
0000|                       ;  Equates for disk errors
0000|
0000|                               .IF  NEWTWIG = 0
0000|                               .ENDC
0000|                               .IF  NEWTWIG = 1                ;new firmware, new error codes
0000| 0000 0007             DRVERR          .EQU    07              ;no disk in drive
0000| 0000 0007             NODISK          .EQU    DRVERR          ;another name for it
0000| 0000 0014             WRPERR          .EQU    20              ;write protect error
0000| 0000 0016             CLMPERR         .EQU    22              ;clamp error
0000| 0000 0017             RDWRERR         .EQU    23              ;read error
0000| 0000 0019             UCLMPERR        .EQU    25              ;unclamp error
0000| 0000 0026             BADTHDR         .EQU    38              ;bad header (not a boot file id)
0000| 0000 0027             TIMOUT          .EQU    39              ;timeout error
0000|
0000| 0012 0000             CMDTIME         .EQU    $120000         ;timeout for taking command (15 secs)
0000| 00C0 0000             FDIRTIME        .EQU    $C00000         ;timeout for setting FDIR (2 mins)
0000| 0180 0000             VFYTIME         .EQU    <FDIRTIME*2>    ;timeout for verify disk operation (4 mins)
0000| 0018 0000             EJCTTIME        .EQU    $180000         ;timeout for ejecting disk (15 secs)
0000| 001C 8000             DSKTMOUT        .EQU    $1C8000         ;timeout for initial speed check (15 secs)
```

```
0000| 00C0 0000           INSRTTIM        .EQU    FDIRTIME        ;timeout for disk to be inserted (2 mins)
0000| 0180 0000           FMTTIME         .EQU    VFYTIME         ;timeout for format operation
0000|                           .ENDC
0000|
0000|                     ;  Equates for disk interrupt status
0000|
0000| 0000 0000           DSK1IN          .EQU    0               ;drive #1 disk in place
0000| 0000 0001           BUTN1           .EQU    1               ;drive #1 button pushed
0000| 0000 0002           RWF1            .EQU    2               ;read/write/format done on drive #1
0000| 0000 0004           DSK2IN          .EQU    4               ;drive #2 disk in place
0000| 0000 0005           BUTN2           .EQU    5               ;drive #2 button pushed
0000| 0000 0006           RWF2            .EQU    6               ;read/write/format done on drive #2
0000|
0000|                     ;  Equates for disk status command response
0000|
0000| 0000 0002           DSKIN           .EQU    2               ;disk inserted
0000| 0000 0003           BUTN            .EQU    3               ;button pressed
0000|
0000| 00FC C015           DRVTYPE         .EQU    $FCC015         ;drive type id (0 = Twiggy,                     CHG009
0000|                                                             ; 1 = single SONY, 2 = double SONY)           CHG009
0000|
0000|                     ;---------------------------------------------------------------------------
0000|                     ;  Equates for use with Profile boot
0000|                     ;---------------------------------------------------------------------------
0000|
0000| 0000 0001           PROFLE          .EQU    1               ;controls assembly of Profile code
0000| 0000 0000           OCD             .EQU    0               ;OPEN CABLE DETECT INPUT
0000| 0000 0001           BSY             .EQU    1               ;BUSY LINE INPUT
0000| 0000 0304           CMDBUFR         .EQU    $304            ;BUFFER FOR COMMAND BYTES
0000| 0000 01B4           STATBFR         .EQU    $1B4            ;STATUS BYTE BUFFER (uses BOOTDATA area)
0000| 0000 01B4           STAT1           .EQU    $1B4            ;STATUS BYTE 1
0000| 0000 01B5           STAT2           .EQU    $1B5            ;STATUS BYTE 2
0000| 0000 01B6           STAT3           .EQU    $1B6            ;STATUS BYTE 3
0000| 0000 01B6           STAT4           .EQU    $1B6            ;STATUS BYTE 4
0000| C140 C000           STATMSK         .EQU    $C140C000       ;MASK FOR DON'T CARE STATUS BITS              CHG016
0000| 0000 0005           PCMDSZ          .EQU    5               ;BYTES FOR READ CMD - 1
0000| 0000 0000           PCMD            .EQU    0               ; COMMAND CODE
0000| 0000 0001           BLKH            .EQU    1               ; HIGH BLOCK ADDRESS
0000| 0000 0002           BLKM            .EQU    2               ; MID BLOCK ADDRESS
0000| 0000 0003           BLKL            .EQU    3               ; LOW BLOCK ADDRESS
0000| 0000 0004           RETRY           .EQU    4               ; RETRY COUNT
0000| 0000 0005           THRESH          .EQU    5               ; THRESHOLD COUNT
0000| 0001 FFEC           HDRBUFR         .EQU    $1FFEC          ;BUFFER FOR HEADER
0000| 0000 0004           FILEID          .EQU    4               ; OFFSET TO FILEID
0000| 0000 AAAA           BOOTPAT         .EQU    $AAAA           ;FILEID FOR BOOT PATTERN
0000| 0002 0000           DATABFR         .EQU    $20000          ;BUFFER FOR DATA
0000| 0000 0014           HDRSIZE         .EQU    20              ;HEADER LENGTH
```

```
0000| 0000 0200           BLKSIZE         .EQU    512             ;BLOCK SIZE
0000| 0120 0000           STRTIME         .EQU    $1200000        ;STARTUP TIMEOUT after power-up = about 3 minutes
0000| 0090 0000           RSTRTIME        .EQU    $900000         ;STARTUP TIMEOUT after reset = ABOUT 100 SECS
0000| 0018 0000           RDTIME          .EQU    $180000         ;READ TIMEOUT = ABOUT 16 SECS                   CHG037
0000| 0000 0500           BSYTIME         .EQU    $0500           ;Wait for busy high = about 10 ms
0000| 0000 FFFF           RSPTIME         .EQU    $FFFF           ;RESPONSE TIMEOUT = ABOUT 500 ms
0000| 0000 000A           RCNT            .EQU    10              ;BOOT RETRY COUNT
0000| 0000 0003           TCNT            .EQU    3               ;THRESHOLD COUNT FOR 30% SPARING
0000|
0000|                     ;  Equates for Profile boot error conditions
0000|                             .IF  NEWTWIG = 0
0000|                             .ELSE
0000| 0000 0050           NODSK           .EQU    80              ;DISK NOT ATTACHED
0000| 0000 0051           DSKBSY          .EQU    81              ;DISK NOT READY
0000| 0000 0052           BADRSP          .EQU    82              ;UNEXPECTED RESPONSE
0000| 0000 0053           STATNZ          .EQU    83              ;NONZERO STATUS BYTE
0000| 0000 0054           BADHDR          .EQU    84              ;INCORRECT HEADER
0000| 0000 0055           TMOUT           .EQU    85              ;TIMEOUT ERROR
0000|                             .ENDC
0000|
0000|                     ;-------------------------------------------------------------------------
0000|                     ;  Equates for I/O slot booting
0000|                     ;-------------------------------------------------------------------------
0000|
0000| 00FC 0001           SLOT1L          .EQU    $FC0001         ;I/O slot 1 SL address
0000| 00FC 4001           SLOT2L          .EQU    $FC4001         ;I/O slot 2 SL address
0000| 00FC 8001           SLOT3L          .EQU    $FC8001         ;I/O slot 3 SL address
0000| 0000 000E           STBIT           .EQU    14              ;status bit in id
0000| 0000 000D           ICBIT           .EQU    13              ;icon bit in id
0000| 0000 000C           TSTBIT          .EQU    12              ;test card bit in id
0000| 0002 0000           STENTRY         .EQU    $20000          ;entry point for status routine
0000| 0002 0002           BTENTRY         .EQU    $20002          ;boot routine entry point
0000| 0002 0004           ICONPTR         .EQU    $20004          ;pointer to icons, if any
0000| 0000 8001           APPLENET        .EQU    $8001           ;id for Applenet card
0000| 0000 9FFF           APPLQUAL        .EQU    $9FFF           ;qualifier for Applenet search
0000| 0000 1000           TSTCRD          .EQU    $1000           ;id for test card
0000| 0000 1800           TSTQUAL         .EQU    $1800           ;qualifier for test card search
0000|
0000|                     ;  Error codes for I/O slot booting
0000|
0000|                             .IF NEWTWIG = 0
0000|                             .ELSE
0000| 0000 005A           NOC             .EQU    90              ;no card installed
0000| 0000 005B           INV             .EQU    91              ;not bootable card
0000| 0000 005C           BADSM           .EQU    92              ;invalid checksum
0000| 0000 005D           BADST           .EQU    93              ;bad status returned
0000|                             .ENDC
```

```
0000|
0000|
0000|                           .PAGE
0000|                           .IF     BURNIN = 1
0000|                         ;--------------------------------------------------------------------------------
0000|                         ;  Special equates for burnin cylcing code
0000|                         ;--------------------------------------------------------------------------------
0000|
0000| 00FC C191               INITFLG         .EQU    $FCC191         ;first pass flag (01 = no)
0000| 00FC C193               HOURSAV         .EQU    $FCC193         ;save of last hour value from clock
0000| 00FC C195               LCNTHI          .EQU    $FCC195         ;loop count
0000| 00FC C197               LCNTLO          .EQU    $FCC197
0000| 00FC C199               TIMFLG          .EQU    $FCC199         ;flag to indicate hour save needed
0000| 00FC C19B               MINSAV          .EQU    $FCC19B         ;save of minute value for Twiggy test
0000| 00FC C19D               DSKCNTH         .EQU    $FCC19D         ;disk read error count - high byte
0000| 00FC C19F               DSKCNTL         .EQU    $FCC19F         ;disk read error count - low byte
0000| 00FC C1A1               CLKSAVE         .EQU    $FCC1A1         ;saved clock value
0000| 00FC C1B1               ALRMSAV         .EQU    $FCC1B1         ;saved alarm value last set
0000| 00FC C1C1               CYCLCNT         .EQU    $FCC1C1         ;count of minutes for power cycling
0000| 00FC C1C3               CYCLVAL         .EQU    $FCC1C3         ;# of mins between power cycles
0000| 00FC C1C5               MINCNT          .EQU    $FCC1C5         ;count of minutes for debug mode
0000| 00FC C1FF               ENDPM           .EQU    $FCC1FF         ;end of parameter memory
0000| 0000 0000               SET1            .EQU    $0              ;initial alarm/year/dd setting
0000| 1000 0000               SET2            .EQU    $10000000       ;d/hh/mm/ss/t setting
0000| 0000 01BC               HOUR            .EQU    $1BC            ;location of latest hour value read
0000| 0000 01BD               MINUTE          .EQU    $1BD            ;location of latest minute value read
0000| 00E0 F000               ONEHOUR         .EQU    $00E0F000       ;one hour setting for alarm
0000| 0003 C000               ONEMIN          .EQU    $0003C000       ;one minute setting for alarm
0000| 0000 9000               TENSECS         .EQU    $00009000       ;ten seconds
0000| 0010 0000               DLYTIME         .EQU    $100000         ;delay for screen display
0000|
0000|                           .ENDC
0000|
0000|                           .PAGE
0000|                         ;--------------------------------------------------------------------------------
0000|                         ;  Equates for Monitor code and screen handling
0000|                         ;--------------------------------------------------------------------------------
0000|
0000|                         ;  Ascii code equates
0000|
0000| 0000 003F               QUESTN          .EQU    $3F             ; ?
0000| 0000 000D               RET             .EQU    $0D             ; CR
0000| 0000 0008               BS              .EQU    $08             ; backspace
0000|
0000|                         ;  Keyboard code equates
0000|
0000| 0000 00F3               KEY4            .EQU    $F3             ;'4'
```

```
0000| 0000 00E4            KEY5            .EQU    $E4             ;'5'
0000| 0000 00E1            KEY6            .EQU    $E1             ;'6'
0000| 0000 00E2            KEY7            .EQU    $E2             ;'7'
0000| 0000 00E3            KEY8            .EQU    $E3             ;'8'
0000| 0000 00D0            KEY9            .EQU    $D0             ;'9'
0000| 0000 00F6            SKEY            .EQU    $F6             ;'S'
0000| 0000 00FF            CmdDwn          .EQU    CMDKEY          ;Command key down
0000| 0000 007F            CmdUp           .EQU    $7F             ;Command key up
0000| 0000 0006            MousUp          .EQU    $06             ;Mouse button up
0000|
0000|                      ;  Low memory usage
0000|
0000| 0000 02C0            KBDBFR          .EQU    $2C0            ;keyboard buffer start
0000| 0000 0300            KBDEND          .EQU    $300            ; and end (64 chars max)
0000|
0000|                              .IF  USERINT = 0
0000|                              .ELSE
0000| 0000 0300            CRTROW          .EQU    $300            ;display row ptr
0000| 0000 0302            CRTCOL          .EQU    $302            ;display col ptr
0000|                              .ENDC
0000| 0000 000C            MAXTEST         .EQU    12              ;max test # for LOOP option
0000|                              .IF  USERINT = 0
0000|                              .ELSE
0000|                      ;  Equates for new user interface code
0000|
0000| 0000 005A            ROWBYTES        .EQU    90              ;width of screen in bytes
0000| 0000 02D0            MaxX            .EQU    720             ;width in pixels
0000| 0000 016C            MaxY            .EQU    364             ;length in pixels
0000| 0000 05A0            MENULINE        .EQU    1440            ;bottom line loc for menu
0000| 0000 05FA            DESKLINE        .EQU    1530            ;top line loc for desktop
0000| 0000 7FF8            DESKLMT         .EQU    32760           ;bottom line loc for desktop
0000| AAAA 5555            DESKPATRN       .EQU    $AAAA5555       ;pattern for "grey" desktop
0000|
0000| 0000 0014            WROW            .EQU    20                      ;window row
0000| 0000 0002            WCOL            .EQU    2                       ;starting window col
0000| 0000 0056            WINDWIDTH       .EQU    86                      ;width of window in bytes
0000| 0000 0140            WINDHIGH        .EQU    320                     ;heigth of window in pixel lines
0000| 0000 00B4            WMIDROW         .EQU    <WINDHIGH/2>+WROW       ;middle row in window
0000| 0000 002D            WMIDCOL         .EQU    <WINDWIDTH/2>+WCOL      ;middle col in window
0000| 0000 0017            W14COL          .EQU    <WINDWIDTH/4>+WCOL      ;col 1/4 across window
0000| 0000 0041            W34COL          .EQU    <WINDWIDTH/4>*3+WCOL    ;col 3/4 across window
0000| 0000 070A            WINDSTRT        .EQU    <WROW*ROWBYTES>+WCOL    ;start of window
0000|
0000| 0000 0031            ALBOXROW        .EQU    49                          ;starting row for alert box
0000| 0000 0006            ALBOXCOL        .EQU    6                           ;starting col for alert box
0000| 0000 004E            ALRTWIDTH       .EQU    78                          ;width of alert box
0000| 0000 00A4            ALRTHIGH        .EQU    164                         ;heigth of alert box
```

```
0000| 0000 1140            ALRTSTRT        .EQU    <ALBOXROW*ROWBYTES>+ALBOXCOL ;upper left corner of alert box
0000| 0000 0083            MIDALROW        .EQU    ALBOXROW+<ALRTHIGH/2>        ;middle row of alert box
0000| 0000 002D            MIDALCOL        .EQU    ALBOXCOL+<ALRTWIDTH/2>       ;middle col of alert box
0000|
0000| 0000 000A            BTNWIDTH        .EQU    10                      ;width of button
0000| 0000 001C            BTNHIGH         .EQU    28                      ;heigth of button
0000| 0000 10E0            BTNSPC          .EQU    48*ROWBYTES             ;space between upper left corner of buttons
0000| 0000 0392            BTNMSPC         .EQU    <10*ROWBYTES>+BTNWIDTH+4 ;position of button label relative to button
0000| 0000 0045            BTNROW          .EQU    ALBOXROW+20             ;starting display row for buttons
0000| 0000 0034            BTNCOL          .EQU    52                      ;starting display col for buttons
0000| 0000 1876            BTN1STRT        .EQU    <BTNROW*ROWBYTES>+BTNCOL ;location of first button
0000| 0000 2956            BTN2STRT        .EQU    BTN1STRT+BTNSPC         ;location of second button
0000| 0000 3A36            BTN3STRT        .EQU    BTN2STRT+BTNSPC         ;location of third button
0000| 0000 1C08            BTN1MSG         .EQU    BTN1STRT+BTNMSPC        ;location of button descriptions
0000| 0000 2CE8            BTN2MSG         .EQU    BTN2STRT+BTNMSPC
0000| 0000 3DC8            BTN3MSG         .EQU    BTN3STRT+BTNMSPC
0000|
0000| 0000 05A2            MENUSTRT        .EQU    MENULINE+2      ;start of pull down menu
0000| 0000 000B            MENULEN         .EQU    11              ;length of menu per entry
0000| 0000 03DE            MENUSPC         .EQU    990             ;vertical space between menu entries
0000| 0000 0012            MENUWIDTH       .EQU    18              ;width of pull down menu
0000| 0000 0111            MENULOC         .EQU    273             ;start pt for menu heading
0000| 0000 0658            MENU1MSG        .EQU    MENUSTRT+182    ;location of first menu entry
0000| 0000 0010            MBARLEN         .EQU    16              ;heigth of menu bar
0000|
0000| 0000 0007            MITEMS          .EQU    7                           ;number of menu items
0000| 0000 20B4            MENUEND         .EQU    MENUSTRT+<MITEMS*MENUSPC>   ;bottom of menu
0000|
0000|                              .IF  BMENU = 1
0000| 0000 0012            BMENUWIDTH      .EQU    MENUWIDTH       ;width of pull down menu
0000| 0000 0022            BMENULEN        .EQU    34              ;length of each boot menu entry
0000| 0000 0BF4            BMENUSPC        .EQU    <BMENULEN*90>   ;vertical space between boot menu entries
0000|                              .ENDC
0000|
0000| 0000 0042            DBOXWIDTH       .EQU    84-MENUWIDTH                ;width of dialog box
0000| 0000 0014            DBOXHIGH        .EQU    20                          ;heigth of dialog box
0000| 0000 0168            DBOXTOP         .EQU    4*ROWBYTES                  ;dialog box spacing down from menu line
0000| 0000 0014            DBOXLEFT        .EQU    MENUWIDTH+2                 ;dialog box spacing left from menu
0000| 0000 071E            DBOXSTRT        .EQU    MENUSTRT+DBOXLEFT+DBOXTOP   ;start of dialog box
0000| 0000 0018            DBOXROW         .EQU    <DBOXSTRT/90>+4             ;pixel row for dialog msg
0000| 0000 0018            DBOXCOL         .EQU    MENUWIDTH+6                 ;byte col for dialog msg
0000|
0000| 0000 07BC            SVCTOP          .EQU    <DBOXHIGH+2>*ROWBYTES       ;service window spacing down
0000|                                                                          ; from top of dialog box
0000| 0000 0014            SVCLEFT         .EQU    MENUWIDTH+2                 ;service window spacing left from menu
0000| 0000 0EDA            SVCSTRT         .EQU    DBOXSTRT+SVCTOP             ;left corner for service window
0000| 0000 0042            SVCWIDTH        .EQU    84-MENUWIDTH                ;width of service window
```

```
0000| 0000 0140            SVCHIGH         .EQU    320                         ;length of service window
0000|
0000| 0000 003E            FIRSTROW        .EQU    <SVCSTRT/90>+20             ;first row for display of msgs
0000| 0000 0018            FIRSTCOL        .EQU    MENUWIDTH+6                 ;first column
0000| 0000 012C            ROWSLEFT        .EQU    SVCHIGH-20                  ;pixel rows to bottom of service window
0000| 0000 001B            CHARROWS        .EQU    <ROWSLEFT/10>-3             ;rows used for character display
0000| 0000 014C            LASTROW         .EQU    <CHARROWS*10>+FIRSTROW      ;last pixel row for display
0000| 0000 0058            LASTCOL         .EQU    FIRSTCOL+SVCWIDTH-2         ;last column
0000| 0000 000A            ROWLINES        .EQU    10                          ;pixel row lines per character
0000| 0000 0042            ROWLEN          .EQU    <LASTCOL-FIRSTCOL>|1+1      ;bytes per pixel row (must be even!)
0000| 0000 001B            NROWS           .EQU    <LASTROW-FIRSTROW>/ROWLINES ;number of character rows
0000| 0000 0008            CHRHIGH         .EQU    8                           ;character heigth in pixel lines
0000| 0000 0001            CHRWIDTH        .EQU    1                           ;width of char in bytes
0000| 0000 000A            CHRSPC          .EQU    CHRHIGH+2                   ;vert pixel lines between chars
0000|
0000| 0000 0006            ICONWIDTH       .EQU    6                       ;width in bytes of icons
0000| 0000 0020            ICONHIGH        .EQU    32                      ;heigth of icons in pixel rows
0000|
0000| 0000 0031            TSTROW          .EQU    ALBOXROW                ;starting row for test alert box
0000| 0000 000A            TSTCOL          .EQU    10                       ;starting col for test alert box
0000| 0000 1144            TSTWSTRT        .EQU    <TSTROW*ROWBYTES>+TSTCOL ;test alert box start
0000| 0000 0046            TSTWWIDTH       .EQU    70                       ;width for test alert box
0000| 0000 0054            TSTWHIGH        .EQU    84                      ;heigth for test alert box
0000| 0000 0040            TSTMROW         .EQU    TSTROW+15               ;row for test message display
0000| 0000 000E            TSTMCOL         .EQU    TSTCOL+4                ;col for test message display
0000| 0000 005B            MIDTSTROW       .EQU    TSTROW+<TSTWHIGH/2>     ;middle row of test box
0000| 0000 004B            CHKROW          .EQU    MIDTSTROW-<ICONHIGH/2>  ;row for check mark display
0000| 0000 0055            TSTIROW         .EQU    CHKROW+10               ;row for test icon display
0000| 0000 0014            TSTICOL         .EQU    TSTCOL+10               ;col for test icon display
0000| 0000 000E            TSTISPC         .EQU    ICONWIDTH+8             ;space between test icons
0000|
0000| 0000 1DF6            CPUSTRT         .EQU    <TSTIROW*ROWBYTES>+TSTICOL ;upper left corner for CPU icon
0000| 0000 1E04            MEMSTRT         .EQU    CPUSTRT+TSTISPC            ;upper left corner for MEM icon
0000| 0000 1E12            IOSTRT          .EQU    MEMSTRT+TSTISPC            ;upper left corner for I/O icon
0000| 0000 1E20            XCRDSTRT        .EQU    IOSTRT+TSTISPC             ;upper left corner for slot icon
0000|
0000| 0000 0073            ERRROW          .EQU    MIDALROW-<ICONHIGH/2>   ;row for error icon display
0000| 0000 0010            ERRCOL          .EQU    ALBOXCOL+10             ;col for error icon display
0000| 0000 287E            ERRSTRT         .EQU    <ERRROW*ROWBYTES>+ERRCOL ;start address for error icon display
0000| 0000 0073            ALRTROW         .EQU    ERRROW                  ;row for alert icon display
0000| 0000 0010            ALRTCOL         .EQU    ERRCOL                  ;col for alert icon display
0000| 0000 0097            CODEROW         .EQU    ERRROW+36               ;row for error code display
0000| 0000 0012            CODECOL         .EQU    ERRCOL+2                ;col for error code display
0000| 0000 007E            MSGROW          .EQU    ALRTROW+11              ;row for alert/error message display
0000| 0000 0018            MSGCOL          .EQU    ALRTCOL+8               ;col for alert/error message display
0000| 0000 0010            MEMROW          .EQU    16                      ;offset row for memory board id # display
0000| 0000 0004            MEMCOL          .EQU    4                       ;offset col for memory board id # display
```

```
0000| 0000 0012            DISKROW         .EQU    18                      ;offset row for diskette id # display
0000| 0000 0004            DISKCOL         .EQU    4                       ;offset col for diskette id # display    CHG024
0000| 0000 0016            SLOTROW         .EQU    22                      ;offset row for slot card id # display
0000| 0000 0003            SLOTCOL         .EQU    3                       ;offset col for slot card id # display
0000| 0000 0006            DRVROW          .EQU    6                       ;offset row for drive id # display       CHG009
0000| 0000 0003            DRVCOL          .EQU    3                       ;offset col for drive id # display       CHG009
0000| 0000 0005            INSRTROW        .EQU    5                       ;offset row for insert rqst id # display CHG009/CHG024
0000| 0000 0004            INSRTCOL        .EQU    4                       ;offset col for insert rqst id # display CHG009
0000|
0000|
0000| 0000 00A4            DEFROW          .EQU    WMIDROW-<ICONHIGH/2>      ;row for default boot icon display
0000| 0000 003E            DEFCOL          .EQU    W34COL-<ICONWIDTH/2>      ;col for default boot icon display
0000| 0000 39E6            DEFSTRT         .EQU    <DEFROW*ROWBYTES>+DEFCOL  ;start address for default boot icon
0000| 0000 0014            ALTCOL          .EQU    W14COL-<ICONWIDTH/2>      ;col for alternate boot icon display
0000| 0000 1B72            COL1STRT        .EQU    <78*ROWBYTES>+6           ;start for first column of boot icons
0000| 0000 1B7E            COL2STRT        .EQU    COL1STRT+12               ;start for second col of boot icons
0000| 0000 39BC            COL2MID         .EQU    <DEFROW*ROWBYTES>+ALTCOL  ;middle of second col
0000| 0000 1B8A            COL3STRT        .EQU    COL2STRT+12               ;start for third col of boot icons
0000| 0000 1680            ICONCSPC        .EQU    <64*ROWBYTES>             ;space between left corner of icons in col
0000| 0000 0440            ICONMSPC        .EQU    <12*ROWBYTES>+6+2         ;start addr offset for boot icon alternate keycode
0000| 0000 000C            ICONRSPC        .EQU    12                        ;space in between cols in same row
0000|
0000| 0000 0445            ALTKYADDR       .EQU    ICONMSPC+5      ;address offset for display of alternate keycode in menu bar
0000|
0000| 0000 0056            PCWIDTH         .EQU    86              ;width of window for power cycling msgs
0000| 0000 00C0            PCHIGH          .EQU    192             ;height of window
0000| 0000 070A            PCSTRT          .EQU    WINDSTRT        ;upper left corner of window
0000| 0000 0059            PCROW           .EQU    ALBOXROW+40     ;first row for power cycle msgs
0000| 0000 000C            PCCOL           .EQU    ALBOXCOL+6      ;first col for power cycle msgs
0000|
0000| 0000 0003            ROMIDROW        .EQU    3               ;cursor row ptr for ROM id display              CHG001
0000| 0000 0050            ROMIDCOL        .EQU    80              ;cursor col ptr for ROM id display              CHG001
0000|
0000|                              .IF  DEBUG = 0
0000| 0000 0480            GLOBALS         .EQU    STKBASE         ;start of global area for mouse/cursor
0000|                              .ELSE
0000|                              .ENDC
0000|
0000| 0000 0480            ClockBytes      .EQU    Globals         ;clock data save area
0000| 0000 0486            MousX           .EQU    ClockBytes+6    ;mouse X-coordinate (word)
0000| 0000 0488            MousY           .EQU    MousX+2         ;mouse Y-coordinate (word)
0000| 0000 048A            MousDx          .EQU    MousY+2         ;mouse delta-x (byte)
0000| 0000 048B            MousDy          .EQU    MousDx+1        ;mouse delta-y (byte)
0000| 0000 048C            MousScaling     .EQU    MousDy+1        ;0=disabled, else=enabled (byte)
0000| 0000 048E            MousThresh      .EQU    MousScale|1+1   ;mouse movement threshold (word)
0000|
0000| 0000 0490            CrsrHotx        .EQU    MousThresh+2    ;hotspot X-coordinate (word)
```

```
0000| 0000 0492            CrsrHoty        .EQU    CrsrHotX+2      ;hotspot Y-coordinate (word)
0000| 0000 0494            CrsrHeight      .EQU    CrsrHotY+2      ;cursor height, 0-32 (word)
0000| 0000 0496            CrsrX           .EQU    CrsrHeight+2    ;cursor X-coordinate (word)
0000| 0000 0498            CrsrY           .EQU    CrsrX+2         ;cursor Y-coordinate (word)
0000| 0000 049A            CrsrTracking    .EQU    CrsrY+2         ;0=disabled, else=enabled (byte)
0000| 0000 049B            CrsrBusy        .EQU    CrsrTracking+1  ;0=not busy, else=busy (byte)
0000| 0000 049C            CrsrVisible     .EQU    CrsrBusy+1      ;0=not visible, else=visible (byte)
0000| 0000 049E            CrsrHidden      .EQU    CrsrVisible|1+1 ;<=0 implies hiddden (word)
0000| 0000 04A0            CrsrObscured    .EQU    CrsrHidden+2    ;0=not obscured, else=obscured (byte)
0000|
0000| 0000 04A2            SavedData       .EQU    CrsrObscured+2  ;data from under cursor (128 bytes)
0000| 0000 0522            SavedX          .EQU    SavedData+128   ;saved data X-coordinate (word)
0000| 0000 0524            SavedY          .EQU    SavedX+2        ;saved data Y-coordinate (word)
0000| 0000 0526            SavedRows       .EQU    SavedY+2        ;rows of saved data (word)
0000| 0000 0528            SavedAddr       .EQU    SavedRows+2     ;saved data screen address (long)
0000|
0000| 0000 052C            LwrRight        .EQU    SavedAddr+4     ;saved lower right corner address (word)
0000| 0000 052E            MsgLen          .EQU    LwrRight+2      ;length of dialog box msg (word)
0000|
0000|                              .IF  BMENU = 0
0000|                              .ELSE
0000| 0000 0530            MenuBase        .EQU    Msglen+2        ;address of last boot menu "box" (word)
0000| 0000 0532            IconAddr        .EQU    MenuBase+2      ;address for last boot icon displayed (word)
0000|                              .ENDC
0000|
0000| 0000 0534            IconCnt         .EQU    IconAddr+2      ;count of boot icons displayed (byte)
0000|
0000| 0000 0535            DRIVE           .EQU    IconCnt+1       ;drive id for dump/verify options (byte)
0000| 0000 0536            BLKNUM          .EQU    DRIVE+1         ;block # for dump option (word)
0000| 0000 0538            CONTXT          .EQU    BLKNUM+2        ;context for dump of MMU contents (byte)
0000|
0000| 0000 053A            RectCnt         .EQU    CONTXT+2        ;count for active rect table (word)
0000| 0000 053A            RectTable       .EQU    RectCnt         ;active rectangle table (same start)
0000|
0000|                              .ENDC
0000|                              .PAGE
0000|                        ;---------------------------------------------------------------------------
0000|                        ; The following memory locations are reserved for ROM use to save test data
0000|                        ;---------------------------------------------------------------------------
0000|
0000| 0000 0180            STATUS          .EQU    $0180           ;POWER-UP STATUS (0=OK)
0000| 0000 0184            SIZRSLT         .EQU    STATUS+4        ;memory sizing test results
0000| 0000 0186            MEMRSLT         .EQU    SIZRSLT+2       ;MEMORY TEST RESULTS
0000| 0000 0188            BOOTMEM         .EQU    MEMRSLT+2       ;result for boot area of memory (128K)
0000| 0000 01A6            PEADDR          .EQU    MEMRSLT+32      ;PARITY ERROR ADDRESS
0000| 0000 01AA            ADRLTCH         .EQU    PEADDR+4        ;CONTENTS OF MEMORY ADDRESS LATCH
0000| 0000 01AC            D7SAV           .EQU    ADRLTCH+2       ;save for D7 when exception occurs
```

```
0000| 0000 01B0            MMURSLT         .EQU    $01B0           ;MMU TEST RESULTS
0000| 0000 01B2            KEYID           .EQU    $01B2           ;Keyboard ID
0000| 0000 01B3            BOOTDVCE        .EQU    $01B3           ;BOOT DEVICE CODE
0000| 0000 01B4            BOOTDATA        .EQU    $01B4           ;BOOT FAILURE DATA
0000| 0000 01BA            CLKDATA         .EQU    $01BA           ;CLOCK SETTING READ
0000| 0000 01C0            DATARGS         .EQU    $01C0           ;DATA REG SAVE AREA
0000| 0000 01E0            ADRREGS         .EQU    $01E0           ;ADDRESS REG SAVE AREA
0000| 0000 01F8            A6SAV           .EQU    $01F8           ;SAVE AREA FOR REG A6
0000| 0000 01FC            USPSAV          .EQU    $01FC           ;SAVE AREA FOR USER STACK PTR
0000|
0000| 0000 0240            SERNUM          .EQU    $0240           ;saved serial number (28 bytes)
0000| 0000 0260            KBDQPTR         .EQU    $0260           ;ptr for keyboard queue
0000|
0000| 0000 0268            XPCTADDR        .EQU    $0268           ;memory test address for parity error          CHG015
0000| 0000 026C            XPCTDATA        .EQU    $026C           ;memory test expected data                     CHG015
0000| 0000 0270            ACTADDR         .EQU    $0270           ;parity error address, phase 2                 CHG015
0000| 0000 0274            ACTDATA         .EQU    $0274           ;actual data read on parity error, phase 2     CHG015
0000| 0000 0278            PEADR2          .EQU    $0278           ;address read from error latch                 CHG015
0000| 0000 027C            PCHPROW         .EQU    $027C           ;parity chip row                               CHG015
0000| 0000 027D            PCHIP           .EQU    $027D           ;parity chip id                                CHG015
0000|
0000| 0000 0280            EXCFC           .EQU    $0280           ; bus function code
0000| 0000 0282            EXCADR          .EQU    $0282           ; address of error
0000| 0000 0286            EXCIR           .EQU    $0286           ; instruction reg
0000| 0000 0288            EXCSR           .EQU    $0288           ; status reg
0000| 0000 028A            EXCPC           .EQU    $028A           ; PC at time of exception
0000| 0000 028E            EXCTYPE         .EQU    $028E           ; exception type
0000| 0000 0290            SUPSTK          .EQU    $0290           ;SUPERVISOR STACK PTR
0000| 0000 0294            MAXMEM          .EQU    $0294           ;MAX MEMORY ADDRESS + 1
0000| 0000 0298            IO1ID           .EQU    $0298           ;I/O SLOT 1 ID
0000| 0000 029A            IO2ID           .EQU    $029A           ;I/O SLOT 2 ID
0000| 0000 029C            IO3ID           .EQU    $029C           ;I/O SLOT 3 ID
0000| 0000 029E            IO1STAT         .EQU    $029E           ;I/O SLOT 1 STATUS
0000| 0000 029F            IO2STAT         .EQU    $029F           ;I/O SLOT 2 STATUS
0000| 0000 02A0            IO3STAT         .EQU    $02A0           ;I/O SLOT 3 STATUS
0000| 0000 02A1            IOROM           .EQU    $02A1           ;I/O ROM VERSION #
0000| 0000 02A2            STATFLGS        .EQU    $02A2           ;additional status indicators
0000| 0000 02A4            MINMEM          .EQU    $02A4           ;MINIMUM PHYSICAL ADDRESS
0000| 0000 02A8            TOTLMEM         .EQU    $02A8           ;total amount of memory
0000| 0000 02AC            SCCRSLT         .EQU    $02AC           ;SCC test results
0000| 0000 02AD            MEMSLOT         .EQU    $02AD           ;Slot # for memory board if memory error
0000| 0000 02AE            DSKRSLT         .EQU    $02AE           ;Disk controller self-test status byte (0=no error)
0000| 0000 02AF            SYSTYPE         .EQU    $02AF           ;System type (0 = Lisa 1; 1, 2, 3 = Lisa 2)       CHG029
0000| 0000 02B0            KBDQ            .EQU    $02B0           ;KEYBOARD QUEUE
0000| 0000 02C0            QEND            .EQU    $02C0           ;END OF Q
0000|
0000|                              .INCLUDE RM248.K.TEXT
```

```
0000|
0000|                           .IF     EXTERNAL = 1
0000|                           .ENDC
0000|
0000|                           .PAGE
0000|                   ;        .ABSOLUTE               ;makes listing look nicer
0000|                           .PROC   LISAROM,0
0000|
0000|                           .ORG    0               ; ORG'ED AT 0 BUT RUNS AT $00FE0000
0000|
0000|                   ;  Reset vectors here to pick up SP and PC values
0000|
0000|                   BASE
0000| 0000                      .WORD   $0000           ;initial SP
0002| 0480                      .WORD   STKBASE
0004|
0004| 00FE                      .WORD   ROMSLCT         ;initial PC (assumes use of MMU reg 127)
0006| 00F6                      .WORD   BEGIN
0008|
0008|                   ;  Set up next locations for exception vectors
0008|
0008| 00FE              BUSVCT  .WORD   ROMSLCT           ; BUS ERROR VECTOR
000A| 0030                      .WORD   EXCPERR
000C| 00FE              ADRVCT  .WORD   ROMSLCT           ; ADDRESS ERROR
000E| 0030                      .WORD   EXCPERR
0010| 00FE              ILLVCT  .WORD   ROMSLCT           ; ILLEGAL INSTRUCTION
0012| 0030                      .WORD   EXCPERR
0014| 00FE              DIV0VCT .WORD   ROMSLCT           ; DIVIDE BY ZERO ERROR
0016| 0030                      .WORD   EXCPERR
0018| 00FE              CHKVCT  .WORD   ROMSLCT           ; CHK INSTRUCTION
001A| 0030                      .WORD   EXCPERR
001C| 00FE              TRAPVCT .WORD   ROMSLCT           ; TRAPV INSTRUCTION
001E| 0030                      .WORD   EXCPERR
0020| 00FE              PRIVCT  .WORD   ROMSLCT           ; PRIVILEGE VIOLATION
0022| 0030                      .WORD   EXCPERR
0024| 00FE              TRCVCT  .WORD   ROMSLCT           ; TRACE OPERATION
0026| 0030                      .WORD   EXCPERR
0028| 00FE              L10VCT  .WORD   ROMSLCT           ; OPCODE 1010 DETECTED
002A| 0030                      .WORD   EXCPERR
002C| 00FE              L11VCT  .WORD   ROMSLCT           ; OPCODE 1111 DETECTED
002E| 0030                      .WORD   EXCPERR
0030|
0030|                   ;-----------------------------------------------------------------
0030|                   ;  Exception and interrupt vector handler for ROM - resets SP and
0030|                   ;  tries a restart
0030|                   ;-----------------------------------------------------------------
0030|
```

```
0030| 3E7C 0480            EXCPERR MOVEA   #STKBASE,SP     ;reset stack ptr
0034| 4287                        CLR.L   D7              ;clear error indicator                  CHG004
0036| 6000 015C                  BRA     ROMTST          ;and restart diags                      CHG004
003A|
003A|                             .PAGE
003A|
003A|                       ;---------------------------------------------------------------------
003A|                       ;  Subroutine for saving registers and stack pointers
003A|                       ;---------------------------------------------------------------------
003A|                       SAVEREGS
003A| 21CF 0290                  MOVE.L  SP,SUPSTK       ;save sup stack ptr
003E|                       SAVEREG2
003E| 21CE 01F8                  MOVE.L  A6,A6SAV        ;save other regs (that aren't reset)
0042| 4E6E                        MOVE.L  USP,A6
0044| 21CE 01FC                  MOVE.L  A6,USPSAV
0048| 3C7C 01F8                  MOVE    #A6SAV,A6       ;set ptr for saving regs
004C| 48E6 FFFC                  MOVEM.L D0-D7/A0-A5,-(A6)
0050| 4E75                        RTS
0052|
0052|                       ;  use spare bytes for message
0052|
0052| 53 45 52 56 49 43 45 SVCMSG  .ASCII  'SERVICE MODE'  ;                                      RM000
0059| 20 4D 4F 44 45
005E| 00                          .BYTE   0               ;                                       RM000
005F|
005F| 00                          .ORG    $60
0060|
0060|                       ;  The next set of vectors cover spurious and autovector interrupts
0060|
0060| 00FE                 SPURVCT .WORD   ROMSLCT           ; SPURIOUS INTERRUPT
0062| 0030                        .WORD   EXCPERR
0064| 00FE                 LVL1VCT .WORD   ROMSLCT           ; INTERNAL I/O INTERRUPTS (DISK,VERT TRACE,ETC.)
0066| 0030                        .WORD   EXCPERR
0068| 00FE                 LVL2VCT .WORD   ROMSLCT           ; KEYBOARD INTERRUPT
006A| 0030                        .WORD   EXCPERR
006C| 00FE                 LVL3VCT .WORD   ROMSLCT           ; I/O SLOT 2 INTERRUPT
006E| 0030                        .WORD   EXCPERR
0070| 00FE                 LVL4VCT .WORD   ROMSLCT           ; I/O SLOT 1
0072| 0030                        .WORD   EXCPERR
0074| 00FE                 LVL5VCT .WORD   ROMSLCT           ; I/O SLOT 0
0076| 0030                        .WORD   EXCPERR
0078| 00FE                 LVL6VCT .WORD   ROMSLCT           ; RS-232
007A| 0030                        .WORD   EXCPERR
007C| 00FE                 LVL7VCT .WORD   ROMSLCT           ; NMI
007E| 00CA                        .WORD   NMIEXCP           ;                                     RM010
0080|
0080|                             .IF     EXTERNAL = 1
```

```
0080|                           .ENDC
0080|
0080|                           .PAGE
0080|                           .ORG    $80
0080|                       ;---------------------------------------------------------------------------
0080|                       ;  Jump Table for calling by external routines
0080|                       ;---------------------------------------------------------------------------
0080|
0080|                       JMPTBL
0080| 4EFA 25D0                     JMP     DORESET         ;go to restart point                    RM000
0084| 4EFA 24AE                     JMP     INITMON         ;jump to ROM Monitor
0088|
0088|                           .IF  USERINT = 0
0088|                           .ELSE
0088| 4EFA 3664                     JMP     CONVRTD5        ;convert row ptr and display message
008C|                           .ENDC
008C|
008C| 4EFA 052C                     JMP     WRTMMU          ;write to set of MMU registers
0090| 4EFA 1EDE                     JMP     PROREAD         ;Profile read a block routine
0094| 4EFA 1CE0                     JMP     TWGREAD         ;Twiggy read a sector routine
0098|
0098|                           .IF  DIAGS = 1
0098| 4EFA 0E16                     JMP     RAMTEST         ;basic memory test
009C| 4E71                          NOP                     ;                                       CHG015
009E| 4E75                          RTS                     ;                                       CHG015
00A0| 4E71                          NOP                     ;                                       CHG015
00A2| 4E75                          RTS                     ;                                       CHG015
00A4|                           .ENDC
00A4|
00A4| 4EFA 052A                     JMP     READMMU         ;read MMU registers
00A8| 4EFA 08AC                     JMP     COPSCMD         ;Send COPS command
00AC|
00AC|                           .IF  DIAGS = 1
00AC| 4EFA 11F2                     JMP     READCLK         ;Read clock setting
00B0|                           .ELSE
00B0|                           .ENDC
00B0|
00B0| 4EFA 157E                     JMP     DSPDEC          ;display hex error code in decimal
00B4| 4EFA 074C                     JMP     CONSET2         ;for setting contrast
00B8| 4EFA 0A3C                     JMP     TONE            ;to beep speaker
00BC| 4EFA 17CE                     JMP     VFYCHKSM        ;verify checksum
00C0|
00C0|                           .IF  ROM4K = 0
00C0| 4EFA 17BC                     JMP     WRTSUM          ;rewrite parameter memory               CHG017
00C4| 4EFA 0B30                     JMP     RDSERN          ;go read system serial #
00C8|                           .ENDC
00C8|
```

```
00C8|                       ;******************** Loop point for ROM test failure ********************************
00C8| 60FE                  SPIN    BRA.S   SPIN            ;hang system                                    CHG007
00CA|
00CA|                       ;*******************************************************************************************
00CA|
00CA|                               .IF     EXTERNAL = 1
00CA|                               .ENDC
00CA|
00CA|                       ;-------------------------------------------------------------------------
00CA|                       ;  NMI Exception Handler                                                    RM010
00CA|                       ;-------------------------------------------------------------------------
00CA|
00CA| 4239 00FC E012        NMIEXCP CLR.B   SETUP           ;enable memory access                       RM010
00D0| 0839 0001 00FC F801           BTST    #1,STATREG      ;parity error?                              RM010
00D8| 6614                          BNE.S   @1              ;skip if not to ignore                      RM010
00DA| 31F9 00FC F000 01AA          MOVE    MEALTCH,ADRLTCH ;save address if yes                        RM010
00E2| 4A39 00FC E01C               TST.B   PAROFF          ;and toggle to clear error bit              RM010
00E8| 4A39 00FC E01E               TST.B   PARON           ;                                           RM010
00EE| 4A39 00FC E010        @1      TST.B   SETUPON         ;return to SETUP state                      RM010
00F4| 4E73                          RTE                     ;                                           RM010
00F6|
00F6|                               .PAGE
00F6|                       ;-------------------------------------------------------------------------
00F6|                       ;  First do "warm-start" no reset check - scan I/O MMU regs to see if set up
00F6|                       ;-------------------------------------------------------------------------
00F6|
00F6|                       BEGIN
00F6|                               .IF     NORESET = 1
00F6| 3039 00FC 8000                MOVE    MMU126L,D0      ;check reg 126 for special I/O space
00FC| 0240 0FFF                     ANDI    #$0FFF,D0       ;ignore don't care bits
0100| 0C40 0901                    CMPI    #IOLMT2,D0      ;for no reset, 126L = $x901  (x = random value)
0104| 664C                          BNE.S   BEGIN2          ;skip if not set up
0106| 0279 0FFF 00FC 8008           ANDI    #$0FFF,MMU126B  ;else also check 126B = $x000
010E| 6642                          BNE.S   BEGIN2
0110|
0110|                       ;  Check OK - set MMU for ROM access and change SETUP before vectoring
0110|
0110| 33FC 0700 0000 8000           MOVE    #MEMLMT,MMU0L   ;set low memory for r/w (to save regs,etc.)
0118| 33FC 0901 00FC 8000           MOVE    #IOLMT2,MMU126L ;set for I/O space access (reset value)
0120| 33FC 0F00 00FE 8000           MOVE    #SPLMT,MMU127L  ;set access for ROM space
0128| 4279 00FE 8008                MOVE    #0,MMU127B
012E| 4239 00FC E012                CLR.B   SETUP           ;enable memory access
0134|
0134| 21CF 0290                     MOVE.L  SP,SUPSTK       ;save supervisor stack ptr
0138| 3E7C 0480                     MOVEA   #STKBASE,SP     ;move stack pointer for ROM use
013C| 6100 FF00                     BSR.S   SAVEREG2        ;save other registers
0140|
```

```
0140|                        ;  Restore ROM Monitor environment
0140|
0140|                                BSR4    CONSET          ;go set default contrast
0140| 49FA 0006              #         LEA     @1,A4
0144| 6000 06B4              #         BRA     CONSET
0148|                        #@1
0148| 95CA                            SUBA.L  A2,A2           ;set for no icons
014A| 4280                            CLR.L   D0              ; error codes
014C| 97CB                            SUBA.L  A3,A3           ;  or messages
014E| 6000 23F4                        BRA     INIT1           ;exit directly to monitor (avoid resaving regs)
0152|
0152|                                .ENDC
0152|
0152|                        ;-------------------------------------------------------------------------
0152|                        ;  Do second warm-start check to see if contrast should be reset
0152|                        ;-------------------------------------------------------------------------
0152|
0152| 4287                   BEGIN2  CLR.L   D7              ;clear for error use
0154| 3039 00FE 8000                 MOVE    MMU127L,D0      ;check reg 127 for ROM space
015A| 0240 0FFF                      ANDI    #$0FFF,D0       ;ignore don't care bits
015E| 0C40 0F00                      CMPI    #SPLMT,D0       ;expect 127L = $xF00  (x = random value)
0162| 6630                          BNE.S   ROMTST          ;skip if not
0164| 0279 0FFF 00FE 8008            ANDI    #$0FFF,MMU127B  ;else check if 127B = $x000
016C| 6626                          BNE.S   ROMTST
016E|
016E|                        ;  Check OK - set MMU for I/O and ROM access and go set contrast
016E|
016E| 08C7 001E                      BSET    #WRMSTRT,D7     ;set warm start indicator
0172| 7000                          MOVEQ   #0,D0           ;clear for use
0174| 33FC 0900 00FC 8000            MOVE    #IOLMT,MMU126L  ;set access for I/O space
017C| 33C0 00FC 8008                MOVE    D0,MMU126B
0182| 33FC 0F00 00FE 8000            MOVE    #SPLMT,MMU127L  ;set access for ROM space
018A|
018A| 4E70                   BEGIN3  RESET                   ;ensure clean I/O state for "warm-start"
018C|
018C|                                .IF  NEWLISA = 1
018C|                                BSR4    CONOFF          ;and go disable contrast
018C| 49FA 0006              #         LEA     @1,A4
0190| 6000 066E              #         BRA     CONOFF
0194|                        #@1
0194|                                .ELSE
0194|                                .ENDC
0194|
0194|
0194|                                .PAGE
0194|                        ;-------------------------------------------------------------------------
0194|                        ;  Start diagnostics - do ROM checksum test first; expected result = 0
```

```
0194|                       ;-----------------------------------------------------------------------
0194|
0194|                       ROMTST
0194|                               .IF  DIAGS = 1
0194|
0194| 4280                          CLR.L   D0              ;clear for checksum use
0196| 41FA FE68                     LEA     BASE,A0         ;init ROM address ptrs
019A| 43FA 3E62                     LEA     LAST,A1
019E| D058                  DOSUM   ADD     (A0)+,D0        ;read location and add to sum
01A0| E358                          ROL     #1,D0           ;rotate to catch multiple bit errors
01A2| B3C8                          CMPA.L  A0,A1           ;loop until done
01A4| 66F8                          BNE.S   DOSUM
01A6| D058                          ADD     (A0)+,D0        ;add checksum word
01A8| 6600 FF1E                     BNE     SPIN            ;loop if error                          CHG007
01AC| 4A87                          TST.L   D7              ;in loop mode?
01AE| 6BE4                          BMI.S   ROMTST          ;restart test if yes
01B0|
01B0|                               .ENDC
01B0|                               .PAGE
01B0|                       ;-----------------------------------------------------------------------------
01B0|                       ;  Next do read/write and address test of MMU supervisor regs
01B0|                       ;  Register Usage (by this routine and/or its subroutines):
01B0|                       ;       A0 = MMU reg pointer            D0 = test pattern
01B0|                       ;       A1 = last MMU limit reg addr    D1 = contents read from MMU reg
01B0|                       ;       A2 = MMU address increment      D2 = OR mask of results
01B0|                       ;       A3 = last MMU base reg addr     D3 = pattern expected at last error
01B0|                       ;       A4 = used for return address    D4 = final value for MMU reg
01B0|                       ;       A5 = MMU address of last error  D5 = unused
01B0|                       ;       A6 = used for return address    D6 = unused
01B0|                       ;       A7 = stack pointer              D7 = error indicator (0 = R/W error)
01B0|                       ;-----------------------------------------------------------------------------
01B0|
01B0|                       MMUTST
01B0|                               .IF     DIAGS = 1
01B0|                               BSR4    MMUINIT         ;initialize test variables
01B0| 49FA 0006             #         LEA     @1,A4
01B4| 6000 0060             #         BRA     MMUINIT
01B8|                       #@1
01B8|                               BSR6    MMURW           ;and go do read/write test
01B8| 4DFA 0006             #         LEA     @1,A6
01BC| 6000 006C             #         BRA     MMURW
01C0|                       #@1
01C0| 6616                          BNE.S   MMUERR          ;abort if error
01C2|
01C2|                               BSRS4   MMUINIT         ;reinitialize
01C2| 49FA 0004             #         LEA     @1,A4
01C6| 604E                 #         BRA.S   MMUINIT
```

```
01C8|                       #@1
01C8|                               BSR6    MMUACHK         ;and do address test
01C8| 4DFA 0006              #          LEA      @1,A6
01CC| 6000 00A2              #          BRA      MMUACHK
01D0|                       #@1
01D0| 6604                          BNE.S   @2              ;skip if error
01D2| 6000 00F2                      BRA     SETMMU          ;else go do initial MMU setup
01D6| 4647                   @2     NOT     D7              ;set address error indicator
01D8|
01D8|                               .PAGE
01D8|                        ;--------------------------------------------------------------------------
01D8|                        ;  The following code is used to toggle every address and data line
01D8|                        ;  going to the MMU if an error in the MMU context 0 tests is found.
01D8|                        ;  Reset signals indicate read/write or addressing error.
01D8|                        ;--------------------------------------------------------------------------
01D8|
01D8| 4A47                   MMUERR  TST     D7              ;check error type
01DA| 6702                           BEQ.S   @2
01DC| 4E70                           RESET                   ;two reset signals for address error
01DE| 4E70                   @2      RESET                   ;only one for R/W error
01E0|
01E0|                        ;  Toggle every data and address bit
01E0|
01E0| 207C 0002 8000         MMULP   MOVE.L  #$00028000,A0   ;set MMU limit reg start address
01E6| 7201                           MOVEQ   #1,D1           ;and starting data pattern
01E8| 7407                           MOVEQ   #7,D2           ;and loop count
01EA|                                BSRS4   TSTLOOP         ;go toggle for limit regs
01EA| 49FA 0004              #          LEA      @1,A4
01EE| 6010                  #          BRA.S    TSTLOOP
01F0|                       #@1
01F0| 207C 0002 8008                   MOVE.L  #$00028008,A0   ;set MMU base reg start address
01F6| 7405                           MOVEQ   #5,D2           ;and loop count
01F8|                                BSRS4   TSTLOOP         ;go test base regs
01F8| 49FA 0004              #          LEA      @1,A4
01FC| 6002                  #          BRA.S    TSTLOOP
01FE|                       #@1
01FE|
01FE| 60D8                           BRA.S   MMUERR          ;and loop indefinitely
0200|                        ;  Subroutine to do reg testing
0200|
0200| 2008                   TSTLOOP MOVE.L  A0,D0           ;save starting address
0202| 3081                   REGTST  MOVE    D1,(A0)         ;do write
0204| 3610                           MOVE    (A0),D3         ;then read
0206| E349                           LSL     #1,D1           ;update pattern
0208| 4840                           SWAP    D0              ;get address
020A| E348                           LSL     #1,D0           ;update and restore
020C| 4840                           SWAP    D0
```

```
020E| 2040                        MOVE.L  D0,A0
0210| 5342                        SUBQ    #1,D2           ;loop until done
0212| 66EE                        BNE.S   REGTST
0214|                             RTS4                    ;exit
0214| 4ED4                #         JMP     (A4)
0216|
0216|                             .PAGE
0216|                      ;--------------------------------------------------------------------------
0216|                      ;  Subroutine to do initial setup for MMU testing
0216|                      ;--------------------------------------------------------------------------
0216|
0216| 303C A55A            MMUINIT MOVE    #PATRN2,D0      ;set test pattern
021A| 7200                        MOVEQ   #0,D1           ;clear for result/error use
021C| 7400                        MOVEQ   #0,D2           ; use MOVEQ for speed
021E| 247C 0002 0000              MOVE.L  #ADR128K,A2     ;set up increment value
0224| 007C 0710                  ORI     #$0710,SR       ;set extend bit and disable interrupts
0228|                             RTS4
0228| 4ED4                #         JMP     (A4)
022A|
022A|                             .PAGE
022A|                      ;--------------------------------------------------------------------------
022A|                      ;  Subroutine to do MMU Read/Write Test for all registers in one context.
022A|                      ;  Zero bit set in CCR if no errors.
022A|                      ;--------------------------------------------------------------------------
022A|
022A| 207C 0000 8000       MMURW   MOVE.L  #MMUSADRL,A0    ;SET MMU LIMIT START ADDR
0230| 227C 00FE 8000              MOVE.L  #MMUEADRL,A1    ;SET MMU LIMIT END ADDR
0236| 267C 00FE 8008              MOVE.L  #MMUEADRB,A3    ;SET MMU BASE END ADDR
023C|
023C|                      RWCHK1  BSR4    CHKRW           ;GO DO READ/WRITE CHECK
023C| 49FA 0006           #         LEA     @1,A4
0240| 6000 0072           #         BRA     CHKRW
0244|                      #@1
0244| 4640                        NOT     D0              ;INVERT FOR NEXT PASS
0246|                             BSRS4   CHKRW           ;GO DO AGAIN
0246| 49FA 0004           #         LEA     @1,A4
024A| 6068                #         BRA.S   CHKRW
024C| 4640                 RWCHK2  NOT     D0              ;INVERT BACK TO ORIGINAL PATTERN
024E|                             BSRS4   CHKRW           ;ONE MORE TIME
024E| 49FA 0004           #         LEA     @1,A4
0252| 6060                #         BRA.S   CHKRW
0254|                      #@1
0254| E350                 RWCHK3  ROXL    #1,D0           ;SET UP NEW PATTERN
0256| B3C8                        CMPA.L  A0,A1           ;CHECK IF DONE
0258| 6704                        BEQ.S   CHKBASE         ;IF YES GO CHECK FOR BASE REG TESTING
025A| D1CA                        ADDA.L  A2,A0           ;ELSE BUMP MMU ADDR
025C| 60DE                        BRA.S   RWCHK1
```

```
025E|
025E| B7C8                CHKBASE CMPA.L  A0,A3           ;DONE WITH BASE?
0260| 670A                        BEQ.S   @2              ;EXIT IF YES
0262| 207C 0000 8008              MOVE.L  #MMUSADRB,A0    ;ELSE SET STARTING BASE ADDRESS
0268| 224B                        MOVEA.L A3,A1           ; AND ENDING ADDRESS
026A| 60D0                        BRA.S   RWCHK1          ;GO CHECK BASE REGS
026C|
026C| 4A42                @2      TST     D2              ;check for errors
026E|                           RTS6                    ;and exit test
026E| 4ED6               #          JMP      (A6)
0270|
0270|                             .PAGE
0270|                     ;-------------------------------------------------------------------------------
0270|                     ;  Subroutine to do MMU address check
0270|                     ;  Leaves limit registers with invalid page value, base regs with 0
0270|                     ;-------------------------------------------------------------------------------
0270|
0270| 207C 0000 8000      MMUACHK MOVE.L  #MMUSADRL,A0    ;SET MMU LIMIT START ADDR
0276| 227C 00FE 8000              MOVE.L  #MMUEADRL,A1    ;SET MMU LIMIT END ADDR
027C| 267C 00FE 8008              MOVE.L  #MMUEADRB,A3    ;SET MMU BASE END ADDR
0282| 383C 0C00                   MOVE    #INVPAG,D4      ;SET FINAL VALUE FOR LIMIT REGS
0286|
0286| 3210                ACHK1   MOVE    (A0),D1         ;READ REG
0288| B141                        EOR     D0,D1           ;CHECK IF EXPECTED
028A| 0241 0FFF                   ANDI    #$0FFF,D1       ;MASK DON'T CARES
028E| 6620                        BNE.S   MADRERR         ;EXIT IF ERROR
0290|
0290| 3084                MMUSET  MOVE    D4,(A0)         ;SET FINAL REG VALUE
0292| E350                        ROXL    #1,D0           ;SET UP NEW PATTERN
0294| B3C8                        CMPA.L  A0,A1           ;CHECK IF DONE
0296| 6704                        BEQ.S   ACHK2           ;IF YES GO CHECK FOR BASE REG TESTING
0298| D1CA                        ADDA.L  A2,A0           ;ELSE BUMP MMU ADDR
029A| 60EA                        BRA.S   ACHK1
029C|
029C| B7C8                ACHK2   CMPA.L  A0,A3           ;DONE WITH BASE?
029E| 670C                        BEQ.S   @2              ;EXIT IF YES
02A0| 207C 0000 8008            MOVE.L  #MMUSADRB,A0    ;ELSE SET STARTING BASE ADDRESS
02A6| 224B                        MOVEA.L A3,A1           ; AND ENDING ADDRESS
02A8| 7800                        MOVEQ   #0,D4           ;SET FINAL VALUE FOR BASE REGS
02AA| 60DA                        BRA.S   ACHK1           ;GO CHECK BASE REGS
02AC|
02AC| 4A42                @2      TST     D2              ;check for errors
02AE|                           RTS6                    ;and exit test
02AE| 4ED6               #          JMP      (A6)
02B0|                     ;  Handle MMU address error
02B0|
02B0| 8441                MADRERR OR      D1,D2           ;save error bits
```

```
02B2| 60DC                          BRA.S   MMUSET          ; and continue test
02B4|
02B4|                              .ELSE
02B4|                              .ENDC
02B4|
02B4|                           ;--------------------------------------------------------------------------
02B4|                           ; Subroutine to do MMU actual read/write
02B4|                           ;--------------------------------------------------------------------------
02B4|
02B4| 3080                      CHKRW   MOVE    D0,(A0)          ;do write
02B6| 3210                              MOVE    (A0),D1          ;read back
02B8| B141                              EOR     D0,D1            ;compare
02BA| 0241 0FFF                        ANDI    #$0FFF,D1        ;mask don't cares
02BE| 6602                            BNE.S   RWERR            ;skip if error
02C0|                                 RTS4                     ;else return
02C0| 4ED4                     #          JMP      (A4)
02C2|
02C2|                           ;  Error collection
02C2|
02C2| 8441                      RWERR   OR      D1,D2            ;save error bits
02C4|                                 RTS4                     ;and return
02C4| 4ED4                     #          JMP      (A4)
02C6|
02C6|                              .PAGE
02C6|                           ;--------------------------------------------------------------------------
02C6|                           ;  Now do setup of MMU supervisor registers for RAM and I/O space access.
02C6|                           ;  Also do read check after write and abort if error.
02C6|                           ;--------------------------------------------------------------------------
02C6|
02C6|                           ;  Do origin registers first
02C6|
02C6| 207C 0000 8008            SETMMU  MOVE.L  #MMUSADRB,A0     ;GET MMU PTR
02CC| 7000                              MOVEQ   #0,D0            ;clear for use
02CE| 7200                              MOVEQ   #0,D1
02D0| 3802                              MOVE    D2,D4            ;SAVE PREVIOUS RESULTS IF ANY
02D2| 7400                              MOVEQ   #0,D2
02D4| 7C00                              MOVEQ   #0,D6
02D6| 247C 0002 0000                    MOVE.L  #ADR128K,A2      ;ADDRESS INCREMENT
02DC| 267C 0000 0100                    MOVE.L  #PAG128K,A3      ;SET UP BASE ADDRESS INCREMENT
02E2| 7C10                              MOVEQ   #16,D6           ;LOOP COUNT
02E4|                           LOADORG BSRS4   CHKRW            ;DO WRITE/READ CHECK
02E4| 49FA 0004                 #          LEA      @1,A4
02E8| 60CA                       #          BRA.S    CHKRW
02EA|                          #@1
02EA| D08B                              ADD.L   A3,D0            ;COMPUTE NEXT MEMORY BASE ADDRESS
02EC| D1CA                              ADDA.L  A2,A0            ;BUMP MMU ORG PTR
02EE| 5346                              SUBQ    #1,D6
```

```
02F0| 66F2                          BNE.S   LOADORG         ;LOOP UNTIL DONE
02F2|
02F2|                          ;  Set base for I/O and special I/O space
02F2|
02F2| 207C 00FC 8008                MOVEA.L #MMU126B,A0     ;PT TO ORG REG 126
02F8| 7000                          MOVEQ   #0,D0           ;set data value
02FA|                               BSRS4   CHKRW
02FA| 49FA 0004               #        LEA     @1,A4
02FE| 60B4                     #        BRA.S   CHKRW
0300|                          #@1
0300| D1CA                            ADDA.L  A2,A0           ;BUMP PTR TO REG 127
0302|                               BSRS4   CHKRW
0302| 49FA 0004               #        LEA     @1,A4
0306| 60AC                     #        BRA.S   CHKRW
0308|                          #@1
0308|
0308|                          ;  Now do limit registers
0308|
0308| 207C 0000 8000                MOVEA.L #MMUSADRL,A0    ;GET MMU LIMIT REG PTR
030E| 303C 0700                      MOVE    #MEMLMT,D0      ;LIMIT FOR 128K MEMORY SEGMENTS
0312| 7200                          MOVEQ   #0,D1           ;use as working reg
0314| 7C10                          MOVEQ   #16,D6          ;LOOP COUNT
0316|                           LOADLMT BSRS4   CHKRW
0316| 49FA 0004               #        LEA     @1,A4
031A| 6098                     #        BRA.S   CHKRW
031C|                          #@1
031C| D1CA                            ADDA.L  A2,A0           ;BUMP MMU PTR
031E| 5346                            SUBQ    #1,D6
0320| 66F4                          BNE.S   LOADLMT         ;LOOP UNITL DONE
0322|
0322|                          ;  Now do MMU limit reg setup for I/O and Special I/O access
0322|
0322| 207C 00FC 8000                MOVEA.L #MMU126L,A0     ;PT TO LMT REG 126
0328| 303C 0900                      MOVE    #IOLMT,D0       ;SET FOR I/O SPACE, FULL ACCESS
032C|                               BSRS4   CHKRW
032C| 49FA 0004               #        LEA     @1,A4
0330| 6082                     #        BRA.S   CHKRW
0332|                          #@1
0332| D1CA                            ADDA.L  A2,A0           ;BUMP PTR TO REG 127
0334| 303C 0F00                      MOVE    #SPLMT,D0       ;SET FOR SPECIAL I/O, FULL ACCESS
0338|                               BSRS4   CHKRW
0338| 49FA 0006               #        LEA     @1,A4
033C| 6000 FF76               #        BRA.S   CHKRW
0340|                          #@1
0340|
0340|                                  .IF  DIAGS = 1
0340|                          ;  Check if errors detected
```

```
0340| 4A42                        TST     D2              ;CHECK ERROR MASK
0342| 6600 FE94                   BNE     MMUERR          ;ABORT IF ERROR
0346| 3404                        MOVE    D4,D2           ;ELSE RESTORE PREVIOUS RESULTS
0348|                             .ENDC
0348|
0348|                             .PAGE
0348|                         ;--------------------------------------------------------------------------
0348|                         ;  Complete testing of MMU by checking other context regs.
0348|                         ;  Uses reg D6 for context indicator.
0348|                         ;--------------------------------------------------------------------------
0348|                             .IF     DIAGS = 1
0348|
0348| 7C00                    MMUTST2 MOVEQ   #0,D6           ;FOR CONTEXT INDICATOR
034A|                             BSR4    MMUINIT         ;REINITIALIZE FOR TESTING
034A| 49FA 0006               #         LEA     @1,A4
034E| 6000 FEC6               #         BRA     MMUINIT
0352|                        #@1
0352|
0352| 4A39 00FC E00A                  TST.B   SEG1ON          ;SET FOR CONTEXT 1
0358| 7C01                        MOVEQ   #1,D6           ;SET CONTEXT INDICATOR
035A|
035A|                               BSR4    CONCHK          ;CHECK IF MMU CONTEXT CHANGED
035A| 49FA 0006               #         LEA     @1,A4
035E| 6000 00B0               #         BRA     CONCHK
0362| 6700 0090                      BEQ     MMUERR2         ;EXIT IF NO - SEG BIT ERROR
0366|
0366|                               BSR6    MMURW           ;ELSE GO DO R/W TEST
0366| 4DFA 0006               #         LEA     @1,A6
036A| 6000 FEBE               #         BRA     MMURW
036E| 6600 0084                      BNE     MMUERR2         ;exit if error
0372|
0372| 4A39 00FC E00E                  TST.B   SEG2ON          ;SET FOR CONTEXT 3
0378| 7C03                        MOVEQ   #3,D6
037A|
037A|                               BSR4    CONCHK          ;CHECK IF MMU CONTEXT CHANGED
037A| 49FA 0006               #         LEA     @1,A4
037E| 6000 0090               #         BRA     CONCHK
0382|                        #@1
0382| 6770                            BEQ.S   MMUERR2         ;EXIT IF NO - SEG BIT ERROR
0384|
0384|                               BSR6    MMURW           ;ELSE GO TEST
0384| 4DFA 0006               #         LEA     @1,A6
0388| 6000 FEA0               #         BRA     MMURW
038C|                        #@1
038C| 6666                            BNE.S   MMUERR2         ;exit if error
038E|
038E| 4A39 00FC E008                  TST.B   SEG1OFF         ;SET FOR CONTEXT 2
```

```
0394| 7C02                          MOVEQ   #2,D6
0396|
0396|                               BSRS4   CONCHK          ;CHECK IF MMU CONTEXT CHANGED
0396| 49FA 0004            #          LEA      @1,A4
039A| 6074                 #          BRA.S    CONCHK
039C|                      #@1
039C| 675C                          BEQ.S   MMUERR3         ;EXIT IF NO - SEG BIT ERROR
039E|
039E|                               BSRS6   MMURW           ;ELSE GO TEST
039E| 4DFA 0006            #          LEA      @1,A6
03A2| 6000 FE86           #          BRA.S    MMURW
03A6|                      #@1
03A6| 6652                          BNE.S   MMUERR3         ;exit if error
03A8|
03A8| 4A39 00FC E00C              TST.B   SEG2OFF         ;RESET FOR CONTEXT 0 REGS
03AE|
03AE|                        ;  Now do MMU addressing check of remaining context regs
03AE|
03AE|                               BSR4    MMUINIT         ;REINITIALIZE
03AE| 49FA 0006            #          LEA      @1,A4
03B2| 6000 FE62           #          BRA      MMUINIT
03B6|                      #@1
03B6|
03B6| 4A39 00FC E00A              TST.B   SEG1ON          ;SET FOR CONTEXT 1
03BC| 7C01                          MOVEQ   #1,D6
03BE|                               BSR6    MMUACHK         ;TEST CONTEXT 1
03BE| 4DFA 0006            #          LEA      @1,A6
03C2| 6000 FEAC           #          BRA      MMUACHK
03C6|                      #@1
03C6| 662C                          BNE.S   MMUERR2         ;exit if error
03C8| 4A39 00FC E00E              TST.B   SEG2ON          ;TEST CONTEXT 3
03CE| 7C03                          MOVEQ   #3,D6
03D0|                               BSR6    MMUACHK
03D0| 4DFA 0006            #          LEA      @1,A6
03D4| 6000 FE9A           #          BRA      MMUACHK
03D8| 661A                          BNE.S   MMUERR2         ;exit if error
03DA|
03DA| 4A39 00FC E008              TST.B   SEG1OFF         ;TEST CONTEXT 2
03E0| 7C02                          MOVEQ   #2,D6
03E2|                               BSR6    MMUACHK
03E2| 4DFA 0006            #          LEA      @1,A6
03E6| 6000 FE88           #          BRA      MMUACHK
03EA|                      #@1
03EA| 660E                          BNE.S   MMUERR3         ;exit if error
03EC|
03EC| 4A39 00FC E00C              TST.B   SEG2OFF         ;RESET TO CONTEXT 0
03F2| 6014                          BRA.S   MMULPCHK        ;go check for loop mode
```

```
03F4|
03F4| 4A39 00FC E008        MMUERR2 TST.B   SEG1OFF         ;ENSURE RESET FOR CONTEXT 0
03FA| 4A39 00FC E00C        MMUERR3 TST.B   SEG2OFF
0400|
0400| E85E                        ROR     #4,D6           ;get context indicator
0402| 8446                        OR      D6,D2           ;save with error bits (if any)
0404| 08C7 0000                  BSET    #MMU,D7         ;set error indicator
0408|                       MMULPCHK
0408| 4A87                        TST.L   D7              ;in loop mode?
040A| 6B00 FDA4                  BMI.S   MMUTST          ;restart full MMU test if yes
040E| 6030                        BRA.S   START           ;else continue to next test
0410|
0410|                             .PAGE
0410|                       ;--------------------------------------------------------------------------
0410|                       ;  Subroutine to verify context change made - does comparison to ensure
0410|                       ;  destruction of context 0 mapping avoided.  Zero bit set if error.
0410|                       ;--------------------------------------------------------------------------
0410|
0410| 3839 00FC 8000        CONCHK  MOVE    MMU126L,D4      ;check limit reg for I/O space
0416| 0244 0FFF                     ANDI    #$0FFF,D4       ;mask don't care
041A| 0C44 0900                     CMPI    #IOLMT,D4       ;still in same context?
041E| 661E                        BNE.S   CONOK           ;exit if not
0420|
0420| 3839 00FE 8000              MOVE    MMU127L,D4      ;else also check reg for ROM space
0426| 0244 0FFF                     ANDI    #$0FFF,D4       ;mask don't care
042A| 0C44 0F00                     CMPI    #SPLMT,D4       ;also set up?
042E| 660E                        BNE.S   CONOK           ;exit if not
0430|
0430| 3839 0000 8000              MOVE    MMU0L,D4        ;else do final check on reg for memory access
0436| 0244 0FFF                     ANDI    #$0FFF,D4
043A| 0C44 0700                     CMPI    #MEMLMT,D4      ;return with match results to caller
043E|
043E|                       CONOK   RTS4
043E| 4ED4                  #         JMP     (A4)
0440|
0440|                             .ENDC
0440|                             .IF  ROM4K = 0
0440|                             .IF  DIAGS = 0
0440|                             .ENDC                   ;{DIAGS}
0440|                             .ENDC                   ;{ROM4K}
0440|                             .PAGE
0440|                       ;--------------------------------------------------------------------------
0440|                       ;  Reset SETUP bit to enable system access and continue with testing
0440|                       ;--------------------------------------------------------------------------
0440|
0440| 4239 00FC E012        START   CLR.B   SETUP           ;TURN OFF SETUP TO ENTER MAP LAND ...
0446|                       ;-----------------------------------------------------------------------------
```

```
0446|                       ;  Now do memory sizing - assumes 128K minimum memory increment
0446|                       ;  Register usage:
0446|                       ;       A0 = minimum physical address          D0 = scratch use
0446|                       ;       A1 = maximum physical address/scratch  D1 = incr for search address
0446|                       ;       A2 = unused                            D2 = unused
0446|                       ;       A3 = next base memory addr to test     D3 = inverted sizing test pattern
0446|                       ;       A4 = return address                    D4 = sizing test pattern
0446|                       ;       A5 = unused                            D5 = retry count
0446|                       ;       A6 = saved error mask                  D6 = error mask
0446|                       ;-------------------------------------------------------------------------
0446|
0446| 4280                  MEMSIZ  CLR.L   D0              ;setup regs for loop
0448| 2040                          MOVE.L  D0,A0
044A| 2240                          MOVE.L  D0,A1
044C| 2640                          MOVE.L  D0,A3
044E| 2C40                          MOVE.L  D0,A6
0450| 7202                          MOVEQ   #2,D1           ;size at 128K boundaries                                RM000
0452| 4841                          SWAP    D1              ;                                                       RM000
0454| 283C AA55 A55A                MOVE.L  #PATRN,D4       ;set test patterns for sizing                           CHG002
045A| 3604                          MOVE    D4,D3           ;use only lower word
045C| 4643                          NOT     D3              ;and its inverse
045E|
045E|                        CHKLO   BSR4    CHKMEM          ;first search for low memory address
045E| 49FA 0006             #         LEA     @1,A4
0462| 6000 00A4             #         BRA     CHKMEM
0466|                       #@1
0466| 4A46                          TST     D6              ;memory found?
0468| 6752                          BEQ.S   SAVELO          ;yes - go save address
046A| 4646                          NOT     D6              ;else invert to check if all bits in error
046C| 4A46                          TST     D6              ;if not, assume memory error
046E| 6648                          BNE.S   @3              ; and go save address
0470| D7C1                   @2     ADDA.L  D1,A3           ;else bump search address
0472| 224B                          MOVEA.L A3,A1           ;set as next working address
0474| B3FC 0020 0000                CMPA.L  #MAXADR,A1      ;at max address?
047A| 66E2                          BNE.S   CHKLO           ;continue search if not
047C|
047C|                       ;  No memory found - toggle LED and check for I/O board; if no I/O (bus error)          CHG004
047C|                       ;  diagnostics are restarted                                                            CHG004
047C|
047C| 13FC 00AF 00FC E800           MOVE.B  #DEFVID2,VIDLTCH ;set LED on and default video latch setting (PAGE 2F)  CHG004
0484| 303C 61A8                     MOVE    #TNTHSEC,D0      ;delay for .1 sec                                      CHG004
0488| 5340                   @9     SUBQ    #1,D0            ;                                                      CHG004
048A| 66FC                          BNE.S   @9               ;                                                      CHG004
048C| 13FC 002F 00FC E800           MOVE.B  #DEFVID,VIDLTCH  ;reset LED and leave video latch setting               CHG004
0494| 207C 00FC DD81                MOVE.L  #VIA1BASE,A0     ;check for I/O board                                   CHG004
049A| 4A10                          TST.B   (A0)             ;bus error will occur if not installed                 CHG004
049C|
```

```
049C|                       ;  Go into read/write loop if no memory found but I/O installed
049C|
049C|                               BSR2    LOTONE          ;beep speaker for error
049C| 45FA 0006            #          LEA      @1,A2
04A0| 6000 00B2            #          BRA      LOTONE
04A4|                      #@1
04A4|                               BSR4    CONSET          ;set contrast
04A4| 49FA 0006            #          LEA      @1,A4
04A8| 6000 0350            #          BRA      CONSET
04AC|                      #@1
04AC| 207C 000F FFFE                 MOVE.L  #ONEMEG-2,A0    ;set default memory address (to span both boards)       CHG002
04B2| 2084                 @4         MOVE.L  D4,(A0)         ;go into read/write loop                                CHG002
04B4| 2610                           MOVE.L  (A0),D3         ;                                                       CHG002
04B6| 60FA                           BRA.S   @4
04B8|
04B8|                       ;  Low memory address found - save and continue
04B8| 4646                 @3         NOT     D6              ;reinvert and
04BA| 3C46                           MOVE    D6,A6           ; save results
04BC|
04BC| 204B                 SAVELO     MOVEA.L A3,A0           ;save low address
04BE| B1FC 0010 0000                 CMPA.L  #ONEMEG,A0      ;check for min low address
04C4| 6F06                           BLE.S   @1              ;skip if OK
04C6| 207C 0010 0000                 MOVEA.L #ONEMEG,A0      ;else set at min value (one 512K board in slot 1)
04CC|
04CC|                               .PAGE
04CC|                       ;-----------------------------------------------------------------------------
04CC|                       ;  Now check for high memory address; search to max address of 2 meg
04CC|                       ;-----------------------------------------------------------------------------
04CC|
04CC| 244B                 @1         MOVEA.L A3,A2           ;save low address as first high address
04CE|
04CE|                       TSTHI
04CE| D7C1                           ADDA.L  D1,A3           ;compute next 128K increment
04D0| 224B                           MOVEA.L A3,A1           ;use as new search value
04D2| B3FC 0020 0000                 CMPA.L  #MAXADR,A1      ;done?
04D8| 6728                           BEQ.S   SIZXIT
04DA|
04DA|                       ;  Following patch added to detect for wraparound problem of old memory boards
04DA| 2008                           MOVE.L  A0,D0           ;check low address                                      RM015
04DC| 6604                           BNE.S   CHKHI           ;old memory boards start at address 0                   RM015
04DE| B651                           CMP     (A1),D3         ;are we wrapped back to already tested location?
04E0| 671E                           BEQ.S   WRAPXIT         ;skip if yes (i.e., old memory board)                   RM015
04E2|
04E2|                       ;  Else continue with check for high address
04E2|
04E2|                       CHKHI   BSRS4   CHKMEM          ;go do memory search
04E2| 49FA 0004            #          LEA      @1,A4
```

```
04E6| 6020                #          BRA.S    CHKMEM
04E8|                     #@1
04E8| 4A46                         TST      D6              ;any errors?
04EA| 670E                         BEQ.S    SAVEHI          ;skip if not to save address
04EC| 4646                         NOT      D6              ;else invert to see if all bits in error
04EE| 4A46                         TST      D6
04F0| 67DC                         BEQ.S    TSTHI           ;skip if yes to ignore address
04F2| 300E                         MOVE     A6,D0           ;else get previous results
04F4| 4646                         NOT      D6              ;reinvert and
04F6| 8046                         OR       D6,D0           ; add new results
04F8| 3C40                         MOVE     D0,A6           ;save for later
04FA|
04FA| 244B                SAVEHI   MOVEA.L  A3,A2           ;save as new potential high address
04FC| 4253                         CLR      (A3)            ;clear test pattern                                RM015
04FE| 60CE                         BRA.S    TSTHI           ; and continue loop
0500|
0500| 4251                WRAPXIT  CLR      (A1)            ;clear test pattern                                RM015
0502|
0502| D5C1                SIZXIT   ADDA.L   D1,A2           ;high address = last valid addr + 128K
0504| 224A                         MOVEA.L  A2,A1           ;save for later use
0506| 605E                         BRA.S    RSTMMU          ;continue on
0508|
0508|                              .PAGE
0508|                     ;--------------------------------------------------------------------------
0508|                     ;  Subroutine to do memory check for sizing.  If error, tries successive
0508|                     ;  memory locations up to retry count (D5).  Returns with error mask in D6.
0508|                     ;--------------------------------------------------------------------------
0508|
0508| 7A20                CHKMEM   MOVEQ    #RETRYCNT,D5    ; set retry count in case of errors
050A| 4246                         CLR      D6              ; clear for error mask
050C| 3284                @1       MOVE     D4,(A1)         ; check if true data stores
050E| 3343 0002                    MOVE     D3,2(A1)        ; and try complement to next location
0512| B851                         CMP      (A1),D4
0514| 6706                         BEQ.S    @2              ; continue if yes
0516| 3011                         MOVE     (A1),D0         ; else get error bits
0518| B940                         EOR      D4,D0
051A| 8C40                         OR       D0,D6           ; and save them
051C|
051C| B669 0002           @2       CMP      2(A1),D3        ; check second location
0520| 6708                         BEQ.S    @3              ; exit if data correct
0522| 3029 0002                    MOVE     2(A1),D0        ; else read again
0526| B740                         EOR      D3,D0           ; get error bits
0528| 8C40                         OR       D0,D6           ; save in error mask
052A|
052A| 3344 0002           @3       MOVE     D4,2(A1)        ; now try in reverse order
052E| 3283                         MOVE     D3,(A1)
0530| B869 0002                    CMP      2(A1),D4        ; check second location
```

```
0534| 6708                        BEQ.S   @4              ; skip if OK
0536| 3029 0002                   MOVE    2(A1),D0        ; else save error bits
053A| B940                        EOR     D4,D0
053C| 8C40                        OR      D0,D6
053E|
053E| B651                 @4     CMP     (A1),D3         ; and check first
0540| 6706                        BEQ.S   @5              ; continue if yes
0542| 3011                        MOVE    (A1),D0         ; else get error bits
0544| B740                        EOR     D3,D0
0546| 8C40                        OR      D0,D6           ; and save them
0548|
0548| 4A46                 @5     TST     D6              ; any  errors?
054A| 6706                        BEQ.S   @6              ; skip if no
054C| 4A99                        TST.L   (A1)+           ; else bump search address to next pair
054E| 5345                        SUBQ    #1,D5           ; decr retry count
0550| 66BA                        BNE.S   @1              ; continue until count exhausted
0552|
0552|                      @6     RTS4                    ; return with results in D6
0552| 4ED4                 #        JMP     (A4)
0554|
0554|                              .PAGE
0554|                       ;--------------------------------------------------------------------------
0554|                       ; Subroutine to set parms for lo tone from speaker
0554|                       ;--------------------------------------------------------------------------
0554|
0554| 7060                  LOTONE  MOVEQ   #$60,D0         ;set frequency
0556| 323C 00FA                     MOVE    #250,D1         ;and duration
055A| 7404                        MOVEQ   #4,D2           ;and volume (medium)
055C|                             BSR4    TONE2           ;go do tone
055C| 49FA 0006            #        LEA     @1,A4
0560| 6000 05A4            #        BRA     TONE2
0564|                      #@1
0564|                             RTS2
0564| 4ED2                 #        JMP     (A2)
0566|
0566|
0566|                              .PAGE
0566|                       ;--------------------------------------------------------------------------
0566|                       ;  Now reset MMU regs according to low and high physical address
0566|                       ;  Remainder of MMU regs in context 0 are set to invalid page
0566|                       ;
0566|                       ;  Register Usage:
0566|                       ;       A0 - low physical address       D0 - scratch/value stored in base reg
0566|                       ;       A1 - high physical address      D1 - value stored in limit reg
0566|                       ;       A2 - MMU base reg ptr           D2 - unused
0566|                       ;       A3 - MMU limit reg ptr          D3 - holds base reg page incr value
0566|                       ;       A4 - used for return address    D4 - used for count of regs to set
```

```
0566|                     ;       A5 - MMU address increment      D5 - low physical page
0566|                     ;       A6 - not used                   D6 - high physical page
0566|                     ;-------------------------------------------------------------------------
0566|
0566|                     ;  First translate memory addresses to 512 byte page values for MMU use
0566|
0566|                     RSTMMU
0566| 2A08                        MOVE.L  A0,D5           ;GET MEMORY ADDRESS VALUES
0568| 2C09                        MOVE.L  A1,D6
056A| 7009                        MOVEQ   #9,D0           ;SET SHIFT COUNT
056C| E0AD                        LSR.L   D0,D5           ;TRANSLATE TO PAGE VALUES
056E| E0AE                        LSR.L   D0,D6
0570|
0570|                     ;  Now initialize for MMU write operations
0570|
0570| 247C 0000 8008              MOVEA.L #MMUSADRB,A2    ;SET MMU BASE REG PTR
0576| 267C 0000 8000              MOVEA.L #MMUSADRL,A3    ;SET LIMIT REG PTR
057C| 2A7C 0002 0000              MOVE.L  #ADR128K,A5     ;SET INCREMENT VALUE FOR MMU ADDRESSES
0582| 263C 0000 0100              MOVE.L  #PAG128K,D3     ;SET INCR VALUE FOR BASE REG CONTENTS
0588| 787E                        MOVEQ   #126,D4         ;SET REG COUNT - NO RESETTING OF REGS 126,127
058A| 3005                        MOVE    D5,D0           ;SET BASE VALUE
058C| 323C 0700                  MOVE    #MEMLMT,D1      ;SET LIMIT VALUE
0590|
0590|                     ;  Remap MMU regs for existing memory
0590|
0590|                     REMAP   BSRS4   WRTMMU          ;REWRITE SET OF MMU REGS
0590| 49FA 0004           #         LEA     @1,A4
0594| 6024                #         BRA.S   WRTMMU
0596|                     #@1
0596| 5344                        SUBQ    #1,D4           ;DECR REG COUNT
0598| D083                        ADD.L   D3,D0           ;BUMP PAGE ADDRESS
059A| BC80                        CMP.L   D0,D6           ;CHECK IF AT UPPER LIMIT
059C| 66F2                        BNE.S   REMAP           ;LOOP IF NO
059E|
059E|                     ;  Now map remainder of regs for invalid access
059E|
059E| 4240                        CLR     D0              ;SET NEW BASE REG VALUE
05A0| 323C 0C00                  MOVE    #INVPAG,D1      ; AND LIMIT REG VALUE
05A4|                     MAPINV  BSRS4   WRTMMU          ;GO DO REWRITE
05A4| 49FA 0004           #         LEA     @1,A4
05A8| 6010                #         BRA.S   WRTMMU
05AA|                     #@1
05AA| 5384                        SUBQ.L  #1,D4           ;DECR COUNT
05AC| 66F6                        BNE.S   MAPINV          ;LOOP UNTIL DONE
05AE|
05AE|                     ;  Finally reset video page to last page of memory
05AE|
```

```
05AE| EC8E                        LSR.L   #6,D6           ;compute address for video page
05B0| 5346                        SUBQ    #1,D6           ;decr to last page
05B2| 13C6 00FC E800              MOVE.B  D6,VIDLTCH      ;and set video latch
05B8|
05B8| 6066                        BRA.S   MEMTST1         ;SKIP TO NEXT TEST
05BA|                             .IF     EXTERNAL = 1
05BA|                             .ENDC
05BA|
05BA|                      ;--------------------------------------------------------------------------
05BA|                      ;  Subroutine to set MMU regs (context 0) - can also be called by external
05BA|                      ;  routines that provide the following register inputs:
05BA|                      ;
05BA|                      ;       A2 = base reg address           D0 = value for base reg
05BA|                      ;       A3 = limit reg address          D1 = value for limit reg
05BA|                      ;       A5 = reg address increment
05BA|                      ;--------------------------------------------------------------------------
05BA|
05BA| 4A39 00FC E010       WRTMMU  TST.B   SETUPON         ;TURN SETUP ON TO ENABLE MMU ACCESS
05C0| 3480                        MOVE    D0,(A2)         ;SET BASE REG
05C2| 3681                        MOVE    D1,(A3)         ;SET LIMIT REG
05C4| D5CD                        ADDA.L  A5,A2           ;BUMP MMU PTRS
05C6| D7CD                        ADDA.L  A5,A3
05C8| 4239 00FC E012              CLR.B   SETUP           ;BACK TO MAP LAND
05CE|                             RTS4                    ;AND BACK TO CALLER
05CE| 4ED4                    #         JMP     (A4)
05D0|
05D0|                             .IF  ROM16K = 1
05D0|                      ;--------------------------------------------------------------------------
05D0|                      ;  Subroutine to read MMU regs - for call by external routines.
05D0|                      ;  Inputs:
05D0|                      ;       D2 = context to read (0-3)
05D0|                      ;       A2 = base reg address
05D0|                      ;       A3 = limit reg address
05D0|                      ;       A4 = return address
05D0|                      ;       A5 = reg address increment
05D0|                      ;  Outputs:
05D0|                      ;       D0 = value of base reg
05D0|                      ;       D1 = value of limit reg
05D0|                      ;       A2,A3 incremented by value in A5
05D0|                      ;  Side Effects:
05D0|                      ;       D3 trashed
05D0|                      ;--------------------------------------------------------------------------
05D0|
05D0| 363C 0FFF            READMMU MOVE    #$0FFF,D3       ;set mask for result
05D4| 4A39 00FC E010              TST.B   SETUPON         ;turn setup on to enable MMU access
05DA|
05DA| 4A42                        TST     D2              ;check context
```

```
05DC| 6722                          BEQ.S   @9              ;skip if context 0
05DE| 0C02 0001                     CMP.B   #1,D2           ;context 1?
05E2| 6716                          BEQ.S   @2
05E4| 0C02 0002                     CMP.B   #2,D2           ;context 2?
05E8| 6708                          BEQ.S   @1
05EA| 4A39 00FC E00E                TST.B   SEG2ON          ;must be context 3
05F0| 6008                          BRA.S   @2              ;set both seg bits
05F2| 4A39 00FC E00E        @1      TST.B   SEG2ON          ;set for context 2
05F8| 6006                          BRA.S   @9
05FA| 4A39 00FC E00A        @2      TST.B   SEG1ON          ;set for context 1 and 3
0600|
0600|                       ;  read the regs
0600|
0600| 3012                  @9      MOVE    (A2),D0         ;read base reg
0602| C043                          AND     D3,D0           ;clear junk
0604| 3213                          MOVE    (A3),D1         ;read limit reg
0606| C243                          AND     D3,D1           ;clear junk
0608| D5CD                          ADDA.L  A5,A2           ;incr ptrs
060A| D7CD                          ADDA.L  A5,A3
060C| 4A39 00FC E008                TST.B   SEG1OFF         ;restore to context 0
0612| 4A39 00FC E00C                TST.B   SEG2OFF
0618| 4239 00FC E012                CLR.B   SETUP           ;back to map land
061E|                               RTS4                    ;and back to caller
061E| 4ED4                  #         JMP     (A4)
0620|
0620|                               .ENDC
0620|                               .IF     EXTERNAL = 1
0620|                               .ENDC
0620|
0620|                               .PAGE
0620|                       ;-------------------------------------------------------------------------
0620|                       ;  Begin memory testing by checking first 800 hex locations (2K).
0620|                       ;  If error here, abort other testing and go into loop since can't relay
0620|                       ;  meaningful results.
0620|                       ;-------------------------------------------------------------------------
0620|
0620| 2448                  MEMTST1 MOVEA.L A0,A2           ;save memory lo, hi addresses
0622| 2649                          MOVEA.L A1,A3
0624|
0624|                               .IF  DIAGS = 1
0624|
0624| 91C8                          SUBA.L  A0,A0           ;set test addresses
0626| 327C 0800                     MOVEA   #LOMEM,A1       ;upper address                          RM000
062A|                               BSR4    RAMTEST         ;go do memory test
062A| 49FA 0006            #         LEA     @1,A4
062E| 6000 0880            #         BRA     RAMTEST
0632|                       #@1
```

```
0632| 6738                        BEQ.S   INITMEM         ;skip if OK
0634|
0634|                      ;  Error in low memory - reset video latch, beep speaker and go into R/W loop
0634|
0634| 200A                        MOVE.L  A2,D0           ;get low physical address
0636| E088                        LSR.L   #8,D0           ;convert to page value
0638| EE88                        LSR.L   #7,D0
063A| 13C0 00FC E800              MOVE.B  D0,VIDLTCH      ;set video latch to bad area
0640|                             BSR4    CONSET          ;ensure contrast on
0640| 49FA 0006           #         LEA     @1,A4
0644| 6000 01B4           #         BRA     CONSET
0648|                     #@1
0648|
0648|                             BSR2    LOTONE          ;beep speaker twice for low memory error
0648| 45FA 0006           #         LEA     @1,A2
064C| 6000 FF06           #         BRA     LOTONE
0650|                     #@1
0650| 303C 61A8                   MOVE    #TNTHSEC,D0     ;delay for about 1/10 sec                       RM000
0654| 5340                TONEDLY SUBQ    #1,D0
0656| 66FC                        BNE.S   TONEDLY
0658|                             BSR2    LOTONE          ;do second beep
0658| 45FA 0006           #         LEA     @1,A2
065C| 6000 FEF6           #         BRA     LOTONE
0660|                     #@1
0660|
0662| 303C A55A                   MOVE    #PATRN2,D0      ;set pattern for usess
0666| 3080                @2      MOVE    D0,(A0)
0668| 3210                        MOVE    (A0),D1
066A| 60FA                        BRA.S   @2              ;loop with random display on screen
066C|
066C|                             .ELSE
066C|                             .ENDC                   ;{DIAGS}
066C|
066C|                      ;  Now attempt to initialize status areas and save results
066C|
066C| 307C 0180           INITMEM MOVEA   #STATUS,A0      ;get ptr to start of status area                RM000
0670| 707F                        MOVEQ   #127,D0         ;set count
0672| 4298                @2      CLR.L   (A0)+           ;clear it
0674| 51C8 FFFC                   DBF     D0,@2           ;until done
0678|
0678| 31C3 0186                   MOVE    D3,MEMRSLT      ;save test results
067C| 31CE 0184                   MOVE    A6,SIZRSLT      ;save sizing results
0680| 21CA 02A4                   MOVE.L  A2,MINMEM       ;save min memory address
0684| 21CB 0294                   MOVE.L  A3,MAXMEM       ;save max memory address
0688| 97CA                        SUBA.L  A2,A3           ;compute total memory
068A| 21CB 02A8                   MOVE.L  A3,TOTLMEM      ;and save also
068E|
```

```
068E| 207C 0000 8000               MOVE.L  #HEX32K,A0      ;compute base address for screen
0694| 97C8                         SUBA.L  A0,A3
0696| 21CB 0110                    MOVE.L  A3,SCRNBASE     ;and save
069A|
069A| 31C2 01B0                    MOVE    D2,MMURSLT      ;and save MMU results also
069E|
069E| 21FC 0000 02B0 0260          MOVE.L  #KBDQ,KBDQPTR   ;init COPS buffer pointer for later use
06A6|
06A6|                             .PAGE
06A6|                        ;--------------------------------------------------------------------------
06A6|                        ; Initialize exception and trap vectors to catch unexpected errors
06A6|                        ;--------------------------------------------------------------------------
06A6|
06A6| 6104                   INITVCT BSR.S   SETVCTRS        ;init vectors
06A8| 6000 00CA                      BRA     SCCSET          ;continue testing                       CHG027
06AC|
06AC|                        ;  Subroutine to set up default vectors
06AC|
06AC|                        SETVCTRS
06AC| 41FA 003E                      LEA     MISC,A0
06B0| 93C9                           SUBA.L  A1,A1
06B2| 7040                           MOVEQ   #64,D0
06B4| 22C8                   @1      MOVE.L  A0,(A1)+        ; fill with unknown ones
06B6| 5340                           SUBQ    #1,D0
06B8| 6EFA                           BGT     @1
06BA| 6126                           BSR.S   SETBUSVCT       ; then, with special ones               RM000
06BC| 41FA 0090                      LEA     AERR,A0
06C0| 21C8 000C                      MOVE.L  A0,ADRVCTR
06C4| 41FA 0032                      LEA     IERR,A0
06C8| 21C8 0010                      MOVE.L  A0,ILLVCTR
06CC| 41FA 0036                      LEA     NMI,A0
06D0| 21C8 007C                      MOVE.L  A0,NMIVCT
06D4| 41FA 0060                      LEA     TRPERR,A0       ; same routine for line 1010 and 1111
06D8| 21C8 0028                      MOVE.L  A0,L10VCTR
06DC| 21C8 002C                      MOVE.L  A0,L11VCTR
06E0|
06E0|                             .IF  USERINT = 0
06E0|                             .ENDC
06E0|
06E0| 4E75                           RTS
06E2|                        ;------------------------------------------------------------
06E2|                        ;  Subroutine to setup bus error vector                         RM000
06E2|                        ;------------------------------------------------------------
06E2|
06E2|                        SETBUSVCT
06E2| 47FA 005E                      LEA     BERR,A3         ;setup default vector           RM000
06E6| 21CB 0008                      MOVE.L  A3,BUSVCTR      ;                               RM000
```

```
06EA| 4E75                        RTS                     ;                                                   RM000
06EC|
06EC|                      ;-------------------------------------------------------------
06EC|                      ;  Exception Handler routines
06EC|                      ;-------------------------------------------------------------
06EC|
06EC| 21C7 01AC            MISC    MOVE.L  D7,D7SAV        ;save incoming value
06F0| 7E00                         MOVEQ   #0,D7
06F2| 08C7 0007                    BSET    #MISEXCP,D7     ;set error indicator
06F6| 606C                         BRA.S   EXCP1
06F8|
06F8| 21C7 01AC            IERR    MOVE.L  D7,D7SAV        ;save incoming value
06FC| 7E00                         MOVEQ   #0,D7
06FE| 08C7 0008                    BSET    #ILLEXCP,D7     ;set error indicator
0702| 6060                         BRA.S   EXCP1
0704|
0704| 21C7 01AC            NMI     MOVE.L  D7,D7SAV        ;save incoming value
0708| 7E00                         MOVEQ   #0,D7
070A| 6100 085C                    BSR     TSTSTAT         ;check status reg for parity error          CHG015
070E| 6620                         BNE.S   NOTPE           ;skip if not
0710|
0710| 08C7 0016                    BSET    #MPAR,D7        ;set error indicator
0714| 6100 08DA                    BSR     GETPADDR        ;get and save error address                 CHG015
0718| 4A39 00FC E01C               TST.B   PAROFF          ;toggle to clear error bit
071E| 0801 0005                    BTST    #5,D1           ;video error?                               CHG015
0722| 6706                         BEQ.S   @1              ;skip if not                                CHG015
0724| 0281 FFFF 8000               ANDI.L  #VMSK,D1        ;mask if yes                                CHG015
072A| 21C1 01A6            @1      MOVE.L  D1,PEADDR       ;save converted error address               CHG015
072E| 6034                         BRA.S   EXCP1           ;go to exit
0730|
0730| 08C7 0004            NOTPE   BSET   #CPUINTR,D7      ;else set NMI code
0734| 602E                         BRA.S   EXCP1           ; and exit
0736|
0736| 21C7 01AC            TRPERR  MOVE.L  D7,D7SAV        ;save incoming value
073A| 7E00                         MOVEQ   #0,D7
073C| 08C7 0009                    BSET    #TRPEXCP,D7     ;set error indicator
0740| 6022                         BRA.S   EXCP1
0742|
0742| 21C7 01AC            BERR    MOVE.L  D7,D7SAV        ;save incoming value
0746| 7E00                         MOVEQ   #0,D7
0748| 08C7 0005                    BSET    #BUSEXCP,D7     ;set error indicator
074C| 600A                         BRA.S   EXCP0
074E| 21C7 01AC            AERR    MOVE.L  D7,D7SAV        ;save incoming value
0752| 7E00                         MOVEQ   #0,D7
0754| 08C7 0006                    BSET    #ADREXCP,D7     ;set error indicator
0758|
0758|                      EXCP0                           ; GROUP 0 EXCEPTIONS HERE
```

```
0758| 31DF 0280                   MOVE    (SP)+,EXCFC     ; SAVE THE EXTRA DATA
075C| 21DF 0282                   MOVE.L  (SP)+,EXCADR
0760| 31DF 0286                   MOVE    (SP)+,EXCIR
0764|
0764|                       EXCP1                           ; GROUP 1 EXCEPTIONS HERE
0764| 31DF 0288                   MOVE    (SP)+,EXCSR     ; SAVE COMMON INFO
0768| 21DF 028A                   MOVE.L  (SP)+,EXCPC
076C| 31C0 028E                   MOVE    D0,EXCTYPE      ; save error type
0770| 6000 0C28                   BRA     TSTCHK          ; and go display error
0774|
0774|                             .PAGE
0774|                       ;--------------------------------------------------------------------------
0774|                       ;  Initialize SCC chip for Applebus use.                                  CHG027
0774|                       ;  Bus error vector setup in case of problems.
0774|                       ;--------------------------------------------------------------------------
0774|
0774|                       SCCSET
0774| 47FA 03E4                   LEA     NOIO,A3             ;set bus error vector in case no IO board  CHG027
0778| 21CB 0008                   MOVE.L  A3,BUSVCTR          ;                                          CHG027
077C| 6100 0952                   BSR     RSTSCC              ;go do setup                               CHG027
0780|
0780|                       ;--------------------------------------------------------------------------
0780|                       ; Now test VIA for parallel port and contrast latch.
0780|                       ; A read/write test on the timer 1 latches is done, then contrast
0780|                       ; is set if OK.
0780|                       ;--------------------------------------------------------------------------
0780|
0780|                       VIA2TST
0780|                             .IF  DIAGS = 1
0780|                       VIA2CHK
0780|                             .IF  ROM16K = 1
0780| 47FA 002C                   LEA     VIA2VCT,A3      ;OK - set up special bus vector
0784| 21CB 0008                   MOVE.L  A3,BUSVCTR
0788|
0788| 207C 00FC D931              MOVE.L  #<VIA2BASE+T1LL2>,A0  ;set base address of timer low latch
078E| 7008                        MOVEQ   #8,D0           ;set offset to high latch
0790|                             BSRS6   VIATST          ;and go do test
0790| 4DFA 0004             #       LEA     @1,A6
0794| 6022                  #       BRA.S   VIATST
0796|                       #@1
0796| 670A                        BEQ.S   @2              ;if OK, continue
0798| 08C7 000B                   BSET    #VIA2,D7        ;else set error bit
079C| 4A87                        TST.L   D7              ;check if in loop mode
079E| 6BE0                        BMI.S   VIA2CHK         ;restart if yes
07A0| 600A                        BRA.S   @3              ;else skip contrast setting
07A2|                             .ENDC
07A2|
```

```
07A2| 4A87                 @2      TST.L   D7              ;in loop mode?
07A4| 6BDA                         BMI.S   VIA2CHK         ;restart if yes
07A6|                              BSRS4    CONOFF         ;go turn off contrast
07A6| 49FA 0004           #          LEA      @1,A4
07AA| 6054               #          BRA.S    CONOFF
07AC|                     #@1
07AC|
07AC|                              .ENDC                   ;{DIAGS}
07AC|
07AC| 6074                 @3      BRA.S   SCRNTST         ;else skip to next test
07AE|
07AE|                              .IF  DIAGS = 1
07AE|                     ;--------------------------------------------------------------------------
07AE|                     ;  Bus error handler for VIA #2 use
07AE|                     ;--------------------------------------------------------------------------
07AE|
07AE| 7033                VIA2VCT MOVEQ   #EVIA2,D0       ;SET ERROR CODE
07B0| 08C7 000B                   BSET    #VIA2,D7        ;set indicator
07B4| 6000 0162                   BRA     IOVCT           ;AND GO HANDLE I/O EXCEPTION
07B8|                              .ENDC                   ;{DIAGS}
07B8|
07B8|                              .IF  ROM16K = 1
07B8|                              .PAGE
07B8|                     ;--------------------------------------------------------------------------
07B8|                     ;   Subroutine to do VIA testing
07B8|                     ;     A0 = address of first timer latch
07B8|                     ;     D0 = offset to other latch
07B8|                     ;--------------------------------------------------------------------------
07B8|
07B8| 2248                VIATST  MOVE.L  A0,A1           ;set up address for second latch
07BA| D3C0                        ADDA.L  D0,A1
07BC| 7000                        MOVEQ   #0,D0           ;for error use
07BE| 4202                        CLR.B   D2              ;clear old data value
07C0| 4210                        MOVE.B   #0,(A0)        ;and the timer latches
07C2| 4211                        MOVE.B   #0,(A1)
07C4|
07C4| 363C 00FF                   MOVE    #$FF,D3         ;set up start value
07C8|                              BSRS4   VIARW           ;go do read/write test
07C8| 49FA 0004           #          LEA      @1,A4
07CC| 6002               #          BRA.S    VIARW
07CE|                     #@1
07CE|                              RTS6                    ;and return
07CE| 4ED6               #          JMP      (A6)
07D0|
07D0|                     ;  Subroutine to do read/write test - loops thru all 256 values
07D0|
07D0| B410                VIARW   CMP.B   (A0),D2         ;check for old values first
```

```
07D2| 6620                        BNE.S   VIAFAIL
07D4| B411                        CMP.B   (A1),D2
07D6| 661C                        BNE.S   VIAFAIL
07D8|
07D8| 1083                        MOVE.B  D3,(A0)         ;set new value in low timer latch
07DA| B411                        CMP.B   (A1),D2         ;ensure high latch not affected
07DC| 6616                        BNE.S   VIAFAIL
07DE| B610                        CMP.B   (A0),D3         ;verify new low latch setting
07E0| 6612                        BNE.S   VIAFAIL
07E2|
07E2| 1283                        MOVE.B  D3,(A1)         ;set new value in high timer latch
07E4| B610                        CMP.B   (A0),D3         ;ensure low latch not affected
07E6| 660C                        BNE.S   VIAFAIL
07E8| B611                        CMP.B   (A1),D3         ;verify new high latch setting
07EA| 6608                        BNE.S   VIAFAIL
07EC|
07EC| 1403                        MOVE.B  D3,D2           ;the new value becomes the old
07EE| 51CB FFE0                   DBF     D3,VIARW        ;loop thru all 256 values
07F2| 6002                        BRA.S   VIARWEND
07F4|
07F4| 5240                VIAFAIL ADDQ    #1,D0           ;set for error
07F6|
07F6| 4A40                VIARWEND TST    D0              ;set zero bit indicator
07F8|                           RTS4
07F8| 4ED4                #          JMP      (A4)
07FA|                           .ENDC
07FA|                           .PAGE
07FA|                     ;--------------------------------------------------------------------------
07FA|                     ;  Subroutine to set contrast latch - sets for default, off or value in D0
07FA|                     ;--------------------------------------------------------------------------
07FA|
07FA| 103C 0080           CONSET  MOVE.B  #$80,D0         ;set mid range value default
07FE| 6002                        BRA.S   CONSET2
0800|
0800| 70FF                CONOFF  MOVEQ   #-1,D0          ;set for contrast off
0802|                     CONSET2                         ;for external entry
0802| 207C 00FC D901              MOVE.L  #VIA2BASE,A0    ;GET 6522 BASE ADDR
0808| 117C 0084 0010              MOVE.B  #$84,DDRB2(A0)  ;ENSURE NO STRAY DATA TO CONTRAST
080E| 10BC 0004                  MOVE.B  #4,ORB2(A0)     ; LATCH BY DISABLING DRIVERS
0812| 117C 00FF 0018              MOVE.B  #$FF,DDRA2(A0)  ;NOW SET PORT A AS OUTPUTS
0818| 1140 0008                  MOVE.B  D0,ORA2(A0)     ;set contrast value
081C| 08D0 0007                  BSET    #7,ORB2(A0)     ;AND STROBE IT
0820|
0820|                           RTS4                    ;RETURN TO CALLER
0820| 4ED4                #          JMP      (A4)
0822|
0822|
```

```
0822|                           .PAGE
0822|                        ;---------------------------------------------------------------------------
0822|                        ;  Test memory to be used for screen.  The screen can then be
0822|                        ;  used for test icon display.  Default choice is last 32K of memory.
0822|                        ;  If this is invalid, do backwards scan through memory until a valid
0822|                        ;  area is found.
0822|                        ;  Assumes:  location SCRNBASE = base address of default screen (set by
0822|                        ;   sizing routine)
0822|                        ;---------------------------------------------------------------------------
0822|
0822|                        SCRNTST
0822|                           .IF  DIAGS = 1
0822|
0822| 2078 0110                 MOVE.L  SCRNBASE,A0     ;get base address of screen
0826| 2278 02A8                 MOVE.L  TOTLMEM,A1      ;set end address
082A|                           BSR4    RAMTEST         ;and go do test
082A| 49FA 0006              #    LEA     @1,A4
082E| 6000 0680              #    BRA     RAMTEST
0832|                        #@1
0832| 676E                      BEQ.S   INVTST          ;continue if no error
0834| 08C7 0015                 BSET    #MEM,D7         ;else set memory read/write error
0838|
0838|                        ;  save error results and then start search for good video page
0838|
0838| 6100 064A                 BSR     TSTINIT         ;initialize for further testing
083C| 6136                      BSR.S   SCRNSAV         ;save results
083E|
083E| 2278 0110                 MOVE.L  SCRNBASE,A1     ;set new search end address
0842| 2049                      MOVE.L  A1,A0
0844| 247C 0000 8000            MOVE.L  #HEX32K,A2      ;screen size is 32K
084A| 91CA                      SUBA.L  A2,A0           ;set new start addr (end-32K)
084C|
084C| 48E7 00E0              @1 MOVEM.L A0-A2,-(SP)     ;save search addresses
0850|                           BSR4    RAMTEST         ;go test
0850| 49FA 0006              #    LEA     @1,A4
0854| 6000 065A              #    BRA     RAMTEST
0858|                        #@1
0858| 4CDF 0700                 MOVEM.L (SP)+,A0-A2     ;restore addresses (no effect on CCR)
085C| 670E                      BEQ.S   SCRNOK          ;skip if OK (non-zero CCR if error)
085E| 2808                      MOVE.L  A0,D4           ;else go save results
0860| 6112                      BSR.S   SCRNSAV
0862| 2248                      MOVE.L  A0,A1           ;set next end
0864| 91CA                      SUBA.L  A2,A0           ; and start addresses
0866| 2008                      MOVE.L  A0,D0           ;continue thru all of memory if necessary
0868| 6EE2                      BGT.S   @1
086A|
086A| 6036                    SCRNERR BRA.S   INVTST          ;continue testing, leave screen at default
```

```
086C|
086C| 21C8 0110             SCRNOK  MOVE.L  A0,SCRNBASE     ;save new screen base
0870| 6114                           BSR.S   SETVLTCH        ;and go set video latch
0872| 602E                           BRA.S   INVTST          ;and exit to next test
0874|
0874|                        ;---------------------------------------------------------------------------
0874|                        ;  Subroutine to save error results from screen test routine
0874|                        ;  Inputs:
0874|                        ;       A3 = ptr to base of save result area
0874|                        ;       D4 = base address of test area
0874|                        ;  Outputs:
0874|                        ;       None
0874|                        ;  Side Effects:
0874|                        ;       D1/D3-D4 trashed
0874|                        ;---------------------------------------------------------------------------
0874|
0874| 7211                   SCRNSAV MOVEQ   #17,D1          ;divide base address by 128K
0876| E2AC                           LSR.L   D1,D4
0878| D844                           ADD     D4,D4           ;double for word index to save area
087A| 2203                           MOVE.L  D3,D1           ;combine error results
087C| 4843                           SWAP    D3
087E| 8641                           OR      D1,D3
0880| 8773 4000                      OR      D3,0(A3,D4)     ;save and exit
0884| 4E75                           RTS
0886|
0886|                        ;---------------------------------------------------------------------------
0886|                        ;  Subroutine to set the video latch
0886|                        ;  Inputs:
0886|                        ;       Location SCRNBASE = logical base address for screen
0886|                        ;  Outputs:
0886|                        ;       None
0886|                        ;  Side Effects:
0886|                        ;       D0-D1 trashed
0886|                        ;---------------------------------------------------------------------------
0886|
0886|                        SETVLTCH
0886| 2438 0110                      MOVE.L  SCRNBASE,D2     ;get logical screen base address
088A| 2238 02A8                      MOVE.L  TOTLMEM,D1      ;get physical amount of memory
088E| 9282                           SUB.L   D2,D1           ;compute screen base offset
0890| 2038 0294                      MOVE.L  MAXMEM,D0       ;get max physical address
0894| 9081                           SUB.L   D1,D0           ;compute physical screen base address
0896| E088                           LSR.L   #8,D0           ;convert to page value
0898| EE88                           LSR.L   #7,D0
089A| 13C0 00FC E800                 MOVE.B  D0,VIDLTCH      ;set latch
08A0| 4E75                           RTS                     ;and exit
08A2|
08A2|                                  .PAGE
```

```
08A2|                       ;-----------------------------------------------------------------------
08A2|                       ;  Now check state of INVID bit to see if inverse video is installed.
08A2|                       ;  If yes, rewrite last 4 words of screen page to avoid retrace line.
08A2|                       ;-----------------------------------------------------------------------
08A2|
08A2|                       INVTST
08A2|                               .IF  INVERTCK = 1       ;                                       CHG013
08A2|                               .ENDC                   ;{INVERTCK}                             CHG013
08A2|                               .ENDC                   ;{DIAGS}
08A2|
08A2|                       ;-----------------------------------------------------------------------
08A2|                       ; Continue testing by now doing COPS VIA test
08A2|                       ;-----------------------------------------------------------------------
08A2|
08A2|                       VIA1TST
08A2|                               .IF  USERINT = 1
08A2|
08A2|                       ;  Draw desktop on screen for test icon display
08A2|
08A2| 6100 2832                     BSR     DRAWDESK        ;draw the desk
08A6| 6134                          BSR.S   DSPCPURM        ;and CPU ROM id                 CHG001
08A8|
08A8|                               .ENDC
08A8|
08A8|                               BSR4    CONSET          ;set default contrast
08A8| 49FA 0006            #          LEA      @1,A4
08AC| 6000 FF4C            #          BRA      CONSET
08B0|                      #@1
08B0|
08B0|                               .IF  ROM16K = 1
08B0| 47FA 0546             VIA1CHK LEA     VIA1VCT,A3      ;first set up bus error vector
08B4| 21CB 0008                     MOVE.L  A3,BUSVCTR
08B8| 207C 00FC DD8D               MOVE.L  #<VIA1BASE+T1LL1>,A0 ;set base address of timer low latch
08BE| 7002                         MOVEQ   #2,D0           ;set offset to high latch
08C0|                               BSR6    VIATST          ;go test
08C0| 4DFA 0006            #          LEA      @1,A6
08C4| 6000 FEF2            #          BRA      VIATST
08C8|                      #@1
08C8| 670C                          BEQ.S   @2              ;skip if OK
08CA| 08C7 000A                     BSET    #VIA1,D7        ;else set error bit
08CE| 4A87                          TST.L   D7              ;loop?
08D0| 6BDE                          BMI.S   VIA1CHK         ;yes - test again
08D2| 6000 0AC6                     BRA     TSTCHK          ;else abort further testing
08D6|
08D6| 4A87                  @2      TST.L   D7              ;check for loop mode
08D8| 6BD6                          BMI.S   VIA1CHK
08DA| 600E                          BRA.S   COPSENBL        ;else go test COPS
```

```
08DC|
08DC|                          ;---------------------------------------------------------------------------
08DC|                          ;  Subroutine to display CPU ROM id
08DC|                          ;---------------------------------------------------------------------------
08DC|
08DC|                          DSPCPURM
08DC| 103A 371F                        MOVE.B  REV,D0          ;read ROM rev                          CHG001
08E0| 7A03                             MOVEQ   #ROMIDROW,D5    ;setup cursor ptrs                     CHG001
08E2| 7C50                             MOVEQ   #ROMIDCOL,D6    ;                                      CHG001
08E4| 6100 2E54                       BSR     DSPVAL          ;do display                            CHG001
08E8| 4E75                             RTS                     ;                                      CHG001
08EA|
08EA|                                  .ENDC
08EA|                                  .PAGE
08EA|                          ;---------------------------------------------------------------------------
08EA|                          ;  Try turning COPS on so that keyboard commands can be received
08EA|                          ;---------------------------------------------------------------------------
08EA|
08EA|                          COPSENBL
08EA| 47FA 002A                        LEA     COPSVCT,A3      ;set up bus error vector first
08EE| 21CB 0008                        MOVE.L  A3,BUSVCTR
08F2| 612C                             BSR.S   CPSINIT         ;enable COPS
08F4| 6514                             BCS.S   COPSBAD         ;skip if error
08F6| 4A87                             TST.L   D7              ;looping desired?
08F8| 6BF0                             BMI.S   COPSENBL        ;go repeat test
08FA|
08FA| 2007                             MOVE.L  D7,D0           ;get error indicator
08FC| 0280 001F FFFF                  ANDI.L  #CPIOMSK,D0     ;mask off don't care bits
0902| 6700 00BE                       BEQ     RSTSCAN         ;continue if OK to do reset scan
0906| 6000 0A92                       BRA     TSTCHK          ;else go report error
090A|
090A| 08C7 000C                  COPSBAD BSET    #IOCOPS,D7      ;else set COPS error
090E| 4A87                             TST.L   D7              ;looping desired?
0910| 6BD8                             BMI.S   COPSENBL        ;go repeat test
0912| 6000 0A86                       BRA     TSTCHK          ;else abort further testing
0916|
0916|                          ;---------------------------------------------------------------------------
0916|                          ;  Bus error handler for COPS testing with entry point for other I/O tests
0916|                          ;---------------------------------------------------------------------------
0916|
0916| 7034                     COPSVCT MOVEQ   #EIOCOP,D0      ;SET ERROR CODE
0918| 08C7 0012                IOVCT   BSET    #IOEXCP,D7      ;SET I/O EXCEPTION ERROR
091C| 6000 FE3A                       BRA     EXCP0           ;AND GO HANDLE EXCEPTION
0920|
0920|                          ;---------------------------------------------------------------------------
0920|                          ;  Subroutine to initiialize COPS interface for use
0920|                          ;---------------------------------------------------------------------------
```

```
0920| 207C 00FC DD81        CPSINIT MOVEA.L #VIA1BASE,A0    ;GET VIA BASE ADDRESS
0926| 117C 0001 0016                MOVE.B  #$01,ACR1(A0)   ;SET PORT A LATCH ENABLE
092C| 0028 0009 0018                OR.B    #$09,PCR1(A0)   ;SET HANDSHAKE ENABLE
0932| 117C 007F 001C                MOVE.B  #$7F,IER1(A0)   ;CLEAR ALL INTRPT ENABLES
0938| 117C 007F 001A                MOVE.B  #$7F,IFR1(A0)   ;AND CLEAR FLAGS
093E|
093E|                         ;  Now turn COPS on, disabling mouse and NMI key
093E|
093E| 4240                    TURNON  CLR     D0              ;SET FOR PORT ON CMD
0940| 6114                            BSR.S   COPSCMD         ;SEND TO COPS
0942| 6510                            BCS.S   @1              ;EXIT IF TIMEOUT ERROR
0944|
0944| 7070                            MOVEQ   #$70,D0         ;DISABLE MOUSE
0946| 610E                            BSR.S   COPSCMD
0948| 650A                            BCS.S   @1
094A|
094A|                                   .IF  DEBUG = 0
094A| 7050                            MOVEQ   #$50,D0         ;disable NMI key
094C| 6108                            BSR.S   COPSCMD
094E| 6504                            BCS.S   @1
0950| 7060                            MOVEQ   #$60,D0
0952| 6102                            BSR.S   COPSCMD
0954|                                  .ENDC
0954|
0954| 4E75                    @1      RTS                     ;AND EXIT
0956|
0956|                                  .PAGE
0956|                         ;-------------------------------------------------------------------------------
0956|                         ;  Subroutine to send cmd to COPS
0956|                         ;  Assumes registers:
0956|                         ;       D0 = cmd value
0956|                         ;  If COPS does not respond, timeout error indicated by setting carry bit.
0956|                         ;-------------------------------------------------------------------------------
0956|
0956|                         COPSCMD
0956| 48E7 F8E0                       MOVEM.L D0-D4/A0-A2,-(SP) ;save regs
095A|                                   DISABLE                 ;disable all interrupts
095A| 40E7                    #         MOVE    SR,-(SP)
095C| 007C 0700               #         ORI     #$0700,SR
0960| 207C 00FC DD81                MOVEA.L #VIA1BASE,A0    ;set COPS VIA interface ptr
0966| 2248                            MOVEA.L A0,A1           ;save for use as port B output reg address
0968| 2448                            MOVEA.L A0,A2
096A| D4FC 0006                      ADDA    #DDRA1,A2       ;compute address for port A data direction reg
096E| 7440                            MOVEQ   #$40,D2         ;set up constants for later use
0970| 76FF                            MOVEQ   #-1,D3
0972| 7806                            MOVEQ   #6,D4
0974|
```

```
0974| 1140 001E                     MOVE.B  D0,PORTA1(A0)   ;set cmd in data reg (no handshake)
0978|
0978|                       ;-------------------------------------------------------------------------
0978|                       ;  First find a ready state (CRDY low)
0978|                       ;  Each of the following loops take about 32 machine cycles = 6.4 us plus
0978|                       ;  a variable amount of time for sync with 6522 (max = 2us)
0978|                       ;-------------------------------------------------------------------------
0978|
0978| 323C 061A                     MOVE    #$061A,D1       ;set timeout for about 10 ms
097C| 5341                  @3      SUBQ    #1,D1
097E| 6732                          BEQ.S   @1              ;exit if timeout
0980| 0911                          BTST    D4,(A1)         ;else wait for "ready" (bit 6 = CRDY)
0982| 66F8                          BNE.S   @3
0984|
0984|                       ;  Now find the next ready state to insure enough time available for data
0984|
0984| C0FC 0001                     MULU    #1,D0           ;kill some time (about 15.2 us) to get
0988|                                                       ; out of previous CRDY
0988| 323C 061A                     MOVE    #$061A,D1       ;reinit timeout count
098C| 5341                  @4      SUBQ    #1,D1
098E| 6722                          BEQ.S   @1              ;exit if timeout
0990| 0911                          BTST    D4,(A1)         ;wait for another "ready"
0992| 66F8                          BNE.S   @4
0994|
0994| 1483                          MOVE.B  D3,(A2)         ; ok, jam out the data
0996|
0996|                       ;  Now wait for CRDY high and then hold data for COPS to read
0996|
0996| 323C 061A                     MOVE    #$061A,D1       ;set timeout for about 10 ms
099A| 5341                  @5      SUBQ    #1,D1
099C| 6714                          BEQ.S   @1              ;exit if timeout
099E| 0911                          BTST    D4,(A1)         ;wait for "not-ready"
09A0| 67F8                          BEQ.S   @5
09A2|
09A2| 700A                          MOVEQ   #$A,D0          ; force about a 40 ms
09A4| 5340                  @6      SUBQ    #1,D0           ;  delay for COPS hold time
09A6| 6EFC                          BGT.S   @6
09A8|
09A8| 4212                          CLR.B   (A2)            ; reset direction reg now
09AA| 117C 0082 001C                MOVE.B  #$82,IER1(A0)   ;  and, enable CA1
09B0| 6008                          BRA.S   @2              ; go to normal exit
09B2|
09B2|                       ;  Timeout occurred - set error indicator
09B2|                        @1     ENABLE                  ;reenable
09B2| 46DF                     #       MOVE    (SP)+,SR
09B4| 003C 0001                      ORI.B   #$01,CCR        ;set carry bit
09B8| 6002                          BRA.S   @9              ;skip to exit
```

```
09BA|
09BA|                          @2      ENABLE                  ;restore interrupt levels
09BA| 46DF                    #         MOVE     (SP)+,SR
09BC| 4CDF 071F                @9      MOVEM.L (SP)+,D0-D4/A0-A2 ;restore regs
09C0| 4E75                             RTS                     ;and return to caller
09C2|
09C2|                                  .PAGE
09C2|                          ;--------------------------------------------------------------------------
09C2|                          ;  Scan COPS for proper reset codes.  Delay added for normal COPS power-up
09C2|                          ;  time of about 1.7 seconds.
09C2|                          ;
09C2|                          ;  Send reset signal and then scan keyboard/mouse interface.  First "clears"
09C2|                          ;  COPS of any pending codes, and then issues reset.  Works via
09C2|                          ;  a "state machine" that checks codes received and sets flags as follows:
09C2|                          ;
09C2|                          ;       D1 = 0 - reset signal in place
09C2|                          ;          = 1 - reset signal removed
09C2|                          ;       D3 = 0 - no keyboard codes received => keyboard disconnected
09C2|                          ;          = 1 - keyboard disconnect code ($80/$FD) received
09C2|                          ;                 => ignore, may be old keyboard
09C2|                          ;          = 2 - keyboard disconnect/connect codes ($80/$FD/$80/id) received
09C2|                          ;                 => keyboard connected
09C2|                          ;
09C2|                          ;       D4 = 0 - no mouse codes received => mouse connected
09C2|                          ;          = 1 - only mouse connect code ($87) received => ignore, may be old sys
09C2|                          ;          = 2 - mouse connect/disconnect ($87/$07) codes received
09C2|                          ;                 => mouse disconnected
09C2|                          ;--------------------------------------------------------------------------
09C2|
09C2|                          RSTSCAN
09C2| 2278 0260                       MOVE.L  KBDQPTR,A1      ;setup buffer ptrs
09C6| 347C 02C0                       MOVEA   #QEND,A2
09CA| 616C                    @1      BSR.S   GETJMP          ;clear COPS queue, saving data
09CC| 64FC                             BCC.S   @1
09CE|
09CE| 6100 00DA                       BSR     RSTKBD          ;do reset of keyboard/mouse interfaces
09D2|
09D2|                                  .IF  ROM4K = 0
09D2| 4281                             CLR.L   D1              ;init some flags
09D4| 4283                             CLR.L   D3
09D6| 4284                             CLR.L   D4
09D8| 615E                             BSR.S   GETJMP          ;check for data
09DA| 6560                             BCS.S   RSTXIT          ;exit if none (may be old keyboard)
09DC|
09DC|                          ;  State 0 - waiting for reset flag or mouse connect code
09DC| 0C00 0080                RST0    CMPI.B  #RSTCODE,D0     ;reset flag?
09E0| 6724                             BEQ.S   RST1            ;skip if yes to state 1
```

```
09E2| 0C00 0087                    CMPI.B  #MSPLG,D0       ;mouse connect code?
09E6| 670E                        BEQ.S   RST2            ;skip if yes to state 2
09E8| 0C00 0007                    CMPI.B  #MSUNPLG,D0     ;mouse disconnect code only?
09EC| 6602                        BNE.S   GET0
09EE| 7802                        MOVEQ   #2,D4           ;set flag for disconnect state
09F0| 6146                GET0    BSR.S   GETJMP          ;go get next code
09F2| 6548                        BCS.S   RSTXIT          ;exit if no more codes
09F4| 60E6                        BRA.S   RST0            ;else continue scan loop
09F6|
09F6|                     ;  State 2 - waiting for mouse unplugged code
09F6|
09F6| 7801                RST2    MOVEQ   #1,D4           ;set flag for mouse connect received
09F8| 613E                        BSR.S   GETJMP          ;go get next byte
09FA| 6540                        BCS.S   RSTXIT          ;exit if none or queue full
09FC| 0C00 0007                    CMPI.B  #MSUNPLG,D0     ;mouse disconnect code?
0A00| 66DA                        BNE.S   RST0            ;no - return to state 0
0A02| 7802                        MOVEQ   #2,D4           ;yes - set flag
0A04| 60EA                        BRA.S   GET0            ;and return to state 0
0A06|
0A06|                     ;  State 1 - waiting for reset code
0A06|
0A06| 6130                RST1    BSR.S   GETJMP          ;go get next byte
0A08| 6532                        BCS.S   RSTXIT          ;exit if no more
0A0A| 0C00 00FD                    CMPI.B  #KUNPLG,D0      ;keyboard unplugged code?
0A0E| 6604                        BNE.S   @1              ;skip if not
0A10| 7601                        MOVEQ   #1,D3           ;else set flag
0A12| 60DC                        BRA.S   GET0            ;and return to state 0
0A14|
0A14| 0C00 00DF            @1      CMPI.B  #$DF,D0         ;id code?
0A18| 6208                        BHI.S   @2              ;skip if not
0A1A| 11C0 01B2                   MOVE.B  D0,KEYID        ;else save for later use
0A1E| 7602                        MOVEQ   #2,D3           ;update flag
0A20| 60CE                        BRA.S   GET0            ;and return to state 0
0A22| 0C00 00FF            @2      CMPI.B  #KCERR,D0       ;Keyboard COPS error?
0A26| 6604                        BNE.S   @3              ;skip if not
0A28| 08C7 000D                    BSET    #KBDCOPS,D7     ;else set error indicator
0A2C|
0A2C| 0C00 00FE            @3      CMPI.B  #ICERR,D0       ;I/O COPS error code?
0A30| 6604                        BNE.S   @4              ;skip if not
0A32| 08C7 000C                    BSET    #IOCOPS,D7      ;else set error indicator
0A36|
0A36| 60B8                @4      BRA.S   GET0            ;continue scan from state 0
0A38|
0A38|                     ;  Insert to save code space
0A38|
0A38| 6144                GETJMP  BSR.S   GETDATA         ;go get COPS data
0A3A| 4E75                        RTS                     ;and return to caller
```

```
0A3C|                       ;  Reset exit - analyze results
0A3C|
0A3C| 4A01                  RSTXIT  TST.B   D1              ;reset signal lifted?
0A3E| 660A                          BNE.S   @1              ;skip if yes
0A40| 6100 0082                     BSR     CLRRST          ;else remove reset signal
0A44| 7201                          MOVEQ   #1,D1           ;set "removed flag"
0A46| 6136                          BSR.S   GETDATA         ;any data?
0A48| 6492                          BCC.S   RST0            ;go decode if yes
0A4A|
0A4A|                       @1
0A4A|                               .IF  FINKBD = 1
0A4A| 4A03                          TST.B   D3              ;any keyboard data detected?
0A4C| 6604                          BNE.S   MSCHK           ;skip if yes - assume keybd connected
0A4E| 08C7 0017                     BSET    #KBDOUT,D7      ;if none, keyboard is disconnected
0A52|
0A52|                       MSCHK
0A52| 4A04                          TST.B   D4              ;any mouse data?
0A54| 6714                          BEQ.S   SCANXIT         ;skip if none - mouse connected
0A56|
0A56| 5344                  @1      SUBQ    #1,D4           ;flag = 1?
0A58| 6710                          BEQ.S   SCANXIT         ;ignore if yes
0A5A|
0A5A| 08C7 0018                     BSET    #MOUSOUT,D7     ;else mouse disconnected
0A5E| 600A                          BRA.S   SCANXIT         ;and go to exit
0A60|
0A60|                               .ELSE
0A60|                               .ENDC                   ;{FINKBD}
0A60|
0A60|                       ;  Error exits - set appropriate indicator
0A60|
0A60| 08C7 0014            SCANERR BSET    #IOKBD,D7       ;I/O or keyboard failure
0A64| 6004                          BRA.S   SCANXIT
0A66|
0A66| 08C7 000C            IOCERR  BSET    #IOCOPS,D7      ;I/O COPS error
0A6A|
0A6A|                               .ELSE
0A6A|                               .ENDC                   ;{ROM4K}
0A6A|
0A6A| 21C9 0260            SCANXIT MOVE.L  A1,KBDQPTR      ;save queue ptr for later use
0A6E|
0A6E|                               .IF  ROM4K = 0
0A6E| 2007                          MOVE.L  D7,D0           ;check error codes
0A70| 0280 0018 3000               ANDI.L  #SCANMSK,D0     ; for scan errors
0A76| 4A80                          TST.L   D0              ;any found?
0A78| 6600 0920                     BNE     TSTCHK          ;skip if yes
0A7C|                               .ENDC
0A7C|
```

```
0A7C| 606A                        BRA.S   BEEP            ;else continue testing
0A7E|
0A7E|                        ;--------------------------------------------------------------------------
0A7E|                        ;  Subroutine to get COPS data
0A7E|                        ;  Assumes registers:
0A7E|                        ;       D0 - scratch use        A0 - VIA address
0A7E|                        ;       D1 - unused             A1 - Ptr to data save area
0A7E|                        ;       D2 - scratch use        A2 - Ptr to end of data area
0A7E|                        ;  Puts data in save area and also leaves in register D0.
0A7E|                        ;  Carry bit set if timeout error or keyboard queue full.
0A7E|                        ;--------------------------------------------------------------------------
0A7E|
0A7E| B5C9                   GETDATA CMPA.L  A1,A2           ;check if at end of queue
0A80| 671A                           BEQ.S   @2              ;exit if yes
0A82| 243C 0000 01FF                 MOVE.L  #$1FF,D2        ;else set timeout for about 5 ms
0A88| 207C 00FC DD81                 MOVEA.L #VIA1BASE,A0    ;set COPS VIA interface ptr
0A8E| 1028 001A              @1      MOVE.B  IFR1(A0),D0     ;check if data avail
0A92| 0800 0001                      BTST    #1,D0
0A96| 660A                           BNE.S   GETIT           ;skip if yes
0A98| 5342                           SUBQ    #1,D2
0A9A| 66F2                           BNE.S   @1              ;else continue
0A9C| 003C 0001              @2      ORI.B   #$01,CCR        ;set timeout error
0AA0| 4E75                           RTS
0AA2|
0AA2| 1028 0002              GETIT   MOVE.B  ORA1(A0),D0     ;read data
0AA6| 12C0                           MOVE.B  D0,(A1)+        ;save it
0AA8| 4E75                           RTS                     ;and exit with results
0AAA|
0AAA|                                .PAGE
0AAA|                        ;--------------------------------------------------------------------------
0AAA|                        ;  Subroutine to do reset of keyboard and mouse interfaces
0AAA|                        ;  Inputs:
0AAA|                        ;       None
0AAA|                        ;  Outputs:
0AAA|                        ;       None
0AAA|                        ;  Side Effects:
0AAA|                        ;       D0/A0 trashed
0AAA|                        ;--------------------------------------------------------------------------
0AAA|
0AAA| 207C 00FC DD81         RSTKBD  MOVEA.L #VIA1BASE,A0    ;set VIA ptr
0AB0| 0890 0000                      BCLR    #0,ORB1(A0)     ;set reset signal
0AB4| 0028 0001 0004                 ORI.B   #$01,DDRB1(A0)  ;send it
0ABA| 203C 0000 0BB8                 MOVE.L  #3000,D0        ;do delay for 12 ms
0AC0| 6120                           BSR.S   DELAY
0AC2| 4E75                           RTS
0AC4|
0AC4|                        ;--------------------------------------------------------------------------
```

```
0AC4|                       ;  Subroutine to remove reset signal for keyboard and mouse interfaces
0AC4|                       ;  Inputs:
0AC4|                       ;       A0 = ptr to parallel port VIA (set in RSTKBD routine)
0AC4|                       ;  Outputs:
0AC4|                       ;       None
0AC4|                       ;  Side Effects:
0AC4|                       ;       D0 trashed
0AC4|                       ;-----------------------------------------------------------------------------
0AC4|
0AC4| 08D0 0000             CLRRST  BSET    #0,ORB1(A0)     ;remove reset signal
0AC8| 6112                          BSR.S   KBDDELAY        ;delay for keyboard reset time
0ACA| 4E75                          RTS
0ACC|
0ACC|                       ;-----------------------------------------------------------------------------
0ACC|                       ; Subroutine to delay for count in D0 (each count = 4 us).  Additional
0ACC|                       ; entry points set up for fixed delays.
0ACC|                       ;-----------------------------------------------------------------------------
0ACC|
0ACC|                               .IF  ROM4K = 0
0ACC| 203C 0000 61A8        DELAY_1 MOVE.L  #TNTHSEC,D0     ;.1 second delay
0AD2| 600E                          BRA.S   DELAY
0AD4|
0AD4| 203C 0013 12D0        DELAY5  MOVE.L  #FIVESEC,D0     ;5 second delay
0ADA| 6006                          BRA.S   DELAY
0ADC|
0ADC|                       KBDDELAY
0ADC| 203C 0006 7C28                MOVE.L  #KBDDLY,D0      ;delay for COPS debounce loop
0AE2|                               .ENDC
0AE2|
0AE2| 5380                  DELAY   SUBQ.L  #1,D0           ;loop until count = 0
0AE4| 66FC                          BNE.S   DELAY
0AE6| 4E75                          RTS
0AE8|
0AE8|                               .PAGE
0AE8|                       ;-----------------------------------------------------------------------------
0AE8|                       ; Sound starting "tone"
0AE8|                       ;-----------------------------------------------------------------------------
0AE8|
0AE8|                       BEEP
0AE8| 6104                          BSR.S   CLICK           ;go click speaker
0AEA| 6000 00AA                     BRA     VIDTST          ;then go do video test
0AEE|
0AEE|                       ;-----------------------------------------------------------------------------
0AEE|                       ; Subroutine to set parms for speaker "click"
0AEE|                       ;-----------------------------------------------------------------------------
0AEE|
0AEE| 103C 00A0             CLICK   MOVE.B  #$A0,D0         ;set frequency
```

```
0AF2| 7200                        MOVEQ   #0,D1           ;and duration
0AF4| 7408                        MOVEQ   #8,D2           ;and volume (medium)                    RM000
0AF6|                                                     ;then fall thru to tone routine         RM000
0AF6|
0AF6|                      ;---------------------------------------------------------------------------
0AF6|                      ;  Routine to beep the speaker
0AF6|                      ;  Assumes regs set up as
0AF6|                      ;    D0 = desired frequency ($00 - $AA)
0AF6|                      ;    D1 = duration (0 = .5 msec)
0AF6|                      ;    D2 = volume (0,2,4,...,E)
0AF6|                      ;---------------------------------------------------------------------------
0AF6|
0AF6| 48E7 1088           TONE    MOVEM.L A0/A4/D3,-(SP)  ;save regs
0AFA|                               BSRS4   TONE2           ;go do tone
0AFA| 49FA 0004           #         LEA     @1,A4
0AFE| 6006                #         BRA.S   TONE2
0B00|                      #@1
0B00| 4CDF 1108                    MOVEM.L (SP)+,A0/A4/D3  ;restore and exit
0B04| 4E75                        RTS
0B06|
0B06|                      ;  separate entry point for call without memory usage
0B06|
0B06| 207C 00FC DD81      TONE2   MOVEA.L #VIA1BASE,A0    ;set VIA ptr
0B0C| 0028 000E 0004              ORI.B   #$0E,DDRB1(A0)  ;set volume bits for output
0B12| 0210 00F1                   ANDI.B  #$F1,ORB1(A0)   ;clear and then
0B16| 8510                        OR.B    D2,ORB1(A0)     ; set volume bits
0B18| 0228 00E3 0016              ANDI.B  #$E3,ACR1(A0)   ;clear shift mode bits
0B1E| 0028 0010 0016              ORI.B   #$10,ACR1(A0)   ;set shift reg for continuous rotate
0B24|
0B24|                      ; check system type
0B24|
0B24| 4A39 00FC C031              TST.B   DISKROM         ;test for Lisa 1 board                  CHG014
0B2A| 6A10                        BPL.S   @3              ;no changes if yes                      CHG014
0B2C| 0839 0005 00FC C031        BTST    #SLOTMR,DISKROM ;else check if slow timers              CHG029
0B34| 6606                        BNE.S   @3              ;skip if yes                            CHG029
0B36| 1600                        MOVE.B  D0,D3           ;else adjust input parm                 CHG014
0B38| E40B                        LSR.B   #2,D3           ; by factor of .25                      CHG014
0B3A| D003                        ADD.B   D3,D0           ;                                       CHG014
0B3C|
0B3C| 1140 0010           @3      MOVE.B  D0,T2CL1(A0)    ;set frequency
0B40| 117C 000F 0014              MOVE.B  #$0F,SHR1(A0)   ;set for square wave and trigger
0B46|
0B46|                      ;  Do time delay -  enter with count in D1 (about .5 msec per count)
0B46|
0B46| 363C 00D0           @1      MOVE.W  #$00D0,D3       ;set delay constant
0B4A| 51CB FFFE           @2      DBF     D3,@2
0B4E| 51C9 FFF6                   DBF     D1,@1
```

```
0B52|
0B52| 0228 00E3 0016        SILENCE ANDI.B  #$E3,ACR1(A0)   ;disable tone
0B58|                               RTS4                    ;and return
0B58| 4ED4                 #          JMP      (A4)
0B5A|
0B5A|
0B5A|                               .IF  DIAGS = 1
0B5A|                        ;-------------------------------------------------------------------------
0B5A|                        ;   Routine to handle I/O board selection errors.  Does check for access
0B5A|                        ;   of other I/O board devices to try to pinpoint error.
0B5A|                        ;-------------------------------------------------------------------------
0B5A|
0B5A| 08C7 0010              NOIO    BSET    #RS232B,D7      ;set SCC port B access error          CHG027
0B5E| 3E7C 0480                      MOVE    #STKBASE,SP     ;restore stack pointer
0B62|                        ;  try access of other I/O board devices
0B62|
0B62| 47FA 0012                      LEA     NOIO2,A3        ;set up new bus error vector
0B66| 21CB 0008                      MOVE.L  A3,BUSVCTR
0B6A| 207C 00FC D901                MOVE.L  #VIA2BASE,A0    ;set base address                     CHG027
0B70| 4A10                          TST.B   (A0)            ;try access
0B72| 6000 FC0C                    BRA     VIA2TST         ;return to testing if OK              CHG027
0B76|
0B76| 08C7 000B              NOIO2   BSET    #VIA2,D7        ;set VIA #2 error also                CHG027
0B7A| 47FA 0012                      LEA     NOIO3,A3        ;try final access to VIA #1           CHG027
0B7E| 21CB 0008                      MOVE.L  A3,BUSVCTR
0B82| 207C 00FC DD81                MOVE.L  #VIA1BASE,A0    ;set base address                     CHG027
0B88| 4A10                          TST.B   (A0)
0B8A| 6000 FC96                    BRA.S   SCRNTST         ;exit if OK                           CHG027
0B8E|
0B8E| 08C7 0001              NOIO3   BSET    #CPUSEL,D7      ;most likely CPU board error
0B92|
0B92| 6000 0806                    BRA     TSTCHK          ;go report errors                     CHG027
0B96|
0B96|                               .ENDC
0B96|
0B96|                               .INCLUDE RM248.S.TEXT
0B96|
0B96|                               .PAGE
0B96|                        ;-------------------------------------------------------------------------
0B96|                        ;  VIDEO CIRCUITRY TEST
0B96|                        ;  The following test checks the vertical retrace signal of the
0B96|                        ;  video circuitry to verify it is toggling.
0B96|                        ;  Register usage:
0B96|                        ;       D0 = timeout count      A0 = unused
0B96|                        ;       D1 = unused             A1 = unused
0B96|                        ;       D2 = bit pointer        A2 = unused
0B96|                        ;       D3 = unused             A3 = address to disable VTIR
```

```
0B96|                       ;       D4 = unused             A4 = address to enable VTIR
0B96|                       ;       D5 = unused             A5 = address of bus status register
0B96|                       ;-------------------------------------------------------------------------------
0B96|
0B96|                       VIDTST
0B96|                               .IF     ROM4K = 0
0B96|
0B96|                               .IF  USERINT = 1
0B96| 6100 25E8                     BSR     MAKETEST        ;display test icons
0B9A| 327C 1DF6                     MOVEA   #CPUSTRT,A1     ;hilite CPU board icon
0B9E| 6100 29D4                     BSR     INVICON
0BA2|                               .ENDC
0BA2|                       VIDCHK
0BA2| 267C 00FC E018                MOVEA.L #VTIRDIS,A3     ;ADDRESS FOR DISABLING VTIR
0BA8| 287C 00FC E01A                MOVEA.L #VTIRENB,A4     ;ADDRESS FOR VTIR ENABLE
0BAE| 2A7C 00FC F801                MOVEA.L #STATREG,A5     ;STATUS REGISTER LOCATION FOR BYTE OPS
0BB4|
0BB4| 303C 0DF4                     MOVE    #$0DF4,D0       ;SET TIMEOUT COUNT FOR ABOUT 20 MS
0BB8| 7402                         MOVEQ   #VRBIT,D2       ;VR BIT LOCATION
0BBA|
0BBA| 4A53                         TST     (A3)            ;RESET THEN
0BBC| 4A54                         TST     (A4)            ; ENABLE VTIR
0BBE| 0515                       @1      BTST    D2,(A5)         ;WAIT FOR LOW
0BC0| 6706                         BEQ.S   @2              ;EXIT IF YES
0BC2| 51C8 FFFA                     DBF     D0,@1           ;ELSE LOOP (ABOUT 5.6 MS PER LOOP)
0BC6| 600C                         BRA.S   VIDERR          ;AND SET ERROR IF TIMEOUT
0BC8|
0BC8| 4A53                       @2      TST     (A3)            ;RESET VTIR
0BCA| 4A54                         TST     (A4)            ;THEN RENABLE
0BCC| 0515                         BTST    D2,(A5)         ;SHOULD BE HIGH BY NOW
0BCE| 6704                         BEQ.S   VIDERR          ;GO TO ERROR EXIT IF NOT
0BD0| 4A53                         TST     (A3)            ;DISABLE VTIR
0BD2| 600C                         BRA.S   VIDXIT          ;and go to exit
0BD4|
0BD4|                       ;  Error exit
0BD4|
0BD4| 08C7 0002               VIDERR  BSET    #VID,D7         ;SET ERROR INDICATOR
0BD8| 4A87                         TST.L   D7              ;in loop mode?
0BDA| 6BC6                         BMI.S   VIDCHK          ;restart test if yes
0BDC| 6000 07BC                     BRA     TSTCHK          ;else go to error msg routine
0BE0|
0BE0|                       ;  Normal exit
0BE0|
0BE0|                       VIDXIT
0BE0|
0BE0|                       ;-------------------------------------------------------------------------------
0BE0|                       ;  Now, try reading of system serial number
```

```
0BE0|                       ;-------------------------------------------------------------------------
0BE0|
0BE0| 307C 0240                    MOVEA   #SERNUM,A0      ;ptr for save of serial #
0BE4| 6110                         BSR.S   RDSERN          ;go do read
0BE6| 64EC                         BCC.S   VIDERR          ;exit if error
0BE8| 4A79 00FC E018               TST     VTIRDIS         ;else disable vertical retrace
0BEE| 4A87                         TST.L   D7              ;check for loop mode
0BF0| 6BB0                         BMI.S   VIDCHK          ;if not, fall thru to next test
0BF2| 6000 0168                    BRA     PARTST          ;and go on to next test
0BF6|
0BF6|                              .PAGE
0BF6|                       ;-------------------------------------------------------------------------
0BF6|                       ;
0BF6|                       ;  Routine to read system serial # from video prom.
0BF6|                       ;  Written by Ken Schmal and Ron Hochsprung.
0BF6|                       ;
0BF6|                       ;       Register Usage:
0BF6|                       ;
0BF6|                       ;       temporary and iterative                 D0
0BF6|                       ;       temporary and iterative                 D1
0BF6|                       ;       temporary and iterative                 D2
0BF6|                       ;       temporary and iterative                 D3
0BF6|                       ;       boolean FOUND to be returned            D4
0BF6|                       ;       pointer to save area for serial #       A0
0BF6|                       ;       SN1 & SN2 pointer                       A1
0BF6|                       ;       STATUS REGISTER pointer                 A2
0BF6|                       ;       SCRACH array pointer                    A3
0BF6|                       ;       SCRACH END pointer                      A4
0BF6|                       ;       Tag const                               A5
0BF6|                       ;       static link and stack frame
0BF6|                       ;         base pointer register                 A6
0BF6|                       ;
0BF6|                       ;  Returns with carry bit set if all OK.
0BF6|                       ;  All registers except D7 and A0 trashed.
0BF6|                       ;
0BF6|                       ;-------------------------------------------------------------------------
0BF6|
0BF6|                       RDSERN
0BF6|
0BF6| 48E7 0180                    MOVEM.L         D7/A0,-(SP)             ;save regs
0BFA|
0BFA|                       ;       turn off all interrupts
0BFA| 40E7                         move            SR, -(sp)               ;save the present status register
0BFC| 007C 0700                    ori.w           #$0700, SR              ;set interrupt to level 7
0C00|
0C00|                       ;-------------------------------------------------------------------------
0C00|                       ;       now set up registers for the algorithm
```

```
0C00|                       ;--------------------------------------------------------------------------
0C00|
0C00| 227C 00FE 8000              move.l          #Snum, a1               ;location in MMU of SN1 & SN2
0C06| 247C 00FC F801              move.l          #Statreg,a2             ;Status Register pointer
0C0C| 4E56 FF18                  link            a6, #dStack             ;make room for SCRACH
0C10| 47EE FF18                  lea             dScrach(a6), a3         ;get pointer for SCRACH
0C14| 49FA 0142                  lea             Tag,a4
0C18| 2D48 FFF8                  move.l          a0,dSavArry(a6)
0C1C|
0C1C|                       ;--------------------------------------------------------------------------
0C1C|                       ;       first we get the block out of the vertical half
0C1C|                       ;--------------------------------------------------------------------------
0C1C|                       ;
0C1C|                       ;       sync up to the vertical retrace bit
0C1C|                       ;
0C1C|
0C1C|                       GetBits1:
0C1C|
0C1C| 7202                        moveq           #2, d1                  ;vertical retrace is bit #2
0C1E| 2D7C 0000 0007 FFFC          move.l          #BytesPerRead,dLcnt(a6) ;read this many bytes
0C26| 4279 00FC E018              clr             VTIRDIS                 ;clear vertical retrace bit
0C2C| 4279 00FC E01A              clr             VTIRENB                 ;set vertical retrace interrupt
0C32| 0312                  @1:     btst            d1, (a2)                ;wait until it's true
0C34| 66FC                        bne.s           @1
0C36|
0C36|                       ;
0C36|                       ;------ read the first block ------
0C36|                       ;
0C36|
0C36| 4C91 00FF             @3:     movem           (a1), d0-d7
0C3A| 4893 00FF                     movem           d0-d7, (a3)
0C3E| 508B                         addq.l          #8, a3
0C40| 508B                         addq.l          #8, a3
0C42| 4E71                         nop
0C44| 7008                         moveq           #dlycnst-1, d0
0C46| 53AE FFFC                   subq.l          #1, dLcnt(a6)
0C4A| 5FC8 FFFE             @4:     dble            d0, @4
0C4E| 6EE6                         bgt.s           @3
0C50|
0C50|                       ;--------------------------------------------------------------------------
0C50|                       ;       then we get the block out of the horizontal half
0C50|                       ;--------------------------------------------------------------------------
0C50|                       ;
0C50|                       ;       kill time until we're near the last vertical retrace line
0C50|                       ;
0C50|
0C50|                       GetBits2:
```

```
0C50| 2D7C 0000 0007 FFFC          move.l          #BytesPerRead, dLcnt(a6);get the last few bytes
0C58| 303C 00AB                   move.w          #TKiller-1, d0          ;time killer constant
0C5C| 51C8 FFFE             @1:   dbra            d0, @1                  ;loop
0C60|
0C60|                       ;
0C60|                       ;------ read the second or last block ------
0C60|                       ;
0C60|
0C60| 4C91 00FF             @2:   movem           (a1), d0-d7
0C64| 4893 00FF                   movem           d0-d7, (a3)
0C68| 508B                        addq.l          #8, a3
0C6A| 508B                        addq.l          #8, a3
0C6C| 4E71                        nop
0C6E| 7008                        moveq           #dlycnst-1, d0
0C70| 53AE FFFC                   subq.l          #1, dLcnt(a6)
0C74| 5FC8 FFFE             @3:   dble            d0, @3
0C78| 6EE6                        bgt.s           @2
0C7A|
0C7A|                       ;-------------------------------------------------------------------------
0C7A|                       ;       now we have to find sync bytes and extract the bit stream
0C7A|                       ;-------------------------------------------------------------------------
0C7A|
0C7A| 4279 00FC E018              clr             VTIRDIS                 ;turn off vertical retrace
0C80| 7801                        moveq           #1, d4                  ;initialize FOUND to true
0C82|
0C82|                       GetBytes:
0C82| 47EE FF18                   lea             dScrach(a6), a3         ;pointer to 1/2 Scrach Array pointer
0C86| 284B                        move.l          a3, a4
0C88| D8FC 0070                   adda            #HalfSize, a4           ;pointer to end of 1/2 Scrach Array     RM000
0C8C|                       ;
0C8C|                       ;       find the first sync byte
0C8C|                       ;
0C8C| 6100 007C                   bsr             FindSync
0C90| 4A44                        tst.w           d4
0C92| 6764                        beq.s           Exit                    ;exit if no sync byte found
0C94|                       ;
0C94|                       ;       now pull out the first block from the bit stream
0C94|                       ;
0C94| 6100 009E                   bsr             GetNibbles
0C98|                       ;       here we look for the second sync byte.
0C98|                       ;
0C98| 47EE FF18                   lea             dScrach(a6), a3
0C9C| D6FC 0070                   adda            #HalfSize, a3           ;pointer to 2/2 Scrach Array pointer    RM000
0CA0| 284B                        move.l          a3,a4
0CA2| D8FC 0070                   adda            #HalfSize,a4            ;pointer to end of 2/2 Scrach Array     RM000
0CA6|                       ;
0CA6| 6100 0062                   bsr             FindSync
```

```
0CAA| 4A44                    tst.w           d4
0CAE|                   ;     beq.s           Exit                    ;again, exit if no sync byte found
0CAE|                   ;     now pull out second block from the bit stream
0CAE|                   ;
0CAE| 6100 0084                bsr             GetNibbles
0CB2|
0CB2|                   ;-------------------------------------------------------------------------
0CB2|                   ;     Check the checksum of the read data
0CB2|                   ;-------------------------------------------------------------------------
0CB2|
0CB2|                   CheckSum:
0CB2| 206E FFF8                move.l          dSavArry(a6),a0
0CB6| 4240                      clr.w           d0
0CB8|
0CB8| 1028 0018                 move.b          24(a0),d0
0CBC| 343C 0064                move.w          #100,d2
0CC0| C0C2                      mulu            d2,d0
0CC2|
0CC2| 1228 0019                 move.b          25(a0),d1
0CC6| 343C 000A                move.w          #10,d2
0CCA| C2C2                      mulu            d2,d1
0CCC| D041                      add.w           d1,d0
0CCE|
0CCE| 1228 001A                 move.b          26(a0),d1
0CD2| D041                      add.w           d1,d0
0CD4|
0CD4| 4241                      clr.w           d1
0CD6| 4242                      clr.w           d2
0CD8| 4243                      clr.w           d3
0CDA| 1630 1000          @2:     move.b          0(a0,d1),d3
0CDE| D443                      add.w           d3,d2
0CE0| 5241                      addq.w          #1,d1
0CE2| 0C41 0018                cmpi.w          #24,d1
0CE6| 66F2                      bne.s           @2
0CE8|
0CE8| 1628 001B                 move.b          27(a0), d3
0CEC| D443                      add.w           d3,d2
0CEE| 0442 003C                subi.w          #4 * $F, d2
0CF2| B440                      cmp.w           d0,d2
0CF4| 6702                      beq.s           @3
0CF6| 4244                      clr.w           d4
0CF8|                   @3:
0CF8|                   ;-------------------------------------------------------------------------
0CF8|                   ;     job well done, lets go home
0CF8|                   ;-------------------------------------------------------------------------
0CF8|
0CF8|                   Exit:
```

```
0CF8| 4E5E                        unlk        a6
0CFA| 46DF                        move        (sp)+, SR           ;restore status reg
0CFC| 4CDF 0180                   MOVEM.L     (SP)+,D7/A0         ;and regs
0D00| 4279 00FC E01A              clr         VTIRENB             ;re-enable interrupts
0D06| E24C                        LSR         #1,D4               ;shift to set/reset error indicator
0D08| 4E75              @1        RTS                             ; and exit
0D0A|
0D0A|                             .PAGE
0D0A|                   ;-------------------------------------------------------------------------
0D0A|                   ;       subroutine to find a sync byte
0D0A|                   ;-------------------------------------------------------------------------
0D0A|
0D0A|                   FindSync:
0D0A| 4280                        clr.l       d0
0D0C| 7202                        moveq       #2, d1              ;two passes to find the sync byte
0D0E| 341B              @1:       move.w      (a3)+, d2           ;
0D10| E34A                        lsl.w       #1, d2              ;
0D12| E310                        roxl.b      #1, d0              ;get SN1
0D14| B9CB                        cmpa.l      a3, a4              ;assure the buffer's circular
0D16| 660A                        bne.s       @2                  ;
0D18| D7FC FFFF FF90              adda.l      #-HalfSize, a3      ;if it's at the end then
0D1E| 5341                        subq        #1, d1              ; check if it's the second try
0D20| 670E                        beq.s       @3                  ; and exit if so
0D22| 0C00 00FF          @2:       cmpi.b      #$0ff, d0           ;test here if it's a sync byte
0D26| 66E6                        bne.s       @1                  ;no: loop again
0D28| E948                        lsl.w       #4, d0              ;yes: adjust the byte
0D2A| E808                        lsr.b       #4, d0              ;
0D2C| 30C0                        move.w      d0, (a0)+           ;save it
0D2E| 4E75                        rts                             ;and return
0D30|
0D30| 4244              @3:       clr.w       d4                  ;uh, oh. No sync byte.
0D32| 4E75                        rts                             ;clear FOUND and return
0D34|                   ;-------------------------------------------------------------------------
0D34|                   ;       subroutine to pull out a 14 nibble block from the bit stream
0D34|                   ;-------------------------------------------------------------------------
0D34|
0D34|                   GetNibbles:
0D34| 7406                        moveq       #BytesPerRead-1, d2 ;
0D36| 7208              @1:       moveq       #8, d1              ;8 bits/byte
0D38| 4280                        clr.l       d0                  ;
0D3A| E3DB              @2:       lsl         (a3)+               ;get SN1 in the next scrach word
0D3C| E310                        roxl.b      #1, d0              ;shift it into the save buffer
0D3E| B9CB                        cmpa.l      a3, a4              ;assure a circular bufer
0D40| 6606                        bne.s       @3                  ;
0D42| D7FC FFFF FF90              adda.l      #-HalfSize, a3      ;
0D48| 5341              @3        subq        #1, d1              ;decrement bit/byte counter
0D4A| 66EE                        bne.s       @2                  ;loop again if still in byte
```

```
0D4C| E948                      lsl.w       #4, d0              ;separate the nibbles
0D4E| E808                      lsr.b       #4, d0              ;
0D50| 30C0                      move        d0, (a0)+           ;save these nibbles
0D52| 5342                      subq        #1, d2              ;decrement byte/SN counter
0D54| 66E0                      bne.s       @1                  ;loop again if still more to go
0D56| 4E75                      rts
0D58|
0D58| 4B41 5300          Tag     .word       $4b41,$5300
0D5C|
0D5C|
0D5C|                           .PAGE
0D5C|                   ;--------------------------------------------------------------------------
0D5C|                   ;  PARITY CIRCUITRY TEST
0D5C|                   ;  The purpose of this test is to verify the operation of the parity checking
0D5C|                   ;  logic by forcing a parity error and ensuring it is caught.
0D5C|                   ;  Register usage:
0D5C|                   ;       D0 = pattern written            A0 = logical address used for test
0D5C|                   ;       D1 = read results               A1 = corresponding physical address
0D5C|                   ;       D2 = NMI indicator              A2 = save for NMI vector
0D5C|                   ;       D3 = save of memory contents    A3 = scratch
0D5C|                   ;       D4 = save of error addr latch   A4 = unused
0D5C|                   ;       D5 = unused                     A5 = address of bus status register
0D5C|                   ;       D6 = unused                     A6 = unused
0D5C|                   ;--------------------------------------------------------------------------
0D5C|
0D5C|                   PARTST
0D5C|                           .ENDC
0D5C|                           .IF  ROM16K = 1
0D5C|
0D5C| 2478 007C                 MOVE.L  NMIVCT,A2       ;SAVE STANDARD NMI VECTOR
0D60| 47FA 0092                 LEA     WWPERR,A3       ;THEN SET UP NEW PARITY ERROR (NMI) VECTOR
0D64| 21CB 007C                 MOVE.L  A3,NMIVCT
0D68| 2A7C 00FC F801            MOVEA.L #STATREG,A5     ;setup status reg ptr for byte ops
0D6E| 4A39 00FC E01C            TST.B   PAROFF          ;disable parity initially
0D74| 4282                     CLR.L   D2              ;clear regs for result use
0D76| 4284                     CLR.L   D4
0D78| 303C 01FF                 MOVE    #$01FF,D0       ;SET UP PATTERN FOR WRITE
0D7C| 307C 0300                 MOVEA   #$300,A0        ;SET UP ADDRESS FOR USE (in already verified mem)       RM000
0D80| 3610                     MOVE    (A0),D3         ;SAVE ITS CONTENTS
0D82| 2248                     MOVEA.L A0,A1           ;COMPUTE CORRESPONDING
0D84| D3F8 02A4                 ADDA.L  MINMEM,A1       ; PHYSICAL ADDRESS
0D88|
0D88| 4A39 00FC E006            TST.B   DG2ON           ;ENABLE WRITE WRONG PARITY FUNCTION
0D8E| 3080                     MOVE    D0,(A0)         ;DO WRITE TO CREATE BAD PARITY
0D90| 4A39 00FC E004            TST.B   DG2OFF          ;DISABLE WWP
0D96|
0D96| 4A39 00FC E01E            TST.B   PARON           ;ENABLE PARITY ERROR DETECTION
```

```
0D9C| 4A42                        TST     D2              ;SHOULDN'T HAVE INTERRUPT YET
0D9E| 6632                        BNE.S   PARERR          ;EXIT IF ERROR
0DA0|
0DA0| 3210                        MOVE    (A0),D1         ;DO READ - PARITY ERROR SHOULD OCCUR
0DA2| 4E71                        NOP                     ;GIVE A LITTLE EXTRA TIME
0DA4| 4A42                        TST     D2              ;NMI RECEIVED?
0DA6| 672A                        BEQ.S   PARERR          ;ERROR IF NO
0DA8|                     ;  Check that parity error and failing address correctly caught
0DA8| 0815 0001                   BTST    #PBIT,(A5)      ;PARITY ERROR BIT SET?
0DAC| 6624                        BNE.S   PARERR          ;EXIT IF NOT
0DAE| 3839 00FC F000              MOVE    MEALTCH,D4      ;GET ERROR ADDRESS
0DB4| 4A39 00FC E01C              TST.B   PAROFF          ;disable parity to clear error bit
0DBA| EB8C                        LSL.L   #5,D4           ;NORMALIZE THE ADDRESS
0DBC| B3C4                        CMPA.L  D4,A1           ;SAME ADDRESS AS WRITTEN TO?
0DBE| 6612                        BNE.S   PARERR          ;EXIT IF ERROR
0DC0| 21CA 007C                   MOVE.L  A2,NMIVCT       ;ELSE RESTORE NMI VECTOR
0DC4| 4240                        CLR     D0
0DC6| 4640                        NOT     D0
0DC8| 3080                        MOVE    D0,(A0)         ;"clear" bad parity
0DCA| 4A39 00FC E01E              TST.B   PARON           ;reenable parity
0DD0| 6016                        BRA.S   PARXIT          ;and skip to exit
0DD2|
0DD2|                     ;  Error exit
0DD2| 08C7 0003            PARERR  BSET    #PAR,D7         ;SET INDICATOR
0DD6| 4A87                        TST.L   D7              ;in loop mode?
0DD8| 6B82                        BMI.S   PARTST          ;restart if yes
0DDA| 4A39 00FC E01C              TST.B   PAROFF          ;else ensure parity disabled
0DE0| 21CA 007C                   MOVE.L  A2,NMIVCT       ;RESTORE NMI VECTOR
0DE4| 6000 05B4                   BRA     TSTCHK          ;AND ABORT FURTHER TESTING
0DE8|
0DE8|                     ;  Normal exit
0DE8|
0DE8| 4A87                  PARXIT  TST.L   D7              ;check for loop mode
0DEA| 6B00 FF70                   BMI.S   PARTST          ;restart test if yes
0DEE| 6100 27C6                   BSR     CHKCPU          ;place check over CPU (all tests OK)
0DF2| 600E                        BRA.S   MEMTST2         ;else go do memory test
0DF4|
0DF4|                     ;  NMI routine for parity error checking
0DF4|
0DF4| 7401                  WWPERR  MOVEQ   #1,D2           ;SET INDICATOR
0DF6| 4E73                        RTE                     ;AND RETURN
0DF8|
0DF8|                     ;-------------------------------------------------------------------------
0DF8|                     ;  Bus error handler for VIA #1 use
0DF8|                     ;-------------------------------------------------------------------------
0DF8|
0DF8| 7032                  VIA1VCT MOVEQ   #EVIA1,D0       ;SET ERROR CODE
```

```
0DFA| 08C7 000A                    BSET    #VIA1,D7        ;set indicator
0DFE| 6000 FB18                    BRA     IOVCT           ;AND GO HANDLE I/O EXCEPTION
0E02|
0E02|                              .ENDC                   ;(ROM16K)
0E02|                              .PAGE
0E02|                         ;---------------------------------------------------------------------------
0E02|                         ;  Now do full memory test with and without parity enabled.  If parameter
0E02|                         ;  memory bit set for extended memory testing, memory tests executed in
0E02|                         ;  twice.  If warm-start, execute only one pass with parity enabled.
0E02|                         ;  Uses registers:
0E02|                         ;       A0 = starting address to test   D0 = used to consolidate test results
0E02|                         ;       A1 = ending address to test     D1 = scratch
0E02|                         ;       A2 = unused                     D2 = address increment
0E02|                         ;       A3 = save address for results   D3 = test results for each 128K
0E02|                         ;       A4 = return address             D4 = max test address
0E02|                         ;       A5 = unused                     D5 = pass count
0E02|                         ;---------------------------------------------------------------------------
0E02|
0E02|                         MEMTST2
0E02|                              .IF  ROM4K = 0
0E02|
0E02|                              .IF  USERINT = 1
0E02| 327C 1E04                    MOVEA   #MEMSTRT,A1     ;hilite memory board test icon
0E06| 6100 276C                    BSR     INVICON
0E0A|                              .ENDC
0E0A|
0E0A| 6100 F8D6                    BSR     SETBUSVCT       ;restore normal bus error vector                RM000
0E0E|                         MEMLOOP
0E0E| 43FA 0104                    LEA     PRTYINT1,A1     ;setup up vector for parity intrpt              CHG015
0E12| 21C9 007C                    MOVE.L  A1,NMIVCT       ;                                               CHG015
0E16|
0E16|                              .IF  ROM16K = 1
0E16|                         ;  First check if this is a warm-start                                        CHG006
0E16|
0E16| 0807 001E                    BTST    #WRMSTRT,D7     ;warm-start?                                    CHG006
0E1A| 6704                         BEQ.S   @0              ;skip if not                                    CHG015
0E1C| 7A01                         MOVEQ   #1,D5           ;else set count for one pass                    CHG015
0E1E| 6020                         BRA.S   @3              ;skip to do it                                  CHG015
0E20|
0E20|                         ;  Next check parameter memory to see if extended testing desired
0E20|
0E20| 6100 0A14                  @0      BSR     CHKPM           ;go check parameter memory
0E24| 650E                         BCS.S   @1              ;skip if not valid to do only one pass
0E26| 0839 0006 00FC C18D          BTST    #6,MEMCODE      ;else check extended memory test indicator
0E2E| 6704                         BEQ.S   @1              ;exit if not set
0E30|
0E30| 7A02                         MOVEQ   #2,D5           ;run two passes for extended mode               CHG015
```

```
0E32| 6002                        BRA.S   @2              ;go do it                                   CHG015
0E34| 7A01                @1      MOVEQ   #1,D5           ;run one pass for normal mode               CHG015
0E36|
0E36|                     ;  Run the memory tests
0E36|
0E36| 4A39 00FC E01C     @2      TST.B   PAROFF          ;first run with parity off                  CHG015
0E3C| 612C                        BSR.S   RUNTESTS        ;run test pass                              CHG015
0E3E| 660E                        BNE.S   TSTDONE         ;skip if error                              CHG015
0E40| 4A39 00FC E01E     @3      TST.B   PARON           ;then run pass with parity on               CHG015
0E46| 6122                        BSR.S   RUNTESTS        ;run test pass                              CHG015
0E48| 6604                        BNE.S   TSTDONE         ;exit if error                              CHG015
0E4A| 5345                        SUBQ    #1,D5           ;decr pass count                            CHG015
0E4C| 66E8                        BNE.S   @2              ;continue testing until done                CHG015
0E4E|
0E4E| 4A87                TSTDONE TST.L   D7              ;in loop mode?
0E50| 6BBC                        BMI.S   MEMLOOP         ;restart if yes
0E52| 0807 0015                   BTST    #MEM,D7         ;memory error?
0E56| 6600 0542                   BNE     TSTCHK          ;abort if yes
0E5A| 6100 2762                   BSR     CHKMBRD         ;else signal memory OK
0E5E| 47FA F8A4                   LEA     NMI,A3          ;restore NMI vector                         CHG015
0E62| 21CB 007C                   MOVE.L  A3,NMIVCT       ;                                           CHG015
0E66| 6000 0198                   BRA     IOTST           ;go on to next test
0E6A|
0E6A|
0E6A|                     ;-----------------------------------------------------------------------
0E6A|                     ;  Subroutine to run the memory tests - saves results as test proceeds
0E6A|                     ;  Zero condition code bit set if no errors.
0E6A|                     ;-----------------------------------------------------------------------
0E6A|
0E6A|                     RUNTESTS
0E6A|
0E6A|                     ;  Do the basic test
0E6A|
0E6A|                     BASICTST
0E6A| 6118                        BSR.S   TSTINIT         ;init for new test
0E6C|                     CALL3
0E6C|                             BSR4    RAMTEST
0E6C| 49FA 0006          #            LEA     @1,A4
0E70| 6000 003E          #            BRA     RAMTEST
0E74|                     #@1
0E74| 6704                        BEQ.S   @1              ;skip if no errors
0E76| 08C7 0015                   BSET    #MEM,D7         ;else set error indicator
0E7A| 611C                  @1    BSR.S   SAVRSLT         ;save results
0E7C| 66EE                        BNE.S   CALL3           ;loop until done                            CHG021
0E7E| 0807 0015                   BTST    #MEM,D7         ;set condition code                         CHG015
0E82| 4E75                        RTS                     ;and exit
0E84|
```

```
0E84|                           .ELSE
0E84|                           .ENDC                   ;{ROM16K}
0E84|
0E84|                           .PAGE
0E84|                   ;-----------------------------------------------------------------------
0E84|                   ;  Subroutine to do initialization for memory tests
0E84|                   ;-----------------------------------------------------------------------
0E84|
0E84| 7402                      MOVEQ   #2,D2           ;test in 128K increments                    RM000
0E86| 4842                      SWAP    D2              ; (sets D2 = $20000)                        RM000
0E88| 2838 0110                 MOVE.L  SCRNBASE,D4     ;get max test address (base of screen)
0E8C| 307C 0800                 MOVEA   #LOMEM,A0       ;set initial start
0E90| 2242                      MOVE.L  D2,A1           ; and ending address
0E92| 367C 0186                 MOVEA   #MEMRSLT,A3     ;set address of result area                 RM000
0E96| 4E75                      RTS
0E98|
0E98|                   ;-----------------------------------------------------------------------
0E98|                   ;  Subroutine to save results and update ptrs.
0E98|                   ;-----------------------------------------------------------------------
0E98|
0E98| 3003              SAVRSLT MOVE    D3,D0           ;get low results
0E9A| 4843                      SWAP    D3              ;get high results
0E9C| 8640                      OR      D0,D3           ;combine
0E9E| 875B                      OR      D3,(A3)+        ; and save
0EA0| B889                      CMP.L   A1,D4           ;at max test address?
0EA2| 670A                      BEQ.S   @1              ;exit if yes
0EA4| 2049                      MOVEA.L A1,A0           ;else set new addresses
0EA6| D3C2                      ADDA.L  D2,A1           ; to check next row of memory
0EA8| B889                      CMP.L   A1,D4           ;in last segment?
0EAA| 6C02                      BGE.S   @1
0EAC| 2244                      MOVE.L  D4,A1           ;set at base of video page
0EAE| 4E75              @1      RTS
0EB0|
0EB0|                           .PAGE
0EB0|                   ;-------------------------------------------------------------------------------
0EB0|                   ; BASIC MEMORY TEST - writes pattern and its complement in memory location,
0EB0|                   ;                     then verifies by reading.  Also does second scan as
0EB0|                   ;                     addressing check.  Uses long word operations for speed.
0EB0|                   ; Inputs:
0EB0|                   ;       A0 - Starting address to test
0EB0|                   ;       A1 - Ending address
0EB0|                   ;       A4 - Return address
0EB0|                   ; Outputs:
0EB0|                   ;       CCR zero bit set if no error
0EB0|                   ;       D3 = OR mask of errors
0EB0|                   ; Uses registers:
0EB0|                   ;       A0 = current test address       D0 = current test pattern
```

```
0EB0|                       ;       A1 = ending test address        D1 = scratch
0EB0|                       ;       A2 = unused                     D2 = unused
0EB0|                       ;       A3 = unused                     D3 = OR mask of errors
0EB0|                       ;       A4 = return address             D4 = unused
0EB0|                       ;       A5 = saved start address        D5 = unused
0EB0|                       ;       A6 = used for return address    D6 = unused
0EB0|                       ;-------------------------------------------------------------------------------
0EB0|
0EB0| 2A48                  RAMTEST MOVE.L  A0,A5           ;save start address
0EB2| 203C AA55 A55A               MOVE.L  #PATRN,D0       ;get pattern
0EB8| 4680                        NOT.L   D0              ;use complement first
0EBA| 7600                        MOVEQ   #0,D3           ;clear for result use
0EBC| 007C 0010                  ORI     #$0010,SR       ;set extend bit for use with pattern rotate
0EC0|
0EC0| 2080                  RAMRW   MOVE.L  D0,(A0)         ;do write
0EC2| B090                        CMP.L   (A0),D0         ;verify
0EC4| 6706                        BEQ.S   RAMCHK2         ;skip if OK
0EC6|                             BSRS6   RDERR           ;else save error bits
0EC6| 4DFA 0004             #       LEA     @1,A6
0ECA| 6040                  #       BRA.S   RDERR
0ECC|                       #@1
0ECC|
0ECC| 4680                  RAMCHK2 NOT.L   D0              ;now use inverse
0ECE| 2080                        MOVE.L  D0,(A0)         ;write to check for stuck bits
0ED0| B098                        CMP.L   (A0)+,D0        ;verify and bump address
0ED2| 670A                        BEQ.S   RAMNXT          ;skip if OK
0ED4| 5988                        SUBQ.L  #4,A0           ;else get error address
0ED6|                             BSRS6   RDERR           ;go save error bits
0ED6| 4DFA 0004             #       LEA     @1,A6
0EDA| 6030                  #       BRA.S   RDERR
0EDC|                       #@1
0EDC| 5888                        ADDQ.L  #4,A0           ;and restore next test address
0EDE|
0EDE| E390                  RAMNXT  ROXL.L  #1,D0           ;create new pattern
0EE0| 4680                        NOT.L   D0              ;invert for test
0EE2| B3C8                        CMPA.L  A0,A1           ;done?
0EE4| 66DA                        BNE.S   RAMRW           ;loop if not
0EE6|
0EE6|                       ;  Now do address check - writes memory as all F's during scan
0EE6| 203C AA55 A55A        ADRTST  MOVE.L  #PATRN,D0       ;reinitialize
0EEC| 204D                        MOVE.L  A5,A0           ;get start address
0EEE| 7200                        MOVEQ   #0,D1
0EF0| 4681                        NOT.L   D1              ;final pattern for write
0EF2| 007C 0010                  ORI     #$0010,SR       ;set extend
0EF6|
0EF6| B090                  ADRCHK  CMP.L   (A0),D0         ;check contents
0EF8| 6706                        BEQ.S   ADRCLR          ;skip if OK
```

```
0EFA|                           BSRS6   RDERR           ;else save errors
0EFA| 4DFA 0004            #      LEA      @1,A6
0EFE| 600C                 #      BRA.S    RDERR
0F00|                      #@1
0F00| 20C1                  ADRCLR  MOVE.L  D1,(A0)+        ;'clear' and go to next location
0F02| E390                        ROXL.L  #1,D0           ;create next pattern
0F04| B3C8                        CMPA.L  A0,A1           ;done?
0F06| 66EE                        BNE.S   ADRCHK          ;loop if not
0F08|
0F08|                       ; Check results
0F08|
0F08| 4A83                        TST.L   D3              ;set condition codes
0F0A|                             RTS4
0F0A| 4ED4                #      JMP      (A4)
0F0C|
0F0C|                       ; Failure routine - save results and continue testing
0F0C|
0F0C| 2210                  RDERR  MOVE.L  (A0),D1         ;do read again
0F0E| B181                        EOR.L   D0,D1           ;isolate bad bits
0F10| 8681                        OR.L    D1,D3           ;save result
0F12|                             RTS6                    ;and return
0F12| 4ED6                #      JMP      (A6)
0F14|
0F14|                             .PAGE
0F14|                       ;-------------------------------------------------------------------------------
0F14|                       ;  Phase 1 Parity error handler for memory tests.  Objective for handler is to
0F14|                       ;  isolate parity error to chip level.
0F14|                       ;  Assumes:
0F14|                       ;       D0 = expected data pattern
0F14|                       ;       A0 = error address or address + 4
0F14|                       ;  Uses registers:
0F14|                       ;       D1 = parity error address
0F14|                       ;       D2 = search size for byte in error
0F14|                       ;       D3 = low memory address
0F14|                       ;       A1 = search address
0F14|                       ;-------------------------------------------------------------------------------
0F14|
0F14|                       PRTYINT1
0F14| 6152                        BSR.S   TSTSTAT         ;check if parity error                  CHG015
0F16| 6600 F7EC                   BNE     NMI             ;skip if not                            CHG015
0F1A| 08C7 0016                  BSET    #MPAR,D7        ;set error indicator                    CHG015
0F1E| 21C0 026C                  MOVE.L  D0,XPCTDATA     ;save data and address                  CHG015
0F22| 21C8 0268                  MOVE.L  A0,XPCTADDR     ;                                       CHG015
0F26| 2638 02A4                  MOVE.L  MINMEM,D3       ;get low memory address                 CHG015
0F2A| 6100 00C4                  BSR     GETPADDR        ;read and convert parity address        CHG015
0F2E| 0801 0005                  BTST    #5,D1           ;main mem error?                        CHG015
0F32| 6604                        BNE.S   @1              ;skip if not                            CHG015
```

```
0F34|
0F34| 743F                        MOVEQ   #MSRCHSZ-1,D2   ;setup up search size for main mem      CHG015
0F36| 600A                        BRA.S   @2              ;skip to do it                        CHG015
0F38| 343C 7FFF            @1     MOVE    #VSRCHSZ-1,D2   ;setup for video memory search        CHG015
0F3C| 0281 FFFF 8000              ANDI.L  #VMSK,D1        ;mask off undefined info              CHG015
0F42| 21C1 01A6            @2     MOVE.L  D1,PEADDR       ;save error address                   CHG015
0F46|
0F46|                       ;  Reset NMI vector and start search for exact address              CHG015
0F46|
0F46| 43FA 002A                    LEA     PRTYINT2,A1     ;setup new vector                     CHG015
0F4A| 21C9 007C                    MOVE.L  A1,NMIVCT       ;                                     CHG015
0F4E| 9283                        SUB.L   D3,D1           ;convert to logical address           CHG015
0F50| 2241                        MOVE.L  D1,A1           ;setup for use                        CHG015
0F52| 4A39 00FC E01C              TST.B   PAROFF          ;clear parity bit                     CHG015
0F58| 4A39 00FC E01E              TST.B   PARON           ;                                     CHG015
0F5E| 4284                        CLR.L   D4              ;clear for use                        CHG015
0F60|
0F60| 1819                  @3    MOVE.B  (A1)+,D4        ;search for parity error by byte      CHG015
0F62| 51CA FFFC                    DBRA    D2,@3           ;loop until found                     CHG015
0F66|
0F66|                       ;  Error did not repeat                                             CHG015
0F66| 605E                        BRA.S   PRIXIT          ;go save error info and exit          CHG015
0F68|
0F68|                       ;-------------------------------------------------------------------------------
0F68|                       ;  Subroutine to check for parity error
0F68|                       ;-------------------------------------------------------------------------------
0F68|
0F68| 0839 0001 00FC F801   TSTSTAT BTST    #1,STATREG      ;check for parity error               CHG015
0F70| 4E75                        RTS                     ;return with condition code set       CHG015
0F72|
0F72|                       ;-------------------------------------------------------------------------------
0F72|                       ;  Parity error handler, phase 2.
0F72|                       ;  Assumes:
0F72|                       ;       A1 = error address + 1
0F72|                       ;       D0 = expected data (long)
0F72|                       ;       D4 = error data (byte)
0F72|                       ;  Uses registers:
0F72|                       ;       D1 = error address
0F72|                       ;       D2 = scratch
0F72|                       ;-------------------------------------------------------------------------------
0F72|
0F72|                       PRTYINT2
0F72| 61F4                        BSR.S   TSTSTAT         ;parity error?                        CHG015
0F74| 6600 F78E                   BNE     NMI             ;skip if not to handle NMI            CHG015
0F78| 6100 0076                   BSR     GETPADDR        ;get error address                    CHG015
0F7C| 21C1 0278                   MOVE.L  D1,PEADR2       ;save it                              CHG015
0F80| 93FC 0000 0001              SUBA.L  #1,A1           ;get actual address                   CHG015
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```
0F86| 21C9 0270                MOVE.L  A1,ACTADDR      ;save address and data                  CHG015
0F8A| 21C4 0274                MOVE.L  D4,ACTDATA      ;                                       CHG015
0F8E| 0801 0005                BTST    #5,D1           ;video error?                           CHG015
0F92| 6632                     BNE.S   PRIXIT          ;skip if yes                            CHG015
0F94|
0F94| 2209                     MOVE.L  A1,D1           ;get error address                      CHG015
0F96| 0281 0000 0003           ANDI.L  #ADRMSK,D1      ;setup up rotate count                  CHG015
0F9C| 2401                     MOVE.L  D1,D2           ;save it                                CHG015
0F9E| 6706                     BEQ.S   @2              ;skip if pre-rotate not needed          CHG015
0FA0|
0FA0| E188               @1    LSL.L   #8,D0           ;shift expected data to high byte       CHG015
0FA2| 5341                     SUBQ    #1,D1           ;                                       CHG015
0FA4| 66FA                     BNE.S   @1              ;                                       CHG015
0FA6|
0FA6| E198               @2    ROL.L   #8,D0           ;shift to low byte                      CHG015
0FA8| 0280 0000 00FF           ANDI.L  #$FF,D0         ;strip unneeded info                    CHG015
0FAE| B900                     EOR.B   D4,D0           ;isolate bad bits                       CHG015
0FB0| 671E                     BEQ.S   PCERR           ;skip if no data error                  CHG015
0FB2| 0802 0000                BTST    #0,D2           ;check if high or low byte error        CHG015
0FB6| 6602                     BNE.S   @3              ;skip if low byte                       CHG015
0FB8| E148                     LSL     #8,D0           ;else shift to high byte                CHG015
0FBA|
0FBA| 367C 0186           @3    MOVEA   #MEMRSLT,A3     ;set ptr to save area                   CHG015
0FBE| 2809                     MOVE.L  A1,D4           ;set error address                      CHG015
0FC0| 2600                     MOVE.L  D0,D3           ;and error bits                         CHG015
0FC2| 6100 F8B0                BSR     SCRNSAV         ;then go save data                      CHG015
0FC6|
0FC6| 4A39 00FC E01C     PRIXIT  TST.B   PAROFF          ;disable parity                         CHG015
0FCC| 6000 F796                BRA     EXCP1           ;and go to exit                         CHG015
0FD0|
0FD0|                    ;  no data error - must be parity chip failure; decode to chip id      CHG015
0FD0|
0FD0| 2209               PCERR   MOVE.L  A1,D1           ;get error address                      CHG015
0FD2| 0801 0000                BTST    #0,D1           ;check if odd or even                   CHG015
0FD6| 6708                     BEQ.S   @1              ;skip if even                           CHG015
0FD8| 11FC 0014 027D           MOVE.B  #$14,PCHIP      ;bad parity chip in low word            CHG015
0FDE| 6006                     BRA.S   @2              ;                                       CHG015
0FE0| 11FC 0009 027D       @1    MOVE.B  #9,PCHIP        ;bad chip in high word                  CHG015
0FE6|
0FE6| 7411               @2    MOVEQ   #17,D2          ;calculate row address                  CHG015
0FE8| E4A9                     LSR.L   D2,D1           ; for parity error                      CHG015
0FEA| 11C1 027C                MOVE.B  D1,PCHPROW      ;save row info                          CHG015
0FEE| 60D6                     BRA.S   PRIXIT          ;and exit                               CHG015
0FF0|
0FF0|                    ;-------------------------------------------------------------------------
0FF0|                    ;  Subroutine to get parity error address
0FF0|                    ;  Returns D1 = error address
```

```
0FF0|                     ;-------------------------------------------------------------------------
0FF0|
0FF0|                     GETPADDR
0FF0| 4281                       CLR.L   D1              ;clear for use                          CHG015
0FF2| 3239 00FC F000             MOVE    MEALTCH,D1      ;read error latch                       CHG015
0FF8| 31C1 01AA                 MOVE    D1,ADRLTCH      ;save it                                CHG015
0FFC| EB89                       LSL.L   #5,D1           ;convert to physical address           CHG015
0FFE| 4E75                       RTS                     ;                                       CHG015
1000|
1000|                            .PAGE
1000|                     ;-------------------------------------------------------------------------
1000|                     ;  Continue with I/O board testing
1000|                     ;-------------------------------------------------------------------------
1000|
1000|                     IOTST
1000|                            .ELSE                   ;{ROM4K}
1000|                            .ENDC                   ;{ROM4K}
1000|
1000|                            .IF  USERINT = 1
1000| 327C 1E12                  MOVEA   #IOSTRT,A1      ;hilite I/O board test icon
1004| 6100 256E                  BSR     INVICON
1008|                            .ENDC
1008|
1008|                            .IF  FULLSCC = 1
1008|                     ;-----------------------------------------------------------------------------;
1008|                     ; SCC Test  (Checks RS232 port controller)
1008|                     ;
1008|                     ;  The SCC interrupt vector is written and read with all 8 bit patterns
1008|                     ;  to check SCC addressing.  An internal loopback test is then done on
1008|                     ;  channel B.                                                                RM014
1008|                     ;
1008|                     ;  The chip is always left in an initial state as follows:
1008|                     ;       both channels are reset
1008|                     ;       master interrupt enable is reset
1008|                     ;       DTR, RTS outputs set high on channel B                              CHG011
1008|                     ;
1008|                     ;  Runs with interrupts off, uses stack.  Uses registers:
1008|                     ;
1008|                     ;  A0 = SCC address                    D0 = error indicator
1008|                     ;  A2 = scratch                        D1 = scratch
1008|                     ;                                      D2 = scratch
1008|                     ;                                      D3 = scratch
1008|                     ;
1008|                     ;  Errors saved in D0 and stored in low memory as follows:
1008|                     ;
1008|                     ;        0000 0001 -> SCC vector read/write error (accessed via channel A)  RM014
1008|                     ;        0000 0010 -> channel B transmit buffer empty timeout               RM014
```

```
1008|                   ;       0000 0100 -> channel B receive buffer full timeout                      RM014
1008|                   ;       0000 1000 -> channel B data compare error                               RM014
1008|                   ;
1008|                   ;-------------------------------------------------------------------------------;
1008|
1008| 47FA 00E4         SCCTEST LEA     SCCVCT,A3       ;set up bus error vector
100C| 21CB 0008                 MOVE.L  A3,BUSVCTR
1010| 6100 00BE                 BSR     RSTSCC          ;reset and set up A0 for SCC
1014| 5488                      ADDQ.L  #ACTL,A0        ;adjust SCC address for channel A
1016| 7200                      MOVEQ   #0,D1           ;SCC interrupt vector starts out 0
1018| 7000                      MOVEQ   #0,D0           ;no errors
101A|
101A|                   VECTLOOP
101A| 10BC 0002                 MOVE.B  #2,(A0)         ;test scc write register 2 (interrupt vector)
101E|                                                   ; via channel A                                 RM014
101E| 3E97                      MOVE    (SP),(SP)       ;delay
1020| 1410                      MOVE.B  (A0),D2         ;read unmodified vector
1022| B401                      CMP.B   D1,D2           ;ok?
1024| 6704                      BEQ.S   @1              ;branch if so
1026| 7001                      MOVEQ   #1,D0           ;otherwise set error code
1028| 6064                      BRA.S   SCCEXIT         ;and exit
102A| 3E97              @1      MOVE    (SP),(SP)
102C| 10BC 0002                 MOVE.B  #2,(A0)         ;write next vector value
1030| 5281                      ADDQ.L  #1,D1           ;increment and delay
1032| 1081                      MOVE.B  D1,(A0)         ;write it
1034| 66E4                      BNE.S   VECTLOOP        ;go through 256 values
1036| 6010                      BRA.S   SETSCC          ;now go do loopback init
1038|
1038|                   ;-------------------------------------------------------------------------
1038|                   ;  Now init channel B for max baud rate and internal loopback.
1038|                   ;  External transmit is inhibited by setting DTR low.
1038|                   ;-------------------------------------------------------------------------
1038|
1038|                   ; Initialization data for SCC: max baud RS-232 async communication
1038|
1038|                   b96data:
1038| 09 00                     .byte   9,$00           ;disable all interupts                          RM014
103A| 04 4D                     .byte   4,$4D           ;x16 clk, 2 stop bits, odd parity
103C| 0B 50                     .byte  11,$50           ;baud rate gen clk to receiver, transmitter
103E| 0C 00                     .byte  12,$00           ;set baud rate to max
1040| 0D 00                     .byte  13,$00
1042| 0E 13                     .byte  14,$13           ;enable baud rate gen, BR=PCLK, loopback
1044| 03 C1                     .byte   3,$C1           ;8 bits/char recv, enable receiver
1046| 05 EA                     .byte   5,$EA           ;DTR low, 8 bits/char xmit, enable xmit, CRC    RM014
1048| 0000 0010         b96lth  .equ    *-b96data
1048|
1048| 45FA FFEE         SETSCC  LEA     B96DATA,A2      ;setup channel B                                RM014
```

```
104C| 323C 0010                MOVE.W  #B96LTH,D1
1050| 5588                     SUBQ.L  #ACTL,A0        ;set address for channel B
1052| 616A                     BSR.S   WRITESCC        ;                                                   RM000
1054|                 ;  do the loopback test
1054|                                                 ;                                                   RM014
1054| 7200               LPTEST  MOVEQ   #0,D1           ;go thru 256 bytes
1056| 76FF                       MOVEQ   #-1,D3          ;set up timeout count
1058|                    SCCLOOP
1058| 0810 0002                  BTST    #TXBE,(A0)      ;wait for transmit buffer empty
105C| 6608                       BNE.S   SCCOUT
105E| 51CB FFF8                 DBRA    D3,SCCLOOP
1062| 5440                       ADDQ    #2,D0
1064| 6024                       BRA.S   SCCLXIT         ;report timeout error
1066| 3E97               SCCOUT  MOVE    (SP),(SP)
1068| 1141 0004                  MOVE.B  D1,SCCDATA(A0)
106C|
106C|                    SCCLOOP2
106C| 0810 0000                  BTST    #RXBF,(A0)      ;wait for data byte to come in
1070| 6608                       BNE.S   SCCIN
1072| 51CB FFF8                 DBRA    D3,SCCLOOP2
1076| 5840                       ADDQ    #4,D0
1078| 6010                       BRA.S   SCCLXIT
107A| 3E97               SCCIN   MOVE    (SP),(SP)
107C| 1428 0004                  MOVE.B  SCCDATA(A0),D2
1080| B401                       CMP.B   D1,D2
1082| 6608                       BNE.S   SCCLERR
1084| 76FF                       MOVEQ   #-1,D3          ;update timeout count
1086| 5201                       ADDQ.B  #1,D1           ;increment data
1088| 66CE                       BNE.S   SCCLOOP         ;just do it 256 times
108A|
108A| 6002               SCCLXIT BRA.S   SCCEXIT
108C|
108C| 5040               SCCLERR ADDQ    #8,D0
108E|
108E|                    ;  exit, saving errors
108E|
108E| 11C0 02AC          SCCEXIT MOVE.B  D0,SCCRSLT      ;save results
1092| 6720                       BEQ.S   @3              ;continue if OK
1094| 0800 0000                  BTST    #0,D0           ;check for chan A error                             RM014
1098| 6704                       BEQ.S   @1
109A| 08C7 000F                 BSET    #RS232A,D7
109E| E248               @1      LSR     #1,D0           ;check for chan B error                             RM014
10A0| 4A00                       TST.B   D0
10A2| 6704                       BEQ.S   @2
10A4| 08C7 0010                 BSET    #RS232B,D7
10A8| 6126               @2      BSR.S   RSTSCC          ;leave SCC at initial condition
10AA| 4A87                       TST.L   D7              ;looping required?
```

```
10AC| 6B00 FF5A                   BMI.S   SCCTEST         ;restart test if yes
10B0| 6000 02E8                   BRA     TSTCHK          ;else go report error
10B4|
10B4| 611A                 @3     BSR.S   RSTSCC          ;leave SCC at initial condition
10B6| 4A87                         TST.L   D7              ;in loop mode?
10B8| 6B00 FF4E                   BMI.S   SCCTEST         ;restart test if yes
10BC| 604E                         BRA.S   DSKTST          ;else continue to next test                              RM014
10BE|
10BE|                             .PAGE
10BE|                      ;--------------------------------------------------------------------------
10BE|                      ; WRITESCC: used to initialize a series of SCC registers.
10BE|                      ;
10BE|                      ;       A0 = SCC address for channel to be initialized
10BE|                      ;       A2 = pointer to an initialization data block as above
10BE|                      ;       A4 = return address
10BE|                      ;       D1 = initialization data block size in bytes
10BE|                      ;
10BE|                      ;       A2, D1, D2 are modified.
10BE|                      ;
10BE|                      ;--------------------------------------------------------------------------
10BE|
10BE|                      WRITESCC
10BE| 1410                         MOVE.B  (A0),D2         ;read to make sure SCC is sync'ed up
10C0| 6002                         BRA.S   @2              ;delay for timing, too
10C2| 109A                 @1      MOVE.B  (A2)+,(A0)
10C4| 51C9 FFFC            @2      DBRA    D1,@1
10C8| 4E75                         RTS
10CA|
10CA|                      ;--------------------------------------------------------------------------
10CA|                      ; Subroutine to initialize SCC.  Does reset and zeroes interrupt vector.
10CA|                      ;--------------------------------------------------------------------------
10CA|
10CA|                      INITBDATA
10CA| 02 00                        .BYTE   2,$00           ;zero interrupt vector
10CC| 09 C0                        .BYTE   9,$C0           ;reset both channels
10CE| 0000 0004            INITBLTH .EQU    4              ;                                                CHG011
10CE|
10CE| 05 82                INITB2  .BYTE   5,$82           ;set DTR, RTS high for Applebus          CHG011
10D0| 0000 0002            INITB2L .EQU    2               ;                                                CHG011
10D0|
10D0|                      RSTSCC
10D0| 207C 00FC D241              MOVE.L  #SCCBCTL,A0     ;point to SCC base address (chan B)
10D6| 45FA FFF2                   LEA     INITBDATA,A2    ;point to channel B init data
10DA| 7204                         MOVEQ   #INITBLTH,D1    ; and set up the length                  CHG011
10DC| 61E0                         BSR.S   WRITESCC        ;then init channel B
10DE| 700C                         MOVEQ   #12,D0          ;delay for SCC reset
10E0| 6100 FA00                   BSR     DELAY
```

```
10E4|
10E4| 45FA FFE8                LEA     INITB2,A2       ;setup DTR, RTS outputs                CHG011
10E8| 7202                     MOVEQ   #INITB2L,D1     ;                                      CHG011
10EA| 61D2                     BSR.S   WRITESCC        ;                                      CHG011
10EC| 4E75                     RTS                     ;and return
10EE|
10EE|                 ;---------------------------------------------------------------------------
10EE|                 ;  Bus error routine for SCC testing
10EE|                 ;---------------------------------------------------------------------------
10EE|
10EE| B1FC 00FC D241  SCCVCT  CMPA.L  #SCCBCTL,A0     ;accessing channel B?
10F4| 6604                    BNE.S   @1              ;skip if no
10F6| 7038                    MOVEQ   #ERS232B,D0     ;set error code for chan B
10F8| 6002                    BRA.S   @2
10FA| 7037             @1     MOVEQ   #ERS232A,D0     ;set error code for chan A
10FC| 4A87             @2     TST.L   D7              ;check if in loop mode
10FE| 6A08                    BPL.S   @3              ;skip if not
1100| 3E7C 0480                MOVEA   #STKBASE,SP     ;else restore stack ptr                RM000
1104| 6000 FF02                BRA     SCCTEST         ;and restart test
1108| 6000 F80E       @3      BRA     IOVCT           ;and go handle I/O card bus error
110C|
110C|                          .ENDC
110C|                          .PAGE
110C|                 ;---------------------------------------------------------------------------
110C|                 ;  Test of disk interface - ensure R/W capability to shared RAM, then
110C|                 ;  try disable interrupts command.  This test will also verify
110C|                 ;  the results of the disk controller's own self-test (ROM and RAM test).
110C|                 ;---------------------------------------------------------------------------
110C|
110C|                 DSKTST
110C|                          .IF  DIAGS = 1
110C|
110C| 47FA 0078                LEA     DSKVCT,A3       ;set up vector in case of bus timeout
1110| 21CB 0008                MOVE.L  A3,BUSVCTR
1114| 207C 00FC C001           MOVE.L  #DISKMEM,A0     ;set ptr for shared memory
111A|
111A|                 ;  Display ROM id                                                       CHG001
111A|
111A| 7A03                     MOVEQ   #ROMIDROW,D5    ;set cursor ptrs                       CHG001
111C| 3C3C 0051                MOVE    #ROMIDCOL+1,D6  ;                                      CHG001
1120| 702F                     MOVEQ   #'/',D0         ;preceed with / char                   CHG001
1122| 6100 2616                BSR     DSPVAL          ;display it                            CHG001
1126| 1028 0030                MOVE.B  ROMV(A0),D0     ;read id                               CHG001
112A| 11C0 02A1                MOVE.B  D0,IOROM        ;save in low memory                    CHG010
112E| 7202                     MOVEQ   #2,D1           ;                                      CHG001
1130| 6100 0546                BSR     OUTCH           ;                                      CHG001
```

```
1134|
1134|                       ;  Read system type                                                  CHG009
1134|
1134| 6162                        BSR.S   SETTYPE         ;determine system type               CHG029
1136|
1136|                       ;  Check disk alive indicator
1136|
1136| 4282                        CLR.L   D2              ;clear for use                       CHG022
1138| 227C 00FC D901              MOVE.L  #VIA2BASE,A1    ;set ptr to parallel port 6522
113E| 0229 00BF 0010              ANDI.B  #$BF,DDRB2(A1)  ;ensure bit 6 is input
1144| 203C 001C 8000              MOVE.L  #DSKTMOUT,D0    ;set up timeout count for 15 secs
114A| 0811 0006            @2      BTST    #DSKDIAG,IRB2(A1) ;check indicator
114E| 6606                        BNE.S   @3              ;skip if set
1150| 5380                        SUBQ.L  #1,D0           ;else loop until timeout (about 8 us per loop)
1152| 66F6                        BNE.S   @2
1154| 7439                        MOVEQ   #EDISK,D2       ;error if not set                    CHG022
1156|
1156|                       ;  Try read operation and check results of self-test
1156|
1156|                       @3
1156|                             .IF  DIAGS = 1
1156| 11E8 0016 02AE              MOVE.B  STST(A0),DSKRSLT ;get results of disk self-test      CHG022
115C| 6616                        BNE.S   INTERR           ;exit if error                      CHG022
115E|
115E| 4A02                  @4    TST.B   D2              ;previous error?                     CHG022
1160| 6612                        BNE.S   INTERR          ;exit if yes                         CHG022
1162|
1162|                       ;  Then try simple write operation to shared RAM
1162|
1162| 7055                        MOVEQ   #$55,D0         ;set up pattern                      RM000
1164| 1140 0002                   MOVE.B  D0,CMD(A0)      ;try write
1168| B028 0002                   CMP.B   CMD(A0),D0      ;verify
116C| 6606                        BNE.S   INTERR          ;exit if error
116E|
116E|                       ;  Finally try a command to disable interrupts
116E|
116E| 6100 0BD6                   BSR     DSABLDSK        ;go issue disable cmd
1172| 640C                        BCC.S   DSKXIT          ;skip if OK
1174|                             .ELSE
1174|                             .ENDC
1174|
1174| 08C7 0011           INTERR  BSET    #DISK,D7        ;else set disk error
1178| 4A87                        TST.L   D7              ;restart if in loop mode
117A| 6B90                        BMI.S   DSKTST
117C| 6000 021C                   BRA     TSTCHK          ;and abort further testing
1180|
1180| 4A87                DSKXIT  TST.L   D7              ;restart if in loop mode
```

```
1182| 6B88                        BMI.S   DSKTST
1184|                             .ENDC
1184|
1184| 603A                        BRA.S   COPSCHK         ;else go to next test
1186|                         ;-------------------------------------------------------------------------
1186|                         ;  Bus error routine for disk testing
1186|                         ;-------------------------------------------------------------------------
1186| 7039                    DSKVCT  MOVEQ   #EDISK,D0       ;SET ERROR CODE
1188|
1188|                             .IF  ROM4K = 0
1188| 4A87                        TST.L   D7              ;check if in loop mode
118A| 6A08                        BPL.S   @3              ;skip if not
118C|                             .ENDC
118C|
118C| 3E7C 0480                   MOVEA   #STKBASE,SP     ;else restore stack ptr                 RM000
1190| 6000 FF7A                   BRA     DSKTST          ;and restart test
1194| 6000 F782               @3  BRA     IOVCT           ;GO HANDLE I/O CARD BUS ERROR
1198|
1198|                         ;-------------------------------------------------------------------------
1198|                         ;  Subroutine for determining system type
1198|                         ;  Returns type value in D0 and sets SYSTYPE location in memory
1198|                         ;    D0 = 0 - Lisa 1
1198|                         ;         1 - Lisa 2/external disk with slow timers
1198|                         ;         2 - Lisa 2/external disk with fast timers
1198|                         ;         3 - Lisa 2/internal disk (Pepsi) with fast timers
1198|                         ;-------------------------------------------------------------------------
1198|
1198| 4280                    SETTYPE CLR.L   D0              ;clear for type usage                   CHG029
119A| 1239 00FC C031              MOVE.B  DISKROM,D1      ;read disk id                           CHG029
11A0| 4A01                        TST.B   D1              ;check for Lisa 1                       CHG029
11A2| 6A16                        BPL.S   @9              ;skip if yes                            CHG029
11A4| 0801 0005                   BTST    #SLOTMR,D1      ;Lisa 2 with slow timers?               CHG029
11A8| 6704                        BEQ.S   @1              ;skip if not                            CHG029
11AA| 7001                        MOVEQ   #1,D0           ;else set type                          CHG029
11AC| 600C                        BRA.S   @9              ;                                       CHG029
11AE| 0801 0006             @1     BTST    #FASTMR,D1      ;Lisa 2 with fast timers?               CHG029
11B2| 6704                        BEQ.S   @2              ;skip if not                            CHG029
11B4| 7002                        MOVEQ   #2,D0           ;else set type                          CHG029
11B6| 6002                        BRA.S   @9              ;                                       CHG029
11B8| 7003                    @2  MOVEQ   #3,D0           ;else must be Pepsi with fast timers    CHG029
11BA| 11C0 02AF             @9     MOVE.B  D0,SYSTYPE      ;save system type                       CHG029
11BE| 4E75                        RTS                     ;                                       CHG029
11C0|
11C0|                              .PAGE
11C0|                         ;-------------------------------------------------------------------------
11C0|                         ;  Scan the keyboard for user commands. Click speaker first to alert user.
11C0|                         ;-------------------------------------------------------------------------
```

```
11C0|
11C0| 47FA F754             COPSCHK LEA     COPSVCT,A3      ;set up bus error vector
11C4| 21CB 0008                     MOVE.L  A3,BUSVCTR
11C8| 6100 F924                     BSR     CLICK           ;notify user that keyboard about to be scanned
11CC| 6100 F8FE                     BSR     DELAY_1         ;delay for 1/10 sec
11D0| 207C 00FC DD81                MOVEA.L #VIA1BASE,A0    ;set up VIA address
11D6| 117C 00C9 0018                MOVE.B  #$C9,PCR1(A0)   ;set intrpt control for later use
11DC|                                                       ; also causes second "click"
11DC|
11DC| 6104                         BSR.S   SCANCPS         ;go check for keyboard input
11DE| 6000 00AC                     BRA     CLKTST          ;and continue on
11E2|
11E2|                          ;-------------------------------------------------------------------------
11E2|                          ;  Subroutine to do scan of keyboard COPS
11E2|                          ;-------------------------------------------------------------------------
11E2|
11E2|                          SCANCPS
11E2| 2278 0260                       MOVE.L  KBDQPTR,A1      ;set up queue ptrs
11E6| 347C 02C0                       MOVEA   #QEND,A2
11EA|
11EA|                          ;  Scan for keyboard data
11EA|
11EA| 6100 F892             KEYSCAN BSR     GETDATA         ;go check for keyboard input
11EE| 6568                           BCS.S   @9              ;exit if no data or queue full
11F0| 0C00 00FF                     CMPI.B  #CMDKEY,D0      ;is it the command key?
11F4| 6624                         BNE.S   @1              ;skip if no
11F6| 6100 F886                     BSR     GETDATA         ;yes - get next char to see if boot cmd
11FA| 655C                         BCS.S   @9              ;exit if queue full or no more data
11FC|
11FC| 0C00 00FE                     CMPI.B  #SHFTKEY,D0     ;check for shift key
1200| 6636                         BNE.S   @2              ;skip if no - go save as boot code
1202| 6100 F87A                     BSR     GETDATA         ;else keep checking for command sequence
1206| 6550                         BCS.S   @9              ;skip if Q full or no data
1208| 0C00 00C4                     CMPI.B  #PKEY,D0        ;'P' key for power-cycling
120C| 660C                         BNE.S   @1              ;skip if not
120E| 11FC 000F 01B3               MOVE.B  #PC,BOOTDVCE    ;set for power-cycle mode
1214| 08C7 001C                     BSET    #ALTBOOT,D7     ;set alternate boot
1218| 60D0                         BRA.S   KEYSCAN         ;and continue scan
121A|
121A|                          @1
121A|                                  .IF  USERINT = 1
121A|
121A|                          ;  do test for downstroke or mouse button (used for burnin cycling)
121A|
121A| 4A00                           TST.B   D0              ;check keycode
121C| 6A1E                         BPL.S   @4              ;skip if not downstroke
121E| 0C00 00FD                     CMPI.B  #ALPHKEY,D0     ;ignore alpha lock key
```

```
1222| 67C6                        BEQ.S   KEYSCAN
1224|                             .ENDC
1224|
1224|                             .IF  BURNIN = 1
1224| 0C00 0086                   CMP.B   #MOUSDWN,D0      ;mouse button?
1228| 6608                        BNE.S   @3               ;skip if not
122A| 08F8 0002 02A2             BSET    #MSBUTN,STATFLGS ;else set flag for later use
1230| 60B8                        BRA.S   KEYSCAN          ;and continue scan
1232|                             .ENDC
1232|
1232|                       @3
1232|                             .IF  USERINT = 1
1232| 08C7 001D                   BSET    #BTMENU,D7       ;set indicator for boot menu
1236|                             .ENDC
1236|
1236| 60B2                        BRA.S   KEYSCAN          ;and continue scan
1238|
1238|                       ;  Save code as possible boot id and set indicator
1238|
1238| 6124                  @2    BSR.S   XLATE            ;translate to boot id code and save
123A| 60AE                        BRA.S   KEYSCAN          ;and continue keyboard scan
123C|
123C|                       ;  Check if release of mouse or COMMAND key (in case continuing after error)
123C|
123C| 0C00 0006             @4    CMP.B   #MOUSUP,D0       ;mouse release?
1240| 6608                        BNE.S   @5
1242| 08B8 0004 02A2             BCLR    #MOUSE,STATFLGS  ;clear marker if yes
1248| 60A0                        BRA.S   KEYSCAN          ;and continue scan
124A|
124A| 0C00 007F             @5    CMP.B   #CMDUP,D0         ;Left CMD key release?
124E| 6606                        BNE.S   @6
1250| 08B8 0003 02A2             BCLR    #CMDFLG,STATFLGS ;clear marker if yes
1256|
1256| 6092                  @6    BRA.S   KEYSCAN          ;continue scan
1258|
1258| 21C9 0260             @9    MOVE.L  A1,KBDQPTR       ;save buffer ptr
125C| 4E75                        RTS                      ;and return to caller
125E|
125E|                       ;---------------------------------------------------------------------
125E|                       ;  Subroutine to translate keycodes to boot device codes.  Returns
125E|                       ;  with boot code in D2 if match found, else D2 = $F for no match.
125E|                       ;  Also saves boot id in memory, and sets alternate boot indicator.
125E|                       ;  Destroys A3 and D2.
125E|                       ;---------------------------------------------------------------------
125E|
125E| 47FA 001A             XLATE   LEA     KEYTBL,A3        ;get ptr to keycode table
1262| 4282                        CLR.L   D2               ;clear for counter
```

```
1264| B01B                  @1      CMP.B   (A3)+,D0        ;do search until match
1266| 6708                          BEQ.S   @2              ;skip if match
1268| 5242                          ADDQ    #1,D2           ;else bump cntr
126A| 4A13                          TST.B   (A3)            ;at end?
126C| 66F6                          BNE.S   @1              ;if not continue scan
126E| 747F                          MOVEQ   #$7F,D2         ;else set for invalid code
1270|                       @2
1270| 11C2 01B3                     MOVE.B  D2,BOOTDVCE     ;save as boot device code
1274| 08C7 001C                     BSET    #ALTBOOT,D7     ;set indicator
1278| 4E75                          RTS                     ;and exit
127A|
127A| F4 F1 F2             KEYTBL   .BYTE   KEY1,KEY2,KEY3          ;1,2,3
127D| F3 E4 01                      .BYTE   KEY4,KEY5,01            ;4,5,reserved (01 is invalid keycode)
1280| E1 E2 01                      .BYTE   KEY6,KEY7,01            ;6,7,reserved
1283| E3 D0 01                      .BYTE   KEY8,KEY9,01            ;8,9,reserved
1286| 01 01 01                      .BYTE   01,01,01                ;reserved
1289| 01                            .BYTE   01                      ;reserved for power-cycle mode
128A| AF                            .BYTE   ENTRKEY                 ;Enter on numeric key pad
128B|                                                               ;  (for Monitor access)
128B| 00                   TBLEND   .BYTE   0                       ;ensure on word boundary
128C|
128C|                             .PAGE
128C|                       ;---------------------------------------------------------------------------
128C|                       ;  Try initial clock read and save data for later use
128C|                       ;---------------------------------------------------------------------------
128C|
128C|                       CLKTST
128C|                             .IF     NEWLISA = 1
128C|                             .IF     DIAGS = 1
128C| 6112                        BSR.S   READCLK         ;go read clock
128E| 4A87                        TST.L   D7              ;restart if in loop mode
1290| 6BFA                        BMI.S   CLKTST
1292| 0807 000E                   BTST    #CLK,D7         ;any errors?
1296| 6600 0102                   BNE     TSTCHK          ;abort if yes
129A| 6100 232A                   BSR     CHKIOBRD        ;else mark I/O board OK
129E| 604E                        BRA.S   CONFIG          ;and exit to next test
12A0|
12A0|                       ;  Subroutine to read clock - destroys regs A0-A2, D0-D1
12A0|
12A0|                       READCLK DISABLE                 ;disable all interrupts
12A0| 40E7                  #          MOVE     SR,-(SP)
12A2| 007C 0700            #          ORI      #$0700,SR
12A6| 7002                        MOVEQ   #$02,D0         ;set up read clock cmd
12A8| 6100 F6AC                   BSR     COPSCMD         ;and send to COPS
12AC| 6534                        BCS.S   CLKERR          ;exit if error
12AE| 347C 01C0                   MOVEA   #DATARGS,A2     ;set ptr to end of save area                RM000
12B2| 327C 01B9            RDCLK0  MOVEA   #CLKDATA-1,A1   ;set ptr to start of save area              RM000
```

```
12B6| 6100 F7C6                    BSR.S   GETDATA         ;go get clock reset code
12BA| 6526                         BCS.S   CLKERR          ;exit if timeout error
12BC| 0C00 0080                    CMP.B   #$80,D0         ;is it the reset code?
12C0| 66F0                         BNE.S   RDCLK0          ;skip if no to continue wait
12C2| 6100 F7BA                    BSR.S   GETDATA         ;go check if clock data
12C6| 651A                         BCS.S   CLKERR
12C8| 0200 00F0                    ANDI.B  #$F0,D0         ;mask to check if clock flag
12CC| 0C00 00E0                    CMP.B   #$E0,D0         ;clock data?
12D0| 66E0                         BNE.S   RDCLK0          ;continue wait if no
12D2|
12D2| 7205                         MOVEQ   #5,D1           ;set expected byte count
12D4| 6100 F7A8             RDCLK1  BSR     GETDATA         ;go read clock data
12D8| 6508                         BCS.S   CLKERR          ;exit if error
12DA| 5341                         SUBQ    #1,D1           ;else loop until all data received
12DC| 66F6                         BNE.S   RDCLK1
12DE|                              ENABLE                  ;restore interrupt mask
12DE| 46DF                   #          MOVE    (SP)+,SR
12E0| 4E75                         RTS
12E2|
12E2|                         ;  Error exit - set indicator and return
12E2|
12E2| 08C7 000E              CLKERR  BSET    #CLK,D7
12E6|                              ENABLE                  ;restore interrupt mask
12E6| 46DF                   #          MOVE    (SP)+,SR
12E8| 003C 0001                     ORI.B   #$01,CCR        ;leave carry bit set
12EC| 4E75                         RTS
12EE|
12EE|                              .ENDC
12EE|                              .ENDC
12EE|                              .PAGE
12EE|                          ;-------------------------------------------------------------------------
12EE|                          ;  Scan I/O slots to determine what cards, if any, are installed and save
12EE|                          ;  id's of installed cards.
12EE|                          ;-------------------------------------------------------------------------
12EE|
12EE|                          CONFIG
12EE|                                  .IF  USERINT = 1
12EE| 327C 1E20                        MOVEA   #XCRDSTRT,A1    ;hilite I/O slot test icon
12F2| 6100 2280                        BSR     INVICON
12F6|                                  .ENDC
12F6|
12F6| 7801                     CONFIG2 MOVEQ   #1,D4           ;set flag for status check
12F8| 610C                             BSR.S   RDSLOTS         ; and go scan the slots
12FA|
12FA|                                  .IF  DIAGS = 1
12FA| 4A87                             TST.L   D7              ;restart if in loop mode
12FC| 6BF8                             BMI.S   CONFIG2
```

```
12FE|                           .ENDC
12FE|
12FE| 6100 22CE                 BSR     CHKXCRD         ;mark I/O slots OK
1302| 6000 0096                 BRA     TSTCHK          ;exit to check overall results
1306|
1306|                       ;-------------------------------------------------------------------------
1306|                       ;  Subroutine to scan I/O expansion slots
1306|                       ;  Inputs:
1306|                       ;       D4 = non-zero if status check to be done, else 0 for no check
1306|                       ;  Outputs:
1306|                       ;       Saves card id's in locations $298-$29C
1306|                       ;       Error bits set in D7 if slot card errors encountered
1306|                       ;       Error code saved in location BOOTDATA+1
1306|                       ;  Side Effects:
1306|                       ;       A5,A6 trashed
1306|                       ;-------------------------------------------------------------------------
1306|
1306| 48E7 4070             RDSLOTS MOVEM.L D1/A1-A3,-(SP)  ;save regs
130A| 2C4F                          MOVE.L  SP,A6           ;save stack ptr
130C| 4281                          CLR.L   D1              ;for result use
130E| 327C 0298                    MOVEA   #IO1ID,A1       ;get ptr to id save area                RM000
1312|
1312| 247C 00FC 0001                MOVE.L  #SLOT1L,A2      ;get slot 1 address
1318|
1318| 2A78 0008                     MOVE.L  BUSVCTR,A5      ;save current bus vector value
131C| 47FA 0014                    LEA     NOCRD1,A3       ;init bus error vector
1320| 21CB 0008                     MOVE.L  A3,BUSVCTR      ; in case no card installed
1324| 030A 0000                     MOVEP   (A2),D1         ;read id for slot 1
1328| 6156                          BSR.S   CHKID           ;go check id
132A| 6408                          BCC.S   SLOT2           ;skip if OK
132C| 08C7 0019                    BSET    #IO1ERR,D7      ;else set error indicator
1330| 6002                          BRA.S   SLOT2           ;and continue
1332|
1332| 4259                  NOCRD1  CLR     (A1)+           ;set id for no card
1334|
1334| 247C 00FC 4001        SLOT2   MOVE.L  #SLOT2L,A2      ;do same for slot 2
133A| 47FA 0014                    LEA     NOCRD2,A3
133E| 21CB 0008                     MOVE.L  A3,BUSVCTR
1342| 030A 0000                     MOVEP   (A2),D1         ;read and check id
1346| 6138                          BSR.S   CHKID
1348| 6408                          BCC.S   SLOT3           ;skip if OK
134A| 08C7 001A                    BSET    #IO2ERR,D7      ;else set error indicator
134E| 6002                          BRA.S   SLOT3           ;and continue
1350|
1350| 4259                  NOCRD2  CLR     (A1)+           ;set id for no card
1352|
1352| 247C 00FC 8001        SLOT3   MOVE.L  #SLOT3L,A2      ;and finally for slot 3
```

```
1358| 47FA 0014                   LEA     NOCRD3,A3
135C| 21CB 0008                   MOVE.L  A3,BUSVCTR
1360| 030A 0000                   MOVEP   (A2),D1         ;read and check id
1364| 611A                        BSR.S   CHKID
1366| 6408                        BCC.S   CFGEXIT         ;skip if OK
1368| 08C7 001B                   BSET    #IO3ERR,D7      ;else set error indicator
136C| 6002                        BRA.S   CFGEXIT         ;go to exit
136E|
136E| 4259                NOCRD3  CLR     (A1)+           ;set id for no card
1370|
1370|                     ;  Restore default bus error vector and SP and continue
1370|
1370| 007C 0700           CFGEXIT ORI     #$0700,SR       ;ensure interrupts off
1374| 21CD 0008                   MOVE.L  A5,BUSVCTR      ;restore from previous saves
1378| 2E4E                        MOVE.L  A6,SP
137A| 4CDF 0E02                   MOVEM.L (SP)+,D1/A1-A3  ;and restore regs
137E| 4E75                        RTS                     ;then exit
1380|
1380|                     ;-----------------------------------------------------------------------
1380|                     ;  Subroutine to do I/O slot card id check.
1380|                     ;  Requires D1 = card id
1380|                     ;-----------------------------------------------------------------------
1380|
1380|                     CHKID
1380| 0C41 FFFF                   CMP     #$FFFF,D1       ;check for prototype card
1384| 6710                        BEQ.S   @9              ;skip if not - treat as no card
1386| 32C1                        MOVE    D1,(A1)+        ;else save id
1388| 6B06                        BMI.S   @7              ;if bootable go do check
138A| 0801 000E                   BTST    #STBIT,D1       ; or do if status routine exists
138E| 6704                        BEQ.S   @8              ;skip if not
1390| 6100 0E3A           @7     BSR     RDIOSLT         ;else go check for good board
1394| 4E75                @8     RTS
1396|
1396| 4259                @9     CLR     (A1)+           ;set id for no card
1398| 4E75                        RTS
139A|
139A|                             .PAGE
139A|                     ;-----------------------------------------------------------------------
139A|                     ; Check test results by checking error indicators in reg D7.
139A|                     ; Output greeting message if system contains memory and all is OK.
139A|                     ; Else output appropriate error messages.
139A|                     ;-----------------------------------------------------------------------
139A|
139A| 6100 EC9E           TSTCHK  BSR     SAVEREGS        ;save regs first
139E|
139E| 47FA 000A                   LEA     TST2,A3         ;setup bus error vector for type check  CHG032
13A2| 21CB 0008                   MOVE.L  A3,BUSVCTR      ;                                       CHG032
```

```
13A6| 6100 FDF0                    BSR     SETTYPE         ;go set system type                     CHG032
13AA|
13AA| 6100 F336             TST2   BSR     SETBUSVCT       ;restore default bus error vector       RM000
13AE| 3E7C 0480                    MOVEA   #STKBASE,SP     ; and default stack
13B2| 6100 F4D2                    BSR     SETVLTCH        ;and set video latch                    CHG020
13B6|
13B6|                             .IF  USERINT = 0
13B6|                             .ELSE
13B6| 6100 1D22                    BSR     CLRDESK         ;clear desktop
13BA|                             .ENDC
13BA|
13BA| 2007                        MOVE.L  D7,D0           ;GET ERROR INDICATORS
13BC| 0280 0E7F FFFF              ANDI.L  #ERRMSK,D0      ;MASK OFF NON-FATAL ERRORS
13C2| 4A80                        TST.L   D0              ;OK?
13C4| 6700 0220                  BEQ     OTHER           ;SKIP IF YES
13C8|
13C8|                             .IF  ROM4K = 0
13C8|                         ;-------------------------------------------------------------------------
13C8|                         ;  Errors detected - scan D7 for CPU error indicators
13C8|                         ;-------------------------------------------------------------------------
13C8|
13C8| 2007                        MOVE.L  D7,D0           ;get error indicators
13CA| 0280 0000 000F              ANDI.L  #CPUMSK,D0      ;mask off no-CPU errors
13D0| 4A80                        TST.L   D0              ;any?
13D2| 673A                        BEQ.S   EXCHK           ;skip if none to check for exception errors
13D4|
13D4|                             .IF  USERINT = 0
13D4|                             .ELSE
13D4| 45FA 25B5                    LEA     CPUBRD,A2       ;set ptr for CPU board icon
13D8|
13D8|                             .ENDC
13D8|
13D8|                         ;  Check for specific error
13D8|
13D8|                             .IF  DIAGS = 1
13D8|
13D8| 0807 0001                    BTST    #CPUSEL,D7      ;check for CPU selection error
13DC| 670A                        BEQ.S   @1              ;skip if not
13DE| 7029                        MOVEQ   #ECPUSEL,D0     ;else get error code
13E0| 6100 0108                    BSR     ERRDISP         ;display it
13E4| 6000 F39A                    BRA     VIA2TST         ;and loop on parallel port VIA test
13E8|
13E8|                         ;  Sound error tones if not selection error (controls path to speaker)
13E8|
13E8| 6100 02E2             @1     BSR     LOPTCH          ;CPU error causes lo,lo,hi tones
13EC| 6100 02DE                    BSR     LOPTCH
13F0| 6100 02D6                    BSR     HIPTCH
```

```
13F4|
13F4|                       ;  Continue check for specific error
13F4|
13F4| 0807 0000                   BTST    #MMU,D7         ;CHECK IF MMU ERROR
13F8| 6704                       BEQ.S   @2              ;SKIP IF NO
13FA| 7028                       MOVEQ   #EMMU,D0        ;ELSE GET ERROR CODE
13FC| 600C                       BRA.S   @9              ;and go output it
13FE|
13FE|                       @2
13FE|                           .IF     NEWLISA = 1
13FE|                           .IF     ROM16K = 1
13FE| 0807 0002                 BTST    #VID,D7         ;CHECK IF VIDEO ERROR
1402| 6704                       BEQ.S   @3              ;SKIP IF NO
1404| 702A                       MOVEQ   #EVID,D0        ;ELSE GET ERROR CODE
1406| 6002                       BRA.S   @9              ;and go output it
1408|
1408| 702B                 @3    MOVEQ   #ECPAR,D0       ;else must be parity ckt error
140A|
140A|                           .ENDC                   ;{ROM16K}
140A|                           .ENDC                   ;{NEWLISA}
140A|                           .ENDC                   ;{DIAGS}
140A|
140A| 6000 01B4           @9    BRA     TSTXIT          ;go to exit
140E|
140E|                           .ENDC                   ;{ROM4K}
140E|
140E|                       ;-------------------------------------------------------------------------------
140E|                       ;  Scan for exception errors
140E|                       ;-------------------------------------------------------------------------------
140E|
140E| 2007                 EXCHK  MOVE.L  D7,D0           ;mask off non-exception errors
1410| 0280 0000 03F0              ANDI.L  #EXMSK,D0
1416| 4A80                        TST.L   D0              ;OK?
1418| 6744                        BEQ.S   IOCHK           ;skip if yes to next check
141A|
141A|                           .IF  USERINT = 0
141A|                           .ELSE
141A|
141A|                       ;  Sound error tones
141A|
141A| 6100 02B0                   BSR     LOPTCH          ;general logic failure causes lo,hi tones
141E| 6100 02A8                   BSR     HIPTCH
1422| 45FA 2930                   LEA     LISA,A2         ;set ptr for general LISA error
1426|                           .ENDC
1426|                       ;  Scan for details on exception errors
1426|
1426| 0807 0004                   BTST    #CPUINTR,D7     ;NMI?
```

```
142A| 6704                        BEQ.S   @1
142C| 702C                        MOVEQ   #ECPUINTR,D0    ;set error code
142E| 602A                        BRA.S   @9              ;and go display
1430|
1430| 0807 0005           @1     BTST    #BUSEXCP,D7     ;bus error?
1434| 6704                        BEQ.S   @2
1436| 702D                        MOVEQ   #EBUSEXCP,D0    ;set error code
1438| 6020                        BRA.S   @9
143A|
143A| 0807 0006           @2     BTST    #ADREXCP,D7     ;address error?
143E| 6704                        BEQ.S   @3
1440| 702E                        MOVEQ   #EADREXCP,D0    ;set error code
1442| 6016                        BRA.S   @9
1444|
1444| 0807 0007           @3     BTST    #MISEXCP,D7     ;miscellaneous error?
1448| 6704                        BEQ.S   @4
144A| 702F                        MOVEQ   #EMISEXCP,D0    ;set error code
144C| 600C                        BRA.S   @9
144E|
144E| 0807 0008           @4     BTST    #ILLEXCP,D7     ;illegal instruction error?
1452| 6704                        BEQ.S   @5
1454| 7030                        MOVEQ   #EILLEXCP,D0    ;set error code
1456| 6002                        BRA.S   @9
1458|
1458| 7031                @5     MOVEQ   #ETRPEXCP,D0    ;must be a trap error
145A|
145A| 6000 0164          @9     BRA     TSTXIT          ;and go to exit
145E|
145E|                      ;--------------------------------------------------------------------------
145E|                      ;  Check for I/O errors
145E|                      ;--------------------------------------------------------------------------
145E|
145E| 2007                IOCHK  MOVE.L  D7,D0           ;GET ERRORS
1460| 0280 001F DC00             ANDI.L  #IOMSK,D0       ;MASK OFF NON-IO ERRORS
1466| 4A80                       TST.L   D0              ;OK?
1468| 6700 008E                  BEQ     KBDCHK          ;SKIP IF YES TO NEXT CHECK
146C|
146C|                           .IF  USERINT = 0
146C|                           .ELSE
146C| 45FA 24DD                 LEA     IOBRD,A2        ;set ptr for I/O board icon
1470|                           .ENDC
1470|
1470|                           .IF  ROM4K = 0
1470|                      ;  Scan for details on I/O errors
1470|
1470|                           .IF     ROM16K = 1
1470| 0807 000A                 BTST    #VIA1,D7        ;check for keyboard VIA errors
```

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1474| 6708                        BEQ.S   @1              ;skip if OK
1476| 7032                        MOVEQ   #EVIA1,D0       ;else set error code
1478| 6170                        BSR.S   ERRDISP         ;display the error
147A| 6000 F434                   BRA     VIA1CHK         ;and loop on VIA #1 test
147E|
147E|                       ;  Sound error tones if not VIA #1 error (controls the speaker)
147E| 6100 024C              @1      BSR     LOPTCH          ;I/O errors cause lo,hi,lo tones
1482| 6100 0244                      BSR     HIPTCH
1486| 6100 0244                      BSR     LOPTCH
148A|                       ;  Continue scan for detailed errors
148A|
148A| 0807 000B                      BTST    #VIA2,D7        ;parallel port VIA error?
148E| 6704                        BEQ.S   @2
1490| 7033                        MOVEQ   #EVIA2,D0       ;set error code
1492| 6052                        BRA.S   @19
1494|                             .ENDC
1494|
1494| 0807 000C              @2      BTST    #IOCOPS,D7
1498| 6708                        BEQ.S   @3
149A| 7034                        MOVEQ   #EIOCOP,D0      ;get error code
149C| 614C                        BSR.S   ERRDISP         ;display error
149E| 6000 F44A                   BRA     COPSENBL        ;and go do loop on COPS test
14A2|
14A2|                       @3
14A2|                             .IF  DIAGS = 1
14A2| 0807 000E                      BTST    #CLK,D7
14A6| 6704                        BEQ.S   @4
14A8| 7036                        MOVEQ   #ECLK,D0        ;ELSE GET ERROR CODE
14AA| 603A                        BRA.S   @19
14AC|                             .ENDC
14AC|
14AC|                       @4
14AC|                             .IF  FULLSCC = 1
14AC| 0807 000F                      BTST    #RS232A,D7
14B0| 6704                        BEQ.S   @6
14B2| 7037                        MOVEQ   #ERS232A,D0     ;ELSE GET ERROR CODE
14B4| 6030                        BRA.S   @19
14B6|
14B6| 0807 0010              @6      BTST    #RS232B,D7
14BA| 6704                        BEQ.S   @7
14BC| 7038                        MOVEQ   #ERS232B,D0     ;ELSE GET ERROR CODE
14BE| 6026                        BRA.S   @19
14C0|                             .ENDC
14C0|
14C0| 0807 0011              @7      BTST    #DISK,D7
14C4| 6704                        BEQ.S   @8
14C6| 7039                        MOVEQ   #EDISK,D0       ;ELSE GET ERROR CODE
```

```
14C8| 601C                        BRA.S   @19
14CA|
14CA| 0807 0012            @8      BTST    #IOEXCP,D7
14CE| 6704                        BEQ.S   @9
14D0| 703A                        MOVEQ   #EIOEXCP,D0     ;ELSE GET ERROR CODE
14D2| 6012                        BRA.S   @19
14D4|
14D4| 0807 0013            @9      BTST    #IOCOPS2,D7     ;COPS code error?
14D8| 6704                        BEQ.S   @10
14DA| 703B                        MOVEQ   #EIOCOP2,D0     ;get error code
14DC| 6008                        BRA.S   @19
14DE|
14DE| 0807 0014            @10     BTST    #IOKBD,D7       ;I/O or keyboard error?
14E2| 6702                        BEQ.S   @19
14E4| 703C                        MOVEQ   #EIOKBD,D0      ;get error code
14E6|
14E6|                           .ENDC                   ;{ROM4K}
14E6|
14E6| 6000 00D8            @19     BRA     TSTXIT
14EA|
14EA|                     ;---------------------------------------------------------------------------
14EA|                     ;  Subroutine to do display for fatal errors
14EA|                     ;---------------------------------------------------------------------------
14EA|
14EA|                     ERRDISP
14EA|                           .IF  USERINT = 1
14EA| 6100 1FEE                 BSR     DSPERRICON      ;display error
14EE|                           .ENDC
14EE|
14EE| 6100 0132                 BSR     DSPCODE         ;output error code
14F2| 08C7 001F                 BSET    #LOOP,D7        ;set for looping operation
14F6| 4E75                       RTS
14F8|
14F8|                     ;---------------------------------------------------------------------------
14F8|                     ;  Check for keyboard error
14F8|                     ;---------------------------------------------------------------------------
14F8|
14F8| 0807 000D           KBDCHK  BTST    #KBDCOPS,D7     ;Keyboard error?
14FC| 6716                       BEQ.S   MEMCHK          ;skip to next check if not
14FE|
14FE|                           .IF  USERINT = 1
14FE|
14FE|                     ;  Sound error tones
14FE|
14FE| 6100 01C8                 BSR     HIPTCH          ;Keyboard error causes hi,lo,hi tones
1502| 6100 01C8                 BSR     LOPTCH
1506| 6100 01C0                 BSR     HIPTCH
```

```
150A| 45FA 2699                    LEA     KEYBDOUT,A2     ;set ptr for keyboard icon
150E|                              .ENDC
150E|
150E| 7035                        MOVEQ   #EKBDCOP,D0     ;set error code
1510| 6000 00AE                    BRA     TSTXIT          ;and go to exit
1514|
1514|
1514|                         ;-------------------------------------------------------------------------
1514|                         ;  Check for memory errors
1514|                         ;-------------------------------------------------------------------------
1514|
1514|                         MEMCHK
1514| 2007                        MOVE.L  D7,D0           ;GET ERRORS
1516| 0280 0060 0000              ANDI.L  #MEMMSK,D0      ;MASK OFF NON-memory ERRORS
151C| 4A80                        TST.L   D0              ;any errors?
151E| 6700 0070                  BEQ     IOSCHK          ;skip if no - must be I/O slot error
1522|
1522|                            .IF  USERINT = 0
1522|                            .ELSE
1522|
1522|                         ;  Sound memory error tones
1522|
1522| 6100 01A8                   BSR     LOPTCH          ;memory error causes lo,hi,hi tones
1526| 6100 01A0                   BSR     HIPTCH
152A| 6100 019C                   BSR     HIPTCH
152E|
152E|                         ;  determine which memory card in error if more than one
152E|
152E| 0CB8 0008 0000 02A8         CMPI.L  #HEX512K,TOTLMEM ;more than 1 memory card?
1536| 6E14                        BGT.S   SCNRSLTS         ;skip if yes
1538|
1538|                         ;  only one card - check memory addresses to determine slot
1538|
1538| 2038 02A4                   MOVE.L  MINMEM,D0       ;get low physical address
153C| 0C80 0010 0000         CHKMADR CMPI.L  #ONEMEG,D0      ;address in slot 1?
1542| 6D04                        BLT.S   @2              ;skip if not
1544| 7201                        MOVEQ   #1,D1           ;set board id for slot 1
1546| 6002                        BRA.S   @3
1548| 7202                    @2      MOVEQ   #2,D1           ;set board id for slot 2
154A| 6026                    @3      BRA.S   MERRCHK         ;and go scan for details
154C|
154C|                         ;  more than one memory card - scan memory test results to determine which card
154C|
154C|                         SCNRSLTS
154C| 0807 0016                   BTST    #MPAR,D7        ;parity error?
1550| 6706                        BEQ.S   @1              ;skip if not
1552| 2038 01A6                   MOVE.L  PEADDR,D0       ;go get error address                   CHG015
```

```
1556| 60E4                        BRA.S   CHKMADR         ;and check it
1558|
1558|                     ;  Check for R/W error
1558|
1558| 307C 0186           @1      MOVEA   #MEMRSLT,A0     ;set ptr to OR masks                    RM000
155C| 7008                        MOVEQ   #8,D0           ;and set counter
155E| 4A58                @4      TST     (A0)+           ;check the rows
1560| 6604                        BNE.S   @5              ;skip if error detected
1562| 5340                        SUBQ    #1,D0           ;else check all masks
1564| 66F8                        BNE.S   @4              ;until done
1566|
1566| 0C00 0004           @5      CMP.B   #4,D0           ;check where error found
156A| 6E04                        BGT.S   @6              ;skip if low memory error
156C| 7201                        MOVEQ   #1,D1           ;high memory on card 1
156E| 6002                        BRA.S   MERRCHK
1570| 7202                @6      MOVEQ   #2,D1           ;low memory on card 2
1572|
1572|                             .ENDC                   ;{USERINT}
1572|
1572|                             .IF  ROM4K = 0
1572|
1572|                     ;  scan for error details
1572|
1572| 0807 0015           MERRCHK BTST    #MEM,D7         ;check for main memory R/W error
1576| 6708                        BEQ.S   @2              ;exit if not
1578| 7046                        MOVEQ   #EMEM,D0        ;else display error code
157A| 11C1 02AD                   MOVE.B  D1,MEMSLOT      ;save slot # for board in error
157E| 6002                        BRA.S   MEMERR
1580|
1580| 7047                @2      MOVEQ   #EPAR,D0        ;must be parity error
1582|
1582|                             .ENDC                   ;{ROM4K}
1582|
1582|                     MEMERR
1582|                             .IF  USERINT = 1
1582|
1582| 21C7 0180                   MOVE.L  D7,STATUS       ;save power-up status
1586| 45FA 2446                   LEA     MEMBRD,A2       ;set ptr for memory board icon
158A| 6100 1EC4                   BSR     DSPNUMICON      ;display icon and board slot #
158E| 6034                        BRA.S   TSTXIT2         ;finally exit to monitor
1590|
1590|                             .ELSE
1590|                             .ENDC                   ;{USERINT}
1590|
1590|                     ;-------------------------------------------------------------------------------
1590|                     ;-------------------------------------------------------------------------------
1590|                     IOSCHK
```

```
1590|                           .IF  ROM4K = 0
1590|                           .IF  USERINT = 0
1590|                           .ELSE
1590|
1590|                       ;  Sound error tones
1590|
1590| 6100 0136                 BSR     HIPTCH          ;I/O slot error causes hi,lo,lo tones
1594| 6100 0136                 BSR     LOPTCH
1598| 6100 0132                 BSR     LOPTCH
159C| 45FA 2476                 LEA     Xcard,A2        ;set ptr for I/O slot board icon
15A0|                           .ENDC
15A0|
15A0| 0807 001B             @1   BTST    #IO3ERR,D7      ;check for slot 3 error
15A4| 6704                      BEQ.S   @2              ;exit if not
15A6| 7203                      MOVEQ   #3,D1           ;else set slot #
15A8| 600C                      BRA.S   @4
15AA|
15AA| 0807 001A             @2   BTST    #IO2ERR,D7      ;slot 2 error?
15AE| 6704                      BEQ.S   @3
15B0| 7202                      MOVEQ   #2,D1           ;set slot #
15B2| 6002                      BRA.S   @4
15B4|
15B4| 7201                 @3   MOVEQ   #1,D1           ;must be slot 1 error
15B6|
15B6| 1038 01B4             @4   MOVE.B  BOOTDATA,D0     ;get error code
15BA| 6100 1E94                 BSR     DSPNUMICON      ;display error icon and slot #
15BE| 6004                      BRA.S   TSTXIT2         ;and exit to monitor
15C0|
15C0|                           .ENDC                   ;{ROM4K}
15C0|
15C0|                       TSTXIT
15C0|                           .IF  USERINT = 0
15C0|                           .ELSE
15C0| 6100 1F18                 BSR     DSPERRICON      ;display error icon
15C4|
15C4|                       TSTXIT2
15C4| 21C7 0180                 MOVE.L  D7,STATUS       ;save status
15C8| 6100 0058                 BSR     DSPCODE         ;display the error code
15CC|
15CC|                       ;  Save error data in special parameter memory area, then exit to monitor
15CC|
15CC|                       ;*****************************
15CC|                       ;  Delete for LISA 2                                                  CHG034
15CC|                       ;*****************************
15CC|
15CC|                       ;       LEA     PMVCT,A3        ;setup bus error vector for PM       RM013
15CC|                       ;       MOVE.L  A3,BUSVCTR      ;                                    RM013
```

```
15CC|                     ;       BSR.S   CHKSTATPM       ;check if error already saved
15CC|                     ;       BCC.S   GOTOMON         ;skip if yes
15CC|                     ;       MOVEA.L #STATSTRT,A0    ;set starting ptr
15CC|                     ;       MOVE.B  D0,(A0)         ;save error code
15CC|                     ;       MOVE    ADRLTCH,D0      ;save error address latch contents
15CC|                     ;       MOVEP   D0,2(A0)
15CC|                     ;       MOVE.B  MEMSLOT,6(A0)   ;save memory slot #
15CC|                     ;       MOVE.L  CLKDATA,D0      ;save clock data
15CC|                     ;       MOVEP.L D0,8(A0)
15CC|                     ;       MOVE    CLKDATA+4,D0
15CC|                     ;       MOVEP   D0,16(A0)
15CC|                     ;       CLR.L   D0              ;clear remaining area
15CC|                     ;       MOVEP.L D0,20(A0)
15CC|
15CC|                     ;       MOVEQ   #STATWRDS-2,D0  ;validate save area
15CC|                     ;       BSR     WRTSUM
15CC|
15CC| 6100 FC14          GOTOMON BSR     SCANCPS         ;clear COPS queue
15D0| 6100 F34E                  BSR     CPSINIT         ;reinit interface
15D4| 6100 19F6                  BSR     CURSORINIT      ;init cursor and mouse
15D8| 6000 0FC2                  BRA     MONITOR         ;then jump to monitor
15DC|
15DC|                     ;-------------------------------------------------------------------------
15DC|                     ;  Parameter memory bus error handler          RM013
15DC|                     ;-------------------------------------------------------------------------
15DC|
15DC| 3E7C 0480          PMVCT   MOVEA   #STKBASE,SP     ;reset stack                                RM013
15E0| 6100 F100                  BSR     SETBUSVCT       ;restore bus error vector                   RM013
15E4| 60E6                       BRA.S   GOTOMON         ;and exit to monitor                        RM013
15E6|
15E6|                     ;-------------------------------------------------------------------------
15E6|                     ;  Subroutine to check special parameter memory validity.
15E6|                     ;  Verify checksum routine sets carry bit if checksum not valid.
15E6|                     ;-------------------------------------------------------------------------
15E6|
15E6|                     ;CHKSTATPM                                                                  CHG034
15E6|                     ;       MOVEM.L D0-D1/A0,-(SP)  ;save regs
15E6|                     ;       MOVEA.L #STATSTRT,A0    ;set starting ptr
15E6|                     ;       MOVEQ   #STATWRDS-1,D0  ;and # of words to check
15E6|                     ;       MOVE    D0,D1           ;set for shared memory
15E6|                     ;       BSR     VFYCHKSM        ;and go do checksum
15E6|                     ;@1     MOVEM.L (SP)+,D0-D1/A0  ;restore regs
15E6|                     ;       RTS
15E6|
15E6|                             .ENDC
15E6|                     ;-------------------------------------------------------------------------
15E6|                     ;  Scan for non-fatal errors
```

```
15E6|                       ;-------------------------------------------------------------------------
15E6|
15E6|                       OTHER
15E6|                               .IF  ROM16K = 1
15E6| 2007                          MOVE.L  D7,D0           ;get errors
15E8| 0280 0180 0000                ANDI.L  #OTHRMSK,D0     ;isolate to non-fatal errors
15EE| 4A80                          TST.L   D0              ;OK?
15F0| 672C                          BEQ.S   @9              ;skip if no errors
15F2| 0807 0017                    BTST    #KBDOUT,D7      ;Keyboard disconnected?
15F6| 6706                          BEQ.S   @1              ;skip if no
15F8|
15F8|                               .IF  USERINT = 0
15F8|                               .ELSE
15FC| 6014                          BRA.S   @2              ;with question markcon
15FE|                               .ENDC
15FE|
15FE|                       @1                              ;must be mouse
15FE|                               .IF  USERINT = 0
15FE|                               .ELSE
15FE| 6100 0236                    BSR     CHKPM           ;check parameter memory before notify
1602|                                                       ; of mouse disconnect
1602| 6516                          BCS.S   @8              ;ignore error if invalid
1604| 0839 0007 00FC C18D          BTST    #MOUSEON,MEMCODE ;check if should be installed
160C| 670C                          BEQ.S   @8              ;skip if not
160E| 45FA 261B                    LEA     MOUSEOUT,A2     ;else display mouse icon
1612| 6100 1F42              @2      BSR     DSPQICON        ;with question mark
1616|                               .ENDC
1616|
1616| 6000 00A0                    BRA     NOTIFY          ;alert user
161A|
161A|                               .ENDC                   ;{ROM16K}
161A|
161A| 0887 0018              @8      BCLR    #MOUSOUT,D7     ;ignore mouse disconnected error
161E|
161E| 6000 00BE              @9      BRA     SYSOK           ;system must be OK
1622|                               .PAGE
1622|                       ;-------------------------------------------------------------------------
1622|                       ;  Subroutine to output error code
1622|                       ;-------------------------------------------------------------------------
1622|
1622| 48E7 F000              DSPCODE MOVEM.L D0-D3,-(SP)     ;save regs
1626|
1626|                               .IF  USERINT = 0
1626|                               .ENDC
1626|                               .IF  NEWTWIG = 0
1626|                               .ENDC
1626|
```

```
1626|                                .IF USERINT = 1
1626| 3A3C 0097                      MOVE    #CODEROW,D5     ;set screen ptrs for display
162A| 3C3C 0012                      MOVE    #CODECOL,D6
162E|                                .ENDC
162E|
162E| 6004                           BRA.S   GETDIG          ;go do display
1630|                                .IF  NEWTWIG = 1
1630|
1630|                           ;  Translate up to 4 digit hex error code to decimal
1630|                           ;  Second entry point for routine
1630|
1630|                          DSPDEC
1630| 48E7 F000                      MOVEM.L D0-D3,-(SP)     ;save regs
1634| 0280 0000 FFFF           GETDIG  ANDI.L  #$0FFFF,D0      ;clear other digits
163A| 7201                           MOVEQ   #1,D1           ;display 1 char at a time
163C| 4A40                           TST     D0              ;is it 0?
163E| 6726                           BEQ.S   @9              ;exit if yes to display it
1640| 4282                           CLR.L   D2              ;clear working regs
1642| 4283                           CLR.L   D3
1644|
1644|                           ;  display all non-zero digits
1644|
1644| 80FC 000A                @1      DIVU    #$A,D0          ;converting to decimal
1648| 4840                           SWAP    D0              ;get remainder
164A| 1400                           MOVE.B  D0,D2           ;save for display
164C| E89A                           ROR.L   #4,D2
164E| 5243                           ADDQ    #1,D3           ;set count
1650|
1650| 4240                           CLR     D0              ;clear remainder
1652| 4840                           SWAP    D0              ;get new quotient
1654| 4A40                           TST     D0              ;quit when =0
1656| 6702                           BEQ.S   @2              ;skip to do display
1658| 60EA                           BRA.S   @1
165A|
165A| E99A                     @2      ROL.L   #4,D2           ;get char for output
165C| 1002                           MOVE.B  D2,D0
165E| 5343                           SUBQ    #1,D3           ;decr digit count
1660| 6704                           BEQ.S   @9              ;skip to display last digit
1662| 6114                           BSR.S   OUTCH           ;display a digit
1664| 60F4                           BRA.S   @2              ;and loop until done
1666|
1666|                                .ENDC
1666|
1666| 6106                     @9      BSR.S   OUTCHR          ;do output and CR
1668|
1668| 4CDF 000F                DSPCXIT MOVEM.L (SP)+,D0-D3     ;restore regs
166C| 4E75                           RTS                     ;and return
```

```
166E|
166E|                     ;-----------------------------------------------------------------------
166E|                     ;  Subroutine to invoke code display routine, then do CR
166E|                     ;-----------------------------------------------------------------------
166E|
166E| 6108                OUTCHR  BSR.S   OUTCH           ;output digits
1670|
1670|                             .IF  USERINT = 0
1670|                             .ELSE
1670| 0645 000A                   ADD     #CHRSPC,D5      ;bump to next char row
1674|                             .ENDC
1674|
1674| 7C01                        MOVEQ   #1,D6           ;and do CR
1676| 4E75                        RTS
1678|
1678|                             .PAGE
1678|                     ;-----------------------------------------------------------------------
1678|                     ;  Subroutines to enable display of hex codes
1678|                     ;  Requires  D0 = value to display
1678|                     ;            D1 = # of digits to display
1678|                     ;-----------------------------------------------------------------------
1678|
1678| 48E7 E000           OUTCH   MOVEM.L D0-D2,-(SP)     ;save regs
167C| 7408                        MOVEQ   #8,D2           ;set max digits to display
167E| B401                @1      CMP.B   D1,D2           ;check digits desired
1680| 6706                        BEQ.S   @2              ;and skip if match
1682| E998                        ROL.L   #4,D0           ;else skip over digit
1684| 5342                        SUBQ    #1,D2           ;update count
1686| 60F6                        BRA.S   @1              ;and loop until match
1688|
1688| E998                @2      ROL.L   #4,D0           ;rotate to next digit
168A| 610A                        BSR.S   OUTNIB          ;go output one digit
168C| 5341                        SUBQ    #1,D1           ;decr count
168E| 66F8                        BNE.S   @2              ;loop until done
1690|
1690| 4CDF 0007                   MOVEM.L (SP)+,D0-D2     ;restore and exit
1694| 4E75                        RTS
1696|
1696|                     ;  The following routine does conversion to ASCII to enable display
1696|
1696| 2F00                OUTNIB  MOVE.L  D0,-(SP)        ;SAVE REG
1698| 0240 000F                   ANDI    #$000F,D0       ;ISOLATE DIGIT TO DISPLAY
169C| 0C00 0009                   CMPI.B  #9,D0           ;CHECK IF NUMERIC
16A0| 6206                        BHI.S   ALPHA           ;SKIP IF NOT
16A2| 0000 0030                   ORI.B   #$30,D0         ;CONVERT TO ASCII
16A6| 6008                        BRA.S   DSPCH           ;AND GO DISPLAY
16A8|
```

```
16A8| 0400 0009            ALPHA   SUBI.B  #9,D0           ;CONVERT FOR
16AC| 0000 0040                    ORI.B   #$40,D0         ; ASCII
16B0|
16B0| 6100 2088            DSPCH   BSR     DSPVAL          ;OUTPUT IT
16B4| 201F                        MOVE.L  (SP)+,D0        ;RESTORE REG
16B6| 4E75                        RTS
16B8|
16B8|                             .PAGE
16B8|                     ;---------------------------------------------------------------------------
16B8|                     ;  Routine to notify user of non-fatal error.  Beep speaker and pause
16B8|                     ;  for 5 seconds.
16B8|                     ;---------------------------------------------------------------------------
16B8|
16B8|                     NOTIFY
16B8|                             .IF  ROM16K = 1
16B8| 610E                        BSR.S   HIPTCH          ;beep at high pitch twice
16BA| 610C                        BSR.S   HIPTCH
16BC| 610E                        BSR.S   LOPTCH          ;beep at low pitch
16BE| 6100 F414                    BSR     DELAY5          ;delay 5 seconds
16C2| 6100 1A16                    BSR     CLRDESK         ;clear desktop                          CHG033
16C6| 601A                        BRA.S   DOBOOT          ;then go attempt boot
16C8|
16C8|                     ;---------------------------------------------------------------------------
16C8|                     ;  Subroutine to beep speaker at high pitch
16C8|                     ;---------------------------------------------------------------------------
16C8| 7020                HIPTCH  MOVEQ   #$20,D0         ; set frequency
16CA| 6002                        BRA.S   SETDUR          ; and go do it
16CC|
16CC|                     ;---------------------------------------------------------------------------
16CC|                     ;  Subroutine to beep speaker at low pitch
16CC|                     ;---------------------------------------------------------------------------
16CC|
16CC| 7060                LOPTCH  MOVEQ   #$60,D0         ; set frequency
16CE| 323C 00FA           SETDUR  MOVE    #250,D1         ; 1/8 sec duration
16D2| 7404                        MOVEQ   #4,D2           ; low volume
16D4| 6100 F420                    BSR     TONE            ; and go do it
16D8| 6100 F3F2                    BSR     DELAY_1         ; delay for .1 sec
16DC| 4E75                        RTS
16DE|
16DE|                             .ENDC
16DE|                             .PAGE
16DE|                     ;---------------------------------------------------------------------------
16DE|                     ;  No errors detected - output greeting message
16DE|                     ;---------------------------------------------------------------------------
16DE|
16DE| 42B8 0180           SYSOK   CLR.L   STATUS          ;set status
16E2|                             .IF  ROM16K = 1
```

```
16E2|                     ;        BSR     CHKSTATPM       ;check special save area                    CHG034
16E2|                     ;        BCC.S   DOBOOT          ;skip if valid data saved
16E2|                     ;        CLR.B   STATSAV         ;else set status to 0
16E2|                              .ENDC
16E2|
16E2|                              .IF  ROM4K = 0
16E2|                              .IF  USERINT = 0
16E2|                              .ENDC                   ;{USERINT}
16E2|                              .ENDC                   ;{ROM4K}
16E2|                              .IF  ROM4K = 0
16E2|                              .IF  USERINT = 0
16E2|                              .ENDC                   ;{USERINT}
16E2|                              .ENDC                   ;{ROM4K}
16E2|
16E2|                              .INCLUDE RM248.B.TEXT
16E2|
16E2|                              .PAGE
16E2|                              .LIST
16E2|                     ;---------------------------------------------------------------------
16E2|                     ;  All is OK - check for boot device and then do bootstrap
16E2|                     ;---------------------------------------------------------------------
16E2|
16E2| 6100 18E8           DOBOOT  BSR     CURSORINIT      ;init cursor/mouse
16E6|
16E6|                     BOOTCHK
16E6| 4280                        CLR.L   D0              ;clear for use
16E8| 0807 001C                   BTST    #ALTBOOT,D7     ;check if alternate boot command rcvd
16EC| 6710                        BEQ.S   @1              ;skip if no
16EE| 1038 01B3                   MOVE.B  BOOTDVCE,D0     ;get alternate boot code
16F2|
16F2|                            .IF     BURNIN = 1
16F2| 0C00 000F                   CMP.B   #PC,D0          ;power-cycle mode?
16F6| 665C                        BNE.S   DVCECHK         ;if no, go determine device
16F8| 6100 0154                   BSR     SAV2PM          ;if yes, save in parameter memory
16FC|                            .ENDC
16FC|
16FC| 6056                        BRA.S   DVCECHK         ;and go determine device
16FE|
16FE|                     @1
16FE|                              .IF USERINT = 1
16FE| 0807 001D                   BTST    #BTMENU,D7      ;boot menu wanted?
1702| 6600 01F4                   BNE     BOOTMENU        ;skip if yes
1706|                              .ENDC
1706|
1706| 6100 012E                   BSR     CHKPM           ;next step is to check parameter memory
170A|
170A|                              .IF  AAPL = 1
```

```
170A|                           .ELSE
170A| 6416                     BCC.S   @2              ;skip if valid
170C|
170C|                   ;  set default boot
170C|
170C| 4A38 02AF                TST.B   SYSTYPE         ;else check if Lisa 1                          CHG030
1710| 670C                     BEQ.S   @5              ;skip if yes                                   CHG030
1712| 7401                     MOVEQ   #1,D2           ;else set wait flag                            CHG030
1714| 6100 0320                BSR     CHKPROFILE      ;and go check if hard disk attached            CHG030
1718| 6704                     BEQ.S   @5              ;skip if yes to do boot from hard disk         CHG030
171A| 7001                     MOVEQ   #TWIG2,D0       ;else set for boot from floppy                 CHG030
171C| 600E                     BRA.S   @3              ;                                              CHG030
171E|
171E| 7002                 @5  MOVEQ   #PROFILE,D0     ;else if not valid do default boot from Profile
1720| 600A                     BRA.S   @3
1722|                           .ENDC
1722|
1722| 1039 00FC C189       @2  MOVE.B  DVCCODE,D0      ;else read device code
1728| E808                     LSR.B   #4,D0           ;rotate to low nibble
172A| 6028                     BRA.S   DVCECHK
172C|
172C|                           .IF  NEWTWIG = 0
172C|                           .ENDC
172C|
172C|                   @3
172C|                           .IF  ROM16K = 1
172C|                   ;  Do special check for Applenet and I/O test cards
172C|
172C| 323C 1000                MOVE    #TSTCRD,D1      ;search first for a bootable test card
1730| 383C 1800                MOVE    #TSTQUAL,D4
1734| 6100 01A0                BSR     SEARCH          ;go do search
1738| 661A                     BNE.S   DVCECHK         ;skip if not found
173A| 3602                     MOVE    D2,D3           ;else save its id
173C| 323C 8001                MOVE    #APPLENET,D1    ;next search for an Applenet card
1740| 383C 9FFF                MOVE    #APPLQUAL,D4
1744| 6100 0190                BSR     SEARCH
1748| 6704                     BEQ.S   @4              ;skip if found to boot from it (DMT need)
174A| 3403                     MOVE    D3,D2           ;else do boot from I/O test card (DIAG need)
174C| 6A06                     BPL.S   DVCECHK         ; unless card boot bit not set                 CHG012
174E|                       @4
174E| C4FC 0003                MULU    #3,D2           ;convert to boot id
1752| 3002                     MOVE    D2,D0           ;and set boot id for appropriate slot
1754|                           .ENDC
1754|
1754|                   ;  Alternate boot desired - check which
1754|
1758|                   DVCECHK MOVE.B  D0,BOOTDVCE     ;save for later reference
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1758|                                .IF TWIGGY = 1
1758| 4A00                           TST.B   D0              ;boot from upper drive?             CHG009
175A| 660E                           BNE.S   @1              ;no - go to next check
175C| 4A38 02AF                      TST.B   SYSTYPE         ;check system type                  CHG009
1760| 6704                           BEQ.S   @11             ;skip if Lisa 1.0                   CHG009
1762| 6000 076A             @10       BRA     PROBOOT         ;else do Pepsi boot                 CHG009
1766|
1766| 4200                 @11       MOVE.B  #DRV1,D0        ;else set drive #                   CHG009
1768| 600A                           BRA.S   @2              ;and go do boot
176A|
176A| 0C00 0001            @1        CMP.B   #TWIG2,D0       ;boot from lower drive?             CHG009
176E| 6608                           BNE.S   @3              ;skip if no
1770| 103C 0080                      MOVE.B  #DRV2,D0        ;else set drive #
1774| 6000 0456            @2        BRA     TWGBOOT         ;and go boot
1778|                                .ENDC
1778|
1778|                      @3
1778|                                .IF PROFLE = 1
1778| 0C00 0002                      CMP.B   #PROFILE,D0     ;boot from Profile?
177C| 67E4                           BEQ.S   @10             ;yes - go do it                     CHG009
177E|                                .ENDC
177E|
177E| 0C00 0004                      CMP.B   #IO1PORT2,D0    ;boot from slot 1, ports 1-2?
1782| 6E08                           BGT.S   @4              ;skip if not
1784| 227C 00FC 0001                 MOVE.L  #SLOT1L,A1      ;set slot address
178A| 601A                           BRA.S   @9              ;and go do boot
178C|
178C| 0C00 0007            @4        CMP.B   #IO2PORT2,D0    ;boot from slot 2, ports 1-2?
1790| 6E08                           BGT.S   @5              ;skip if not
1792| 227C 00FC 4001                 MOVE.L  #SLOT2L,A1      ;set slot address
1798| 600C                           BRA.S   @9              ;and go do boot
179A|
179A| 0C00 000A            @5        CMP.B   #IO3PORT2,D0    ;boot from slot 3, ports 1-2?
179E| 6E0A                           BGT.S   @6              ;skip if not
17A0| 227C 00FC 8001                 MOVE.L  #SLOT3L,A1      ;set slot address
17A6|
17A6| 6000 09B6            @9        BRA     IOSBOOT         ;and go do boot
17AA|
17AA|                      @6
17AA|                                .IF     BURNIN = 1
17AA| 0C00 000F                      CMP.B   #PC,D0          ;power-cycle?
17AE| 6700 0A8A                      BEQ     CHKPASS         ;go do cycling
17B2|                                .ENDC
17B2|
17B2|                                .IF  ROM4K = 0
17B2| 0C00 0010            @7        CMP.B   #MON,D0         ;abort boot?
17B6| 6676                           BNE.S   LSTCHK          ;skip if no match
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17B8|
17B8|                                .IF  USERINT = 1
17B8| 08B8 0000 02A2                BCLR    #NORSTRT,STATFLGS ;allow restart option but
17BE| 08F8 0001 02A2                BSET    #NOCONT,STATFLGS  ; no CONTINUE button for direct to monitor jump
17C4| 6100 194E                     BSR     CLRMENU           ;clear menu bar and
17C8| 6100 199A                     BSR     MAKEPCALRT        ; open alert box for monitor or power cycling
17CC|                                .ENDC
17CC|
17CC|                                .IF  BURNIN = 1
17CC|
17CC|                           ;  Check if completing power-cycling operation
17CC|
17CC|                                .IF  DEBUG = 0
17CC| 47FA 0052                     LEA     PMERR,A3        ;set vector for parameter mem error
17D0| 21CB 0008                     MOVE.L  A3,BUSVCTR
17D4|                                .ENDC
17D4|
17D4| 6100 0060                     BSR     CHKPM           ;check validity of parameter memory
17D8| 653E                         BCS.S   PMEXIT          ;skip if not
17DA| 1039 00FC C189                MOVE.B  DVCCODE,D0      ;get boot code
17E0| E808                         LSR.B   #4,D0           ;shift to lower nibble
17E2|
17E2|                                .IF     NEWTWIG = 0
17E2|                                .ENDC
17E2|
17E2| 0C00 000F                     CMPI.B  #PC,D0          ;exiting from power-cycling?
17E6| 6630                         BNE.S   PMEXIT          ;skip if no
17E8| 4239 00FC C189                CLR.B   DVCCODE         ;else reset boot and
17EE| 08B9 0006 00FC C18D           BCLR    #6,MEMCODE      ; memory test indicators
17F6|
17F6| 47FA 25FC                     LEA     LOOPMSG,A3      ;display loop count
17FA| 6100 1F04                     BSR     DSPMSG
17FE| 207C 00FC C195                MOVE.L  #LCNTHI,A0      ;set ptr to loop count
1804| 0108 0000                     MOVEP   (A0),D0         ;get it
1808| 7204                         MOVEQ   #4,D1           ;set # of digits to display
180A| 6100 FE62                     BSR     OUTCHR          ;and do display
180E| 7C0C                         MOVEQ   #PCCOL,D6       ;reset col for proper left margin
1810|
1810| 6100 0CB8                     BSR     DSPCLK          ;display final clock value
1814| 6100 0CFA                     BSR     TWGDSP          ;and display Twiggy error count
1818|
1818|                           ;  Normal exit
1818|                           PMEXIT
1818|                                .IF  DEBUG = 0
1818| 6100 EEC8                     BSR     SETBUSVCT       ;restore normal bus error vector        RM000
181C|                                .ENDC                   ;{debug}
181C|
```

```
181C|                           .ENDC                   ;{BURNIN}
181C|
181C| 6000 0D7E                 BRA     MONITOR         ;and go to monitor
1820|
1820|                           .IF  BURNIN = 1
1820|                       ;  Bus error handler for parameter memory error
1820|
1820| 47FA 25E1             PMERR   LEA     PMMSG,A3        ;setup error message
1824| 45FA 2125                     LEA     IOBRD,A2        ;and icon
1828| 4280                          CLR.L   D0              ;no error code
182A| 6000 0D08                     BRA     INITMON         ;exit to monitor
182E|
182E|                           .ENDC                   ;{BURNIN}
182E|                           .ENDC                   ;{ROM4K}
182E|                       LSTCHK
182E|                           .IF  AAPL = 1
182E|                           .ENDC
182E|
182E|                           .IF  USERINT = 0
182E|                           .ELSE
182E| 6100 0EDC                 BSR     SQUAWK          ;else sound error tone
1832| 6000 00C4                 BRA     BOOTMENU        ;and go to boot menu
1836|                           .ENDC
1836|
1836|                           .PAGE
1836|                       ;---------------------------------------------------------------------------
1836|                       ;  Subroutine to check parameter memory validity.  Calls generalized
1836|                       ;  verify checksum routine.
1836|                       ;---------------------------------------------------------------------------
1836|
1836| 48E7 C080             CHKPM   MOVEM.L D0-D1/A0,-(SP)  ;save regs
183A| 207C 00FC C181                MOVEA.L #PMSTRT,A0      ;set starting ptr
1840| 303C 001F                     MOVE    #PMWRDS-1,D0    ;and # of words to check
1844| 3200                          MOVE    D0,D1           ;set for shared memory
1846| 6144                          BSR.S   VFYCHKSM        ;and go do checksum
1848| 4CDF 0103             @1      MOVEM.L (SP)+,D0-D1/A0  ;restore regs
184C| 4E75                          RTS
184E|                           .IF BURNIN = 1
184E|                       ;---------------------------------------------------------------------------
184E|                       ;  Subroutine to save boot device code to parameter memory.
184E|                       ;---------------------------------------------------------------------------
184E| 48E7 C080             SAV2PM  MOVEM.L D0-D1/A0,-(SP)  ;save regs
1852|                           .IF     NEWTWIG = 0
1852|                           .ENDC
1852| E908                          LSL.B   #4,D0           ;rotate device code to upper nibble
1854| 1239 00FC C189                MOVE.B  DVCCODE,D1      ;read current setting
185A| 0201 000F                     ANDI.B  #$0F,D1         ;clear device indicator
```

```
185E| 8001                          OR.B    D1,D0           ;save other data
1860| 13C0 00FC C189                MOVE.B  D0,DVCCODE      ;and write new device code
1866|
1866|                          ;  also set for full memory test
1866| 08F9 0006 00FC C18D           BSET    #6,MEMCODE      ;ensure memory test indicator set
186E|
186E|                          ;  then compute new checksum
186E|
186E| 207C 00FC C181                MOVEA.L #PMSTRT,A0      ;compute new checksum
1874| 701E                          MOVEQ   #PMWRDS-2,D0    ;leaving out checksum word
1876| 6106                          BSR.S   WRTSUM
1878| 4CDF 0103             @2      MOVEM.L (SP)+,D0-D1/A0  ;restore regs
187C| 4E75                          RTS
187E|
187E|                          ;-------------------------------------------------------------------------
187E|                          ;  Subroutine to write new checksum to parameter memory area
187E|                          ;-------------------------------------------------------------------------
187E| 3200                     WRTSUM  MOVE    D0,D1           ;set for shared memory
1880| 610A                          BSR.S   VFYCHKSM
1882| 4643                          NOT     D3              ;compute 2's complement
1884| 5243                          ADDQ    #1,D3
1886| 0788 0000                     MOVEP   D3,(A0)         ;write as new checksum
188A| 4E75                          RTS
188C|
188C|                               .ENDC
188C|
188C|                          ;-------------------------------------------------------------------------
188C|                          ;  Subroutine to verify 16 bit checksum validity for memory contents.
188C|                          ;
188C|                          ;  Inputs Required:  A0 = starting address for verify
188C|                          ;                   D0 = # of words-1 to read
188C|                          ;                   D1 = 0 for regular memory (uses MOVE.W)
188C|                          ;                      = nonzero for shared memory (uses MOVEP)
188C|                          ;
188C|                          ;  Outputs:          Carry bit set if computed checksum not 0.
188C|                          ;                   D2 = expected checksum  (last word read)
188C|                          ;                   D3 = computed checksum
188C|                          ;-------------------------------------------------------------------------
188C|
188C|                          VFYCHKSM
188C| 4282                          CLR.L   D2              ;clear regs for use
188E| 4283                          CLR.L   D3
1890| 4A41                     CKLOOP  TST     D1              ;shared memory?
1892| 6708                          BEQ.S   @1              ;skip if no
1894| 0508 0000                     MOVEP   (A0),D2         ;else read alternate bytes
1898| 5888                          ADDQ.L  #4,A0           ;bump address
189A| 6002                          BRA.S   @2              ;skip to do checksum
```

```
189C| 3418                @1      MOVE    (A0)+,D2        ;read words
189E| D642                @2      ADD     D2,D3           ;add to computed checksum
18A0| E35B                        ROL     #1,D3           ;rotate for better effectiveness
18A2| 51C8 FFEC                   DBF     D0,CKLOOP       ;loop until done
18A6| 4A43                        TST     D3              ;expected result = 0
18A8| 6704                        BEQ.S   CKXIT
18AA| 003C 0001                   ORI.B   #$01,CCR        ;else set error indicator
18AE| 4E75                CKXIT   RTS
18B0|
18B0|                             .IF     NEWTWIG = 0
18B0|                             .ENDC
18B0|                             .IF  USERINT = 1
18B0|                     ;-------------------------------------------------------------------------
18B0|                     ;  Subroutine to expand boot id read from parameter memory to keycode
18B0|                     ;  Returns with keycode in D0.
18B0|                     ;-------------------------------------------------------------------------
18B0|
18B0| 48E7 2030         EXPAND  MOVEM.L D2/A2-A3,-(SP)  ;save regs
18B4| 45FA F9C4                 LEA     KEYTBL,A2       ;set ptrs to keycode table
18B8| 47FA F9D1                 LEA     TBLEND,A3
18BC| 4282                      CLR.L   D2              ;use for search id
18BE| B002                @1      CMP.B   D2,D0           ;check for match
18C0| 670C                      BEQ.S   @2              ;skip if yes
18C2| 5242                      ADDQ    #1,D2           ;incr search id
18C4| 528A                      ADDQ.L  #1,A2           ;bump table ptr
18C6| B7CA                      CMPA.L  A2,A3           ;at end?
18C8| 66F4                      BNE.S   @1              ;loop if not
18CA| 7002                      MOVEQ   #PROFILE,D0     ;else set for default boot
18CC| 6002                      BRA.S   @3              ;and go to exit
18CE| 1012                @2      MOVE.B  (A2),D0         ;get keycode
18D0| 4CDF 0C04           @3      MOVEM.L (SP)+,D2/A2-A3  ;restore regs
18D4| 4E75                      RTS
18D6|
18D6|                     ;-------------------------------------------------------------------------
18D6|                     ;  Routine to search I/O slots for specific card
18D6|                     ;  Expects  D1 = card id to search for
18D6|                     ;           D4 = qualifier for search (mask)
18D6|                     ;  Returns  CC = 0 if card found and
18D6|                     ;           D2 = slot #
18D6|                     ;-------------------------------------------------------------------------
18D6|
18D6| 48E7 9000         SEARCH  MOVEM.L D0/D3,-(SP)     ;save regs
18DA| 7400                      MOVEQ   #0,D2           ;setup as slot counter
18DC| 7602                      MOVEQ   #2,D3           ;set # of slots - 1 to check
18DE| 41F8 0298                 LEA     IO1ID,A0        ;get location of saved slot id's
18E2| 5242                @1      ADDQ    #1,D2           ;bump slot #
18E4| 3018                      MOVE    (A0)+,D0        ;read slot id
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18E6| C044                      AND     D4,D0           ;mask it
18E8| B041                      CMP     D1,D0           ;match?
18EA| 6706                      BEQ.S   @2              ;skip if yes
18EC| 51CB FFF4                 DBF     D3,@1
18F0| 4A42                      TST     D2              ;set nonzero status if no match
18F2| 4CDF 0009          @2     MOVEM.L (SP)+,D0/D3     ;restore regs
18F6| 4E75                      RTS                     ;exit
18F8|
18F8|                           .PAGE
18F8|                   ;-------------------------------------------------------------------------
18F8|                   ;  Routines to display boot icon menu
18F8|                   ;-------------------------------------------------------------------------
18F8|
18F8|                   BOOTMENU
18F8| 0238 000F 02A2          ANDI.B  #$0F,STATFLGS   ;initialize flags
18FE| 4278 053A               CLR     RectCnt         ;clear active rectangle counter
1902| 7C01                    MOVEQ   #1,D6           ;set min # of boot alternates           CHG009
1904|                                                 ; i.e., at least have lower drive
1904|                                                 ;  to boot from
1904| 4A38 02AF               TST.B   SYSTYPE         ;check system type                      CHG009
1908| 6602                    BNE.S   @10             ;Skip if Lisa 2                         CHG009
190A| 5246                    ADDQ    #1,D6           ;else incr count for upper floppy drive CHG009
190C|
190C| 7401                    @10     MOVEQ   #1,D2           ;set flag to do wait if needed          RM011
190E| 6100 0126                BSR     CHKPROFILE      ;go check for attached Profile
1912| 6602                    BNE.S   @1              ;skip if not there
1914| 5246                    ADDQ    #1,D6           ;else bump boot count
1916|
1916| 4284                    @1      CLR.L   D4              ;set flag for no status check
1918| 6100 F9EC                BSR     RDSLOTS         ;go scan the I/O slots
191C| 41F8 0298               LEA     IO1ID,A0        ;check results
1920| 3018                    MOVE    (A0)+,D0        ;read first ID
1922| 6A12                    BPL.S   @2              ;skip if not bootable or not there
1924| 247C 00FC 0001          MOVE.L  #SLOT1L,A2      ;set slot address
192A| 6100 026E               BSR     RDSLT           ;go check if any icons
192E| 6506                    BCS.S   @2              ;skip if any error
1930| 0243 0003               ANDI    #$03,D3         ;else clear don't care bits (max count = 2)
1934| DC43                    ADD     D3,D6           ;and add to icon count
1936|
1936| 3018                    @2      MOVE    (A0)+,D0        ;check slot 2
1938| 6A12                    BPL.S   @3              ;skip if not bootable
193A| 247C 00FC 4001          MOVE.L  #SLOT2L,A2      ;set slot address
1940| 6100 0258               BSR     RDSLT           ;go check if any icons
1944| 6506                    BCS.S   @3              ;skip if any error
1946| 0243 0003               ANDI    #$03,D3         ;else clear don't care bits (max count = 2)
194A| DC43                    ADD     D3,D6           ;and add to icon count
194C|
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194C| 3018                  @3      MOVE    (A0)+,D0        ;check final slot
194E| 6A12                          BPL.S   @4
1950| 247C 00FC 8001              MOVE.L  #SLOT3L,A2      ;set slot address
1956| 6100 0242                    BSR     RDSLT           ;go check if any icons
195A| 6506                        BCS.S   @4              ;skip if any error
195C| 0243 0003                    ANDI    #$03,D3         ;else clear don't care bits (max count = 2)
1960| DC43                        ADD     D3,D6           ;and add to icon count
1962|
1962|                       ;  set starting icon display address according to boot count
1962|
1962| 0C06 000A             @4      CMP.B   #10,D6          ;max of 10 icons in menu
1966| 6F02                        BLE.S   @5              ;skip if OK
1968| 7C0A                        MOVEQ   #10,D6          ;else set max count
196A|
196A|                       ;  now display blank boot icon menu
196A| 7012                  @5      MOVEQ   #BMENUWIDTH,D0  ;set menu parameters
196C| 2206                        MOVE.L  D6,D1           ;get count of entries
196E| C2FC 0022                    MULU    #BMENULEN,D1    ;length depends on number of entries
1972| 47FA 2524                    LEA     STRTMSG,A3      ;set menu heading
1976| 6100 0E58                    BSR     DSPMENUBOX      ;and go display the menu
197A| 31FC 05A2 0530               MOVE    #MENUSTRT,MenuBase ;setup base menu address
1980| 31FC 0658 0532               MOVE    #MENU1MSG,IconAddr ;and display pt for first entry
1986|
1986|                       ;  next fill in the menu entries with icons and alternate keycodes
1986|                       ;  D0 set with system type
1986|                       ICONCHK
1986| 1038 02AF                    MOVE.B  SYSTYPE,D0      ;read system type               CHG009/CHG029
198A| 6714                        BEQ.S   @1              ;skip if Lisa 1.0               CHG009
198C| 0C00 0003                    CMP.B   #3,D0           ;else check if internal disk    CHG009/CHG029
1990| 661C                        BNE.S   @2              ;skip if not - no upper icon    CHG009/CHG029
1992|
1992| 4282                        CLR.L   D2              ;else set for no wait           CHG009
1994| 6100 00A0                    BSR     CHKPROFILE      ; and check if integral disk    CHG009
1998|                                                     ; installed                     CHG009
1998| 6614                        BNE.S   @2              ;skip if not                    CHG009
199A| 45FA 213E                    LEA     UPPER,A2        ;set icon ptr for integral disk CHG009
199E| 6006                        BRA.S   @3              ;and go display                 CHG009
19A0|
19A0| 45FA 217C             @1      LEA     DRIVEN,A2       ;set icon ptr for drive         CHG009
19A4| 7201                        MOVEQ   #1,D1           ;set drive id #                 CHG009
19A6| 7400                  @3      MOVEQ   #TWIG1,D2       ;set id code                    CHG009
19A8| 76FF                        MOVEQ   #-1,D3          ;set compressed icon indicator
19AA| 6100 00E8                    BSR     DSPMNTRY        ;display the entry
19AE|
19AE| 45FA 216E             @2      LEA     DRIVEN,A2       ;set icon ptr for drive         CHG009
19B2| 7202                        MOVEQ   #2,D1           ; and drive id #                CHG009
19B4| 7401                        MOVEQ   #TWIG2,D2       ;set id code
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19B6| 76FF                        MOVEQ   #-1,D3          ;set compressed indicator
19B8| 6100 00DA                    BSR     DSPMNTRY        ;display the entry
19BC|
19BC| 4282                        CLR.L   D2              ;set flag for no wait           RM011
19BE| 0C00 0003                    CMP.B   #3,D0           ;skip check if internal disk    CHG009/CHG029
19C2| 6712                        BEQ.S   SCNSLTS         ;                               CHG009/CHG029
19C4|
19C4| 6100 0070                    BSR     CHKPROFILE      ;else check if external disk attached
19C8| 660C                        BNE.S   SCNSLTS         ;skip if not
19CA| 45FA 20D3                   LEA     PROICON,A2      ;else set icon ptr for Profile
19CE| 7402                        MOVEQ   #PROFILE,D2     ;set id code
19D0| 76FF                        MOVEQ   #-1,D3          ;set compressed indicator
19D2| 6100 00C0                    BSR     DSPMNTRY        ;display the entry
19D6|
19D6|                       ;  check for bootable devices in slots (what a pain!)
19D6|
19D6| 4280                  SCNSLTS CLR.L   D0              ;clear for use
19D8| 41F8 0298                      LEA     IO1ID,A0        ;set ptr for slot id
19DC| 3018                        MOVE    (A0)+,D0        ;get id
19DE| 6A0E                        BPL.S   CHKS2           ;skip if not bootable or not there
19E0| 247C 00FC 0001              MOVE.L  #SLOT1L,A2      ;else set slot address
19E6| 7201                        MOVEQ   #1,D1           ;set slot # for generic display if no ROM icon
19E8| 7403                        MOVEQ   #IO1PORT1,D2    ;set base boot id for slot
19EA| 6100 0158                    BSR     CHKSLOT         ;go check slot and display icons
19EE|
19EE| 3018                  CHKS2   MOVE    (A0)+,D0        ;read next id
19F0| 6A0E                        BPL.S   CHKS3           ;skip if not bootable or not there
19F2| 247C 00FC 4001              MOVE.L  #SLOT2L,A2      ;else set slot address
19F8| 7202                        MOVEQ   #2,D1           ;set slot # for generic display
19FA| 7406                        MOVEQ   #IO2PORT1,D2    ;set base boot id for slot
19FC| 6100 0146                    BSR     CHKSLOT         ;go check slot and display icons
1A00|
1A00| 3018                  CHKS3   MOVE    (A0)+,D0        ;read slot 3 id
1A02| 6A10                        BPL.S   WT4BOOT         ;skip if not bootable or not there
1A04| 247C 00FC 8001              MOVE.L  #SLOT3L,A2      ;else set slot address
1A0A| 7203                        MOVEQ   #3,D1           ;set slot # for generic display
1A0C| 343C 0009                    MOVE    #IO3PORT1,D2    ;set base boot id for slot
1A10| 6100 0132                    BSR     CHKSLOT         ;go check slot 3 and display icons
1A14|
1A14|                       ;-----------------------------------------------------------------------
1A14|                       ;  Menu displayed - now wait for operator selection
1A14|                       ;-----------------------------------------------------------------------
1A14|                       WT4BOOT
1A14| 6100 15F8                      BSR     CursorDisplay    ;display cursor on screen
1A18| 08F8 0005 02A2                 BSET    #CHKCMD,STATFLGS ;set flag for CMD key check
1A1E| 6100 1226                      BSR     GETINPUT        ;go wait for user input
1A22| 6500 0CC2                      BCS     GETERR          ;skip if error
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1A26| 6100 F836                BSR     XLATE           ;translate and save boot id
1A2A| 6100 15BE                BSR     CursorHide      ;remove cursor from screen
1A2E| 6100 16AA                BSR     CLRDESK         ;clear desktop
1A32| 6000 FCB2                BRA     BOOTCHK         ;and go start boot
1A36|
1A36|                         .PAGE
1A36|                 ;--------------------------------------------------------------------------
1A36|                 ;  Routine to check for Profile attached to built-in parallel port.
1A36|                 ;  Checks for Profile connected (OCD) and tries an initial handshake to
1A36|                 ;  ensure the device is a Profile.
1A36|                 ;
1A36|                 ;  Inputs: D2 = nonzero if full wait for Profile ready should be done
1A36|                 ;  Outputs: Zero condition code bit cleared if error
1A36|                 ;--------------------------------------------------------------------------
1A36|
1A36|                 CHKPROFILE
1A36| 48E7 AA80              MOVEM.L A0/D0/D2/D4/D6,-(SP)    ;save regs                              RM011
1A3A| 6100 05B4              BSR     PROINIT                 ;init for Profile access
1A3E| 664E                   BNE.S   @9                      ;skip if not attached
1A40|
1A40| 6100 06F0              BSR     WFNBSY3                 ;wait for not busy                      RM000
1A44| 4A00                   TST.B   D0                      ;check return code
1A46| 671E                   BEQ.S   @0                      ;skip if OK
1A48| 4A02                   TST.B   D2                      ;do full wait?                          RM011
1A4A| 6740                   BEQ.S   @7                      ;skip if not                            RM011
1A4C|
1A4C| 4280                   CLR.L   D0                      ;else reset error code for retry
1A4E| 6100 0456              BSR     WAITALRT                ;output wait alert
1A52| 6100 06D6              BSR     WFNBSY2                 ;try wait for normal profile boot time  CHG019
1A56| 48E7 8080              MOVEM.L A0/D0,-(SP)             ;save regs
1A5A| 6100 167E              BSR     CLRDESK                 ;clear desktop
1A5E| 4CDF 0101              MOVEM.L (SP)+,A0/D0             ;restore regs
1A62| 4A00                   TST.B   D0
1A64| 661E                   BNE.S   @8                      ;exit if still not ready
1A66|
1A66| 0210 00EF        @0    ANDI.B  #$EF,ORB2(A0)           ;set command = true
1A6A| 6100 0690              BSR     WFBSY                   ;then get initial Profile response      RM016
1A6E| 660A                   BNE.S   @1                      ;skip if error
1A70|
1A70| 0C28 0001 0078         CMPI.B  #1,PORTA2(A0)           ;check for expected '01' response
1A76| 6702                   BEQ.S   @1                      ;skip if OK
1A78| 7052                   MOVEQ   #BADRSP,D0              ;else set error code
1A7A|
1A7A| 7600            @1     MOVEQ   #0,D3                   ;send '0' response to reset Profile
1A7C| 6100 0690              BSR     SENDRSP
1A80| 6100 06A0              BSR     WFNBSY                  ;wait until command taken
1A84|
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1A84| 4228 0018            @8      CLR.B   DDRA2(A0)               ;set port A bits to input
1A88| 0010 0018                    ORI.B   #$18,ORB2(A0)           ;and set dir=in, cmd=false
1A8C|
1A8C| 4A40                @7      TST     D0                      ;set return code
1A8E|
1A8E| 4CDF 0155            @9      MOVEM.L (SP)+,A0/D0/D2/D4/D6    ;restore                              RM011
1A92| 4E75                        RTS                             ; and exit
1A94|
1A94|                    ;---------------------------------------------------------------------------
1A94|                    ;  Subroutine to invoke display of boot menu entry
1A94|                    ;  Inputs:
1A94|                    ;       D2 = boot id
1A94|                    ;       A2 = ptr to icon
1A94|                    ;  Outputs:
1A94|                    ;       Location MenuBase updated with address for next menu "box"
1A94|                    ;  Side Effects:
1A94|                    ;       None
1A94|                    ;---------------------------------------------------------------------------
1A94|
1A94|                    DSPMNTRY
1A94| 48E7 8040                  MOVEM.L D0/A1,-(SP)     ;save boot id and addr ptr
1A98| 3002                       MOVE    D2,D0           ;get boot id
1A9A| 6100 FE14                 BSR     EXPAND          ;go convert boot id to keycode
1A9E| 3278 0530                 MOVE    MenuBase,A1     ;get address for display of entry
1AA2| 6106                       BSR.S   ICONMENU        ;go display in menu
1AA4| 4CDF 0201                 MOVEM.L (SP)+,D0/A1     ;restore boot id and addr ptr
1AA8| 4E75                       RTS                     ;and exit
1AAA|
1AAA|                    ;---------------------------------------------------------------------------
1AAA|                    ;  Subroutine to display icon menu on screen.  Creates "active rectangle
1AAA|                    ;  table" as entries are made.
1AAA|                    ;  Inputs:
1AAA|                    ;       D0 = alternate keycode
1AAA|                    ;       D3 = compressed icon indicator
1AAA|                    ;       A1 = address for start of next menu "box"
1AAA|                    ;       A2 = ptr to icon
1AAA|                    ;  Outputs:
1AAA|                    ;       A1 = ptr for display of next menu entry
1AAA|                    ;  Side Effects:
1AAA|                    ;       None
1AAA|                    ;---------------------------------------------------------------------------
1AAA|
1AAA|                    ICONMENU
1AAA| 48E7 F8A4                  MOVEM.L D0-D4/A0/A2/A5,-(SP)
1AAE|
1AAE|                    ;  first save icon coordinates in active rectangle table
1AAE|
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1AAE| 41F8 053A                LEA     RectTable,A0    ;get ptr to active rect table
1AB2| 3410                     MOVE    (A0),D2         ;get current count of rect's
1AB4| C4FC 0005                MULU    #5,D2           ;five entries per rect
1AB8| D442                     ADD     D2,D2           ;double for word index
1ABA| 5258                     ADDQ    #1,(A0)+        ;incr for new rect
1ABC| 3180 2000                MOVE    D0,0(A0,D2.W)   ;save keycode id for new rect
1AC0| 6100 0C58                BSR     KeyToAscii      ;convert keycode to Ascii
1AC4| 3800                     MOVE    D0,D4           ;save for later display
1AC6|
1AC6|                    ;  compute X,Y pixel coordinates from starting address
1AC6|
1AC6| 6100 193E                BSR     GETROWCOL       ;get pixel row, byte col
1ACA| CCFC 0008                MULU    #8,D6           ;convert to pixel col
1ACE| 3186 2002                MOVE    D6,2(A0,D2.W)   ;save upper left X
1AD2| 3185 2004                MOVE    D5,4(A0,D2.W)   ; and Y coordinates
1AD6|
1AD6| 303C 0090                MOVE    #<MENUWIDTH*8>,D0 ;width in pixels of menu entry
1ADA| DC40                     ADD     D0,D6             ;compute and save
1ADC| 3186 2006                MOVE    D6,6(A0,D2.W)     ; lower Y coordinate
1AE0| 0645 0022                ADD     #<ICONHIGH+2>,D5  ;compute and save
1AE4| 3185 2008                MOVE    D5,8(A0,D2.W)     ; lower X coordinate
1AE8|
1AE8|                    ;  now do icon display
1AE8|
1AE8| 9DCE                     SUBA.L  A6,A6           ;clear for use
1AEA| 3C78 0532                MOVE    IconAddr,A6     ;get address for icon display
1AEE| 224E                     MOVE.L  A6,A1           ;save for later use
1AF0| DDF8 0110                ADD.L   SCRNBASE,A6     ;convert to screen address
1AF4| 4A03                     TST.B   D3              ;check for compressed icon
1AF6| 6A14                     BPL.S   @1              ;skip if not
1AF8| 6100 1AE8                BSR     DSPICON         ;go do display
1AFC|
1AFC| 41FA 2020                LEA     DRIVEN,A0       ;displaying drive?                  CHG009
1B00| B5C8                     CMPA.L  A0,A2           ;                                   CHG009
1B02| 660C                     BNE.S   @2              ;skip if not                        CHG009
1B04| 2A49                     MOVE.L  A1,A5           ;else set icon display address      CHG009
1B06| 6100 195C                BSR     DSPNUM          ; and display with id #             CHG009
1B0A| 6004                     BRA.S   @2              ;skip to continue                   CHG009
1B0C|
1B0C| 6100 1916           @1   BSR     DSPRGICON       ;display an uncompressed icon       CHG008
1B10|
1B10|                    ;  now display the alternate keycode
1B10|
1B10| D2FC 0445           @2   ADD     #ALTKYADDR,A1   ;set starting display pt
1B14| 6100 18F0                BSR     GETROWCOL       ;convert to row, col
1B18| 4240                     CLR     D0              ;first display the apple
1B1A| 6100 1C1E                BSR     DSPVAL
```

```
1B1E| 3004                    MOVE    D4,D0           ;get Ascii char
1B20| 6100 1C18                BSR     DSPVAL          ;and display it
1B24|
1B24|                  ;  finally compute the next menu entry and icon display address
1B24|
1B24| 3278 0530       @3      MOVE    MenuBase,A1     ;get base address for the entry
1B28| D2FC 0BF4               ADD     #BMenuSpc,A1    ;space to next col
1B2C| 31C9 0530               MOVE    A1,MenuBase     ;and save for next entry
1B30|
1B30| 3278 0532               MOVE    IconAddr,A1     ;else get this icon's address
1B34| D2FC 0BF4               ADD     #BMenuspc,A1    ;and bump to next spot in column
1B38| 31C9 0532               MOVE    A1,IconAddr     ;and do update
1B3C| 6000                    BRA.S   @4
1B3E|
1B3E| 4CDF 251F       @4      MOVEM.L (SP)+,D0-D4/A0/A2/A5
1B42| 4E75                    RTS
1B44|                  ;-------------------------------------------------------------------------
1B44|                  ;  Routine to check slots for icons and do display or do generic display.
1B44|                  ;  Inputs:
1B44|                  ;       D0 = card id
1B44|                  ;       D1 = slot #
1B44|                  ;       D2 = first boot id for slot
1B44|                  ;       A1 = address for icon display
1B44|                  ;       A2 = slot address
1B44|                  ;  Outputs:
1B44|                  ;       Returns with carry bit set if error.
1B44|                  ;  Side Effects:
1B44|                  ;       None
1B44|                  ;-------------------------------------------------------------------------
1B44|
1B44| 48E7 F8E0       CHKSLOT MOVEM.L D0-D4/A0-A2,-(SP) ;save regs
1B48| 0800 000D               BTST    #ICBIT,D0       ;icon available?
1B4C| 661A                    BNE.S   CHKICONS        ;skip if yes
1B4E|
1B4E|                  ;  no icons available - display slot # and display generic slot card icon
1B4E| 45FA 1EC4               LEA     XCARD,A2        ;point to generic icon
1B52| 76FF                    MOVEQ   #-1,D3          ;set compressed flag
1B54| 3278 0532               MOVE    IconAddr,A1     ;get display address for later use
1B58| 6100 FF3A               BSR     DSPMNTRY        ;go display entry
1B5C| 45FA 1EB6               LEA     XCARD,A2        ;set icon ptr
1B60| 2A49                    MOVE.L  A1,A5           ;get icon address
1B62| 6100 1900               BSR     DSPNUM          ;display slot #
1B66| 602C                    BRA.S   CHKSXIT         ;and exit
1B68|
1B68|                  ;  Slot has icon - read ROM and get ptr to desired icon
1B68|
1B68|                  CHKICONS
```

```
1B68| 6130                        BSR.S   RDSLT           ;go read slot
1B6A| 6528                        BCS.S   CHKSXIT         ;exit if error
1B6C| 227C 0001 FFFC              MOVE.L  #ADR128K-4,A1   ;set base address of I/O slot ROM code
1B72| 2803                        MOVE.L  D3,D4           ;save icon count
1B74| 0244 0003                   ANDI    #$03,D4         ;isolate count (max = 2)
1B78| 204A                        MOVE.L  A2,A0           ;get code ptr
1B7A| 3218                        MOVE    (A0)+,D1        ;get icon offset
1B7C| 2449                        MOVE.L  A1,A2           ;get base address
1B7E| D4C1                        ADD     D1,A2           ;add offset to set up icon ptr
1B80| 6100 FF12                   BSR     DSPMNTRY        ;display as menu entry
1B84|
1B84| 5344                        SUBQ    #1,D4           ;more than one icon?
1B86| 670C                        BEQ.S   CHKSXIT         ;skip if not
1B88| 3218                        MOVE    (A0)+,D1        ;else get ptr to second icon
1B8A| 5242                        ADDQ    #1,D2           ;bump boot id ptr for slot
1B8C| 2449                        MOVE.L  A1,A2           ;restore base address
1B8E| D4C1                        ADD     D1,A2           ;set up icon address
1B90| 6100 FF02                   BSR     DSPMNTRY        ;display as menu entry
1B94|
1B94| 4CDF 071F            CHKSXIT MOVEM.L (SP)+,D0-D4/A0-A2 ;restore regs and exit
1B98| 4E75                        RTS
1B9A|
1B9A|                      ;---------------------------------------------------------------------
1B9A|                      ;  Routine to read I/O slot ROM's and get icon count if any.
1B9A|                      ;
1B9A|                      ;  Expects D0 = boot id
1B9A|                      ;          A2 = slot address
1B9A|                      ;
1B9A|                      ;  Returns D3 = icon count
1B9A|                      ;          A2 = address of ptr to first icon if more than one
1B9A|                      ;---------------------------------------------------------------------
1B9A|
1B9A| 48E7 A000            RDSLT   MOVEM.L D0/D2,-(SP)     ;save boot id's
1B9E| 0800 000D                    BTST    #ICBIT,D0       ;any icons stored in ROM?
1BA2| 6720                        BEQ.S   @2              ;skip if none
1BA4| 4284                        CLR.L   D4              ;set flag for no status check
1BA6| 6100 0624                   BSR     RDIOSLT         ;and go read ROM on slot
1BAA| 651A                        BCS.S   @1              ;skip if error
1BAC|
1BAC| 4283                        CLR.L   D3              ;clear for use
1BAE| 3639 0002 0004              MOVE    ICONPTR,D3      ;get icon ptr
1BB4| 08C3 0000                   BSET    #0,D3           ;must be odd address
1BB8| 247C 0001 FFFC              MOVE.L  #ADR128K-4,A2   ;set base address
1BBE| D5C3                        ADD.L   D3,A2           ;set actual address
1BC0| 161A                        MOVE.B  (A2)+,D3        ;read icon count
1BC2| 6002                        BRA.S   @1
1BC4|
```

```
1BC4| 7601                  @2      MOVEQ   #1,D3           ;set default icon count
1BC6|
1BC6| 4CDF 0005             @1      MOVEM.L (SP)+,D0/D2     ;restore boot id's
1BCA| 4E75                          RTS
1BCC|                               .ENDC                   ;{USERINT}
1BCC|                               .PAGE
1BCC|                       ;---------------------------------------------------------------------------
1BCC|                       ;  Do default boot from Twiggy specified drive.
1BCC|                       ;  Assumes regs:
1BCC|                       ;       D0 = drive #
1BCC|                       ;  Following assumptions are made for power-up status:
1BCC|                       ;    1) No interrupt from disk unless diskette inserted or button pushed
1BCC|                       ;---------------------------------------------------------------------------
1BCC|
1BCC| 47FA F5B8             TWGBOOT LEA     DSKVCT,A3       ; first set up bus error vector
1BD0| 21CB 0008                    MOVE.L  A3,BUSVCTR
1BD4|
1BD4|                               .IF  USERINT = 0
1BD4|                               .ELSE
1BD4| 11C0 0535                    MOVE.B  D0,DRIVE        ;save drive id
1BD8| 6100 02CC                    BSR     WAITALRT        ;display wait icon
1BDC|                               .ENDC
1BDC|
1BDC| 207C 00FC C001              MOVE.L  #DISKMEM,A0     ; set ptr to controller memory
1BE2| 227C 0001 FFF4              MOVE.L  #TWGHDR,A1      ; set ptr to load header
1BE8| 247C 0002 0000              MOVE.L  #TWGHDR+12,A2   ; and ptr to load data
1BEE| 4281                        CLR.L   D1              ; set drive/side/sector/track ptr
1BF0| 0280 0000 00FF              ANDI.L  #$00FF,D0       ; mask off junk
1BF6|
1BF6| 4A40                        TST     D0              ;enable only drive selected
1BF8| 6608                        BNE.S   @1
1BFA| 117C 0008 0002              MOVE.B  #$08,CMD(A0)    ;enable drive #1
1C00| 6006                        BRA.S   @2
1C02| 117C 0080 0002       @1      MOVE.B  #$80,CMD(A0)    ;enable drive #2
1C08|
1C08| E098                  @2      ROR.L   #8,D0           ; get actual drive desired
1C0A| 8280                        OR.L    D0,D1           ; and save for shared mem format
1C0C|
1C0C| 10BC 0086                    MOVE.B  #ENBLINT,(A0)   ;go do enable
1C10| 6100 01F2                    BSR     CMDCHK          ;wait until cmd taken
1C14| 6500 0082                    BCS     DSKTIMERR       ;skip if timeout error
1C18| 267C 00FC DD81              MOVE.L  #VIA1BASE,A3    ;else enable
1C1E| 08AB 0004 0004              BCLR    #FDIR,DDRB1(A3) ; FDIR
1C24|
1C24|                       ;        BTST    #FDIR,(A3)      ;FDIR present?
1C24|                       ;        BEQ.S   DOREAD          ;skip if no to do read
1C24|
```

```
1C24| 6100 024C            CLRINT  BSR     CLRFDIR         ;clear interrupts
1C28| 6500 006E                    BCS     DSKTIMERR       ;exit if timeout error
1C2C|
1C2C|                             .PAGE
1C2C|                     ;--------------------------------------------------------------------------------
1C2C|                     ;  Read boot data - retry on sector 0 if needed.
1C2C|                     ;--------------------------------------------------------------------------------
1C2C|
1C2C|                     DOREAD
1C2C| 4240                       CLR     D0              ; set speed value
1C2E| 6100 0140                  BSR     TWGRD           ; go read sector 0                      RM000
1C32| 640A                       BCC.S   @1              ; skip if OK
1C34| 0C00 0027                  CMP.B   #TIMOUT,D0      ; timeout error?
1C38| 6700 0060                  BEQ     DSKCHK          ; exit if yes
1C3C| 600A                       BRA.S   RDRETRY         ; else go do retry
1C3E|
1C3E| 3029 0004            @1      MOVE    FILEID(A1),D0   ; else get file ID
1C42| 0C40 AAAA                   CMP     #BOOTPAT,D0     ; is it a boot file?
1C46| 6724                       BEQ.S   RDSCTR1         ; skip if yes
1C48|
1C48|                     ;  Do retry by reading track 1 to try to get head properly aligned, then
1C48|                     ;  retry reading track 0
1C48| 123C 0001            RDRETRY MOVE.B  #1,D1           ; set for track 1
1C4C| 4240                       CLR     D0              ; set speed value
1C4E| 6100 0120                  BSR     TWGRD           ; go do read                            RM000
1C52| 6546                       BCS.S   DSKCHK          ; exit if second error
1C54| 4201                       CLR.B   D1              ; else retry track 0
1C56| 4240                       CLR     D0              ; set speed value
1C58| 6100 0116                  BSR     TWGRD           ; go do read                            RM000
1C5C| 653C                       BCS.S   DSKCHK          ; exit if error
1C5E|
1C5E|                     ;  Now check again for a valid boot track
1C5E| 3029 0004                  MOVE    FILEID(A1),D0   ; get file ID
1C62| 0C40 AAAA                   CMP     #BOOTPAT,D0     ; is it a boot file?
1C66| 6704                       BEQ.S   RDSCTR1         ; skip if yes
1C68| 7026                       MOVEQ   #BADTHDR,D0     ; set error code
1C6A| 602E                       BRA.S   DSKCHK          ; and exit
1C6C|
1C6C|                     RDSCTR1
1C6C|                              .IF  NEWTWIG = 0
1C6C|                              .ENDC
1C6C|
1C6C| 42B8 01B4                  CLR.L   BOOTDATA        ;set for no error
1C70| 47FA 009C                  LEA     DSKERR2,A3      ;set up vectors in case of bad diskette
1C74| 49FA 009E                  LEA     DSKERR3,A4
1C78| 6100 0236                  BSR     VCTRINIT
1C7C| 247C 0002 0000            MOVE.L  #TWGDATA,A2     ;set data ptr (software view)
```

```
1C82|
1C82|                       ;  Do keyboard/mouse reset before continuing boot process
1C82|
1C82|                       STRTBOOT
1C82| 48E7 8080                    MOVEM.L A0/D0,-(SP)     ;save regs
1C86| 6100 EE22                    BSR     RSTKBD          ;send reset signal
1C8A| 6100 EE38                    BSR     CLRRST          ;then clear it
1C8E| 4238 02B0                    CLR.B   KBDQ            ;clear first byte of keyboard queue
1C92| 4CDF 0101                    MOVEM.L (SP)+,A0/D0     ;restore regs
1C96| 4ED2                         JMP     (A2)            ;and away we go ...
1C98|
1C98|                              .PAGE
1C98|                       ;---------------------------------------------------------------------------
1C98|                       ;  Error occurred - output error message and go to monitor
1C98|                       ;---------------------------------------------------------------------------
1C98|
1C98|                       DSKTIMERR
1C98| 7027                         MOVEQ   #TIMOUT,D0      ;set timeout error code
1C9A| 11C0 01B4             DSKCHK  MOVE.B  D0,BOOTDATA     ;save the error status
1C9E| 0C00 0027                    CMPI.B  #TIMOUT,D0      ;timeout?
1CA2| 6720                         BEQ.S   DSKERR          ;skip if yes
1CA4| 6100 01CC                    BSR     CLRFDIR         ;ensure intrpt cleared
1CA8| 6512                         BCS.S   DSKOUT          ;exit if error
1CAA|
1CAA|                              .IF  USERINT = 0
1CAA|                              .ENDC
1CAA|
1CAA| 11E8 00BA 01B6        DSKBAD  MOVE.B  CHKCNT(A0),BOOTDATA+2  ; and data checksum count
1CB0|
1CB0|                              .IF  NEWTWIG = 1
1CB0| 11E8 00C4 01B5                MOVE.B  CHKCNT2(A0),BOOTDATA+1 ; and address checksum count
1CB6| 11E8 0058 01B7                MOVE.B  RTRYCNT(A0),BOOTDATA+3 ; and retry count
1CBC|                              .ENDC
1CBC|
1CBC| 6100 0198             DSKOUT  BSR     EJCTDSK         ;then eject the disk
1CC0|
1CC0| 6100 0084             DSKDIS  BSR     DSABLDSK        ;disable both drives
1CC4|
1CC4| 6100 EA1C             DSKERR  BSR     SETBUSVCT       ; restore default bus error vector      RM000
1CC8|
1CC8|                              .IF  USERINT = 0
1CC8|                              .ELSE
1CC8| 6100 0092                    BSR     CHKDRIVE        ;go determine drive
1CCC| 1038 01B4                    MOVE.B  BOOTDATA,D0     ;get error code
1CD0| 0C00 0007                    CMP.B   #NODISK,D0      ;no disk error?
1CD4| 6614                         BNE.S   @1              ;skip if not
1CD6|
```

```
1CD6|                                                   ;2 statements deleted                CHG009
1CD6|
1CD6| 45FA 1E7E                  LEA     INSERTD,A2      ;set icon for insert rqst            CHG009
1CDA| 6100 1850                  BSR     DSPALRTICON     ;display basic icon                  CHG009
1CDE| 3A7C 287E                  MOVE    #ERRSTRT,A5     ;set display pt for id #             CHG009
1CE2| 6100 1780                  BSR     DSPNUM          ; and display it                     CHG009
1CE6| 6000 0256                  BRA     BFAIL2          ;then go signal user
1CEA|
1CEA| 0C00 0017          @1      CMP.B   #RDWRERR,D0     ;read error?
1CEE| 670C                       BEQ.S   @2              ;skip if yes
1CF0| 0C00 0026                  CMP.B   #BADTHDR,D0     ;bad file id?
1CF4| 6706                       BEQ.S   @2
1CF6| 0C00 004B                  CMP.B   #EBOOT,D0       ;boot error?
1CFA| 6606                       BNE.S   @3              ;skip if not
1CFC|
1CFC| 6100 1752          @2      BSR     DSPNUMICON      ;display diskette icon with id #
1D00| 6008                       BRA.S   TBOOTERR        ;and exit
1D02|
1D02| 45FA 1C47          @3      LEA     IOBRD,A2        ;error must be on I/O board
1D06| 6100 17D2                  BSR     DSPERRICON      ;display icon
1D0A|                            .ENDC
1D0A|
1D0A|                   TBOOTERR
1D0A|                            .IF  USERINT = 0
1D0A|                            .ELSE
1D0A| 6000 022E                  BRA     BOOTFAIL        ;and go signal boot failure
1D0E|                            .ENDC
1D0E|
1D0E|                   ;---------------------------------------------------------------------------
1D0E|                   ;  Handler for Twiggy boot errors
1D0E|                   ;---------------------------------------------------------------------------
1D0E|                   DSKERR2 BSRS4   SAVEXCP         ;go save exception info
1D0E| 49FA 0004               #          LEA      @1,A4
1D12| 6008                     #          BRA.S    SAVEXCP
1D14|                          #@1
1D14|
1D14|                   DSKERR3 BSRS4   BTERR           ;regroup
1D14| 49FA 0004               #          LEA      @1,A4
1D18| 6010                     #          BRA.S    BTERR
1D1A|                          #@1
1D1A| 60A0                            BRA.S   DSKOUT          ;and display error
1D1C|
1D1C|                   SAVEXCP
1D1C| 31DF 0280                      MOVE    (SP)+,EXCFC     ;save function code
1D20| 21DF 0282                      MOVE.L  (SP)+,EXCADR    ;and address
1D24| 31DF 0286                      MOVE    (SP)+,EXCIR     ;and instruction reg
1D28|                               RTS4
```

```
1D28| 4ED4                #          JMP      (A4)
1D2A|
1D2A| 31DF 0288            BTERR   MOVE    (SP)+,EXCSR     ;save status reg
1D2E| 21DF 028A                    MOVE.L  (SP)+,EXCPC     ;and pc
1D32| 6100 E306                    BSR     SAVEREGS        ;save regs
1D36| 3E7C 0480                    MOVEA   #STKBASE,SP     ;reset stack pointer
1D3A| 6100 E970                    BSR     SETVCTRS        ;reinit vectors
1D3E| 704B                        MOVEQ   #EBOOT,D0       ;set boot error
1D40| 11C0 01B4                    MOVE.B  D0,BOOTDATA     ;and save
1D44|                             RTS4
1D44| 4ED4                #          JMP      (A4)
1D46|
1D46|                     ;--------------------------------------------------------------------------
1D46|                     ;  Subroutine to disable interrupts from both Twiggy drives
1D46|                     ;  Inputs:
1D46|                     ;       None
1D46|                     ;  Outputs:
1D46|                     ;       Carry bit set if timeout error (in CMDCHK).
1D46|                     ;  Side Effects:
1D46|                     ;       A0 trashed (other regs trashed in CMDCHK)
1D46|                     ;--------------------------------------------------------------------------
1D46|
1D46|                     DSABLDSK
1D46| 207C 00FC C001              MOVE.L  #DISKMEM,A0     ;set ptr to shared memory
1D4C| 117C 0088 0002              MOVE.B  #$88,CMD(A0)    ;disable ints from both drives
1D52| 10BC 0087                  MOVE.B  #DSABLINT,(A0)
1D56| 6100 00AC                  BSR     CMDCHK          ;wait for command to be taken
1D5A| 4E75                      RTS                     ;then return
1D5C|
1D5C|                     ;--------------------------------------------------------------------------
1D5C|                     ;  Subroutine to determine drive # in error and get icon ptr
1D5C|                     ;  Inputs:
1D5C|                     ;       Location DRIVE = drive id # (0 or $80)
1D5C|                     ;  Outputs:
1D5C|                     ;       A2 = ptr to diskette icon
1D5C|                     ;       D1 = id #
1D5C|                     ;  Side Effects:
1D5C|                     ;       None
1D5C|                     ;--------------------------------------------------------------------------
1D5C|
1D5C|                     CHKDRIVE
1D5C| 45FA 1FC0                  LEA     DISKETTE,A2     ;set ptr for diskette icon
1D60| 1238 0535                  MOVE.B  DRIVE,D1        ;get drive id
1D64| 4A01                      TST.B   D1              ; drive #1?
1D66| 6604                      BNE.S   @1              ; skip if no
1D68|
1D68|                           .IF  USERINT = 0
```

```
1D68|                           .ELSE
1D68| 7201                     MOVEQ   #1,D1           ; else set up id code
1D6A|                           .ENDC
1D6A|
1D6A| 6002                     BRA.S   @2
1D6C|                   @1
1D6C|                           .IF  USERINT = 0
1D6C|                           .ELSE
1D6C| 7202                     MOVEQ   #2,D1           ; else set up id code
1D6E|                           .ENDC
1D6E|                   @2
1D6E| 4E75                     RTS                     ;exit
1D70|
1D70|
1D70|                           .IF     EXTERNAL = 1
1D70|                           .ENDC
1D70|                           .PAGE
1D70|                   ;--------------------------------------------------------------------------
1D70|                   ;  Read a Twiggy sector routine.  Uses hardware view of the world, with
1D70|                   ;  12 bytes for header and 256 bytes (512 for new format) of data per sector.
1D70|                   ;  Also assumes registers:
1D70|                   ;    D0 = speed (for new Twiggy code)   A0 = disk shared memory address
1D70|                   ;    D1 = drive/side/sector/track       A1 = address to load header(12 bytes)
1D70|                   ;    D2 = timeout for read              A2 = address to load data(256 or 512 bytes)
1D70|                   ;    D3 = scratch                       A3 = VIA address for FDIR
1D70|                   ;  If error, returns with carry bit set and error code in D0.
1D70|                   ;--------------------------------------------------------------------------
1D70|
1D70|                   TWGRD
1D70| 243C 00C0 0000             MOVE.L  #FDIRTIME,D2    ; set default timeout value            RM000
1D76|
1D76|                   TWGREAD
1D76|                           .IF TWIGGY = 1
1D76| 48E7 1078                 MOVEM.L D3/A1-A4,-(SP)  ; save regs
1D7A|                           DISABLE                 ; disable interrupts
1D7A| 40E7                 #          MOVE     SR,-(SP)
1D7C| 007C 0700            #          ORI      #$0700,SR
1D80| 6100 0114                 BSR     CHKFDIR         ;ensure no ints pending
1D84| 03C8 0004                 MOVEP.L D1,DRV(A0)      ; set disk ptrs
1D88|                           .IF     NEWTWIG = 1
1D88| 1140 000C                 MOVE.B  D0,SPEED(A0)    ;set speed value
1D8C|                           .ENDC
1D8C| 4228 0002                 MOVE.B  #READS,CMD(A0)  ; set for read operation
1D90| 10BC 0081                 MOVE.B  #EXRW,(A0)      ; and go do it
1D94| 6100 00A8                 BSR     CHKFIN          ; wait
1D98| 6556                     BCS.S   TWGOUT          ; exit if timeout
1D9A| 1028 0010                 MOVE.B  STAT(A0),D0     ; get disk return code
```

```
1D9E| 117C 00CC 0002              MOVE.B  #$CC,CMD(A0)    ;clear RWTS interrupt bits
1DA4| 10BC 0085                   MOVE.B  #CLRSTAT,(A0)
1DA8| 615A                        BSR.S   CMDCHK          ;wait until cmd taken
1DAA| 6544                        BCS.S   TWGOUT          ;exit if error
1DAC| 4A00                        TST.B   D0              ;check status code
1DAE| 6642                        BNE.S   TWGERR          ; and exit if error
1DB0|
1DB0|                     ;  Read successful - transfer header and then data to main memory
1DB0|
1DB0|                             .IF  NEWTWIG = 0
1DB0|                             .ELSE
1DB0| 49E8 03E8                   LEA     DSKBUFF(A0),A4  ;set address for Twiggy buffer
1DB4| 074C 0000             XFRHDR  MOVEP.L (A4),D3         ;load header bytes
1DB8| 22C3                        MOVE.L  D3,(A1)+
1DBA| 074C 0008                   MOVEP.L 8(A4),D3
1DBE| 22C3                        MOVE.L  D3,(A1)+
1DC0| 074C 0010                   MOVEP.L 16(A4),D3
1DC4| 22C3                        MOVE.L  D3,(A1)+
1DC6|
1DC6| 49E8 0400                   LEA     DSKDATA(A0),A4  ;set address for data
1DCA| 303C 001F                   MOVE.W  #31,D0          ;need to load 512 bytes
1DCE| 074C 0000             XFRDATA MOVEP.L (A4),D3         ;load data bytes
1DD2| 24C3                        MOVE.L  D3,(A2)+
1DD4| 074C 0008                   MOVEP.L 8(A4),D3
1DD8| 24C3                        MOVE.L  D3,(A2)+
1DDA| 074C 0010                   MOVEP.L 16(A4),D3
1DDE| 24C3                        MOVE.L  D3,(A2)+
1DE0| 074C 0018                   MOVEP.L 24(A4),D3
1DE4| 24C3                        MOVE.L  D3,(A2)+
1DE6| D8FC 0020                   ADD.W   #32,A4
1DEA| 51C8 FFE2                   DBF     D0,XFRDATA      ;loop until done
1DEE| 600A                        BRA.S   TWGOK           ;and go to exit
1DF0|
1DF0|                             .ENDC
1DF0|
1DF0|                     ;  Error exit - set carry bit as error indicator
1DF0|
1DF0| 7027                  TWGOUT  MOVEQ   #TIMOUT,D0      ; set timeout error
1DF2|                       TWGERR  ENABLE                  ; restore interrupt mask
1DF2| 46DF                  #         MOVE    (SP)+,SR
1DF4| 003C 0001                   ORI.B   #$01,CCR
1DF8| 6004                        BRA.S   TWGRXIT         ; and exit
1DFA|
1DFA|                       TWGOK   ENABLE                  ; restore interrupt mask
1DFA| 46DF                  #         MOVE    (SP)+,SR
1DFC| 4280                        CLR.L   D0              ; set OK return code          CHG025
1DFE|
```

```
1DFE| 4CDF 1E08            TWGRXIT MOVEM.L (SP)+,D3/A1-A4  ; restore regs
1E02| 4E75                        RTS                     ; and return to caller
1E04|
1E04|                     ;-------------------------------------------------------------------------
1E04|                     ;  Subroutine to check for disk command taken. Also does check for DSKDIAG
1E04|                     ;  in case Twiggy controller becomes busy servicing second disk drive before
1E04|                     ;  command is seen.  Loop takes about 12.4 us if DSKDIAG OK, else DSKDIAG
1E04|                     ;  loop takes about 9.6 us.
1E04|                     ;
1E04|                     ;  Destroys register A0
1E04|                     ;-------------------------------------------------------------------------
1E04|
1E04| 48E7 1010          CMDCHK  MOVEM.L D3/A3,-(SP)     ;save regs
1E08| 263C 0012 0000             MOVE.L  #CMDTIME,D3     ;set timeout for about 15 secs
1E0E| 207C 00FC C001             MOVE.L  #DISKMEM,A0     ;set ptr to shared memory
1E14| 267C 00FC D901             MOVE.L  #VIA2BASE,A3    ;also set up to monitor DSKDIAG
1E1A| 022B 00BF 0010             ANDI.B  #$BF,DDRB2(A3)
1E20| 4A10                @1      TST.B   (A0)            ;cmd taken when byte 0'ed
1E22| 6714                        BEQ.S   @2
1E24| 0813 0006            @3      BTST    #DSKDIAG,IRB2(A3) ;check if controller not ready
1E28| 6606                        BNE.S   @4              ;skip if OK
1E2A| 5383                        SUBQ.L  #1,D3           ;else loop until timeout or ready
1E2C| 66F6                        BNE.S   @3
1E2E| 6004                        BRA.S   @5              ;take error exit
1E30| 5383                @4      SUBQ.L  #1,D3
1E32| 66EC                        BNE.S   @1              ;loop until yes or timeout
1E34| 003C 0001            @5      ORI.B   #$01,CCR        ;set error
1E38| 4CDF 0808            @2      MOVEM.L (SP)+,D3/A3     ;restore regs
1E3C| 4E75                        RTS
1E3E|
1E3E|                     ;-------------------------------------------------------------------------
1E3E|                     ;  Subroutine to check for disk interrupt (FDIR asserted) - loop takes 8.8us
1E3E|                     ;  Destroys register D3 and A3
1E3E|                     ;-------------------------------------------------------------------------
1E3E|
1E3E|                     CHKFIN
1E3E|                             .IF  NEWTWIG = 0
1E3E|                             .ENDC
1E3E|                             .IF  NEWTWIG = 1
1E3E| 2602                        MOVE.L  D2,D3           ;set user-supplied timeout
1E40|                             .ENDC
1E40| 267C 00FC DD81             MOVE.L  #VIA1BASE,A3    ;set ptr for interface
1E46| 0813 0004            @1      BTST    #4,(A3)         ;FDIR?
1E4A| 6608                        BNE.S   @2              ;exit if yes
1E4C| 5383                        SUBQ.L  #1,D3
1E4E| 66F6                        BNE.S   @1              ;else loop
1E50| 003C 0001                   ORI.B   #$01,CCR        ;set error
```

```
1E54| 4E75                  @2      RTS
1E56|
1E56|                              .PAGE
1E56|                      ;-------------------------------------------------------------------------
1E56|                      ;  Subroutine to eject disk
1E56|                      ;  Assumes A0 = ptr to disk shared memory
1E56|                      ;-------------------------------------------------------------------------
1E56|
1E56|                      EJCTDSK
1E56|                              .IF     NEWTWIG = 1
1E56| 611A                         BSR.S   CLRFDIR          ;ensure interrupts cleared
1E58| 6516                         BCS.S   @1               ;exit if error
1E5A| 243C 0018 0000              MOVE.L  #EJCTTIME,D2     ;set eject timeout
1E60|                              .ENDC
1E60| 117C 0002 0002              MOVE.B  #UNCLAMP,CMD(A0) ;set up cmd
1E66| 10BC 0081                   MOVE.B  #EXRW,(A0)       ;go do it
1E6A| 61D2                         BSR.S   CHKFIN           ;wait for FDIR
1E6C| 6502                         BCS.S   @1               ;skip if error
1E6E| 6102                         BSR.S   CLRFDIR          ;clear intrpt and return
1E70| 4E75                  @1      RTS
1E72|
1E72|                      ;-------------------------------------------------------------------------
1E72|                      ;  Subroutine to clear interrupt.  Waits for FDIR to go low before return.
1E72|                      ;  Assumes A0 = ptr to disk shared memory.
1E72|                      ;-------------------------------------------------------------------------
1E72|
1E72| 117C 00FF 0002       CLRFDIR MOVE.B  #$FF,CMD(A0)     ;clear FDIR
1E78| 10BC 0085                    MOVE.B  #CLRSTAT,(A0)
1E7C| 6186                         BSR.S   CMDCHK           ;wait until cmd taken
1E7E| 267C 00FC DD81              MOVE.L  #VIA1BASE,A3     ;then wait for FDIR to go low
1E84| 7619                         MOVEQ   #25,D3           ;set timeout for about 200 us
1E86| 0813 0004             @1      BTST    #FDIR,(A3)       ;FDIR?
1E8A| 6708                         BEQ.S   @2               ;skip if none
1E8C| 5343                         SUBQ    #1,D3            ;else loop until gone or timeout
1E8E| 66F6                         BNE.S   @1
1E90| 003C 0001                   ORI.B   #01,CCR          ;set error indicator
1E94| 4E75                  @2      RTS
1E96|
1E96|                      ;-------------------------------------------------------------------------
1E96|                      ;  Subroutine to ensure FDIR gone after clear status cmd
1E96|                      ;-------------------------------------------------------------------------
1E96|
1E96| 267C 00FC DD81       CHKFDIR MOVE.L  #VIA1BASE,A3     ;set ptr for FDIR status
1E9C| 0813 0004                    BTST    #FDIR,(A3)       ;FDIR present?
1EA0| 6702                         BEQ.S   @1               ;skip if not
1EA2| 61CE                         BSR.S   CLRFDIR          ;else do clear
1EA4| 4E75                  @1      RTS                      ;and exit
```

```
1EA6|
1EA6|                           .IF  USERINT = 0
1EA6|                           .ENDC                   ;{USERINT}
1EA6|
1EA6|                           .IF  USERINT = 1
1EA6|                       ;---------------------------------------------------------------------------
1EA6|                       ;  Subroutine to enable display of wait icon.  Main entry point creates
1EA6|                       ;  alert box also, secondary enrty point (DSPWTICON) invokes icon display
1EA6|                       ;  only.
1EA6|                       ;  Inputs:
1EA6|                       ;       None
1EA6|                       ;  Outputs:
1EA6|                       ;       None
1EA6|                       ;  Side Effects:
1EA6|                       ;       A2,A3 trashed
1EA6|                       ;---------------------------------------------------------------------------
1EA6|
1EA6|                       WAITALRT
1EA6|                       DSPWTICON
1EA6| 45FA 1B95                     LEA     WAITICON,A2     ;and display wait icon
1EAA| 6100 1680                     BSR     DSPALRTICON
1EAE| 4E75                          RTS
1EB0|                           .ENDC                   ;{USERINT}
1EB0|
1EB0|                           .ENDC                   ;{TWIGGY}
1EB0|
1EB0|                       ;---------------------------------------------------------------------------
1EB0|                       ;  Routine to reinit vectors before release of control to boot loader.
1EB0|                       ;  Sets all vectors other than reset and interrupts to jump to the
1EB0|                       ;  failing boot device handler.
1EB0|                       ;
1EB0|                       ;  Inputs:
1EB0|                       ;       A3 = address of boot error handler for bus/address errors
1EB0|                       ;       A4 = address of boot error handler for other exceptions
1EB0|                       ;  Outputs:
1EB0|                       ;       None
1EB0|                       ;  Side Effects:
1EB0|                       ;       A0/D1 trashed
1EB0|                       ;---------------------------------------------------------------------------
1EB0|
1EB0|                       VCTRINIT
1EB0| 307C 0008                     MOVEA   #BUSVCTR,A0     ;get ptr to vector locations            RM000
1EB4| 20CB                          MOVE.L  A3,(A0)+        ;set up for bus error
1EB6| 20CB                          MOVE.L  A3,(A0)+        ;and address error
1EB8| 7214                          MOVEQ   #20,D1          ;# of remaining low vectors to init
1EBA| 20CC                    @1    MOVE.L  A4,(A0)+        ;setup handler for errors up
1EBC| 5341                          SUBQ    #1,D1           ; to spurious intrpt vector
```

```
1EBE| 66FA                        BNE.S   @1
1EC0| 307C 0080                    MOVEA   #TRPVCT0,A0     ;next do all trap vectors              RM000
1EC4| 7220                        MOVEQ   #32,D1          ;set count
1EC6| 20CC                 @2     MOVE.L  A4,(A0)+        ;and do init
1EC8| 5341                        SUBQ    #1,D1
1ECA| 66FA                        BNE.S   @2
1ECC| 4E75                        RTS
1ECE|
1ECE|                             .IF     EXTERNAL = 1
1ECE|                             .ENDC
1ECE|                             .PAGE
1ECE|                             .IF PROFLE = 1          ;ASSEMBLE ONLY IF PROFILE CODE NEEDED
1ECE|                      ;-------------------------------------------------------------------------
1ECE|                      ;  Routine to boot from Profile hard disk attached to parallel port
1ECE|                      ;  Sets up input parameters and then calls READ routine.  If no error
1ECE|                      ;  on return (carry not set), a jump to the loaded boot code is done.
1ECE|                      ;-------------------------------------------------------------------------
1ECE|
1ECE|                      PROBOOT
1ECE|                             .IF  USERINT = 0
1ECE|                             .ELSE
1ECE| 61D6                        BSR     WAITALRT                ; display wait icon
1ED0|                             .ENDC
1ED0|
1ED0| 227C 0001 FFEC              MOVE.L  #HDRBUFR,A1             ; set up ptr to save header
1ED6| 247C 0002 0000              MOVE.L  #HDRBUFR+20,A2          ; ptr for data
1EDC| 4281                        CLR.L   D1                      ; set sector #
1EDE| 243C 0120 0000              MOVE.L  #STRTIME,D2             ; set timeout count (3 mins)
1EE4| 760A                        MOVEQ   #RCNT,D3                ; set retry count
1EE6| 7803                        MOVEQ   #TCNT,D4                ; set threshold count
1EE8| 6100 0086                  BSR     PROREAD                 ; go get data
1EEC| 6522                        BCS.S   HDSKERR                 ; exit if error
1EEE|
1EEE|                      ;  Now verify header and if OK, jump to startup program
1EEE|
1EEE| 3029 0004                  MOVE    FILEID(A1),D0           ; get file id
1EF2| 0C40 AAAA                  CMP     #BOOTPAT,D0             ; is it a boot block?
1EF6| 6704                        BEQ.S   PBOOT                   ; continue if OK
1EF8| 7054                        MOVEQ   #BADHDR,D0              ; else set error code
1EFA| 6014                        BRA.S   HDSKERR                 ; and exit
1EFC|
1EFC| 47FA 0060            PBOOT   LEA     HDERR2,A3               ;set up vectors in case of errors
1F04| 61AA                        BSR     VCTRINIT4
1F06|
1F06| 247C 0002 0000              MOVE.L  #HDRBUFR+20,A2          ; set ptr for data
1F0C| 6000 FD74                  BRA     STRTBOOT                ; and go start execution
1F10|
```

```
1F10|                       ;  Error detected - output message and abort boot
1F10|
1F10|                       HDSKERR
1F10|                               .IF  USERINT = 0
1F10|                               .ELSE
1F10|
1F10| 0C38 0003 02AF               CMP.B   #3,SYSTYPE              ;check system type              CHG009/CHG029
1F16| 6706                         BEQ.S   @2                      ;skip if internal disk          CHG009/CHG029
1F18| 45FA 1B85                   LEA     PROICON,A2              ;else setup Profile icon
1F1C| 6004                         BRA.S   @3                      ;skip to do display             CHG009
1F1E| 45FA 1BBA            @2      LEA     UPPER,A2                ;set for integral hard disk     CHG009
1F22|
1F22| 0C00 0050            @3      CMP.B   #NODSK,D0               ;Profile not attached error?
1F26| 660E                         BNE.S   @1                      ;skip if not
1F28|
1F28|                       ;  If default boot and no Profile attached, go to boot menu
1F28|
1F28| 0807 001C                   BTST    #ALTBOOT,D7             ;is this a default boot?
1F2C| 6608                         BNE.S   @1                      ;skip if not
1F2E| 6100 11AA                   BSR     CLRDESK                 ;clear desktop
1F32| 6000 F8FA                   BRA     LSTCHK                  ;and do beep and display the boot menu
1F36|
1F36| 6100 15A2            @1      BSR     DSPERRICON              ;display with bad mark
1F3A|
1F3A|                               .ENDC                           ;{PROFILE}
1F3A|
1F3A|                       ;  Sound error tones and display error code
1F3A|
1F3A|                       BOOTFAIL
1F3A| 6100 F6E6                   BSR     DSPCODE                 ;display error code
1F3E|
1F3E|                       BFAIL2
1F3E| 6100 F788                   BSR     HIPTCH                  ;startup failure causes hi,hi,hi tones
1F42| 6100 F784                   BSR     HIPTCH
1F46| 6100 F780                   BSR     HIPTCH
1F4A| 6100 11C8                   BSR     CLRMENU                 ;clear menu bar
1F4E| 0238 00FC 02A2               ANDI.B  #$FC,STATFLGS           ;allow CONTINUE option from boot error
1F54| 08F8 0000 02A2               BSET    #NORSTRT,STATFLGS       ; but not restart option
1F5A| 6000 0640                   BRA     MONITOR                 ;and go to monitor
1F5E|
1F5E|                        HDERR2  BSR4    SAVEXCP                 ;save exception info
1F5E| 49FA 0006                 #         LEA     @1,A4
1F62| 6000 FDB8                 #         BRA     SAVEXCP
1F66|                         #@1
1F66|                         HDERR3  BSR4    BTERR                   ;regroup from error
1F66| 49FA 0006                 #         LEA     @1,A4
1F6A| 6000 FDBE                 #         BRA     BTERR
```

```
1F6E|                       #@1
1F6E| 60A0                          BRA.S   HDSKERR                ;and go display it
1F70|
1F70|                               .IF     EXTERNAL = 1
1F70|                               .ENDC
1F70|
1F70|                               .PAGE
1F70|                        ;--------------------------------------------------------------------------
1F70|                        ;  First initialize and then ensure disk is attached by checking OCD line.
1F70|                        ;  Assumes ACR and IER registers of VIA set up by caller.  For boot, these
1F70|                        ;  are cleared by power-up reset.
1F70|                        ;  Register usage:
1F70|                        ;    D0 = scratch use           A0 = VIA address for parallel port interface
1F70|                        ;    D1 = block to read         A1 = address to save header
1F70|                        ;    D2 = timeout count         A2 = address to save data
1F70|                        ;    D3 = retry count           A3 = scratch
1F70|                        ;    D4 = threshold count       A4 = unused
1F70|                        ;  Returns:
1F70|                        ;    D0 = error code (0 = OK)
1F70|                        ;    D1 = error bytes (4)
1F70|                        ;    D2 - D7 and A1 - A6 are preserved
1F70|                        ;--------------------------------------------------------------------------
1F70|
1F70| 48E7 3F7E             PROREAD MOVEM.L D2-D7/A1-A6,-(SP)       ; save regs
1F74|                               DISABLE                         ; ensure interrupts off
1F74| 40E7                  #          MOVE     SR,-(SP)
1F76| 007C 0700             #          ORI      #$0700,SR
1F7A| 6174                          BSR.S   PROINIT                 ; init for Profile access and check
1F7C|                                                               ;  if attached
1F7C| 6704                          BEQ.S   CHKBSY                  ; go on if OK
1F7E| 7050                          MOVEQ   #NODSK,D0               ; else set error code and
1F80| 605C                          BRA.S   PROERR                  ; skip if error - no disk attached
1F82|
1F82|                        ;  Now check if Profile ready - wait time presently set for about 100 seconds
1F82|                        ;  to allow enough time for normal Profile startup time of about 80 seconds
1F82|
1F82| 0810 0001             CHKBSY  BTST    #BSY,IRB2(A0)           ; check if Profile ready (not busy)
1F86| 6608                          BNE.S   TRYRD                   ; skip if yes
1F88| 5382                          SUBQ.L  #1,D2                   ; else loop until timeout
1F8A| 66F6                          BNE.S   CHKBSY
1F8C|
1F8C| 7051                          MOVEQ   #DSKBSY,D0              ; set disk busy error code
1F8E| 604E                          BRA.S   PROERR                  ; and go to error exit
1F90|
1F90|                        ;  Now start read and check status to see if OK
1F90|
1F90| 6100 00B6             TRYRD   BSR     STRTRD                  ; go begin read process
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1F94| 6418                        BCC.S   @1                      ; skip if OK                    CHG016
1F96| 6100 018A                   BSR     WFNBSY                  ; else check for ready          CHG016
1F9A| 6100 00AC                   BSR     STRTRD                  ; and do retry                  CHG016
1F9E| 640E                        BCC.S   @1                      ; continue if OK                CHG016
1FA0| 6100 01A4                   BSR     DOCRES                  ; else issue reset signal       CHG016
1FA4| 6100 017C                   BSR     WFNBSY                  ; wait until ready              CHG016
1FA8| 6100 009E                   BSR     STRTRD                  ; and try one more time         CHG016
1FAC| 6530                        BCS.S   PROERR                  ; finally exit if error
1FAE|
1FAE| 4A78 01B6            @1      TST.W   STAT3                   ; check if reset error          CHG016
1FB2| 6A06                        BPL.S   @2                      ; skip if not
1FB4| 6100 0092                   BSR     STRTRD                  ; else go try read again
1FB8| 6524                        BCS.S   PROERR                  ; and abort if error
1FBA|
1FBA| 4AB8 01B4            @2      TST.L   STATBFR                 ; check complete status
1FBE| 6712                        BEQ.S   RDDATA                  ; skip if OK
1FC0| 2238 01B4                   MOVE.L  STATBFR,D1              ; else get status
1FC4| 2001                        MOVE.L  D1,D0                   ; save for use
1FC6| 0280 C140 C000              ANDI.L  #STATMSK,D0             ; mask don't care bits
1FCC| 6704                        BEQ.S   RDDATA                  ; and continue if OK
1FCE| 7053                        MOVEQ   #STATNZ,D0              ; else set error code
1FD0| 600C                        BRA.S   PROERR                  ; and go to error exit
1FD2|
1FD2|                     ;  All OK - go read block and transfer to memory; do as multiple moves for
1FD2|                     ;  max transfer rate.
1FD2|
1FD2| 7004               RDDATA  MOVEQ   #<HDRSIZE/4>-1,D0       ; set count for header read
1FD4| 615C                        BSR.S   READIT                  ; go do it
1FD6|
1FD6| 707F                        MOVEQ   #<BLKSIZE/4>-1,D0       ; set count for data read
1FD8| 224A                        MOVEA.L A2,A1                   ; set new read location
1FDA| 6156                        BSR.S   READIT
1FDC|
1FDC| 6008                        BRA.S   PROXIT                  ; and go to exit
1FDE|
1FDE|                     ;  Error exit - set carry bit as indicator flag
1FDE|
1FDE| 46DF                    #         MOVE    (SP)+,SR          ;restore interrupt mask
1FE0| 003C 0001                   ORI.B   #$01,CCR
1FE4| 6004                        BRA.S   PROXIT2
1FE6|
1FE6|                     ;  Normal exit - restore regs and exit
1FE6|                      PROXIT  ENABLE                          ;restore interrupt mask
1FE6| 46DF                    #         MOVE    (SP)+,SR
1FE8| 4280                        CLR.L   D0                      ;set OK return code             CHG025
1FEA|
1FEA| 4CDF 7EFC             PROXIT2 MOVEM.L (SP)+,D2-D7/A1-A6
```

```
1FEE| 4E75                          RTS
1FF0|
1FF0|                        ;--------------------------------------------------------------------------
1FF0|                        ;  Subroutine to init parallel port for Profile access.
1FF0|                        ;  Inputs:
1FF0|                        ;       None
1FF0|                        ;  Outputs:
1FF0|                        ;       D0 cleared for error use
1FF0|                        ;       A0 = VIA base address for parallel port
1FF0|                        ;       CCR zero bit set if cable connected
1FF0|                        ;  Side Effects:
1FF0|                        ;       None
1FF0|                        ;--------------------------------------------------------------------------
1FF0|
1FF0|                        PROINIT
1FF0| 4280                           CLR.L   D0                      ; clear for result use
1FF2| 267C 00FC DD81                 MOVE.L  #VIA1BASE,A3            ; get kybd VIA base address                     CHG036
1FF8| 0013 00A0                     ORI.B   #$A0,ORB1(A3)           ; initialize profile-reset and parity-reset     CHG036
1FFC| 002B 00A0 0004                ORI.B   #$A0,DDRB1(A3)          ;  and set lines as outputs                     CHG036
2002| 207C 00FC D901                 MOVE.L  #VIA2BASE,A0            ; get paraport VIA base address
2008| 0228 007B 0060                 ANDI.B  #$7B,PCR2(A0)           ; set ctrl CA2 pulse mode/positive edge
200E| 0028 006B 0060                 ORI.B   #$6B,PCR2(A0)
2014| 4228 0018                     MOVE.B  #$00,DDRA2(A0)          ; set port A bits to input
2018| 0010 0018                     ORI.B   #$18,ORB2(A0)           ; then set direction=in, cmd=false,             CHG036
201C| 0210 00FB                     ANDI.B  #$FB,ORB2(A0)           ;  enable=true                                  CHG036
2020| 0228 00FC 0010                ANDI.B  #$FC,DDRB2(A0)          ; set port B bits 0,1=in,
2026| 0028 001C 0010                ORI.B   #$1C,DDRB2(A0)          ;  2,3,4=out
202C| 0810 0000                     BTST    #OCD,IRB2(A0)           ; check OCD line
2030| 4E75                          RTS                             ; and exit
2032|
2032|                        ;--------------------------------------------------------------------------
2032|                        ;  Subroutine to read bytes from Profile.  Assumes:
2032|                        ;    D0 = byte count - 1
2032|                        ;    A0 = VIA address for parallel interface
2032|                        ;    A1 = memory load address
2032|                        ;--------------------------------------------------------------------------
2032|
2032| 12E8 0008              READIT  MOVE.B  IRA2(A0),(A1)+          ; read the bytes
2036| 12E8 0008                      MOVE.B  IRA2(A0),(A1)+
203A| 12E8 0008                      MOVE.B  IRA2(A0),(A1)+
203E| 12E8 0008                      MOVE.B  IRA2(A0),(A1)+
2042| 51C8 FFEE                      DBF     D0,READIT
2046| 4E75                           RTS
2048|
2048|                                .PAGE
2048|                        ;--------------------------------------------------------------------------
2048|                        ;  Subroutine to begin the read process.  First calls a routine that
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2048|                    ;  an appropriate response from Profile is executed.  Then a wait for
2048|                    ;  Assumes regs:
2048|                    ;    D0 = scratch use          A0 = VIA address
2048|                    ;    D1 = block to read        A1 = unused
2048|                    ;    D2 = used for Profile cmd  A2 = unused
2048|                    ;    D3 = retry count          A3 = scratch use
2048|                    ;    D4 = threshold count      A4 = unused
2048|                    ;  If error, carry bit set and error code in D0.
2048|                    ;-------------------------------------------------------------------------
2048|
2048| 367C 0304          STRTRD  MOVEA   #CMDBUFR,A3             ; first set up command                  RM000
204C| 2681                       MOVE.L  D1,(A3)                 ; set read command (0) and block #
204E| 1743 0004                  MOVE.B  D3,RETRY(A3)            ; set retry count
2052| 1744 0005                  MOVE.B  D4,THRESH(A3)           ; set threshhold for sparing
2056| 611E                       BSR.S   STAT01                  ; get 01 byte and send read command
2058| 651A                       BCS.S   STRTXIT                 ; exit if error
205A|
205A|                    ;  OK so far - go check if Profile ready to send data
205A|
205A| 7402                       MOVEQ   #2,D2                   ; get 02 byte                           RM000
205C| 615E                       BSR.S   FINDD2
205E| 6514                       BCS.S   STRTXIT                 ; exit if timeout error
2060|
2060|                    ;  Get status bytes
2060| 367C 01B4          GETSTAT MOVEA   #STATBFR,A3             ; set buffer ptr                        RM000
2064| 16E8 0008                  MOVE.B  IRA2(A0),(A3)+          ; read and save the status
2068| 16E8 0008                  MOVE.B  IRA2(A0),(A3)+
206C| 16E8 0008                  MOVE.B  IRA2(A0),(A3)+
2070| 16E8 0008                  MOVE.B  IRA2(A0),(A3)+
2074|
2074| 4E75               STRTXIT RTS                             ; return to caller
2076|
2076|                            .PAGE
2076|                    ;-------------------------------------------------------------------------
2076|                    ;  Subroutine to get in sync with Profile.
2076|                    ;  Input regs:
2076|                    ;    A0 = VIA address
2076|                    ;    A3 = ptr to command buffer
2076|                    ;  If error, returns with carry bit set and error code in D0
2076|                    ;-------------------------------------------------------------------------
2076|
2076| 48E7 2800          STAT01  MOVEM.L D2/D4,-(SP)             ; save regs
207A| 7401                       MOVE.L  #1,D2                   ; try to find state 01
207C| 613E                       BSR.S   FINDD2
207E| 6412                       BCC.S   COPY6                   ; skip if OK
2080| 0C00 0055                  CMP.B   #TMOUT,D0               ; else check if timeout error
2084| 672C                       BEQ.S   STATERR                 ; and exit if yes
```

```
2086|
2086| 6100 00AA                   BSR     WFNBSY3                 ; ensure Profile ready                  RM000
208A| 4A00                        TST.B   D0                      ; check for timeout error
208C| 6624                        BNE.S   STATERR                 ; and exit if yes
208E|
208E| 612C                @2      BSR.S   FINDD2                  ; try to find state 01 again
2090| 6524                        BCS.S   STATXIT                 ; exit if error again
2092|
2092| 0210 00F7           COPY6   ANDI.B  #$F7,ORB2(A0)           ; set dir=out
2096| 117C 00FF 0018              MOVE.B  #$FF,DDRA2(A0)          ; set port A bits to output
209C| 303C 0005                   MOVE.W  #PCMDSZ,D0              ; set command size
20A0| 115B 0008           COPY6LP MOVE.B  (A3)+,ORA2(A0)          ; send the command bytes
20A4| 51C8 FFFA                   DBF     D0,COPY6LP
20A8| 0010 0008                   ORI.B   #$08,ORB2(A0)           ; reset dir=in
20AC| 4228 0018                   MOVE.B  #$00,DDRA2(A0)          ;  and set port A bits to input
20B0| 6004                        BRA.S   STATXIT                 ; then exit
20B2|
20B2| 003C 0001           STATERR ORI.B   #$01,CCR                ; set error indicator
20B6|
20B6| 4CDF 0014           STATXIT MOVEM.L (SP)+,D2/D4             ; restore regs
20BA| 4E75                        RTS
20BC|
20BC|                             .PAGE
20BC|                     ;--------------------------------------------------------------------------
20BC|                     ;  Subroutine to handshake with Profile and wait for command completion.
20BC|                     ;  Polls busy bit until it goes low (not busy).
20BC|                     ;  Assumes regs:
20BC|                     ;    A0 = VIA address
20BC|                     ;    D2 = Expected response to previously issued command
20BC|                     ;  If error, carry bit set and error code in D0.
20BC|                     ;--------------------------------------------------------------------------
20BC|
20BC| 48E7 7800           FINDD2  MOVEM.L D1-D4,-(SP)             ; save regs
20C0| 0210 00EF                   ANDI.B  #$EF,ORB2(A0)           ; set cmd=true
20C4| 4228 0018                   MOVE.B  #$00,DDRA2(A0)          ; set port A bits to input
20C8| 4280                        CLR.L   D0                      ; used for return code
20CA| 6130                        BSR.S   WFBSY                   ; wait for busy
20CC| 6618                        BNE.S   FINDERR                 ; exit if error
20CE|
20CE| 1228 0078           GETRSP  MOVE.B  PORTA2(A0),D1           ; get response in D1 w/o handshake
20D2| 4203                        CLR.B   D3                      ; used for reply to Profile
20D4| B202                        CMP.B   D2,D1                   ; did pippin return state requested ?
20D6| 6704                        BEQ.S   RSPOK                   ; skip if yes
20D8| 7052                        MOVEQ   #BADRSP,D0              ; else set error code
20DA| 6002                        BRA.S   SNDR1                   ; and go send reply
20DC|
20DC| 7655                RSPOK   MOVEQ   #$55,D3                 ; set up OK reply                       RM000
```

```
20DE|
20DE| 612E                SNDR1   BSR.S   SENDRSP                 ; send response
20E0|
20E0| 4A00                        TST.B   D0                      ; check return code
20E2| 6602                        BNE.S   FINDERR                 ; skip if error
20E4|
20E4| 613C                        BSR.S   WFNBSY                  ; now go wait for not busy
20E6|
20E6| 4228 0018          FINDERR MOVE.B  #$00,DDRA2(A0)          ; reset port A bits to input
20EA| 0010 0018                  ORI.B   #$18,ORB2(A0)           ; and dir = in, cmd=false
20EE|
20EE| 4A00                        TST.B   D0                      ; check return code
20F0| 6704                        BEQ.S   FNDXIT                  ; skip if OK
20F2| 003C 0001                  ORI.B   #$01,CCR                ; else set error indicator
20F6|
20F6| 4CDF 001E          FNDXIT  MOVEM.L (SP)+,D1-D4             ; restore regs(but don't affect CCR bits)
20FA| 4E75                        RTS
20FC|
20FC|
20FC|                     ;-------------------------------------------------------------------------
20FC|                     ;  Subroutine to wait for Profile busy signal.  Polls busy bit until it
20FC|                     ;  goes high (busy).
20FC|                     ;  Assumes regs:
20FC|                     ;    A0 = VIA address
20FC|                     ;    D4 = timeout value if WFBSY1 entry point used
20FC|                     ;  If error, error code in D0.
20FC|                     ;-------------------------------------------------------------------------
20FC|
20FC| 383C FFFF          WFBSY   MOVE    #RSPTIME,D4             ; set response timeout = 100 msec
2100|
2100| 0810 0001          WFBSY1  BTST    #BSY,IRB2(A0)           ; wait for busy
2104| 6706                        BEQ.S   @9                      ; skip if OK
2106| 5344                        SUBQ    #1,D4                   ; else loop until timeout
2108| 66F6                        BNE.S   WFBSY1
210A| 7055                        MOVEQ   #TMOUT,D0               ; set timeout error
210C| 4E75                @9      RTS
210E|
210E|                     ;-------------------------------------------------------------------------
210E|                     ;  Subroutine to send response command to Profile.
210E|                     ;  Assumes regs:
210E|                     ;    A0 = VIA address
210E|                     ;-------------------------------------------------------------------------
210E|
210E| 0210 00E7          SENDRSP ANDI.B  #$E7,ORB2(A0)           ; set dir=out, cmd=true
2112| 117C 00FF 0018              MOVE.B  #$FF,DDRA2(A0)          ; set port A bits to output
2118| 1143 0078                   MOVE.B  D3,PORTA2(A0)           ; send reply(00 or 55) w/o handshake
211C| 0010 0010                   ORI.B   #$10,ORB2(A0)           ; set cmd=false
```

```
2120| 4E75                        RTS
2122|
2122|                     ;---------------------------------------------------------------------------
2122|                     ;  Subroutine to wait for Profile not busy signal.  Polls busy bit until it
2122|                     ;  goes low (not busy).
2122|                     ;  Assumes regs:
2122|                     ;    A0 = VIA address
2122|                     ;    D4 = timeout value if WFNBSY1 entry point used
2122|                     ;  If error, D0 has error code.
2122|                     ;---------------------------------------------------------------------------
2122|
2122| 283C 0018 0000      WFNBSY  MOVE.L  #RDTIME,D4          ; set timeout for about 16 secs         CHG037
2128| 600E                        BRA.S   WFNBSY1             ;                                       CHG019
212A|
212A| 283C 0120 0000      WFNBSY2 MOVE.L  #STRTIME,D4         ; set initial Profile self-test time    CHG019
2130| 6006                        BRA.S   WFNBSY1             ;                                       CHG019
2132|
2132| 283C 0000 0500      WFNBSY3 MOVE.L  #BSYTIME,D4         ; set timeout for about 10 ms           RM000
2138|
2138| 0810 0001           WFNBSY1 BTST    #BSY,IRB2(A0)       ; wait for not busy
213C| 6606                        BNE.S   @9                  ; exit if OK
213E| 5384                        SUBQ.L  #1,D4               ; else loop until timeout
2140| 66F6                        BNE.S   WFNBSY1
2142| 7055                        MOVEQ   #TMOUT,D0           ; set timeout error
2144| 4E75                @9      RTS
2146|
2146|                     ;---------------------------------------------------------------------------
2146|                     ;  Subroutine to send reset to Profile controller to enable handshake retry     CHG016
2146|                     ;---------------------------------------------------------------------------
2146|
2146| 267C 00FC DD81      DOCRES  MOVE.L  #VIA1BASE,A3        ;use keyboard 6522                      CHG026
214C| 0213 007F                   ANDI.B  #$7F,ORB1(A3)       ;set reset signal                       CHG016/CHG026/CHG036
2150| 6100 E97A                   BSR     DELAY_1             ;delay for controller to get signal     CHG016
2154| 0013 0080                   ORI.B   #$80,ORB1(A3)       ;remove reset signal                    CHG016/CHG026/CHG036
2158| 6100 E972                   BSR     DELAY_1             ;delay for controller to respond        CHG038
215C| 4E75                        RTS                         ;and exit
215E|
215E|                             .ENDC                       ;{PROFLE}
215E|                             .IF     EXTERNAL = 1
215E|                             .ENDC
215E|                             .PAGE
215E|                     ;---------------------------------------------------------------------
215E|                     ;  Routine to boot from I/O slot.
215E|                     ;  Verifies that slot has bootable card installed and then reads in ROM
215E|                     ;  data.  If status routine exists it is executed, else jump to boot
215E|                     ;  routine done if checksum OK.
215E|                     ;
```

```
215E|                     ;  Inputs:
215E|                     ;       D0 = boot device id ($4-$C)
215E|                     ;       A0 = scratch use
215E|                     ;       A1 = slot address
215E|                     ;  Outputs: (relayed to loaded boot program)
215E|                     ;       D0 = boot device id
215E|                     ;       A1 = slot address
215E|                     ;-------------------------------------------------------------------------
215E|
215E| 1800                IOSBOOT MOVE.B  D0,D4           ;save boot device id
2160|                                                     ; also acts as flag for status check
2160| 2A78 0008                   MOVE.L  BUSVCTR,A5      ;save bus error vector
2164| 2C4F                        MOVE.L  SP,A6           ;save current stack pointer
2166|
2166| 47FA 002C                   LEA     NOCRD,A3        ;setup new bus error vector
216A| 21CB 0008                   MOVE.L  A3,BUSVCTR
216E| 0309 0000                   MOVEP   (A1),D1         ;read card id
2172|
2172|                             .IF  USERINT = 0
2172|                             .ENDC
2172|
2172| 4A41                        TST     D1              ;check if card installed
2174| 6A28                        BPL.S   INVID           ;exit if not bootable
2176| 0C41 FFFF                   CMP     #$FFFF,D1       ;check if special case
217A| 6722                        BEQ.S   INVID
217C|
217C|                             .IF  USERINT = 1
217C| 6100 FD28                   BSR     WAITALRT        ;display wait icon
2180|                             .ENDC
2180|
2180| 2449                        MOVE.L  A1,A2           ;get slot address
2182| 6148                        BSR.S   RDIOSLT         ;go check the board
2184| 651C                        BCS.S   BADBRD          ;exit if error
2186|
2186|                     STATOK
2186| 1038 01B3                   MOVE.B  BOOTDVCE,D0     ;setup boot device id
218A| 247C 0002 0002              MOVE.L  #BTENTRY,A2     ;and starting program address
2190| 6000 FAF0                   BRA     STRTBOOT        ;and go do boot ...
2194|
2194|                     ;  Error routines for I/O slot booting. Error code saved and error message output.
2194| 705A                NOCRD   MOVEQ   #NOC,D0         ;set error code
2196| 21CD 0008                   MOVE.L  A5,BUSVCTR      ;restore bus error vector
219A| 2E4E                        MOVE.L  A6,SP           ;and stack ptr
219C| 6008                        BRA.S   SENDMSG         ;then go display msg
219E|
219E| 705B                INVID   MOVEQ   #INV,D0         ;set error code
21A0| 6004                        BRA.S   SENDMSG         ;go do display
```

```
21A2|
21A2| 1838 01B3            BADBRD  MOVE.B  BOOTDVCE,D4     ;restore boot device id for checking
21A6|
21A6|                      SENDMSG
21A6| 11C0 01B4                    MOVE.B  D0,BOOTDATA     ;save error code
21AA|
21AA|                            .IF  USERINT = 0
21AA|                            .ELSE
21AA|                      ;  determine which slot # being used
21AA|
21AA| 45FA 1868                    LEA     XCARD,A2        ;set general I/O slot card ptr
21AE| 0C04 0004                    CMP.B   #IO1PORT2,D4    ;in slot 1 range?
21B2| 6E04                        BGT.S   @1
21B4| 7201                        MOVEQ   #1,D1           ;yes - set slot #1
21B6| 600C                        BRA.S   @3
21B8|
21B8| 0C04 0007            @1      CMP.B   #IO2PORT2,D4    ;slot 2 range?
21BC| 6E04                        BGT.S   @2
21BE| 7202                        MOVEQ   #2,D1           ;set slot 2 id
21C0| 6002                        BRA.S   @3
21C2|
21C2| 7203                @2      MOVEQ   #3,D1           ;else must be slot 3
21C4|
21C4| 6100 128A            @3      BSR     DSPNUMICON      ;display error icon and slot #
21C8| 6000 FD70                    BRA     BOOTFAIL        ;and signal boot failure
21CC|                             .ENDC
21CC|
21CC|                             .PAGE
21CC|                             .IF  NEWTWIG = 1
21CC|                      ;-------------------------------------------------------------------------------
21CC|                      ;  Routine to read ROM on an I/O slot.
21CC|                      ;  Inputs:
21CC|                      ;       A2 = I/O slot base address
21CC|                      ;       D4 = nonzero if status check also to be done, else 0 for no check
21CC|                      ;       D1 = card id if status check needed
21CC|                      ;  Outputs:
21CC|                      ;       Carry bit set if error, error code saved in D0, error code from
21CC|                      ;       status check saved in BOOTDATA+1
21CC|                      ;  Side Effects:
21CC|                      ;       D0, A2 trashed
21CC|                      ;-------------------------------------------------------------------------------
21CC| 48E7 70C0            RDIOSLT MOVEM.L D1-D3/A0-A1,-(SP) ;save regs
21D0| 207C 0001 FFFC              MOVE.L  #ADR128K-4,A0   ;set load pt (also load id/word count)
21D6| 224A                        MOVE.L  A2,A1           ;save slot address for later use
21D8| 4280                        CLR.L   D0              ;clear for use
21DA| 010A 0004                    MOVEP   4(A2),D0        ;read word count
21DE| 5440                        ADDQ    #2,D0           ;incr for id/count fields
```

```
21E0| 0C40 0FFF                    CMPI    #$0FFF,D0       ;check for max count
21E4| 6244                        BHI.S   INVSUM          ;exit if error
21E6| 4282                        CLR.L   D2              ;clear for use
21E8| 4283                        CLR.L   D3
21EA|
21EA| 050A 0000            LOADPGM MOVEP   (A2),D2         ;read word
21EE| 3082                        MOVE    D2,(A0)         ;save in memory
21F0| 3418                        MOVE    (A0)+,D2        ;reread it from memory
21F2| D642                        ADD     D2,D3           ;add to checksum
21F4| E35B                        ROL     #1,D3           ;rotate for better effectiveness
21F6| 588A                        ADDQ.L  #4,A2           ;bump address ptr
21F8| 5340                        SUBQ    #1,D0
21FA| 66EE                        BNE.S   LOADPGM         ;loop until done
21FC|
21FC| 050A 0000                  MOVEP   (A2),D2         ;read expected checksum (2 bytes)
2200| D642                        ADD     D2,D3           ;add to calculated checksum
2202| 4A43                        TST     D3              ;check for 0 result (also clears carry bit)
2204| 6624                        BNE.S   INVSUM          ;skip if error
s2206|
2206|                     ;  Do status check if desired and available
2206|
2206| 4A44                        TST     D4              ;do status check?
2208| 672A                        BEQ.S   RDIOXIT         ;skip if not
220A| 0801 000E                  BTST    #STBIT,D1       ;status routine available?
220E| 6724                        BEQ.S   RDIOXIT         ;skip if not
2210|
2210| 48E7 0F3E                  MOVEM.L D4-D7/A2-A6,-(SP) ;save regs not already saved
2214| 4EB9 0002 0000              JSR     STENTRY           ;go execute status routine
221A| 4CDF 7CF0                  MOVEM.L (SP)+,D4-D7/A2-A6 ;restore regs
221E|
221E| 4A40                        TST     D0              ;check status
2220| 6712                        BEQ.S   RDIOXIT         ;skip if no error
2222| 11C0 01B5                  MOVE.B  D0,BOOTDATA+1   ;save card error code
2226| 705D                        MOVEQ   #BADST,D0       ;set general error code
2228| 6002                        BRA.S   SAVERR
222A|
222A| 705C                INVSUM  MOVEQ   #BADSM,D0       ;set invalid checksum
222C|
222C| 11C0 01B4           SAVERR  MOVE.B  D0,BOOTDATA     ;save error code
2230| 003C 0001                  ORI.B   #$01,CCR        ;set error indicator
2234|
2234| 4CDF 030E           RDIOXIT MOVEM.L (SP)+,D1-D3/A0-A1 ;restore regs
2238| 4E75                        RTS
223A|
223A|                           .ENDC
223A|
223A|                           .IF     BURNIN = 1
```

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223A|                           .PAGE
223A|                       ;--------------------------------------------------------------------------
223A|                       ;  Special code to enable burnin cycling by the ROM.  Does initialization
223A|                       ;  on first pass, and then causes cycling for the specified cycle count,
223A|                       ;  which defaults to approximately 60 minutes.  At
223A|                       ;  that point a branch to a system shutdown routine is performed.
223A|                       ;--------------------------------------------------------------------------
223A|
223A|                       ;  Do first pass initialization
223A|
223A| 0C39 0001 00FC C191   CHKPASS CMP.B   #$01,INITFLG    ;first pass done?
2242| 6756                          BEQ.S   CHKTIM          ;skip if yes
2244| 207C 00FC C191        CHKPAS2 MOVEA.L #INITFLG,A0     ;set ptr for other data areas
224A| 227C 00FC C1FF                MOVEA.L #ENDPM,A1       ;and ending ptr
2250|
2250| 4210                  CLRPM   CLR.B   (A0)            ;do clear
2252| 5488                          ADDQ.L  #2,A0           ;bump ptr
2254| B3C8                          CMPA.L  A0,A1           ;loop until done
2256| 66F8                          BNE.S   CLRPM
2258|
2258| 7001                          MOVEQ   #1,D0
225A| 13C0 00FC C191                MOVE.B  D0,INITFLG      ;set init flag
2260| 13FC 003C 00FC C1C3           MOVE.B  #60,CYCLVAL     ;set cycling for 60 minutes
2268| 42B8 01BA                     CLR.L   CLKDATA         ;and init clock data area
226C| 4278 01BE                     CLR     CLKDATA+4
2270|
2270|                       ;  Set clock to initial value so run can be ended at cycle count.  Sends
2270|                       ;  value of day=01, all other values=0 (e.g., time = 00:00:00).
2270|
2270| 702C                          MOVEQ   #$2C,D0         ;set up clock set cmd
2272| 6100 E6E2                     BSR     COPSCMD         ;and send to COPS
2276| 651E                          BCS.S   @9              ;exit if error                          RM000
2278| 4281                          MOVE.L  #SET1,D1        ;set up value for clock
227A| 7408                          MOVEQ   #8,D2           ;set "char" count
227C| 6100 01E8                     BSR     TODSET          ;and go do it
2280| 6514                          BCS.S   @9              ;                                       RM000
2282| 223C 1000 0000                MOVE.L  #SET2,D1        ;set up next value for clock
2288| 7408                          MOVEQ   #8,D2           ;set "char" count
228A| 6100 01DA                     BSR     TODSET          ;and go do it
228E| 6506                          BCS.S   @9              ;                                       RM000
2290| 7025                          MOVEQ   #$25,D0         ;finally set up clock enable cmd
2292| 6100 E6C2                     BSR     COPSCMD         ;and send it
2296| 6500 01B0             @9      BCS     SETERR1         ;exit if error
229A|
229A|                       ;  Check to see if cycle count to be changed and if time data needs to be saved
229A|
229A|                       CHKTIM
```

```
229A|                           .IF  USERINT = 1
229A| 6100 0EC8                BSR     MAKEPCALRT      ;setup powercycle alert box
229E|                           .ENDC
229E|
229E| 0838 0002 02A2           BTST    #MSBUTN,STATFLGS ;mouse button detected?
22A4| 6718                     BEQ.S   @3              ;skip if no                             RM000
22A6| 1039 00FC C1C3           MOVE.B  CYCLVAL,D0      ;read current setting                   RM000
22AC| 0C00 003C                CMP.B   #60,D0          ;long cycle set?                        RM000
22B0| 6604                     BNE.S   @1
22B2| 7003                     MOVEQ   #3,D0           ;set for 3 minute cycle                 RM000
22B4| 6002                     BRA.S   @2
22B6| 703C              @1     MOVEQ   #60,D0          ;set for 60 minute cycle                RM000
22B8| 13C0 00FC C1C3     @2     MOVE.B  D0,CYCLVAL      ;save in PM                             RM000
22BE|
22BE| 0C39 0001 00FC C199   @3  CMP.B   #$01,TIMFLG     ;time data saved?                       RM000
22C6| 6722                     BEQ.S   TWGCHK          ;skip if yes
22C8|
22C8| 2038 01BC                MOVE.L  HOUR,D0         ;get minutes
22CC| E998                     ROL.L   #4,D0
22CE| 4840                     SWAP    D0
22D0| 13C0 00FC C19B           MOVE.B  D0,MINSAV       ;save minutes
22D6| 4239 00FC C1C5           CLR.B   MINCNT          ;and clear minute count
22DC| 4239 00FC C1C1           CLR.B   CYCLCNT         ; and cycle count
22E2| 13FC 0001 00FC C199      MOVE.B  #$01,TIMFLG     ;and set flag
22EA|
22EA|                     ;  Check if time for Twiggy test (do every two minutes)
22EA|
22EA| 0C39 0002 00FC C1C5 TWGCHK CMP.B  #2,MINCNT       ;check minute counter
22F2| 6600 0082                BNE     WRTMSG
22F6|
22F6| 4239 00FC C1C5           CLR.B   MINCNT          ;clear counter
22FC| 47FA 1AEB                LEA     TWGMSG,A3       ;get msg ptr
2300| 6100 13F4                BSR     DSPMSGR         ;and display it
2304| 7C0C                     MOVEQ   #PCCOL,D6       ;reset left margin
2306|
2306| 47FA EE7E                LEA     DSKVCT,A3       ;set up bus error vector
230A| 21CB 0008                MOVE.L  A3,BUSVCTR
230E| 207C 00FC C001           MOVE.L  #DISKMEM,A0     ;set ptr to shared memory
2314| 267C 00FC DD81           MOVE.L  #VIA1BASE,A3
231A| 4A38 02AF                TST.B   SYSTYPE         ;check system type                      CHG009
231E| 6704                     BEQ.S   @1              ;skip if Lisa 1.0                       CHG009
2320| 7850                     MOVEQ   #80,D4          ;else set track count for SONY drive    CHG009
2322| 6012                     BRA.S   @2              ;and go test single drive               CHG009
2324|
2324| 4281              @1     CLR.L   D1              ;else set for drive 1, track 0 to start
2326| 782D                     MOVEQ   #45,D4          ;set count (# of tracks)
2328|
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2328|                       ;  Now do the drive test, one drive at a time
2328|
2328| 6100 FB48                    BSR     CLRFDIR         ;first clear interrupts
232C| 6516                          BCS.S   TSTERR          ;exit if error
232E| 6100 014E                    BSR     TWGTST          ;go do test
2332| 6510                          BCS.S   TSTERR
2334| 782D                          MOVEQ   #45,D4          ;reset track count                      CHG009
2336|
2336| 4281                 @2       CLR.L   D1              ;set for drive 2                        CHG009
2338| 123C 0008                     MOVE.B  #$08,D1
233C| E899                          ROR.L   #4,D1
233E| 6100 013E                    BSR     TWGTST          ;and do test again
2342| 6420                          BCC.S   DISINT          ;and continue if OK
2344|
2344| 47FA 1ACA            TSTERR   LEA     TWGFAIL,A3      ;display error msg
2348| 6100 13AC                     BSR     DSPMSGR
234C| 7C0C                          MOVEQ   #PCCOL,D6       ;reset left margin
234E| 0C00 0027                    CMP.B   #TIMOUT,D0      ;timeout error?
2352| 6700 010A                    BEQ     CMDERR          ;exit testing if yes
2356| 5239 00FC C19F               ADDQ.B  #1,DSKCNTL      ;else bump low error count
235C| 6406                          BCC.S   DISINT          ;skip if no overflow
235E| 5239 00FC C19D               ADDQ.B  #1,DSKCNTH      ;else bump high counter also
2364|
2364|                       ;  Disable interrupt so disks can be ejected
2364|
2364| 6100 01AA            DISINT   BSR     TWGDSP          ;display Twiggy error count
2368| 117C 0088 0002               MOVE.B  #$88,CMD(A0)    ;set ptr for both drives
236E| 10BC 0087                    MOVE.B  #DSABLINT,(A0)  ;send disable cmd
2372| 6100 FA90                    BSR     CMDCHK          ;wait until done
2376|
2376|                       ;  Output initial message
2376|
2376| 47FA 1A56            WRTMSG   LEA     BRNMSG,A3       ;get msg ptr
237A| 6100 1384                    BSR     DSPMSG          ;and display it
237E| 1039 00FC C1C3               MOVE.B  CYCLVAL,D0      ;get cycling value
2384| 6100 F2AA                    BSR     DSPDEC          ;display as decimal
2388| 7C0C                          MOVEQ   #PCCOL,D6       ;set col for window limits
238A|                       ;  Increment loop count and display it on screen
238A| 5239 00FC C197       CNTINC   ADDQ.B  #1,LCNTLO       ;inc low byte
2390| 6406                          BCC.S   DSPTIM          ;skip if no carry
2392| 5239 00FC C195               ADDQ.B  #1,LCNTHI       ;else inc high byte also
2398|
2398| 6100 0130            DSPTIM   BSR     DSPCLK          ;go display time
239C|
239C|                       ;  Now check time to see if update needed
239C|
239C| 2038 01BC                    MOVE.L  HOUR,D0         ;get minute value
```

```
23A0| E998                          ROL.L   #4,D0
23A2| 4840                          SWAP    D0
23A4| B039 00FC C19B                CMP.B   MINSAV,D0       ;has value changed?
23AA| 6712                          BEQ.S   NOCHG           ;skip if not
23AC| 5239 00FC C1C5                ADDQ.B  #1,MINCNT       ;else bump minute count
23B2| 5239 00FC C1C1                ADDQ.B  #1,CYCLCNT      ;and cycle count
23B8| 13C0 00FC C19B                MOVE.B  D0,MINSAV       ;save new minute value
23BE|
23BE|                        ;  Delay so screen can be read
23BE|
23BE| 6100 E714              NOCHG   BSR     DELAY5          ;delay for 5 secs
23C2|                        ;  Check to see if run should be ended
23C2|
23C2| 1039 00FC C1C1                MOVE.B  CYCLCNT,D0      ;get cycle count
23C8| 1239 00FC C1C3                MOVE.B  CYCLVAL,D1      ;get desired cycle value
23CE| B001                          CMP.B   D1,D0           ;cycle if same or greater
23D0| 6C16                          BGE.S   SHUTDOWN
23D2|
23D2|                        ;  If not, cause double bus fault to restart diagnostics
23D2|                        ;  First make parameter memory valid
23D2|
23D2| 103C 000F                    MOVE.B  #PC,D0          ;set power-cycle boot code
23D6| 6100 F476                    BSR     SAV2PM          ;and go set param mem
23DA| 6100 FC14                    BSR     PROINIT         ;check for attached hard disk   CHG019
23DE| 6604                          BNE.S   @1              ;skip if none                   CHG019
23E0| 6100 FD48                    BSR     WFNBSY2         ;else wait until disk ready     CHG019
23E4| 6000 026C              @1      BRA     DORESET         ;then go cause a system reset
23E8|
23E8|                        ;  Do soft power-off for specified cycle period
23E8|                        SHUTDOWN
23E8| 4239 00FC C199                CLR.B   TIMFLG          ;reset time save indicator
23EE| 2038 01BC                    MOVE.L  CLKDATA+2,D0    ;and save clock data
23F2| 227C 00FC C1A1                MOVE.L  #CLKSAVE,A1
23F8| 01C9 0000                    MOVEP.L D0,(A1)
23FC|
23FC|                        ;  Disable Twiggy controller to avoid any RAM problems
23FC|
23FC|                        DSCONT
23FC| 207C 00FC C001                MOVE.L  #DISKMEM,A0     ;set ptr to shared memory
2402| 10BC 0089                    MOVE.B  #DIE,(A0)       ;and send "die" cmd
2406| 6100 F9FC                    BSR     CMDCHK          ;wait until done
240A| 6552                          BCS.S   CMDERR          ;exit if error
240C|
240C| 702D                          MOVEQ   #$2D,D0         ;enable alarm setting
240E| 6100 E546                    BSR     COPSCMD
2412| 6538                          BCS.S   SETERR2
2414|
```

```
2414| 4281                          CLR.L   D1
2416| 1239 00FC C1C3                MOVE.B  CYCLVAL,D1      ;get desired shutdown time
241C| 703C                          MOVEQ   #60,D0          ;multiply by 60 for seconds
241E| C2C0                          MULU    D0,D1
2420| 700C                          MOVEQ   #12,D0          ;rotate to send as alarm value
2422| E1B9                          ROL.L   D0,D1
2424|
2424| 227C 00FC C1B1                MOVE.L  #ALRMSAV,A1
242A| 03C9 0000                     MOVEP.L D1,(A1)         ;save alarm value
242E| 7405                          MOVEQ   #5,D2           ;5 digits for alarm value
2430| 6134                          BSR.S   TODSET
2432| 6518                          BCS.S   SETERR2
2434|
2434|                         ;  Make parameter memory valid
2434| 103C 000F                     MOVE.B  #PC,D0          ;set power-cycle boot code
2438| 6100 F414                     BSR     SAV2PM          ;and go set param mem
243C|                         ;  And finally send power-off cmd
243C| 7023                          MOVEQ   #$23,D0         ;set up enable/power off cmd
243E| 6100 E516                     BSR     COPSCMD         ;send it
2442| 6508                          BCS.S   SETERR2
2444| 4E71                    SELF  NOP
2446| 60FC                          BRA.S   SELF            ;goodbye ...
2448|
2448| 703D                    SETERR1 MOVEQ   #SERR1,D0     ;set error code
244A| 6002                          BRA.S   DSPERR          ;and go display
244C|
244C| 703E                    SETERR2 MOVEQ   #SERR2,D0     ;set error code
244E|
244E|                           DSPERR
244E|                                   .IF  USERINT = 0
244E|                                   .ELSE
244E| 45FA 14FB                       LEA     IOBRD,A2      ;set icon ptr
2452| 6100 1086                       BSR     DSPERRICON    ;display it
2456|                                   .ENDC
2456|
2456| 6100 F1CA                       BSR     DSPCODE
245A| 6000 0140                       BRA     MONITOR       ;and exit to monitor
245E|
245E|                         ;  Error routine if disk cmd not taken
245E|
245E| 08C7 0011               CMDERR  BSET    #DISK,D7      ;set error bit
2462| 6000 EF36                       BRA     TSTCHK        ;and exit
2466|
2466|                                   .PAGE
2466|                         ;-----------------------------------------------------------------------
2466|                         ;  Subroutine to send clock data.  Assumes registers:
2466|                         ;       D0 = scratch use
```

```
2466|                       ;       D1 = clock data
2466|                       ;       D2 = digit count
2466|                       ;-------------------------------------------------------------------------
2466|
2466| E999                  TODSET  ROL.L   #4,D1           ;get digit
2468| 1001                          MOVE.B  D1,D0           ;set up for COPS as 1X
246A| 0200 000F                     ANDI.B  #$0F,D0         ; where X = digit for clock
246E| 0000 0010                     ORI.B   #$10,D0
2472| 6100 E4E2                     BSR     COPSCMD         ;and send it
2476| 6504                          BCS.S   SETXIT          ;exit if error
2478| 5342                          SUBQ    #1,D2           ;decr count
247A| 66EA                          BNE.S   TODSET          ;and loop until done
247C| 4E75                  SETXIT  RTS
247E|
247E|                               .PAGE
247E|                       ;-------------------------------------------------------------------------
247E|                       ;  Subroutine to do Twiggy testing
247E|                       ;  Expects
247E|                       ;       D0 = scratch use                A0 = shared memory address
247E|                       ;       D1 = drive parameters           A1 = unused
247E|                       ;       D2 = FDIR timeout value         A2 = unused
247E|                       ;       D3 = unused                     A3 = VIA address for FDIR access
247E|                       ;       D4 = loop count for reads
247E|                       ;-------------------------------------------------------------------------
247E|
247E| 117C 0088 0002        TWGTST  MOVE.B  #$88,CMD(A0)    ;enable interrupts from both drives
2484| 10BC 0086                     MOVE.B  #ENBLINT,(A0)   ;do it
2488| 6100 F97A                     BSR     CMDCHK          ;wait until done
248C| 6536                          BCS.S   TERR            ;exit if error
248E| 08AB 0004 0004                BCLR    #FDIR,DDRB1(A3) ;enable FDIR bit
2494| 243C 00C0 0000                MOVE.L  #FDIRTIME,D2    ;set timeout value for FDIR
249A|
249A| 03C8 0004             TWGLOOP MOVEP.L D1,DRV(A0)      ; set disk ptrs
249E| 4228 0002                     MOVE.B  #READS,CMD(A0)  ; set for read operation
24A2| 10BC 0081                     MOVE.B  #EXRW,(A0)      ; and go do it
24A6| 6100 F996                     BSR     CHKFIN          ; wait
24AA| 6516                          BCS.S   TOOLONG         ; exit if timeout
24AC| 1028 0010                     MOVE.B  STAT(A0),D0     ; get disk return code
24B0| 6100 F9C0                     BSR     CLRFDIR         ; clear interrupt indicator
24B4| 650C                          BCS.S   TOOLONG
24B6| 4A00                          TST.B   D0              ;any error?
24B8| 660A                          BNE.S   TERR            ; and exit if error
24BA| 5241                          ADDQ    #1,D1           ;incr track ptr
24BC| 5344                          SUBQ    #1,D4           ;decrement count
24BE| 66DA                          BNE.S   TWGLOOP         ;loop until done
24C0| 4E75                          RTS
24C2|
```

```
24C2| 7027                TOOLONG MOVEQ   #TIMOUT,D0      ;set error code
24C4| 003C 0001            TERR    ORI.B   #$01,CCR        ;set indicator
24C8|
24C8| 4E75                        RTS                     ;and exit
24CA|
24CA|                     ;---------------------------------------------------------------------------
24CA|                     ;  Subroutine to display clock reading as D HH MM SS
24CA|                     ;---------------------------------------------------------------------------
24CA|
24CA| 47FA 1914           DSPCLK  LEA     TIMMSG,A3       ;get msg ptr
24CE| 6100 1230                   BSR     DSPMSG          ;and display it
24D2| 5246                        ADDQ    #1,D6           ;add extra space
24D4| 6100 EDCA                   BSR     READCLK         ;go read clock
24D8| 2038 01BC                   MOVE.L  CLKDATA+2,D0    ;get time (minus Ey/dd digits)
24DC| 227C 00FC C1A1              MOVE.L  #CLKSAVE,A1     ;and save it
24E2| 01C9 0000                   MOVEP.L D0,(A1)
24E6|
24E6| E998                        ROL.L   #4,D0           ;get day value
24E8| 7201                        MOVEQ   #1,D1           ;set # of digits to display
24EA| 6100 F18C                   BSR     OUTCH           ;and display it
24EE| 5246                        ADDQ    #1,D6           ;bump col ptr
24F0|
24F0| E198                        ROL.L   #8,D0           ;get hour
24F2| 7202                        MOVEQ   #2,D1           ;and display
24F4| 6100 F182                   BSR     OUTCH
24F8| 5246                        ADDQ    #1,D6
24FA|
24FA| E198                        ROL.L   #8,D0           ;display minute
24FC| 7202                        MOVEQ   #2,D1
24FE| 6100 F178                   BSR     OUTCH
2502| 5246                        ADDQ    #1,D6
2504|
2504| E198                        ROL.L   #8,D0           ;display seconds
2506| 7202                        MOVEQ   #2,D1
2508| 6100 F164                   BSR     OUTCHR
250C|
250C|                           .IF  USERINT = 1
250C| 7C0C                        MOVEQ   #PCCOL,D6       ;set col for window
250E|                           .ENDC
250E|
250E| 4E75                        RTS
2510|
2510|
2510|                           .PAGE
2510|                     ;---------------------------------------------------------------------------
2510|                     ;  Subroutine to display Twiggy error count
2510|                     ;---------------------------------------------------------------------------
```

```
2510|
2510| 48E7 C010            TWGDSP  MOVEM.L D0-D1/A3,-(SP)  ;save regs
2514| 47FA 190D                    LEA     TWGRSLT,A3      ;output msg
2518| 6100 11E6                    BSR     DSPMSG
251C| 267C 00FC C19D              MOVE.L  #DSKCNTH,A3     ;set ptr to error count
2522| 010B 0000                    MOVEP   (A3),D0         ;get count
2526| 7204                         MOVEQ   #4,D1           ;# of digits to display
2528| 6100 F144                    BSR     OUTCHR
252C|
252C|                              .IF  USERINT = 1
252C| 7C0C                         MOVEQ   #PCCOL,D6       ;set col for window
252E|                              .ENDC
252E|
252E| 4CDF 0803                    MOVEM.L (SP)+,D0-D1/A3  ;restore and exit
2532| 4E75                         RTS
2534|
2534|                              .ENDC
2534|
2534|                              .PAGE
2534|                              .IF  USERINT = 0
2534|                              .ENDC
2534|
2534|
2534|                              .INCLUDE RM248.M.TEXT
2534|
2534|                              .PAGE
2534|                         ;-------------------------------------------------------------------------
2534|                         ;  Monitor code - first displays requested icons, error codes or messages,
2534|                         ;  and then outputs menu of options to user and awaits input
2534|                         ;-------------------------------------------------------------------------
2534|
2534|                         INITMON                             ;entry point for displays
2534|                              .IF  ROM4K = 0
2534| 6100 DB04                    BSR     SAVEREGS           ;save registers
2538| 4287                         CLR.L   D7                 ;reset reg for error indicators
253A| 4238 02A2                    CLR.B   STATFLGS           ; and status flags
253E| 08F8 0001 02A2               BSET    #NOCONT,STATFLGS   ;set external entry indicator
2544|
2544|                         INIT1
2544| 48E7 8030                    MOVEM.L D0/A2-A3,-(SP)     ;save incoming arguments
2548| 6100 F7FC                    BSR     DSABLDSK           ;disable ints from both drives
254C| 6100 E55C                    BSR     RSTKBD             ;reset keyboard
2550| 6100 E572                    BSR     CLRRST             ;and clear reset
2554| 6100 0A76                    BSR     CursorInit         ;init cursor and mouse
2558| 4CDF 0C01                    MOVEM.L (SP)+,D0/A2-A3     ;restore arguments
255C|
255C|                         INIT2                           ;internal entry point
```

```
255C|                           .IF  DEBUG = 0
255C| 3E7C 0480                 MOVEA   #STKBASE,SP     ;reset stack pointer                    RM000
2560|                           .ENDC
2560|
2560|                           .IF  USERINT = 1
2560| 48E7 8030                 MOVEM.L D0/A2-A3,-(SP)  ;save incoming arguments
2564|                           .ENDC
2564|                           .ENDC                   ;{ROM4K}
2564|
2564| 6100 E320                 BSR     SETVLTCH        ;set video latch
2568|
2568|                           .IF  USERINT = 0
2568|                           .ELSE
2568| 6100 0B6C                 BSR     DRAWDESK        ;display the desktop
256C| 6100 0BFA                 BSR     MAKEALERT       ;draw alert box (in case no icon display)
2570|
2570| 4CDF 0401           INIT3 MOVEM.L (SP)+,D0/A2     ;restore arguments
2574|
2574| 220A                      MOVE.L  A2,D1           ;icon display?
2576| 6704                      BEQ.S   @0              ;skip if no
2578| 6100 0FB2                 BSR     DSPALRTICON     ;go do icon display
257C|
257C| 4A40                @0    TST     D0              ;error code display?
257E| 6712                      BEQ.S   @2              ;skip if no
2580| 220A                      MOVE.L  A2,D1           ;icon displayed?
2582| 660A                      BNE.S   @1              ;skip if yes
2584| 7A7E                      MOVEQ   #MSGROW,D5      ;else display error code on same line
2586| 7C12                      MOVEQ   #CODECOL,D6     ; as error msg
2588| 6100 F0A6                 BSR     DSPDEC          ;display as decimal #
258C| 6004                      BRA.S   @2
258E|
258E| 6100 F092           @1    BSR     DSPCODE         ;output error code under icon
2592|
2592| 265F                @2    MOVE.L  (SP)+,A3        ;restore msg ptr
2594|                           .ENDC
2594|
2594| 200B                      MOVE.L  A3,D0           ;message display?
2596| 6704                      BEQ.S   MONITOR
2598|
2598|                           .IF  USERINT = 0
2598|                           .ELSE
2598| 6100 1140                 BSR     DSPALRTMSG      ;go display message in alert box
259C|                           .ENDC
259C|
259C|                     MONITOR                       ;entry point for no screen setup
259C|                           .IF  ROM4K = 0
259C| 007C 0700                 ORI     #$0700,SR       ;disable all interrupts
```

```
25A0| 6100 E10A                    BSR     SETVCTRS        ;set vectors for ROM space              CHG028
25A4|                             .ELSE
25A4|                             .ENDC
25A4|
25A4|                             .IF  ROM4K = 0
25A4|                         ;---------------------------------------------------------------------------
25A4|                         ;  Now output first level menu, prompt line and cursor.  Do preliminary
25A4|                         ;  check to see if CONTINUE option can be displayed.  This is the Customer
25A4|                         ;  mode level of the monitor code.
25A4|                         ;---------------------------------------------------------------------------
25A4|
25A4|                         LEVEL1
25A4|                             .IF  USERINT = 1
25A4| 4278 053A                   CLR     RECTCNT         ;clear active rectangle count
25A8| 0238 000F 02A2              ANDI.B  #$0F,STATFLGS   ;init flags
25AE| 08F8 0006 02A2              BSET    #BTN,STATFLGS   ;set operating with buttons flag
25B4|
25B4| 0838 0001 02A2              BTST    #NOCONT,STATFLGS ;display continue?
25BA| 6630                        BNE.S   OTHRBTNS        ;skip if no
25BC| 2038 0180                   MOVE.L  STATUS,D0       ;get test status
25C0| 0280 001E 3FFA              ANDI.L  #CONTMSK,D0     ;mask don't cares
25C6| 661E                        BNE.S   @1              ;skip if error that disallows continuing
25C8| 4A78 0188                   TST     BOOTMEM         ;check boot memory area for R/W errors
25CC| 6618                        BNE.S   @1              ;skip if any errors
25CE|
25CE| 327C 2956                   MOVE    #BTN2STRT,A1    ;display CONTINUE button
25D2| 103C 00F1                   MOVE.B  #KEY2,D0        ;with alternate keycode
25D6| 47FA 18A0                   LEA     CONTMSG,A3      ;and description
25DA| 347C 2CE8                   MOVEA   #BTN2MSG,A2     ;and location                           RM000
25DE| 4281                        CLR.L   D1              ;don't append '...' string
25E0| 6100 0C98                   BSR     MAKEBUTN
25E4| 6006                        BRA.S   OTHRBTNS        ;and go make other buttons
25E6| 08F8 0001 02A2        @1      BSET    #NOCONT,STATFLGS ;set indicator for no CONTINUE option
25EC|
25EC|                         OTHRBTNS
25EC|                             .ENDC
25EC|
25EC|                         DOMENU
25EC|                             .IF  USERINT = 0
25EC|                             .ELSE
25EC| 0838 0000 02A2              BTST    #NORSTRT,STATFLGS ;display RESTART button?
25F2| 6616                        BNE.S   @1                ;skip if not
25F4| 327C 1876                   MOVE    #BTN1STRT,A1      ;else do display
25F8| 103C 00F4                   MOVE.B  #KEY1,D0
25FC| 47FA 185A                   LEA     RTRYMSG,A3
2600| 347C 1C08                   MOVEA   #BTN1MSG,A2     ;                                       RM000
2604| 4281                        CLR.L   D1              ;don't append '...' string
```

```
2606| 6100 0C72                   BSR     MAKEBUTN
260A|
260A| 327C 3A36           @1     MOVE    #BTN3STRT,A1    ;display STARTUP button
260E| 303C 00F2                  MOVE    #KEY3,D0
2612| 47FA 1884                  LEA     STRTMSG,A3
2616| 347C 3DC8                  MOVEA   #BTN3MSG,A2     ;                                       RM000
261A| 72FF                       MOVEQ   #-1,D1          ;append '...' string
261C| 6100 0C5C                  BSR     MAKEBUTN
2620|
2620|                      ;       MOVE.L  #KBDBFR,KBDQPTR ;init queue ptr
2620|
2620| 6100 09EC                  BSR     CursorDisplay   ;display mouse cursor
2624| 08F8 0005 02A2             BSET    #CHKCMD,STATFLGS ;require user keyboard input to be prefaced
262A|                                                       ; by the CMD key
262A| 6100 061A           GETL1 BSR     GETINPUT        ;and go wait for input
262E| 6500 00B6                  BCS     GETERR          ;exit if error
2632| 6100 09B6                  BSR     CursorHide      ;remove cursor from screen
2636|
2636|                           .ENDC
2636|
2636|
2636|                      ;  Check if input valid.  If invalid, beep speaker.
2636|
2636| 0C00 00F2                  CMP.B   #KEY3,D0        ;alternate boot?
263A| 6608                       BNE.S   @2
263C|
263C|                           .IF  USERINT = 0
263C|                           .ELSE
263C| 6100 0A9C                  BSR     CLRDESK         ;close the alert box
2640| 6000 F2B6                  BRA     BOOTMENU        ;and go display boot menu
2644|                           .ENDC
2644|
2644| 0838 0000 02A2        @2   BTST    #NORSTRT,STATFLGS ;RESTART button displayed?
264A| 6612                       BNE.S   CONTCHK           ;skip if not
264C| 0C00 00F4                  CMP.B   #KEY1,D0        ;retry?
2650| 660C                       BNE.S   CONTCHK         ;skip if not
2652|
2652|                      DORESET
2652| 4287                       CLR.L   D7              ;clear error reg                        RM000
2654| 4A39 00FC E010             TST.B   SETUPON         ;turn on setup bit                      RM000
265A| 6000 DB2E                  BRA     BEGIN3          ;and restart diags                      RM000
265E|
265E|                      CONTCHK
265E|                           .IF  USERINT = 1
265E| 0838 0001 02A2             BTST    #NOCONT,STATFLGS ;continue option displayed?
2664| 666C                       BNE.S   @4              ;skip if not
2666| 0C00 00F1                  CMP.B   #KEY2,D0        ;continue option selected?
```

```
266A| 6666                      BNE.S   @4
266C|
266C|                    ;  continue from point of failure
266C|
266C| 6100 0A6C                BSR     CLRDESK         ;clear desktop                          CHG008
2670| 0287 7000 0000           ANDI.L  #ALTBMSK,D7     ;erase error indicators
2676| 2038 0180                MOVE.L  STATUS,D0       ;get power-up status
267A| 0800 0000                BTST    #MMU,D0         ;MMU error?
267E| 6600 E100                BNE     VIA2TST         ;yes - continue from VIA tests
2682|
2682| 0280 008F FFFF           ANDI.L  #BOOTMSK,D0     ;check if error that continues to boot attempt
2688| 6700 F05C                BEQ     BOOTCHK         ;skip if yes
268C| 2F00                      MOVE.L  D0,-(SP)        ;else save status
268E| 6100 0AF0                BSR     MAKETEST        ;make test window
2692|
2692|                    ;  do init for continue to other tests
2692| 103C 0070                MOVE.B  #$70,D0         ;turn off mouse
2696| 6100 E2BE                BSR     COPSCMD
269A| 201F                      MOVE.L  (SP)+,D0        ;restore status
269C|
269C| 0800 0002                BTST    #VID,D0         ;serial # error?
26A0| 670C                      BEQ.S   @1              ;skip if not
26A2| 327C 1DF6                MOVEA   #CPUSTRT,A1     ;display CPU icon
26A6| 6100 0ECC                BSR     INVICON
26AA| 6000 E6B0                BRA     PARTST          ;continue with parity test
26AE|
26AE| EE88                      @1      LSR.L   #7,D0           ;skip other CPU errors
26B0| 4A00                      TST.B   D0              ;clock error?
26B2| 6600 EC3A                BNE     CONFIG          ;yes - continue with config check
26B6|
26B6| E488                      LSR.L   #2,D0
26B8| 4A00                      TST.B   D0              ;RS232 error?
26BA| 670C                      BEQ.S   @2              ;skip if not
26BC| 327C 1E12                MOVEA   #IOSTRT,A1      ;else display I/O board icon
26C0| 6100 0EB2                BSR     INVICON
26C4| 6000 EA46                BRA     DSKTST          ;cont with disk test
26C8|
26C8| 4A39 00FC E01E           @2      TST.B   PARON           ;must be memory error - reenable parity
26CE| 6000 E930                BRA     IOTST           ; and continue with I/O board testing
26D2|
26D2|                          .ENDC
26D2|                    @4
26D2|                          .IF  USERINT = 0
26D2|                          .ENDC
26D2|
26D2| 0C00 00F6                CMP.B   #SKEY,D0        ; service mode desired?
26D6| 6700 0064                BEQ     LEVEL2          ; skip if yes
```

```
26DA|
26DA|                       ;  Indicate invalid by beeping speaker
26DA|
26DA|                       GETL1XIT
26DA| 6100 0030                    BSR     SQUAWK          ; sorry charlie
26DE|                              .IF  USERINT = 0
26DE|                              .ELSE
26DE|                       LEV1LOOP
26DE| 6100 092E                    BSR     CursorDisplay   ;redisplay cursor
26E2| 6000 FF46                    BRA.S   GETL1           ;go get more input
26E6|
26E6|                       ;  Error exit - go output error and return to level 1
26E6|
26E6|                       GETERR
26E6| 45FA 1263                    LEA     IOBRD,A2        ;get I/O board icon
26EA| 97CB                         SUBA.L  A3,A3           ;no error message
26EC| 6000 FE6E                    BRA     INIT2
26F0|                              .ENDC
26F0|
26F0|                              .ENDC                   ;{ROM4K}
26F0|                              .PAGE
26F0|                       ;---------------------------------------------------------------------------
26F0|                       ;  Subroutine to clear video page of memory or write arbitrary long word
26F0|                       ;  pattern to entire screen (WRTSCRN entry point).
26F0|                       ;---------------------------------------------------------------------------
26F0|
26F0| 4280                  CLRSCRN CLR.L   D0              ; write 0's for white screen
26F2|                       WRTSCRN                         ; entry pt for write to screen (assumes D0 set)
26F2| 2078 0110                    MOVE.L  SCRNBASE,A0     ; get screen base address
26F6| 323C 1FFD                    MOVE    #HEX8K-3,D1     ; set longs count
26FA| 20C0                  @1      MOVE.L  D0,(A0)+          ; clear for video page
26FC| 51C9 FFFC                    DBF     D1,@1
2700| 4E75                         RTS
2702|
2702|                              .IF  ROM4K = 0
2702|                              .IF  USERINT = 0
2702|                              .ENDC
2702|                              .PAGE
2702|                              .IF  USERINT = 0
2702|                              .ELSE
2702|                       ;---------------------------------------------------------------------------
2702|                       ;  Subroutine to read keycode from COPS - returns down transitions in D0
2702|                       ;---------------------------------------------------------------------------
2702|
2702|                       ReadKey
2702| 6100 0634                    BSR     WT4INPUT
2706| 4A00                         TST.B   D0              ;ignore "up" transitions and mouse data
```

```
2708| 6AF8                        BPL.S   ReadKey
270A| 4E75                        RTS                     ;exit with data
270C|
270C|                           .ENDC
270C|
270C|                       ;-------------------------------------------------------------------------
270C|                       ;  Subroutine to beep speaker for invalid input
270C|                       ;-------------------------------------------------------------------------
270C|
270C| 7020                  SQUAWK  MOVEQ   #$20,D0         ; set frequency
270E| 323C 00FA                     MOVE    #250,D1         ; 1/8 sec duration
2712| 7404                          MOVEQ   #4,D2           ; low volume
2714| 6100 E3E0                     BSR     TONE            ; and go do it
2718| 4E75                          RTS
271A|
271A|                       ;-------------------------------------------------------------------------
271A|                       ;  Subroutine to convert keycodes to Ascii
271A|                       ;  Inputs:  D0 = keycode (word)
271A|                       ;  Outputs: D0 = Ascii (byte) or =2 if input invalid
271A|                       ;-------------------------------------------------------------------------
271A|
271A|                       KeyToAscii
271A| 48E7 4080                     MOVEM.L D1/A0,-(SP)     ;save regs
271E| 41FA 119C                     LEA     AsciiTable,A0   ;keycode to ascii table
2722| 3200                          MOVE    D0,D1           ;keycode to convert
2724| 0241 007F                     ANDI    #$007F,D1       ;ensure valid
2728| 0441 0020                     SUBI    #32,D1          ;decrement for table                    RM000
272C| 6A04                          BPL.S   @1              ;skip if valid                          RM000
272E| 7002                          MOVEQ   #2,D0           ;else set for invalid char              RM000
2730| 6004                          BRA.S   @2              ;                                       RM000
2732| 1030 1000             @1      MOVE.B  0(A0,D1.W),D0   ;get ascii
2736| 4CDF 0102             @2      MOVEM.L (SP)+,D1/A0     ;restore
273A| 4E75                          RTS                     ;exit
273C|
273C|
273C|                           .PAGE
273C|                       ;-------------------------------------------------------------------------
273C|                       ;  Monitor level 2 (Service mode) - enables access to memory and disk
273C|                       ;-------------------------------------------------------------------------
273C|
273C|                       LEVEL2
273C|                           .IF  USERINT = 0
273C|                           .ELSE
273C| 6100 099C                 BSR     CLRDESK         ;display the desktop
2740|
2740|                           .IF  BMENU = 0
2740|                           .ENDC
```

```
2740|
2740|                       ;  make window for output, and display menu line and pull down menu
2740|
2740| 6100 00D2                     BSR     MAKESVCW        ;output service window
2744| 6100 005A             DSPMENU BSR     WRTMENU
2748|
2748|                       ;  do final initialization and await input
2748|
2748| 6100 08C4                     BSR     CursorDisplay   ;display cursor
274C|                       ;-------------------------------------------------------------------------
274C|                       ;  Program NMI key
274C|                       ;
274C|                       ;       MOVEQ   #$5A,D0         ;set / key for NMI
274C|                       ;       BSR     COPSCMD
274C|                       ;       MOVEQ   #$61,D0
274C|                       ;       BSR     COPSCMD
274C|                       ;-------------------------------------------------------------------------
274C|
274C|                       GETLEV2
274C| 6100 04F8                     BSR     GETINPUT        ;and go await input
2750| 6594                          BCS     GETERR          ;exit if error
2752| 6100 0896                     BSR     CursorHide      ;else remove cursor from screen and go
2756|                                                       ; analyze input
2756|
2756|                               .ENDC
2756|
2756|                               .IF  USERINT = 0
2756|                               .ENDC
2756|
2756|                       ;  Check for valid input
2756|
2756| 0C00 00F4                     CMP.B   #KEY1,D0        ; display memory?
275A| 6700 00DA                     BEQ     DSPMEM
275E| 0C00 00F1                     CMP.B   #KEY2,D0        ; set memory?
2762| 6700 013E                     BEQ     SETMEM
2766|
2766| 0C00 00F2                     CMP.B   #KEY3,D0        ; call routine
276A| 6700 019C                     BEQ     CALLRTN
276E|
276E|                               .IF  ROM16K = 1
276E| 0C00 00F3                     CMP.B   #KEY4,D0        ; loop?
2772| 6700 01C0                     BEQ     LOOPTST
2776|                               .ENDC
2776|
2776| 0C00 00E4                     CMP.B   #KEY5,D0        ; video adjust?
277A| 6700 0278                     BEQ     VIDAJST
277E|
```

```
277E|                                   .IF  BURNIN = 1
277E| 0C00 00E1                        CMP.B   #KEY6,D0        ; power cycle?
2782| 6700 02E8                        BEQ     PowerCycle
2786|                                   .ENDC
2786|
2786| 0C00 00E2                        CMP.B   #KEY7,D0        ; quit?
278A| 6610                            BNE.S   @1
278C| 08B8 0000 02A2                   BCLR    #NORSTRT,STATFLGS ;clear no reset status flag
2792| 4280                            CLR.L   D0                ;set parms for level1 - no error code
2794| 95CA                            SUBA.L  A2,A2             ;no icon display
2796| 97CB                            SUBA.L  A3,A3             ;no message display
2798| 6000 FDC2                       BRA     INIT2             ;and go back to level1
279C|
279C| 6000 02D6              @1       BRA     INVALID         ; else invalid input
27A0|
27A0|                                   .PAGE
27A0|                                   .IF  USERINT = 1
27A0|                         ;-------------------------------------------------------------------------------
27A0|                         ;  Routine to display the preliminary pull-down menu
27A0|                         ;-------------------------------------------------------------------------------
27A0|
27A0|                         WRTMENU
27A0|                                   .IF  BMENU = 0
27A0|                                   .ELSE
27A0| 4278 053A                         CLR     RectCnt         ;clear active rectangle count
27A4| 0238 000F 02A2                    ANDI.B  #$0F,STATFLGS   ;init flags
27AA| 7012                            MOVEQ   #MENUWIDTH,D0   ;set menu parms
27AC| 7207                            MOVEQ   #MITEMS,D1      ;set # of items in menu
27AE| C2FC 000B                        MULU    #MENULEN,D1     ;length depends on # of items
27B2| 47FA 170D                        LEA     MENUHDG,A3      ;set ptr for menu heading
27B6| 6118                            BSR.S   DSPMENUBOX      ;go display blank menu box w/ heading
27B8|
27B8| 7807                            MOVEQ   #MITEMS,D4      ;set # of items in menu
27BA| 327C 05A2                        MOVE    #MENUSTRT,A1    ;set menu starting point
27BE| 347C 0658                        MOVE    #MENU1MSG,A2    ;menu items display address
27C2| 47FA 1705                        LEA     DISPMSG,A3      ;set ptr to menu entries
27C6| 49FA 1771                        LEA     MENUID,A4       ;ptr to id's for menu entries
27CA| 6100 0B9E                        BSR     MAKEMENU        ;go fill in the menu
27CE|
27CE|                                   .ENDC                   ;{MENU}
27CE|
27CE| 4E75                            RTS
27D0|
27D0|                                   .IF  BMENU = 1
27D0|                         ;-------------------------------------------------------------------------------
27D0|                         ;  Subroutine to display blank menu box with heading
27D0|                         ;  Inputs:
```

```
27D0|                     ;       D0 = menu width
27D0|                     ;       D1 = menu length
27D0|                     ;       A3 = menu heading
27D0|                     ;  Outputs:
27D0|                     ;       None
27D0|                     ;  Side Effects:
27D0|                     ;       D2/A1,A3 trashed
27D0|                     ;-------------------------------------------------------------------------------
27D0|
27D0|                     DSPMENUBOX
27D0| 48E7 C000                   MOVEM.L D0-D1,-(SP)     ;save regs
27D4| 08F8 0007 02A2              BSET    #MENU,STATFLGS  ;set working with menu flag
27DA| 6100 0938                   BSR     CLRMENU         ;first clear the menu bar
27DE| 5441                        ADDQ    #2,D1           ;bump length for bottom border
27E0| 327C 05A2                   MOVE    #MENUSTRT,A1    ;set menu starting point
27E4| 6100 0A00                   BSR     MAKEBOX         ;display the box
27E8| 327C 0111                   MOVEA   #MENULOC,A1     ;set up menu heading display point
27EC| 6100 0C18                   BSR     GETROWCOL       ;convert to screen ptrs
27F0|
27F0| 4281                        CLR.L   D1              ;don't display '...' string
27F2| 6100 0E40                   BSR     DSPSTRING       ;display the title
27F6| 97CA                        SUBA.L  A2,A3           ;get length of menu title
27F8| 240B                        MOVE.L  A3,D2           ;move to working reg
27FA| 5442                        ADDQ    #2,D2           ;add extra bytes to cover entire title
27FC| 0202 00FE                   ANDI.B  #$FE,D2         ;ensure it's even
2800| 3002                        MOVE    D2,D0           ;save as width of menu heading "box"
2802| 720E                        MOVEQ   #14,D1          ;set height for "box"
2804| 74FF                        MOVEQ   #-1,D2          ;set fill pattern
2806| 92FC 005B                   SUB.W   #91,A1          ;decrement start pt by 1 row + 1 byte
280A| 6100 0922                   BSR     INVERSE         ;go hilite it
280E| 4CDF 0003                   MOVEM.L (SP)+,D0-D1     ;restore regs
2812| 4E75                        RTS
2814|
2814|                           .ENDC                   ;{MENU}
2814|
2814|                     ;-------------------------------------------------------------------------------
2814|                     ;  Subroutine to create Service mode window
2814|                     ;-------------------------------------------------------------------------------
2814|
2814|                     MAKESVCW
2814| 327C 0EDA                   MOVEA   #SVCSTRT,A1     ;left corner point                    RM000
2818| 7042                        MOVEQ   #SVCWIDTH,D0    ;width of window
281A| 223C 0000 0140              MOVE.L  #SVCHIGH,D1     ;height
2820| 47FA D830                   LEA     SVCMSG,A3       ;title
2824| 6100 09A0                   BSR     MAKEWINDOW      ;go do it
2828| 31FC 003E 0300              MOVE    #FIRSTROW,CRTROW ;init screen ptrs
282E| 31FC 0018 0302              MOVE    #FIRSTCOL,CRTCOL
```

```
2834| 4E75                        RTS
2836|
2836|                             .ENDC                   ;{USERINT}
2836|
2836|                        ;-------------------------------------------------------------------------------
2836|                        ;  Do display memory operation
2836|                        ;-------------------------------------------------------------------------------
2836|
2836| 6100 036C              DSPMEM  BSR     GETA            ;go get address
283A| 6500 0238                      BCS     INVALID
283E| 4A43                           TST     D3              ;if no input go back to menu line
2840|
2840|                             .IF  USERINT = 0
2840|                             .ELSE
2840| 6700 0240                      BEQ     LEV2LOOP
2844|                             .ENDC
2844|
2844| 0882 0000                      BCLR    #0,D2           ;ensure even address
2848| 2442                           MOVE.L  D2,A2           ;and save
284A|
284A|                        ;  Check for all input on one line
284A| 6100 034A                      BSR     GETCH           ;read queue to see if more input
284E| 6506                           BCS.S   @1              ;skip if not
2850| 0C00 0020                      CMPI.B  #' ',D0         ;must be a space separator
2854| 6708                           BEQ.S   RDCNT           ;skip if yes
2856|
2856| 47FA 1774              @1      LEA     CNTMSG,A3       ;display count prompt
285A| 6100 0236                      BSR     PROMPT
285E|
285E|                        ;  Decode count input and do display
285E|
285E| 7204                   RDCNT   MOVEQ   #4,D1           ;go get count (max of $FFFF)
2860| 6100 0350                      BSR     GETPARM
2864| 6500 020E                      BCS     INVALID
2868| 6100 02E6                      BSR     PUTLF           ;set display ptrs and space 1 line
286C| 4A43                           TST     D3              ;set default count if no input
286E| 6702                           BEQ.S   @4
2870| 6002                           BRA.S   @5
2872|
2872| 7410                   @4      MOVEQ   #16,D2          ;set default count
2874|
2874|                        ;  Do display of memory
2874|
2874| 200A                   @5      MOVE.L  A2,D0           ;get display address
2876| 7208                           MOVEQ   #8,D1           ;and display it
2878| 6100 EDFE                      BSR     OUTCH
287C|
```

```
287C|                           .IF  USERINT = 0
287C|                           .ELSE
287C| 5846                      ADDQ    #4,D6           ;bump col for data display
287E|                           .ENDC
287E| 7808                      MOVEQ   #8,D4           ;set loop count
2880| 301A                 @6   MOVE    (A2)+,D0        ;read data word
2882| 7204                      MOVEQ   #4,D1           ;display it
2884| 6100 EDF2                BSR     OUTCH
2888| 5246                      ADDQ    #1,D6           ;add space
288A| 5344                      SUBQ    #1,D4           ;loop for one line
288C| 66F2                      BNE.S   @6
288E|
288E| 5182                      SUBQ.L  #8,D2           ;decr data count                        RM000
2890| 5182                      SUBQ.L  #8,D2           ;                                       RM000
2892| 6F06                      BLE.S   @7              ;exit if done
2894| 6100 02BA                 BSR     PUTLF           ;go to next line
2898| 60DA                      BRA.S   @5              ;and continue until done
289A|
289A| 6100 02B4            @7   BSR     PUTLF           ;add blank line
289E|
289E|                           .IF  USERINT = 0
289E|                           .ELSE
289E| 6000 01E2                BRA     LEV2LOOP        ;continue level2 loop
28A2|                           .ENDC
28A2|
28A2|                           .PAGE
28A2|                   ;-----------------------------------------------------------------------------
28A2|                   ;  Do set memory operation - enables setting of bytes, words or longs
28A2|                   ;  up to 24 bytes max.  Decodes data length to determine type of operation.
28A2|                   ;-----------------------------------------------------------------------------
28A2|
28A2| 6100 0300         SETMEM  BSR     GETA            ;go get address
28A6| 6500 01CC                 BCS     INVALID         ;abort if invalid
28AA| 4A43                      TST     D3              ;any input?
28AC|
28AC|                           .IF  USERINT = 0
28AC|                           .ELSE
28AC| 6700 01D4                 BEQ     LEV2LOOP        ;abort if none
28B0|                           .ENDC
28B0|
28B0| 2442                      MOVE.L  D2,A2           ;save target address
28B2|                   ;  Check for all input on one line
28B2|
28B2| 6100 02E2                BSR     GETCH           ;read queue to see if more input
28B6| 6506                      BCS.S   @1              ;skip if not
28B8| 0C00 0020                CMPI.B  #' ',D0         ;must be a space separator
28BC| 6708                      BEQ.S   RDDTA           ;skip if yes
```

```
28BE|
28BE| 47FA 1705             @1      LEA     DATAMSG,A3      ;else output data prompt
28C2| 6100 01CE                     BSR     PROMPT
28C6|
28C6|                      ;  Decode parameter input and do operation
28C6| 7208                 RDDTA   MOVEQ   #8,D1           ;get max of 8 chars
28C8| 6100 02E8                     BSR     GETPARM
28CC| 6500 01A6                     BCS     INVALID
28D0| 4A43                         TST     D3              ;any input?
28D2|
28D2|                              .IF  USERINT = 0
28D2|                              .ELSE
28D2| 6700 01AE                     BEQ     LEV2LOOP
28D6|                              .ENDC
28D6|
28D6|                      ;  write data to memory
28D6|
28D6| 0C03 0002                     CMP.B   #2,D3           ;first test for byte operation
28DA| 6E04                         BGT.S   @1
28DC| 14C2                         MOVE.B  D2,(A2)+        ;write byte
28DE| 6014                         BRA.S   @3
28E0| 200A                 @1      MOVE.L  A2,D0           ;ensure even address for word or long op
28E2| 0880 0000                     BCLR    #0,D0
28E6| 2440                         MOVE.L  D0,A2
28E8| 0C03 0004                     CMP.B   #4,D3           ;test for word op
28EC| 6E04                         BGT.S   @2
28EE| 34C2                         MOVE    D2,(A2)+        ;write word
28F0| 6002                         BRA.S   @3
28F2|
28F2| 24C2                 @2      MOVE.L  D2,(A2)+        ;write long
28F4|
28F4| 6100 02A0             @3      BSR     GETCH           ;read input queue
28F8| 650A                         BCS.S   @4              ;skip if none
28FA| 0C00 0020                     CMPI.B  #' ',D0         ;must be a space separator
28FE| 6600 0174                     BNE     INVALID         ;exit if error
2902| 60C2                         BRA.S   RDDTA           ;else continue operation
2904|
2904|                      @4
2904|                              .IF  USERINT = 0
2904|                              .ELSE
2904| 6000 017C                     BRA     LEV2LOOP        ;continue level2 loop
2908|                              .ENDC
2908|
2908|                              .PAGE
2908|                      ;-------------------------------------------------------------------------------
2908|                      ;  Do 'call' function - ensures address is on word boundary.
2908|                      ;-------------------------------------------------------------------------------
```

```
2908|
2908| 6100 029A            CALLRTN BSR     GETA            ;go get address
290C| 6500 0166                    BCS     INVALID
2910| 4A43                        TST     D3              ;abort if no input
2912|
2912|                            .IF  USERINT = 0
2912|                            .ELSE
2912| 6700 016E                  BEQ     LEV2LOOP        ;continue level2 loop
2916|                            .ENDC
2916|
2916| 0882 0000                  BCLR    #0,D2           ;else ensure on word boundary
291A| 21C2 01F8                  MOVE.L  D2,A6SAV        ;save for jump
291E|
291E|                      ;  load registers from save area before jumping
291E|
291E| 4DF8 01C0                  LEA     DATARGS,A6      ;get ptr
2922| 4CDE 3FFF                  MOVEM.L (A6)+,D0-D7/A0-A5  ;load regs
2926| 2C78 01F8                  MOVE.L  A6SAV,A6        ;restore address
292A| 4E96                       JSR     (A6)            ;and do call
292C| 6100 D70C                  BSR     SAVEREGS        ;save registers on exit
2930|
2930|                            .IF  USERINT = 0
2930|                            .ELSE
2930| 6000 0150                  BRA     LEV2LOOP        ;continue level2 loop
2934|                            .ENDC
2934|
2934|                            .IF     ROM16K = 1
2934|                            .PAGE
2934|                      ;-------------------------------------------------------------------------------
2934|                      ;  Do loop on diagnostic
2934|                      ;-------------------------------------------------------------------------------
2934|
2934|                      LOOPTST
2934|                            .IF USERINT = 1
2934| 6100 FEDE                  BSR     MAKESVCW        ;redraw service window
2938| 6100 0216                  BSR     PUTLF           ;add blank line and setup ptrs
293C| 47FA 1602                  LEA     TSTMENU,A3      ;set ptr to test choices
2940| 7818                       MOVEQ   #FIRSTCOL,D4    ;set left margin
2942| 6100 0DBC                  BSR     DSPMSG          ;and go do display choices
2946|                            .ENDC
2946|
2946| 47FA 168C                  LEA     TSTMSG,A3       ;display test routine prompt
294A| 6100 0146                  BSR     PROMPT
294E| 6500 0124                  BCS     INVALID         ;skip if bad input
2952| 4A43                       TST     D3              ;any input?
2954|
2954|                            .IF  USERINT = 0
```

```
2954|                           .ELSE
2954| 6608                      BNE.S   @0              ;skip if yes
2956| 6100 FEBC                 BSR     MAKESVCW        ;else redraw service window
295A| 6000 0126                 BRA     LEV2LOOP        ;and return to level 2
295E|                           .ENDC
295E|
295E| 5343                @0    SUBQ    #1,D3           ;ensure only one char input
2960| 6600 0112                 BNE     INVALID         ;skip if more than one
2964|
2964| 7201                      MOVEQ   #1,D1           ;go get one character of input
2966| 6100 024A                 BSR     GETPARM
296A| 0C02 000C                 CMP.B   #MAXTEST,D2     ;check if within max range
296E| 6200 0104                 BHI     INVALID         ;exit if not
2972| 5342                      SUBQ    #1,D2           ;decr for index
2974| 6B00 00FE                 BMI     INVALID         ;skip if negative (i.e., 0 was input)
2978|
2978|                     ;-------------------------------------------------------------------------------
2978|                     ;  Program NMI key to exit loop
2978|                     ;
2978|                     ;        LEA     LOOPEND,A3      ;set NMI vector
2978|                     ;        MOVE.L  A3,NMIVCT
2978|                     ;        MOVEQ   #$5A,D0         ;set / key for NMI
2978|                     ;        BSR     COPSCMD
2978|                     ;        MOVEQ   #$61,D0
2978|                     ;        BSR     COPSCMD
2978|                     ;-------------------------------------------------------------------------------
2978|
2978|                           .IF  USERINT = 1
2978|
2978|                           .IF  FULLSCC = 0
2978|                           .ENDC
2978|
2978| 2F02                      MOVE.L  D2,-(SP)        ;save test #
297A| 6100 075E                 BSR     CLRDESK         ;clear desktop except for menu bar
297E| 6100 0800                 BSR     MAKETEST        ;draw test window
2982| 241F                      MOVE.L  (SP)+,D2        ;restore test #
2984| 0C02 0004                 CMP.B   #4,D2           ;CPU test?
2988| 6C06                      BGE.S   @1              ;skip if not
298A| 327C 1DF6                 MOVEA   #CPUSTRT,A1     ;else set ptr for CPU board icon                RM000
298E| 601C                      BRA.S   @4              ;and go hilite it
2990|
2990| 0C02 000A           @1    CMP.B   #10,D2          ;I/O board test?
2994| 6C06                      BGE.S   @2
2996| 327C 1E12                 MOVEA   #IOSTRT,A1      ;set ptr for I/O board icon                     RM000
299A| 6010                      BRA.S   @4
299C|
29A0| 6C06                      BGE.S   @31,D2          ;memory test?
```

```
29A2| 327C 1E04                    MOVEA   #MEMSTRT,A1     ;set ptr for memory board icon                RM000
29A6| 6004                        BRA.S   @4
29A8| 327C 1E20            @3      MOVEA   #XCRDSTRT,A1    ;else must be I/O slot card                   RM000
29AC|
29AC| 6100 0BC6            @4      BSR     INVICON         ;display in test window
29B0|                              .ENDC
29B0|
29B0| D442                        ADD     D2,D2           ;double test # for table index
29B2| 08C7 001F                    BSET    #LOOP,D7        ;set loop flag
29B6| 41FA 0024                    LEA     LOOPTBL,A0      ;and jump to requested routine
29BA| D0F0 2000                    ADD     0(A0,D2.W),A0
29BE| 4ED0                        JMP     (A0)
29C0|
29C0|                       ;-------------------------------------------------------------------------
29C0|                       ;  Loop exit via NMI routine
29C0|                       ;
29C0|                       ;LOOPEND BTST    #1,STATREG      ;parity error?
29C0|                       ;        BEQ     NMI             ;skip if yes to report error
29C0|                       ;        MOVE.L  #STKBASE,SP     ;else restore stack
29C0|                       ;        BRA     LEVEL2          ;and redisplay service mode
29C0|                       ;-------------------------------------------------------------------------
29C0|
29C0|                       ;  special entry points for routines that require initial setup
29C0|
29C0|                       MMUTSTE1
29C0| 4A39 00FC E010                TST.B   SETUPON         ;turn on SETUP bit for MMU tests
29C6| 6000 D7E8                     BRA     MMUTST          ;go do main test
29CA|
29CA|                              .IF  FULLSCC = 0
29CA|                              .ENDC
29CA|
29CA| 08F9 0006 00FC C18D   MEMTST3 BSET    #6,MEMCODE      ;set for extended memory test
29D2| 7002                        MOVEQ   #PROFILE,D0     ;and for normal boot default (Profile)
29D4| 6100 EE78                    BSR     SAV2PM          ;save in parameter memory
29D8| 6000 E434                    BRA     MEMLOOP         ;and go do memory testing
29DC|
29DC|                       ;  jump table for looping on start-up diagnostics
29DC|
29DC| D7B8                  LOOPTBL .WORD   ROMTST-LOOPTBL          ;1 = ROM checksum test
29DE| FFE4                        .WORD   MMUTSTE1-LOOPTBL        ;2 = MMU test
29E0| E1C6                        .WORD   VIDCHK-LOOPTBL          ;3 = Video test
29E2| E380                        .WORD   PARTST-LOOPTBL          ;4 = Parity logic test
29E4| DDA4                        .WORD   VIA2TST-LOOPTBL         ;5 = Parallel port VIA test
29E6| DED4                        .WORD   VIA1CHK-LOOPTBL         ;6 = Keyboard port VIA test
29E8| DF0E                        .WORD   COPSENBL-LOOPTBL        ;7 = I/O board COPS test
29EA|
29EA|                              .IF  FULLSCC = 1
```

```
29EA| E62C                        .WORD   SCCTEST-LOOPTBL         ;8 = SCC test
29EC|                            .ELSE
29EC|                            .ENDC
29EC|
29EC| E730                        .WORD   DSKTST-LOOPTBL          ;9 = disk controller test
29EE| E8B0                        .WORD   CLKTST-LOOPTBL          ;A = clock test
29F0| FFEE                        .WORD   MEMTST3-LOOPTBL         ;B = memory test
29F2| E91A                        .WORD   CONFIG2-LOOPTBL         ;C = configuration check
29F4|
29F4|                            .ENDC
29F4|                            .PAGE
29F4|                       ;--------------------------------------------------------------------------
29F4|                       ;  Display video adjust pattern
29F4|                       ;--------------------------------------------------------------------------
29F4|
29F4| 70FF                  VIDAJST MOVEQ   #-1,D0          ;first erase the screen
29F6| 6100 FCFA                     BSR     WRTSCRN
29FA|
29FA|                       ;  Next draw the horizontal lines
29FA|
29FA| 4280                          CLR.L   D0              ;set scan line
29FC| 6128                          BSR.S   DRWHORZ         ;go draw white line
29FE| 701B                          MOVEQ   #27,D0          ;set next scan line
2A00| 721C                          MOVEQ   #28,D1          ;set increment value also
2A02| 740C                          MOVEQ   #12,D2          ;set line count
2A04| 6120                  @1      BSR.S   DRWHORZ         ;draw some more
2A06| D041                          ADD     D1,D0           ;incr to next line position
2A08| 51CA FFFA                     DBF     D2,@1           ;loop until done
2A0C|
2A0C|                       ;  Now draw the vertical lines
2A0C|
2A0C| 4280                          CLR.L   D0              ;set pixel #
2A0E| 6130                          BSR.S   DRWVERT         ;draw a vertical line
2A10| 702C                          MOVEQ   #44,D0          ;set next pixel position
2A12| 722D                          MOVEQ   #45,D1          ;set incr value also
2A14| 740F                          MOVEQ   #15,D2          ;set line count
2A16| 6128                  @2      BSR.S   DRWVERT         ;draw some more
2A18| D041                          ADD     D1,D0           ;incr to next pixel position
2A1A| 51CA FFFA                     DBF     D2,@2           ;loop until done
2A1E|
2A1E|                       ;  Wait for any keystroke to terminate display
2A1E|
2A1E| 6100 FCE2                     BSR     READKEY
2A22| 6000 FD18                     BRA     LEVEL2          ;return to menu display
2A26|
2A26|                            .PAGE
2A26|                       ;--------------------------------------------------------------------------
```

```
2A26|                     ;  Subroutine to draw horizontal lines.  Requires inputs:
2A26|                     ;    D0 = scan line (0 to 363 decimal)
2A26|                     ;    $110 = base address of screen
2A26|                     ;-------------------------------------------------------------------------------
2A26|
2A26| 48E7 C080          DRWHORZ MOVEM.L D0/D1/A0,-(SP)  ;save regs
2A2A| 725A                       MOVEQ   #90,D1          ;line length in bytes
2A2C| C0C1                       MULU    D1,D0           ;compute address offset
2A2E| 2078 0110                 MOVE.L  SCRNBASE,A0     ;get base screen address
2A32| D1C0                       ADDA.L  D0,A0           ;add offset
2A34| 4218                @1     CLR.B   (A0)+           ;draw the line
2A36| 5341                       SUBQ    #1,D1
2A38| 66FA                       BNE.S   @1
2A3A| 4CDF 0103                   MOVEM.L (SP)+,D0/D1/A0  ;restore
2A3E| 4E75                       RTS
2A40|
2A40|                     ;-------------------------------------------------------------------------------
2A40|                     ;  Subroutine to draw vertical lines.  Requires inputs:
2A40|                     ;    D0 = pixel position (0 to 719 decimal)
2A40|                     ;    $110 = base address of screen
2A40|                     ;-------------------------------------------------------------------------------
2A40|
2A40| 48E7 F080          DRWVERT MOVEM.L D0-D3/A0,-(SP)  ;save regs
2A44| 7208                       MOVEQ   #8,D1           ;pixels per byte
2A46| 80C1                       DIVU    D1,D0           ;compute address offset
2A48| 4282                       CLR.L   D2
2A4A| 3400                       MOVE    D0,D2           ;save offset
2A4C| 2078 0110                 MOVE.L  SCRNBASE,A0     ;get base screen address
2A50| D1C2                       ADDA.L  D2,A0           ;add offset
2A52|
2A52| 4840                       SWAP    D0              ;get remainder
2A54| 9240                       SUB     D0,D1           ;compute bit position to set
2A56| 5341                       SUBQ    #1,D1
2A58|
2A58| 745A                       MOVEQ   #90,D2          ;distance to next pixel
2A5A| 363C 016C                 MOVE    #364,D3         ;line length
2A5E| 0390                @1     BCLR    D1,(A0)         ;draw the line
2A60| D1C2                       ADDA.L  D2,A0           ;compute next pixel to set
2A62| 5343                       SUBQ    #1,D3
2A64| 66F8                       BNE.S   @1              ;loop until done
2A66| 4CDF 010F                   MOVEM.L (SP)+,D0-D3/A0  ;restore
2A6A| 4E75                       RTS
2A6C|
2A6C|                            .IF  BURNIN = 1
2A6C|                     ;-------------------------------------------------------------------------------
2A6C|                     ;  Power cycle entry point - branches to cycling routine
2A6C|                     ;-------------------------------------------------------------------------------
```

```
2A6C|
2A6C|                           PowerCycle
2A6C| 6100 066C                        BSR     CLRDESK         ;clear desktop
2A70| 6000 F7D2                        BRA     CHKPAS2         ;go start power cycle
2A74|
2A74|                                 .ENDC
2A74|
2A74|                                 .PAGE
2A74|                           ;---------------------------------------------------------------------------
2A74|                           ;  Invalid input detected - beep speaker and notify user
2A74|                           ;---------------------------------------------------------------------------
2A74| 6100 FC96                 INVALID BSR     SQUAWK          ;that's a no no
2A78|                                 .IF  USERINT = 0
2A78|                                 .ELSE
2A78| 47FA 1561                       LEA     WHATMSG,A3      ;output question mark
2A7C| 6100 018C                       BSR     DBOXDSPLY       ;display in dialog box
2A80| 6004                            BRA.S   INVXIT
2A82|
2A82|                           LEV2LOOP
2A82| 6100 01A4                       BSR     CLRDBOX         ;go remove dialog box
2A86|                           INVXIT
2A86| 6100 FD18                       BSR     WRTMENU         ;redisplay pull-down menu
2A8A| 6100 0582                       BSR     CursorDisplay   ;redisplay cursor
2A8E| 6000 FCBC                       BRA     GETLEV2         ;and go get more input
2A92|                                 .ENDC
2A92|
2A92|                                 .IF  ROM16K = 1
2A92|                                 .IF  FULLSCC = 0
2A92|                                 .ENDC                   ;{FULLSCC}
2A92|                                 .ENDC                   ;{ROM16K}
2A92|
2A92|                                 .PAGE
2A92|                                 .IF  USERINT = 0
2A92|                                 .ELSE
2A92|                           ;---------------------------------------------------------------------------
2A92|                           ;  Subroutine to output prompt line and gather input
2A92|                           ;---------------------------------------------------------------------------
2A92|
2A92| 48E7 0620                 PROMPT  MOVEM.L D5-D6/A2,-(SP)  ;save screen ptrs and target address
2A96| 6100 071A                       BSR     MAKEDBOX        ;make dialog box
2A9A| 3A3C 0018                       MOVE    #DBOXROW,D5     ;set msg ptrs
2A9E| 3C3C 0018                       MOVE    #DBOXCOL,D6
2AA2| 6100 0974                       BSR     GETLENGTH       ;get message length
2AA6| 5442                            ADDQ    #2,D2           ;incr for spacing
2AA8| 31C2 052E                       MOVE    D2,MSGLEN       ;save as message length
2AAC| 6100 0C52                       BSR     DSPMSG          ;write msg
2AB0| 6100 0008                       BSR     RDINPUT         ;go handle input
```

```
2AB4| 4CDF 0460                    MOVEM.L (SP)+,D5-D6/A2  ;restore and exit
2AB8| 4E75                         RTS
2ABA|
2ABA|                         ;-------------------------------------------------------------------------------
2ABA|                         ;  Subroutine to read keyboard input and save in buffer.  Accepts max of
2ABA|                         ;  48 characters.
2ABA|                         ;-------------------------------------------------------------------------------
2ABA|
2ABA|                         RDINPUT
2ABA| 207C 0000 02C0                 MOVE.L  #KBDBFR,A0      ;set buffer ptrs
2AC0| 2248                           MOVE.L  A0,A1           ;same for head and tail
2AC2| 4283                           CLR.L   D3              ;clear for result use
2AC4|
2AC4| 6100 FC3C              READIN   BSR     READKEY         ;get char
2AC8| 6100 FC50                     BSR     KeyToASCII      ;convert to ASCII
2ACC|
2ACC| 4A00                           TST.B   D0              ;ignore CMD, Option, Shift, Alpha lock
2ACE| 67F4                           BEQ.S   READIN
2AD0| 0C00 0008                     CMP.B   #BS,D0          ;backspace key?
2AD4| 6612                           BNE.S   @2
2AD6| 4A43                           TST     D3              ;any input
2AD8| 67EA                           BEQ.S   READIN          ;no - ignore
2ADA| 5343                           SUBQ    #1,D3           ;decrement count
2ADC| 4A21                           TST.B   -(A1)           ;delete char from queue
2ADE| 6100 008C                     BSR     PUTBS           ;do backspace on screen
2AE2| 6100 0096                     BSR     CLRIT           ;clear char on screen
2AE6| 60DC                           BRA.S   READIN          ;and continue
2AE8|
2AE8| 0C00 000D              @2      CMP.B   #RET,D0         ;return key?
2AEC| 6718                           BEQ.S   @3              ; yes - exit
2AEE|
2AEE| 0C03 0030                     CMP.B   #48,D3          ;at max?
2AF2| 6D06                           BLT.S   @4              ;skip if no
2AF4| 6100 FC16                     BSR     SQUAWK          ;else notify user
2AF8| 60CA                           BRA.S   READIN          ;and ignore input
2AFA|
2AFA| 5243                    @4      ADDQ    #1,D3           ;incr char count
2AFC| 6100 0088                     BSR     ENQKBD          ;queue it
2B00| 6100 0C38                     BSR     DSPVAL          ;and output it
2B04| 60BE                           BRA.S   READIN          ;and continue read
2B06|
2B06| 4E75                    @3      RTS
2B08|                         ;-------------------------------------------------------------------------
2B08|                         ;  SCROLL  - move contents of Service Window up one whole line.  Assumed
2B08|                         ;  that we are at bottom line when called. D6 (column) and D5 (row) are
2B08|                         ;  set to start of last line.
2B08|                         ;-------------------------------------------------------------------------
```

```
2B08|
2B08| 48E7 E080            SCROLL  MOVEM.L D0-D2/A0,-(SP)          ;save data regs and bfr ptr
2B0C| 7A48                        MOVEQ   #FIRSTROW+ROWLINES,D5   ;set beginning character row +1
2B0E| 7C18                        MOVEQ   #FIRSTCOL,D6            ; and beginning column
2B10| 6100 0C08                   BSR     SETCRSR                 ;get address of screen
2B14| 204E                        MOVE.L  A6,A0                   ;set as to ptr
2B16| D0FC 0384                   ADDA    #<RBYTES*10>,A0         ;set from ptr down one character row          RM000
2B1A| 343C 001B                   MOVE    #NROWS,D2               ;number of rows to move
2B1E|
2B1E| 323C 000A            @1      MOVE    #ROWLINES,D1    ;number of pixel lines per character row
2B22| 303C 0042            @2      MOVE    #ROWLEN,D0      ;length of a pixel line in window
2B26| 3CD8                 @3      MOVE    (A0)+,(A6)+     ;scroll it
2B28| 5540                        SUBQ    #2,D0           ;do entire pixel line
2B2A| 6EFA                        BGT.S   @3
2B2C|
2B2C| 5245                        ADDQ    #1,D5           ;bump to next row
2B2E| 7C18                 @4      MOVEQ   #FIRSTCOL,D6    ;set first col
2B30| 6100 0BE8                   BSR     SETCRSR         ;compute address
2B34| 204E                        MOVE.L  A6,A0           ;set as to ptr
2B36| D0FC 0384                   ADDA    #<RBYTES*10>,A0 ;set from ptr down one character row          RM000
2B3A| 5341                        SUBQ    #1,D1           ;do all pixel lines
2B3C| 66E4                        BNE.S   @2
2B3E|
2B3E| 5342                        SUBQ    #1,D2           ;finished a character row
2B40| 66DC                        BNE.S   @1              ; loop until done
2B42|
2B42| 3A3C 014C                   MOVE    #LASTROW,D5     ;peg at bottom
2B46| 3C3C 0018                   MOVE    #FIRSTCOL,D6
2B4A| 4CDF 0107                   MOVEM.L (SP)+,D0-D2/A0  ;restore data regs and bfr ptr
2B4E| 4E75                        RTS
2B50|
2B50|                            .PAGE
2B50|
2B50|                     ;  PUTLF - advance to next row; this may cause a scroll if at bottom
2B50|
2B50| 3A38 0300          PUTLF   MOVE    CRTROW,D5       ;get last state
2B54| 7C18                        MOVEQ   #FIRSTCOL,D6    ;update column to left edge of window
2B56| 0645 000A                   ADD     #ROWLINES,D5    ;bump row by number of pixel lines per row
2B5A| 0C45 014C                   CMPI    #LASTROW,D5
2B5E| 6F02                        BLE.S   @9              ;skip if its ok
2B60| 61A6                        BSR.S   SCROLL          ; else, do a scroll operation
2B62| 31C5 0300            @9      MOVE    D5,CRTROW       ;save updates
2B66| 31C6 0302                   MOVE    D6,CRTCOL
2B6A| 4E75                        RTS
2B6C|
2B6C|                     ;  PUTBS - move cursor left one position.
2B6C|                     ;  Assumes location MSGLEN = left most column for window.
```

```
2B6C|
2B6C| 5346                PUTBS   SUBQ    #1,D6
2B6E| BC78 052E                   CMP     MSGLEN,D6        ;stop at left edge
2B72| 6C04                       BGE.S   @9
2B74| 3C38 052E                   MOVE    MSGLEN,D6
2B78| 4E75                @9      RTS
2B7A|
2B7A|                     ;  Routine to erase data on screen
2B7A| 303C 0020           CLRIT   MOVE    #' ',D0          ; output a space
2B7E| 6100 0BBA                   BSR     DSPVAL
2B82| 5346                       SUBQ    #1,D6            ; reposition col ptr
2B84| 4E75                       RTS                      ; and that's all there is...
2B86|
2B86|                            .ENDC
2B86|                            .PAGE
2B86|                     ;-------------------------------------------------------------------------------
2B86|                     ;  Subroutine to save keyboard input in buffer - ignores data if buffer full.
2B86|                     ;-------------------------------------------------------------------------------
2B86|
2B86| 2F0A                ENQKBD  MOVE.L  A2,-(SP)         ;save working reg
2B88| 347C 0300                   MOVEA   #KBDEND,A2       ;get ptr to end of buffer              RM000
2B8C| B5C9                       CMPA.L  A1,A2            ; at end of buffer?
2B8E| 6702                       BEQ.S   @9               ; exit if yes
2B90| 12C0                       MOVE.B  D0,(A1)+         ; else do save
2B92| 245F                @9      MOVE.L  (SP)+,A2         ;restore
2B94| 4E75                       RTS
2B96|
2B96|                     ;-------------------------------------------------------------------------------
2B96|                     ;  This code gets the next byte from the keyboard queue and delivers it to
2B96|                     ;  caller in D0.
2B96|                     ;-------------------------------------------------------------------------------
2B96|
2B96| B3C8                GETCH   CMPA.L  A0,A1            ;check if any data
2B98| 6704                       BEQ.S   @1               ;exit if none
2B9A| 1018                       MOVE.B  (A0)+,D0         ;get data
2B9C| 6004                       BRA.S   @2
2B9E| 003C 0001           @1      ORI.B   #$01,CCR         ;set empty indicator
2BA2| 4E75                @2      RTS
2BA4|
2BA4|                            .PAGE
2BA4|                     ;-------------------------------------------------------------------------
2BA4|                     ;  Subroutine to get address parameter
2BA4|                     ;-------------------------------------------------------------------------
2BA4|
2BA4| 47FA 1415           GETA    LEA     ADDRMSG,A3       ;output prompt and get input
2BA8| 6100 FEE8                   BSR     PROMPT
2BAC| 7208                       MOVEQ   #8,D1            ;decode address (max of 8 digits)
```

```
2BAE| 6102                    BSR.S   GETPARM
2BB0| 4E75                    RTS
2BB2|
2BB2|                         .PAGE
2BB2|                    ;--------------------------------------------------------------------------
2BB2|                    ;  Subroutine to get input parameters.  Reads Ascii values from keyboard
2BB2|                    ;  buffer and calls conversion routine to return hex values.  Stops after
2BB2|                    ;  reading requested input or 'space' separator encountered.
2BB2|                    ;  Inputs:  D1 = max chars to read
2BB2|                    ;  Outputs: D2 = value read
2BB2|                    ;           D3 = # of chars read
2BB2|                    ;  Carry bit set if invalid chars.
2BB2|                    ;--------------------------------------------------------------------------
2BB2|
2BB2| 4283               GETPARM CLR.L   D3              ;use for counter
2BB4| 4282                       CLR.L   D2              ;use for result
2BB6|
2BB6| 61DE               READQ   BSR     GETCH           ;check input queue
2BB8| 652E                       BCS.S   GETEXIT         ;exit if no chars
2BBA| 0C00 0020                  CMPI.B  #' ',D0         ;space separator?
2BBE| 6604                       BNE.S   @3              ;if not, go response
2BC0| 4A20                       TST.B   -(A0)           ;replace on queue
2BC2| 6024                       BRA.S   GETEXIT         ;and exit
2BC4|
2BC4| 0C00 0030           @3      CMPI.B  #'0',D0         ;check if valid hex char
2BC8| 6D24                       BLT.S   INVPARM
2BCA| 0C00 0039                  CMPI.B  #'9',D0
2BCE| 630C                       BLS.S   OKCH            ;OK if 0-9
2BD0| 0C00 0041                  CMPI.B  #'A',D0         ; or A-F
2BD4| 6D18                       BLT.S   INVPARM
2BD6| 0C00 0046                  CMPI.B  #'F',D0
2BDA| 6E12                       BGT.S   INVPARM
2BDC|
2BDC| 6116               OKCH    BSR.S   CONVERT         ;convert to hex digit
2BDE| E98A                       LSL.L   #4,D2           ;save char
2BE0| 8400                       OR.B    D0,D2
2BE2| 5243                       ADDQ    #1,D3           ;bump counter
2BE4| B203                       CMP.B   D3,D1           ;at max?
2BE6| 66CE                       BNE.S   READQ           ;continue if no
2BE8|
2BE8| 023C 00FE           GETEXIT ANDI.B  #$FE,CCR        ;clear error indicator
2BEC| 6004                       BRA.S   GETXIT2         ;and exit
2BEE|
2BEE| 003C 0001           INVPARM ORI.B   #$01,CCR        ;set error indicator
2BF2|
2BF2| 4E75               GETXIT2 RTS
2BF4|
```

```
2BF4|                    ;-------------------------------------------------------------------------
2BF4|                    ;  Subroutine to convert Ascii character to hex.  Expects input in D0
2BF4|                    ;  and returns converted value in D0.
2BF4|                    ;-------------------------------------------------------------------------
2BF4|
2BF4| 0C00 0040          CONVERT CMP.B   #$40,D0         ;check if number or letter
2BF8| 6E06                       BGT.S   @1              ;skip if letter
2BFA| 0400 0030                  SUBI.B  #$30,D0         ;simple operation for number
2BFE| 6008                       BRA.S   @9
2C00|
2C00| 0400 0041          @1      SUBI.B  #$41,D0         ;a little different for letters
2C04| 0600 000A                  ADDI.B  #$0A,D0
2C08|
2C08| 4E75               @9      RTS
2C0A|
2C0A|                            .PAGE
2C0A|                            .IF  USERINT = 1
2C0A|                    ;-------------------------------------------------------------------------
2C0A|                    ;  Subroutine to write to dialog box
2C0A|                    ;-------------------------------------------------------------------------
2C0A|
2C0A|                    DBOXDSPLY
2C0A| 48E7 8600                  MOVEM.L D0/D5-D6,-(SP)  ;save D0 and current cursor ptrs
2C0E| 6100 05A2                  BSR     MAKEDBOX        ;clear dialog box and redraw
2C12| 3A3C 0018                  MOVE    #DBOXROW,D5     ;set box coordinates
2C16| 3C3C 0018                  MOVE    #DBOXCOL,D6
2C1A| 6100 0AFE                  BSR     SETCRSR         ;get address in A6
2C1E| 6100 0AE0                  BSR     DSPMSG          ;write msg
2C22| 4CDF 0061                  MOVEM.L (SP)+,D0/D5-D6  ;restore
2C26| 4E75                       RTS                     ;and exit
2C28|
2C28|                    ;-------------------------------------------------------------------------
2C28|                    ;  Subroutine to remove dialog box from screen
2C28|                    ;-------------------------------------------------------------------------
2C28|
2C28| 705A               CLRDBOX MOVEQ   #ROWBYTES,D0            ;set pixel line length                          RM000
2C2A| 3C7C 05FA                  MOVEA   #DESKLINE,A6            ;set starting point as bottom of menu line      RM000
2C2E| 4281                       CLR.L   D1
2C30| 2A4E                       MOVE.L  A6,A5                   ;set limit as bottom of dialog box
2C32| 223C 0000 0708             MOVE.L  #<DBOXHIGH*ROWBYTES>,D1 ; by adding box heigth to start pt
2C38| 0681 0000 0168             ADD.L   #DBOXTOP,D1
2C3E| DBC1                       ADDA.L  D1,A5
2C40| 6100 04AC                  BSR     GRAY                    ;redraw gray pattern
2C44| 4E75                       RTS
2C46|                    ;-------------------------------------------------------------------------
2C46|                    ;  GETINPUT routine - waits for inputs from mouse or keyboard and returns
2C46|                    ;  with keycode in D0 if keyboard input, or rectangle ID if active rect is
```

```
2C46|                     ;  selected with the mouse.  If CMD flag is set, keyboard input returned
2C46|                     ;  only when prefaced by the CMD key.
2C46|                     ;-------------------------------------------------------------------------------
2C46|
2C46|                     ;  State 1 - General wait
2C46|
2C46|                     GETINPUT
2C46| 0838 0003 02A2              BTST    #CMDFLG,STATFLGS ;command key still down?
2C4C| 666C                        BNE.S   GET2             ;skip if yes
2C4E| 6100 00E8           GET1    BSR     WT4INPUT        ;else go wait for COPS input
2C52|                     CHKIT
2C52| 0C00 0006                  CMP.B   #MOUSUP,D0       ;mouse button up?
2C56| 6608                        BNE.S   @1
2C58| 08B8 0004 02A2              BCLR    #MOUSE,STATFLGS ;clear mouse flag
2C5E| 60EE                        BRA.S   GET1             ;and go wait for more input
2C60|
2C60| 0C00 0086           @1      CMP.B   #MOUSDWN,D0      ;mouse button down?
2C64| 6608                        BNE.S   @2
2C66| 08F8 0004 02A2              BSET    #MOUSE,STATFLGS ;set reminder flag
2C6C| 6014                        BRA.S   @3
2C6E|
2C6E| 4A00                 @2      TST.B   D0               ;mouse data?
2C70| 661A                        BNE.S   @5               ;skip if not
2C72| 6100 0376                  BSR     CursorHide       ;else clear old cursor
2C76| 6100 0396                  BSR     CursorDisplay    ;and redisplay cursor in new position
2C7A|
2C7A| 0838 0004 02A2              BTST    #MOUSE,STATFLGS ;is mouse button down?
2C80| 67CC                        BEQ.S   GET1             ;skip if not
2C82|
2C82| 6100 01C2           @3      BSR     CHKPOSN          ;else go check mouse position
2C86| 67C6                        BEQ.S   GET1             ;continue if not over a rect
2C88| 6000 0082                  BRA     GET3             ;else go to state 3
2C8C|
2C8C| 0C00 00FF           @5      CMP.B   #CmdDwn,D0       ;command key down?
2C90| 6608                        BNE.S   @6
2C92| 08F8 0003 02A2              BSET    #CMDFLG,STATFLGS ;set flag if yes
2C98| 6020                        BRA.S   GET2             ;and go to state 2
2C9A|
2C9A| 0C00 007F           @6      CMP.B   #CmdUp,D0        ;command key up?
2C9E| 6608                        BNE.S   @4
2CA0| 08B8 0003 02A2              BCLR    #CMDFLG,STATFLGS ;clear flag if yes
2CA6| 60A6                        BRA.S   GET1             ;and continue in loop
2CA8| 0838 0005 02A2        @4      BTST    #CHKCMD,STATFLGS ;CMD key prefix required?
2CAE| 669E                        BNE.S   GET1             ;loop if yes
2CB0| 4A00                 @7      TST.B   D0               ;else check if downstroke
2CB2| 6A92                        BPL.S   GETINPUT         ;skip upstrokes
2CB4| 6100 01EC                  BSR     CHKINPUT         ;go check if rectangle selected
```

```
2CB8| 4E75                        RTS                     ;and return with keycode
2CBA|
2CBA|                      ;  State 2 - Command (apple) button down
2CBA|
2CBA|                      GET2
2CBA| 6100 007C            WAIT2   BSR     WT4INPUT        ;else go wait for COPS input
2CBE|
2CBE| 0C00 007F            CHKIT2  CMP.B   #CMDUP,D0       ;command key up?
2CC2| 6608                        BNE.S   @2              ;skip if not
2CC4| 08B8 0003 02A2              BCLR    #CMDFLG,STATFLGS ;else clear flag
2CCA| 6082                        BRA.S   GET1            ;and return to state 1
2CCC|
2CCC| 0C00 0006            @2      CMP.B   #MOUSUP,D0      ;mouse button up?
2CD0| 6608                        BNE.S   @3
2CD2| 08B8 0004 02A2              BCLR    #MOUSE,STATFLGS ;clear mouse flag
2CD8| 60E0                        BRA.S   GET2            ;and go wait for more input
2CDA|
2CDA| 0C00 0086            @3      CMP.B   #MOUSDWN,D0     ;mouse button down?
2CDE| 6608                        BNE.S   @4
2CE0| 08F8 0004 02A2              BSET    #MOUSE,STATFLGS ;set reminder flag
2CE6| 6014                        BRA.S   @5
2CE8|
2CE8| 4A00                  @4      TST.B   D0              ;mouse data?
2CEA| 6618                        BNE.S   @6
2CEC| 6100 02FC                   BSR     CursorHide      ;else clear old cursor
2CF0| 6100 031C                   BSR     CursorDisplay   ;and redisplay cursor in new position
2CF4|
2CF4| 0838 0004 02A2              BTST    #MOUSE,STATFLGS ;is mouse button down?
2CFA| 67BE                        BEQ.S   GET2            ;skip if not
2CFC|
2CFC| 6100 0148            @5      BSR     CHKPOSN         ;else go check mouse position
2D00| 67B8                        BEQ.S   GET2            ;continue if not over a rect
2D02| 6008                        BRA.S   GET3            ;else go to state 3
2D04|
2D04| 6AB4                  @6      BPL.S   WAIT2           ;ignore upstrokes
2D06| 6100 019A                   BSR     CHKINPUT        ;go check if rectangle selected
2D0A| 4E75                        RTS                     ;and return with keycode
2D0C|
2D0C|                      ;  State 3 - Mouse button down and over an active rectangle
2D0C|
2D0C| 3200                  GET3    MOVE    D0,D1           ;save rectangle ID
2D0E| 6100 0028            WAIT3   BSR     WT4INPUT        ;go wait for input
2D12|
2D12| 0C00 0006                   CMP.B   #MOUSUP,D0      ;mouse button up?
2D16| 660A                        BNE.S   @1              ;skip if not
2D18| 08B8 0004 02A2              BCLR    #MOUSE,STATFLGS ;clear indicator
2D1E| 3001                        MOVE    D1,D0           ;restore rectangle ID
```

```
2D20| 4E75                    RTS                     ;and go analyze input
2D22|
2D22| 4A00              @1    TST.B   D0              ;mouse data?
2D24| 66E8                    BNE.S   WAIT3           ;continue wait if not - ignore keyboard input
2D26|
2D26| 6100 02C2        @2    BSR     CursorHide      ;move cursor to new position
2D2A| 6100 02E2              BSR     CursorDisplay
2D2E| 6100 0116              BSR     CHKPOSN         ;check if over a rect
2D32| 66D8                    BNE.S   GET3            ;stay in this state if yes
2D34| 6000 FF10              BRA     GETINPUT        ;else return to state 1
2D38|
2D38|                    ;---------------------------------------------------------------------
2D38|                    ;  WT4INPUT
2D38|                    ;
2D38|                    ;       Routine to wait for input from COPS.  Returns with keycode in D0
2D38|                    ;       or sets D0 = 0 if mouse data received.
2D38|                    ;
2D38|                    ;---------------------------------------------------------------------
2D38|
2D38|                    WT4INPUT
2D38|
2D38|                    ;  State 0 - general wait
2D38|
2D38| 6100 0084          COPS0   BSR     ReadCOPS        ;get input from COPS
2D3C| 4A00                    TST.B   D0              ;mouse data?
2D3E| 6708                    BEQ.S   COPS1           ;go to state 1 if yes
2D40| 0C00 0080              CMP.B   #RSTCODE,D0     ;reset code?
2D44| 6716                    BEQ.S   COPS2           ;skip to state 2 if yes
2D46| 4E75                    RTS                     ;else return with the keycode
2D48|
2D48|                    ;  State 1 - waiting for mouse data
2D48| 6174               COPS1   BSR.S   ReadCOPS        ;get COPS input
2D4A| 11C0 048A                MOVE.B  D0,MousDx       ;save mouse delta-x
2D4E| 616E                    BSR.S   ReadCOPS        ;read and
2D50| 11C0 048B                MOVE.B  D0,MousDy       ;save mouse delta-y
2D54| 6100 01D4              BSR     MouseMovement   ;record the mouse movement
2D58| 4240                    CLR     D0              ;set mouse flag
2D5A| 4E75                    RTS                     ;and exit
2D5C|
2D5C|                    ;  State 2 - waiting for reset code
2D5C|
2D5C| 6160               COPS2   BSR.S   ReadCOPS        ;get COPS input
2D5E| 0C00 00DF                CMP.B   #$DF,D0         ;reset code <= $DF?
2D62| 6318                    BLS.S   @1              ;branch if yes
2D64| 0C00 00EF                CMP.B   #$EF,D0         ;reset code <= $EF?
2D68| 6318                    BLS.S   @2              ;skip if yes
2D6A| 0C00 00FB                CMP.B   #$FB,D0         ;reset code <= $FB
```

```
2D6E| 6500 0018                    BLO.S   @3              ;branch if < $FB
2D72| 6716                         BEQ.S   @4              ;branch if = $FB
2D74| 0C00 00FD                    CMP.B   #$FD,D0         ;reset code <= $FD?
2D78| 630E                         BLS.S   @3              ;branch if <= $FD
2D7A| 6010                         BRA.S   @5              ;branch if > $FD
2D7C|
2D7C|                      ;  $00 - $DF    Keyboard ID number - save and return to state 0
2D7C| 11C0 01B2            @1      MOVE.B  D0,KeyID        ;save new ID
2D80| 60B6                         BRA.S   COPS0           ;return to general wait
2D82|
2D82|                      ;  $E0 - $EF    Clock data - save first nibble, and go to state 4
2D82|
2D82| 11C0 0480            @2      MOVE.B  D0,ClockBytes   ;save it
2D86| 6016                         BRA.S   COPS4           ;and go get rest of data
2D88|
2D88|                      ;  $F0 - $FA    Reserved --- ignored
2D88|                      ;  $FC - $FD    Clock timer interrupt, keyboard unplugged --- ignored
2D88|
2D88| 60AE                @3      BRA.S   COPS0           ;go back to general wait
2D8A|
2D8A|                      ;  $FB          Soft on/off button - go to power-off routine
2D8A|
2D8A| 604C                @4      BRA.S   PowerOff        ;go shutdown the system
2D8C|
2D8C|                      ;  $FE - $FF    COPS failure codes - go to error routine
2D8C| 0C00 00FE            @5      CMP.B   #$FE,D0         ;I/O board COPS?
2D90| 6604                         BNE.S   @6
2D92| 7034                         MOVEQ   #EIOCOP,D0      ;else set I/O COPS error code
2D94| 6002                         BRA.S   @7
2D96| 7035                @6      MOVEQ   #EKBDCOP,D0     ;set keyboard COPS error code
2D98| 003C 0001            @7      ORI.B   #$01,CCR        ;set return error indicator
2D9C| 4E75                         RTS
2D9E|
2D9E|                      ;  State 4 - waiting for clock data; use timeout routine to guard against error
2D9E|
2D9E| 48E7 60E0            COPS4   MOVEM.L D1-D2/A0-A2,-(SP) ;save regs
2DA2| 43F8 0481                    LEA     ClockBytes+1,A1 ;set ptrs to save area
2DA6| 45F8 0486                    LEA     ClockBytes+6,A2
2DAA| 7205                         MOVEQ   #5,D1           ;5 more bytes expected
2DAC| 6100 DCD0            @1      BSR     GETDATA         ;get COPS data
2DB0| 6504                         BCS.S   @2              ;skip if any errors
2DB2| 5341                         SUBQ    #1,D1           ;loop until done
2DB4| 66F6                         BNE.S   @1
2DB6|
2DB6| 4CDF 0706            @2      MOVEM.L (SP)+,D1-D2/A0-A2 ;restore regs and
2DBA| 6000 FF7C                    BRA.S   COPS0           ;go back to general wait
2DBE|
```

```
2DBE|                           .ENDC           ;{USERINT}
2DBE|
2DBE|                       ;-------------------------------------------------------------------------
2DBE|                       ;  ReadCOPS
2DBE|                       ;
2DBE|                       ;       Routine to get data from COPS. Returns with data in D0.
2DBE|                       ;
2DBE|                       ;-------------------------------------------------------------------------
2DBE|
2DBE|                       ReadCOPS
2DBE| 2F08                          MOVE.L  A0,-(SP)
2DC0| 207C 00FC DD81               MOVE.L  #VIA1BASE,A0    ;get interface ptr
2DC6| 1028 001A              @1       MOVE.B  IFR1(A0),D0     ;poll for data
2DCA| 0800 0001                       BTST    #1,D0
2DCE| 67F6                           BEQ.S   @1              ;loop until data received
2DD0| 1028 0002                       MOVE.B  ORA1(A0),D0     ;read
2DD4| 205F                           MOVE.L  (SP)+,A0        ;and return
2DD6| 4E75                           RTS
2DD8|
2DD8|                           .IF  USERINT = 1
2DD8|                       ;-------------------------------------------------------------------------
2DD8|                       ;  PowerOff - routine to shutdown the system
2DD8|                       ;-------------------------------------------------------------------------
2DD8|
2DD8|                       PowerOff
2DD8| 0807 0011                     BTST    #DISK,D7        ;disk controller error?                 CHG023
2DDC| 6622                          BNE.S   @9              ;skip if yes                            CHG023
2DDE| 207C 00FC C001                MOVE.L  #DISKMEM,A0     ;set ptr for shared memory
2DE4| 6144                          BSR.S   ENBLDRVS        ;enable both drives
2DE6| 4228 0004                     MOVE.B  #DRV1,DRV(A0)   ;eject diskette in drive 1
2DEA| 6100 F06A                     BSR     EJCTDSK
2DEE| 117C 0080 0004               MOVE.B  #DRV2,DRV(A0)   ;and drive 2
2DF4| 6100 F060                     BSR     EJCTDSK
2DF8|
2DF8| 10BC 0089                     MOVE.B  #DIE,(A0)       ;get Twiggy controller out of memory
2DFC| 6100 F006                     BSR     CMDCHK          ;wait until command taken
2E00|                        @9     BSR4    CONOFF          ;turn off contrast                      CHG003
2E00| 49FA 0006                  #       LEA     @1,A4
2E04| 6000 D9FA                  #       BRA     CONOFF
2E08|                        #@1
2E08| 203C 0003 D090               MOVE.L  #ONESEC,D0      ;wait for it to happen                  CHG003
2E0E| 6100 DCD2                     BSR     DELAY           ;                                       CHG003
2E12| 7021                          MOVEQ   #$21,D0         ;power off, timer off, clock on         RM000
2E14| 6100 DB40                     BSR     COPSCMD         ;go do it
2E18| 6100 DCC2                     BSR     KBDDELAY        ;wait about 1.7 secs for power-off
2E1C|
2E1C| 6100 F8EE                     BSR     SQUAWK          ;error if still on
```

```
2E20| 45FA 0B29                    LEA     IOBRD,A2
2E24| 7034                        MOVEQ   #EIOCOP,D0      ;set error code
2E26| 6000 E798                    BRA     TSTXIT          ;display error and go back to level1 monitor
2E2A|
2E2A|                         ;-------------------------------------------------------------------------
2E2A|                         ;  Subroutine to enable drives
2E2A|                         ;-------------------------------------------------------------------------
2E2A|
2E2A|                         ENBLDRVS
2E2A| 117C 0088 0002                MOVE.B  #$88,CMD(A0)    ;enable both drives
2E30| 10BC 0086                    MOVE.B  #ENBLINT,(A0)
2E34| 6100 EFCE                    BSR     CMDCHK
2E38| 267C 00FC DD81                MOVE.L  #VIA1BASE,A3    ;and enable FDIR
2E3E| 08AB 0004 0004              BCLR    #FDIR,DDRB1(A3)
2E44| 4E75                        RTS
2E46|
2E46|                         ;-------------------------------------------------------------------------
2E46|                         ;  CHKPOSN
2E46|                         ;
2E46|                         ;  Routine to check mouse position versus active rectangle table.
2E46|                         ;  If over a rectangle, inverts it and returns with its ID.
2E46|                         ;  If not over a rectangle, ensures all rectangles not inverted, and
2E46|                         ;  returns with D0 = 0.
2E46|                         ;
2E46|                         ;  Active rectangle table has following format:
2E46|                         ;
2E46|                         ;       Word 1 : number of entries in table
2E46|                         ;       Word 2 : ID for first entry, MSB = 1 if inverted on screen
2E46|                         ;       Next 4 words contain X,Y pixel coordinates for upper left
2E46|                         ;        and bottom right corners
2E46|                         ;       Each successive entry follows same format, with 5 words per entry
2E46|                         ;
2E46|                         ;       Register usage:
2E46|                         ;               A0 = ptr to rectangle table
2E46|                         ;               D0 = # of entries in table
2E46|                         ;               D1 = ID for current entry
2E46|                         ;               D2 = X-coordinate for upper left
2E46|                         ;               D3 = Y-coordinate for upper left
2E46|                         ;               D4 = X-coordinate for bottom right
2E46|                         ;               D5 = Y-coordinate for bottom right
2E46|                         ;               D6 = X-coordinate for current cursor location
2E46|                         ;               D7 = Y-coordinate for current cursor location
2E46|                         ;
2E46|                         ;       On exit, D0 = ID code of rectangle cursor is over or
2E46|                         ;                   = 0 if not over any rectangle
2E46|                         ;
2E46|                         ;-------------------------------------------------------------------------
```

```
2E46|
2E46| 48E7 7F80            CHKPOSN MOVEM.L D1-D7/A0,-(SP)
2E4A| 3C38 0496                    MOVE    CrsrX,D6        ;get current cursor location
2E4E| 3E38 0498                    MOVE    CrsrY,D7
2E52| 41F8 053A                    LEA     RectTable,A0    ;set ptr to table
2E56| 3018                        MOVE    (A0)+,D0        ;get count
2E58| 6742                        BEQ.S   CHKPXIT         ;exit if 0
2E5A| 4C98 003E            GETNTRY MOVEM   (A0)+,D1-D5     ;else get entry (5 words)
2E5E|
2E5E|                      ;  check if cursor over rectangle
2E5E|
2E5E| BC42                        CMP     D2,D6           ;CrsrX < upper left X?
2E60| 6D0E                        BLT.S   @1              ;branch if cursor to left of rectangle
2E62| BC44                        CMP     D4,D6           ;CrsrX > bottom right X?
2E64| 6E0A                        BGT.S   @1              ;branch if cursor to right of rectangle
2E66| BE43                        CMP     D3,D7           ;CrsrY < upper left Y?
2E68| 6D06                        BLT.S   @1              ;branch if cursor above rectangle
2E6A| BE45                        CMP     D5,D7           ;CrsrY > bottom right Y?
2E6C| 6E02                        BGT.S   @1              ;branch if cursor below rectangle
2E6E| 600E                        BRA.S   @3              ;cursor over this entry - go invert it
2E70|
2E70|                      ;  not over this entry - check if inverted, then continue through table
2E70| 4A41                 @1     TST     D1              ;entry inverted?
2E74| 6100 004C                    BSR     INVERT          ;else go reinvert
2E78| 5340                 @2     SUBQ    #1,D0           ;decrement entry count
2E7A| 66DE                        BNE.S   GETNTRY         ;check next entry if not done
2E7C| 601E                        BRA.S   CHKPXIT         ;else exit with D0 = 0
2E7E|
2E7E|                      ;  over the rectangle - if not already, invert it and data saved
2E7E|
2E7E| 4A41                 @3     TST     D1              ;already inverted?
2E80| 6B18                        BMI.S   @6              ;exit if yes
2E82| 6100 003E                    BSR     INVERT          ;go invert rectangle
2E86|
2E86|                      ;  check if any other entries previously inverted
2E86|
2E86| 5340                 @4     SUBQ    #1,D0           ;done?
2E88| 6710                        BEQ.S   @6              ;skip if yes
2E8A| 4A58                        TST     (A0)+           ;else check next entry
2E8C| 6B04                        BMI.S   @5              ;skip if inverted
2E8E| 5048                        ADDQ    #8,A0           ;else bump to next entry
2E90| 60F4                        BRA.S   @4              ;and continue loop
2E92|
2E92| 4C98 003C            @5     MOVEM   (A0)+,D2-D5     ;get coordinates
2E96| 6100 002A                    BSR     INVERT          ;and go reinvert and then exit
2E9A|                                                      ;since at most one rect inverted
2E9A|
```

```
2E9A| 3001                @6      MOVE    D1,D0           ;set return code
2E9C|
2E9C| 4CDF 01FE           CHKPXIT MOVEM.L (SP)+,D1-D7/A0
2EA0| 4E75                        RTS                     ;and exit
2EA2|
2EA2|                     ;-------------------------------------------------------------------------
2EA2|                     ;  CHKINPUT
2EA2|                     ;
2EA2|                     ;  Routine to check keyboard input versus active rectangle table.
2EA2|                     ;  If rectangle selected, inverts it and returns.
2EA2|                     ;
2EA2|                     ;  Active rectangle table has following format:
2EA2|                     ;
2EA2|                     ;       Word 1 : number of entries in table
2EA2|                     ;       Word 2 : ID for first entry, MSB = 1 if inverted on screen
2EA2|                     ;       Next 4 words contain X,Y pixel coordinates for upper left
2EA2|                     ;        and bottom right corners
2EA2|                     ;       Each successive entry follows same format, with 5 words per entry
2EA2|                     ;
2EA2|                     ;       Register usage:
2EA2|                     ;               A0 = ptr to rectangle table
2EA2|                     ;               D0 = keyboard input
2EA2|                     ;               D1 = ID for current entry
2EA2|                     ;               D2 = X-coordinate for upper left
2EA2|                     ;               D3 = Y-coordinate for upper left
2EA2|                     ;               D4 = X-coordinate for bottom right
2EA2|                     ;               D5 = Y-coordinate for bottom right
2EA2|                     ;               D6 = # of entries in table
2EA2|                     ;
2EA2|                     ;-------------------------------------------------------------------------
2EA2|
2EA2|                     CHKINPUT
2EA2| 48E7 7E80                MOVEM.L D1-D6/A0,-(SP)
2EA6| 41F8 053A                LEA     RectTable,A0    ;set ptr to table
2EAA| 3C18                      MOVE    (A0)+,D6        ;get count
2EAC| 4C98 003E           RDENTRY MOVEM   (A0)+,D1-D5     ;get entry (5 words)
2EB0| B200                      CMP.B   D0,D1           ;match with keyboard input?
2EB2| 6706                      BEQ.S   @1              ;skip if yes
2EB4| 5346                      SUBQ    #1,D6           ;else loop thru all entries
2EB6| 66F4                      BNE.S   RDENTRY
2EB8| 6002                      BRA.S   @2              ;skip to exit
2EBA|
2EBA| 6106                @1      BSR.S   INVERT          ;go invert rectangle
2EBC|
2EBC| 4CDF 017E           @2      MOVEM.L (SP)+,D1-D6/A0  ;restore regs
2EC0| 4E75                        RTS                     ;and return
2EC2|                     ;-------------------------------------------------------------------------
```

```
2EC2|                       ;  INVERT
2EC2|                       ;
2EC2|                       ;  Routine to invert buttons, menu or icon.  Computes upper left address,
2EC2|                       ;  width and heigth of rectangle, then calls INVERSE and other routines
2EC2|                       ;  as needed.
2EC2|                       ;
2EC2|                       ;  Register inputs: D2 = upper left X-coordinate
2EC2|                       ;                   D3 = upper left Y-coordinate
2EC2|                       ;                   D4 = bottom right X-coordinate
2EC2|                       ;                   D5 = bottom right Y-coordinate
2EC2|                       ;                   A0 = ptr to start of next entry in rectangle table
2EC2|                       ;
2EC2|                       ;-------------------------------------------------------------------------------
2EC2|
2EC2| 48E7 F840             INVERT  MOVEM.L D0-D4/A1,-(SP)
2EC6|
2EC6| 6100 0122                     BSR     CursorHide      ;remove cursor
2ECA|
2ECA| 0868 0007 FFF6               BCHG    #7,-10(A0)      ;flip the invert bit indicator for entry
2ED0|
2ED0| 3004                         MOVE    D4,D0           ;compute width
2ED2| 9042                         SUB     D2,D0
2ED4| 80FC 0008                     DIVU    #8,D0           ;convert to bytes
2ED8| 3205                         MOVE    D5,D1           ;compute height in pixel rows
2EDA| 9243                         SUB     D3,D1
2EDC| 5241                         ADDQ    #1,D1           ;bump by 1 to do bottom line also
2EDE|
2EDE| 93C9                         SUBA.L  A1,A1           ;use for upper left address
2EE0| E64A                         LSR     #3,D2           ;divide pixel column by 8 for bytes
2EE2| D2C2                         ADD     D2,A1           ;add to address
2EE4| 785A                         MOVEQ   #MaxX/8,D4      ;bytes per row on screen
2EE6| C6C4                         MULU    D4,D3           ; * pixel row
2EE8| D2C3                         ADD     D3,A1           ;address of upper left corner
2EEA|
2EEA| 0838 0007 02A2               BTST    #MENU,STATFLGS  ;doing menu item?
2EF0| 6706                         BEQ.S   @0              ;skip if not
2EF2| D2FC 005A                     ADDA    #ROWBYTES,A1    ;else add 1 scan line to avoid menu             RM000
2EF6|                                                       ; bar line inversion
2EF6| 5341                         SUBQ    #1,D1           ;and decr length to avoid inverting bottom line
2EF8|                                                       ; of menu box
2EF8|
2EF8| 74FF                   @0    MOVEQ   #-1,D2          ;set fill pattern
2EFA| 48E7 E040                     MOVEM.L D0-D2/A1,-(SP)  ;save args
2EFE| 6100 022E                     BSR     INVERSE         ;invert it
2F02|
2F02| 4CDF 0207                     MOVEM.L (SP)+,D0-D2/A1  ;restore args
2F06|
```

```
2F06| 0838 0006 02A2              BTST    #BTN,STATFLGS   ;doing buttons?
2F0C| 6706                       BEQ.S   @1              ;skip if not
2F0E| 6100 03E8                  BSR     DRAWBUTN        ;redraw button
2F12| 600C                       BRA.S   @9              ;and exit
2F14|
2F14| 0838 0007 02A2        @1    BTST    #MENU,STATFLGS  ;doing menu?
2F1A| 6704                       BEQ.S   @9              ;skip if not
2F1C| 6100 0424                  BSR     DRAWSIDES       ;just redraw sides
2F20|
2F20| 6100 00EC            @9    BSR     CursorDisplay   ;redisplay cursor
2F24|
2F24| 4CDF 021F                  MOVEM.L (SP)+,D0-D4/A1  ;restore regs
2F28| 4E75                       RTS                     ;and return
2F2A|
2F2A|                           .PAGE
2F2A|                   ;--------------------------------------------------------------------------
2F2A|                   ;
2F2A|                   ;   Hardware Interface for the Mouse
2F2A|                   ;
2F2A|                   ;   Written by Rick Meyers
2F2A|                   ;   (c) Apple Computer Incorporated, 1983
2F2A|                   ;
2F2A|                   ;   The routines below provide an assembly language interface to the mouse.
2F2A|                   ;   Input parameters are passed in registers, output parameters are returned
2F2A|                   ;   in registers.  Unless otherwise noted, all registers are preserved.
2F2A|                   ;
2F2A|                   ;   The Mouse
2F2A|                   ;
2F2A|                   ;   The mouse is a pointing device used to indicate screen locations.  Mouse
2F2A|                   ;   coordinates are located between pixels on the screen.  Therefore, the
2F2A|                   ;   X-coordinate can range from 0 to 720, and the Y-coordinate from 0 to 364.
2F2A|                   ;   The initial mouse location is 0,0.
2F2A|                   ;
2F2A|                   ;   Mouse Scaling
2F2A|                   ;
2F2A|                   ;   The relationship between physical mouse movements and logical mouse
2F2A|                   ;   movements is not necessary a fixed linear mapping.  Three alternatives
2F2A|                   ;   are available: 1) unscaled, 2) scaled for fine movement and 3) scaled
2F2A|                   ;   for coarse movement.
2F2A|                   ;
2F2A|                   ;   When mouse movement is unscaled, a horizontal mouse movement of x units
2F2A|                   ;   yields a change in the mouse X-coordinate of x pixels.  Similiarly, a
2F2A|                   ;   vertical movement of y units yields a change is the mouse Y-coordinate
2F2A|                   ;   of y pixels.  These rules apply independent of the speed of the mouse
2F2A|                   ;   movement.
2F2A|                   ;
2F2A|                   ;   When mouse movement is scaled, horizontal movements are magnified by 3/2
```

```
2F2A|                     ;   relative to vertical movements.  This is intended to compensate for the
2F2A|                     ;   2/3 aspect ratio of pixels on the screen.  When scaling is in effect, a
2F2A|                     ;   distinction is made between fine (small) movements and coarse (large)
2F2A|                     ;   movements.  Fine movements are slightly reduced, while coarse movements
2F2A|                     ;   are magnified. For scaled fine movements, a horizontal mouse movement of
2F2A|                     ;   x units yields a change in the X-coordinate of x pixels, but a vertical
2F2A|                     ;   movement of y units yields a change of (2/3)*y pixels.  For scaled coarse
2F2A|                     ;   movements, a horizontal movement a x units yields a change of (3/2)*x
2F2A|                     ;   pixels, while a vertical movements of y units yields a change of y pixels.
2F2A|                     ;
2F2A|                     ;   The distinction between fine movements and coarse movements is determined
2F2A|                     ;   by the sum of the x and y movements each time the mouse location is
2F2A|                     ;   updated.  If this sum is at or below the 'threshold', the movement is
2F2A|                     ;   considered to be a fine movement.  Values of the threshold range from 0
2F2A|                     ;   (which yields all coarse movements) to 256 (which yields all fine
2F2A|                     ;   movements).  Given the default mouse updating frequency, a threshold of
2F2A|                     ;   about 8 (threshold's initial setting) gives a comfortable transition between
2F2A|                     ;   fine and coarse movements.
2F2A|                     ;-------------------------------------------------------------------------------
2F2A|
2F2A|
2F2A|                     ;-------------------------------------------------------------------------
2F2A|                     ;
2F2A|                     ;   Mouse Movement
2F2A|                     ;
2F2A|                     ;   This routine is called by the GETINPUT routine when the COPS has
2F2A|                     ;   reported mouse movement.  All registers are preserved.
2F2A|                     ;
2F2A|                     ;
2F2A|                     ;   Register Assignments:
2F2A|                     ;
2F2A|                     ;       D0  --  Mouse X-Coordinate (integer)
2F2A|                     ;       D1  --  Mouse Y-Corrdinate (integer)
2F2A|                     ;       D2  --  Mouse Dx (integer)
2F2A|                     ;       D3  --  Mouse Dy (integer)
2F2A|                     ;
2F2A| 48E7 7C00          MouseMovement   MOVEM.L D1-D5,-(SP)         ; save registers
2F2E| 3038 0486                         MOVE.W  MousX,D0            ; mouse X-coordinate
2F32| 3238 0488                         MOVE.W  MousY,D1            ; mouse Y-coordinate
2F36| 1438 048A                         MOVE.B  MousDx,D2           ; mouse Dx (byte)
2F3A| 4882                              EXT.W   D2                  ; mouse Dx (integer)
2F3C| 1638 048B                         MOVE.B  MousDy,D3           ; mouse Dy (byte)
2F40| 4883                              EXT.W   D3                  ; mouse Dy (integer)
2F42|
2F42| 3802                  Scale       MOVE.W  D2,D4               ; mouse Dx
2F44| 6C02                              BGE.S   @1                  ; branch if >= 0
2F46| 4444                              NEG.W   D4                  ; ABS(mouse Dx)
```

```
2F48|
2F48| 3A03                @1          MOVE.W  D3,D5           ; mouse Dy
2F4A| 6C02                            BGE.S   @2              ; branch if >= 0
2F4C| 4445                            NEG.W   D5              ; ABS(mouse Dy)
2F4E|
2F4E| D845                @2          ADD.W   D5,D4           ; ABS(Dx) + ABS(Dy)
2F50| 9878 048E                       SUB.W   MousThresh,D4   ;  - MouseThreshold
2F54| 6E16                            BGT.S   Coarse          ; branch if coarse movement
2F56|
2F56| D042                Fine        ADD.W   D2,D0           ; new X-coordinate (scale 1)
2F58| 3403                            MOVE.W  D3,D2           ; save Dy
2F5A| D643                            ADD.W   D3,D3           ; Dy*2
2F5C| D643                            ADD.W   D3,D3           ; Dy*4
2F5E| D642                            ADD.W   D2,D3           ; Dy*5
2F60| 5443                            ADDQ    #2,D3           ; (Dy*5)+2
2F62| 6D02                            BLT.S   @3              ; branch if negative
2F64| 5643                            ADDQ    #3,D3           ; (Dy*5)+5
2F66| E643                @3          ASR.W   #3,D3           ; Dy*(5/8) with rounding
2F68| D243                            ADD.W   D3,D1           ; new Y-coordinate (scale 5/8)
2F6A| 6010                            BRA.S   Bounds          ; continue
2F6C|
2F6C| D243                Coarse      ADD.W   D3,D1           ; new Y-coordinate (scale 1)
2F6E| 3602                            MOVE.W  D2,D3           ; save Dx
2F70| D443                            ADD.W   D3,D2           ; Dx*2
2F72| D443                            ADD.W   D3,D2           ; Dx*3
2F74| 6D02                            BLT.S   @4              ; branch if negative
2F76| 5242                            ADDQ.W  #1,D2           ; (Dx*3)+1
2F78| E242                @4          ASR.W   #1,D2           ; Dx*(3/2) with rounding
2F7A| D042                            ADD.W   D2,D0           ; new X-coordinate (scale 3/2)
2F7C|
2F7C| 4A40                Bounds      TST.W   D0              ; new X-coordinate >= 0
2F7E| 6C02                            BGE.S   @5              ; branch if >= 0
2F80| 4240                            MOVE.W  #0,D0           ; minimum X of 0
2F82|
2F82| 0C40 02D0           @5          CMP.W   #MaxX,D0        ; new X-coordinate <= 720
2F86| 6F04                            BLE.S   @6              ; branch if <= 720
2F88| 303C 02D0                       MOVE.W  #MaxX,D0        ; maximum X of 720
2F8C|
2F8C| 4A41                @6          TST.W   D1              ; new Y-coordinate >= 0
2F8E| 6C02                            BGE.S   @7              ; branch if >= 0
2F90| 4241                            MOVE.W  #0,D1           ; minimum Y of 0
2F92|
2F92| 0C41 016C           @7          CMP.W   #MaxY,D1        ; new Y-coordinate <= 364
2F96| 6F04                            BLE.S   @8              ; branch if <= 364
2F98| 323C 016C                       MOVE.W  #MaxY,D1        ; maximum Y of 364
2F9C|
2F9C| 31C0 0486           @8          MOVE.W  D0,MousX        ; update Mouse X-coordinate
```

```
2FA0| 31C1 0488                          MOVE.W  D1,MousY            ; update Mouse Y-coordinate
2FA4| 31C0 0496                          MOVE.W  D0,CrsrX            ; also update cursor coordinates
2FA8| 31C1 0498                          MOVE.W  D1,CrsrY
2FAC| 4CDF 003E                          MOVEM.L (SP)+,D1-D5         ; restore registers
2FB0| 4E75                               RTS                         ; return
2FB2|
2FB2|                        ;-------------------------------------------------------------------------
2FB2|                        ;
2FB2|                        ;  Routine to initialize mouse handling
2FB2|                        ;
2FB2|                        ;-------------------------------------------------------------------------
2FB2|
2FB2|                        MousInit
2FB2| 31FC 0168 0486                     MOVE.W  #360,MousX          ; set inital mouse location
2FB8| 31FC 00B6 0488                     MOVE.W  #182,MousY          ;  to center of screen
2FBE| 31FC 0008 048E                     MOVE.W  #8,MousThresh       ; set scaling threshold
2FC4| 707C                               MOVEQ   #$7C,D0             ; and enable mouse data
2FC6| 6100 D98E                          BSR     COPSCMD
2FCA| 4E75                               RTS
2FCC|
2FCC|                        ;-------------------------------------------------------------------------
2FCC|                        ;
2FCC|                        ;   Hardware Interface for the Cursor
2FCC|                        ;
2FCC|                        ;   Written by Rick Meyers
2FCC|                        ;   (c) Apple Computer Incorporated, 1983
2FCC|                        ;
2FCC|                        ;
2FCC|                        ;   The routines below provide an assembly language interface to the cursor.
2FCC|                        ;   Input parameters are passed in registers, output parameters are returned
2FCC|                        ;   in registers.  Unless otherwise noted, all registers are preserved.
2FCC|                        ;
2FCC|                        ;   The Cursor
2FCC|                        ;
2FCC|                        ;   The cursor is a small image that is displayed on the screen.  It's shape
2FCC|                        ;   is specified by two bitmaps, called 'data' and 'mask'.  These bitmaps are
2FCC|                        ;   16 bits wide and from 0 to 32 bits high.  The rule used to combine the
2FCC|                        ;   bits already on the screen with the data and mask is
2FCC|                        ;
2FCC|                        ;       screen <- (screen and (not mask)) xor data.
2FCC|                        ;
2FCC|                        ;   The effect is that white areas of the screen are replaced with the cursor
2FCC|                        ;   data.  Black areas of the screen are replaced with (not mask) xor data.
2FCC|                        ;   If the data and mask bitmaps are identical, the effect is to 'or' the data
2FCC|                        ;   onto the screen.
2FCC|                        ;
2FCC|                        ;   The cursor has both a location and a hotspot.  The location is a position
```

```
2FCC|                     ;   on the screen, with X-coordinates of 0 to 720 and Y-coordinates of 0 to 364 .
2FCC|                     ;   The hotspot is a position within the cursor bitmaps, with X- and Y-coordi-
2FCC|                     ;   nates ranging from 0 to 16.  The cursor is displayed on the screen with it's
2FCC|                     ;   hotspot at location.  If the cursor's location is near an edge of the screen,
2FCC|                     ;   the cursor image may be partially or completely off the screen.
2FCC|                     ;
2FCC|                     ;-------------------------------------------------------------------------------
2FCC|                     ;
2FCC|                     ;   Routine:    CursorInit
2FCC|                     ;   Arguments:  None
2FCC|                     ;   Function:   Sets up the initial defaults used by the ROM cursor.  Initial
2FCC|                     ;               position is set for center of the screen.
2FCC|                     ;
2FCC|                     ;-------------------------------------------------------------------------------
2FCC|
2FCC| 4278 0490           CursorInit      MOVE.W  #0,CrsrHotX         ; cursor hotspot X-coordinate
2FD0| 4278 0492                           MOVE.W  #0,CrsrHotY         ; cursor hotspot Y-coordinate
2FD4| 31FC 0010 0494                      MOVE.W  #16,CrsrHeight      ; cursor hieght, 0-32
2FDA| 31FC 0168 0496                      MOVE.W  #360,CrsrX          ; initial cursor X-coordinate
2FE0| 31FC 00B6 0498                      MOVE.W  #182,CrsrY          ; initial cursor Y-coordinate
2FE6| 61CA                                BSR.S   MousInit            ; init mouse for cursor control
2FE8| 4E75                                RTS                         ; return
2FEA|
2FEA|                     ;-------------------------------------------------------------------------------
2FEA|                     ;
2FEA|                     ;   Cursor Hide and Display
2FEA|                     ;
2FEA|                     ;   Care must be taken when updating the screen image which is 'under' the
2FEA|                     ;   cursor.  The simplest approach is to remove the cursor from the screen
2FEA|                     ;   (hide), do the screen modification, then redisplay the cursor (display).
2FEA|                     ;   Each hide operation must be followed by a corresponding display
2FEA|                     ;   operation.  The operations are paired and can be nested.  The first of a
2FEA|                     ;   series of hides removes the cursor from the screen; it's corresponding
2FEA|                     ;   display redisplays the cursor.  Intervening operations have no apparent
2FEA|                     ;   effect.
2FEA|                     ;
2FEA|                     ;-------------------------------------------------------------------------------
2FEA|
2FEA|                     ;-------------------------------------------------------------------------------
2FEA|                     ;   Routine:    CursorHide
2FEA|                     ;   Arguments:  None
2FEA|                     ;   Function:   Remove the cursor from the screen.  Note that every call to
2FEA|                     ;               CursorHide must be followed by exactly one call to CursorDisplay.
2FEA|                     ;-------------------------------------------------------------------------------
2FEA|
2FEA| 48E7 C0C0           CursorHide      MOVEM.L D0-D1/A0-A1,-(SP)   ; save registers
2FEE| 41F8 04A2                           LEA     SavedData,A0        ; saved data address
```

```
2FF2| 2278 0528                        MOVE.L  SavedAddr,A1        ; saved data screen address
2FF6| 3038 0526                        MOVE.W  SavedRows,D0        ; rows of saved data
2FFA| 323C 005A                        MOVE.W  #MaxX/8,D1          ; bytes per row on screen
2FFE| 6004                             BRA.S   @2                  ; test of rows=0
3000|
3000| 2298                  @1        MOVE.L  (A0)+,(A1)          ; from saved to screen
3002| D2C1                             ADD.W   D1,A1               ; screen address of next row
3004| 51C8 FFFA             @2        DBF     D0,@1               ; loop 'SavedRows' times
3008|
3008| 4CDF 0303                       MOVEM.L (SP)+,D0-D1/A0-A1   ; restore registers
300C| 4E75                            RTS                         ; return
300E|
300E|                       ;-------------------------------------------------------------------------------
300E|                       ;
300E|                       ;   Routine:    CursorDisplay
300E|                       ;   Arguments:    none
300E|                       ;   Function:   Redisplay the cursor.  Note that every call to CursorDisplay
300E|                       ;               must be preceeded by exactly one call to CursorHide.
300E|                       ;
300E|                       ;   Register Assignments:
300E|                       ;
300E|                       ;       D0  --  saved data X-coordinate, cursor data
300E|                       ;       D1  --  saved data Y-coordinate, cursor mask
300E|                       ;       D2  --  left shift count
300E|                       ;       D3  --  32-bit mask
300E|                       ;       D4  --  rows of saved data
300E|                       ;       D5  --  bytes per row on screen
300E|                       ;
300E|                       ;       A0  --  saved data address
300E|                       ;       A1  --  saved data screen address
300E|                       ;       A2  --  cursor data address
300E|                       ;       A3  --  cursor mask address
300E|                       ;-------------------------------------------------------------------------------
300E|
300E| 48E7 FCF0             CursorDisplay   MOVEM.L D0-D5/A0-A3,-(SP)   ; save registers
3012|
3012| 41F8 04A2                       LEA     SavedData,A0        ; saved data address
3016| 2278 0110                       MOVE.L  ScrnBase,A1         ; screen memory address
301A| 45FA 0900                       LEA     CrsrData,A2         ; cursor data bitmap address
301E| 47FA 08FC                       LEA     CrsrMask,A3         ; cursor mask bitmap address
3022| 3038 0490                       MOVE.W  CrsrHotX,D0         ; cursor hotspot X-coordinate
3026| 3238 0492                       MOVE.W  CrsrHotY,D1         ; cursor hotspot Y-coordinate
302A| 3838 0494                       MOVE.W  CrsrHeight,D4       ; cursor height
302E|
302E|                       ;   Compute and bounds check the X-coordinate of the data under the cursor.
302E| 9078 0496             @11       SUB.W   CrsrX,D0            ;  cursor X-coordinate
3032| 4440                            NEG.W   D0                  ;  - cursor hotspot X-coordinate
```

```
3034| 3400                            MOVE.W  D0,D2               ; upper left X-coordinate
3036| 0242 000F                       AND.W   #$000F,D2           ; bit offset within word
303A| 4442                            NEG.W   D2                  ;  negated and converted to
303C| 0642 0010                       ADD.W   #16,D2              ;  left shift count
3040| 4283                            CLR.L   D3                  ; 32-bit mask                          RM000
3042| 4643                            NOT     D3                  ; D3 = $0000FFFF                       RM000
3044| E5AB                            LSL.L   D2,D3               ;  shifted into position
3046|
3046| 0240 FFF0                       AND.W   #$FFF0,D0           ; upper left X-coord rounded down
304A| 6C0A                            BGE.S   @0                  ; branch if >= 0
304C|
304C| 4240                            MOVE.W  #0,D0               ; minimum upper left X-coord of 0
304E| E18B                            LSL.L   #8,D3               ; adjust 32-bit mask
3050| E18B                            LSL.L   #8,D3               ; adjust 32-bit mask
3052| 0642 0010                       ADD.W   #16,D2              ; adjust left shift count
3056|
3056| 0C40 02B0             @0         CMP.W   #MaxX-32,D0         ; upper left X-coord <= 720-32
305A| 6F14                            BLE.S   @2                  ; branch if <= 720-32
305C|
305C| 0C40 02D0                       CMP.W   #MaxX,D0            ; cursor off right edge ?
3060| 6602                            BNE.S   @1                  ; branch if not off right edge
3062| 7600                            MOVEQ   #0,D3               ; mask off all bits
3064|
3064| 303C 02B0             @1         MOVE.W  #MaxX-32,D0         ; maximum X-coord of 720-32
3068| E08B                            LSR.L   #8,D3               ; adjust 32-bit mask
306A| E08B                            LSR.L   #8,D3               ; adjust 32-bit mask
306C| 0642 0010                       ADD.W   #16,D2              ; adjust left shift count
3070|
3070|                       ;   Compute and bounds check the Y-coordinate of the data under the cursor.
3070|
3070| 9278 0498             @2         SUB.W   CrsrY,D1            ; cursor Y-coordinate
3074| 4441                            NEG.W   D1                  ;  - cursor hotspot Y-coordinate
3076| 6C0C                            BGE.S   @3                  ; branch if upper left Y >= 0
3078|
3078| D841                            ADD.W   D1,D4               ; decrease rows of saved data
307A| D241                            ADD.W   D1,D1               ; double for byte count
307C| 94C1                            SUB.W   D1,A2               ; increase cursor data address
307E| 96C1                            SUB.W   D1,A3               ; increase cursor mask address
3080| 4241                            MOVE.W  #0,D1               ; minimum upper left Y of 0
3082| 6010                            BRA.S   @4                  ; continue
3084|
3084| 3A3C 016C             @3         MOVE.W  #MaxY,D5            ; maximum Y-coordinate
3088| 9A44                            SUB.W   D4,D5               ;  - cursor height
308A| B245                            CMP.W   D5,D1               ; cursor bottom <= 364-CrsrHeight ?
308C| 6F0C                            BLE.S   @5                  ; branch if <= 364-CrsrHeight
308E|
308E| 383C 016C                       MOVE.W  #MaxY,D4            ; last row on screen
```

```
3092| 9841                                SUB.W   D1,D4               ; adjust rows of saved data
3094|
3094| 4A44                  @4            TST.W   D4                  ; rows of saved data >= 0 ?
3096| 6C02                                BGE.S   @5                  ; branch if  >= 0
3098| 4244                                MOVE.W  #0,D4               ; minimum rows of saved data
309A|
309A| 31C0 0522              @5            MOVE.W  D0,SavedX           ; saved data X-coordinate
309E| 31C1 0524                            MOVE.W  D1,SavedY           ; saved data Y-coordinate
30A2| 31C4 0526                            MOVE.W  D4,SavedRows        ; rows of saved data
30A6|
30A6|                       ;   Display the cursor on the screen.
30A6|
30A6| E648                                LSR.W   #3,D0               ; convert X-coord to bytes
30A8| D2C0                                ADD.W   D0,A1               ;  and add to screen address
30AA| 7A5A                                MOVEQ   #MaxX/8,D5          ; bytes per row on screen
30AC| C2C5                                MULU    D5,D1               ;  * Y-coord
30AE| D3C1                                ADD.L   D1,A1               ;  added to screen address
30B0| 21C9 0528                          MOVE.L  A1,SavedAddr        ; saved data screen address
30B4| 6016                                BRA.S   @7                  ; test for rows=0
30B6|
30B6| 301A                   @6           MOVE.W  (A2)+,D0            ; cursor data
30B8| E5B8                                ROL.L   D2,D0               ; shift to proper bit position
30BA| C083                                AND.L   D3,D0               ; eliminate unwanted bits
30BC| 321B                                MOVE.W  (A3)+,D1            ; cursor mask
30BE| E5B9                                ROL.L   D2,D1               ; shift to proper bit position
30C0| C283                                AND.L   D3,D1               ; eliminate unwanted bits
30C2| 4681                                NOT.L   D1                  ; invert cursor mask
30C4|
30C4| 20D1                                MOVE.L  (A1),(A0)+          ; from screen to saved data
30C6| C391                                AND.L   D1,(A1)             ; screen and (not mask)
30C8| B191                                EOR.L   D0,(A1)             ;  xor cursor data
30CA| D2C5                                ADD.W   D5,A1               ; screen address of next row
30CC| 51CC FFE8              @7            DBF     D4,@6               ; loop 'SavedRows' times
30D0|
30D0| 4CDF 0F3F                          MOVEM.L (SP)+,D0-D5/A0-A3   ; restore registers
30D4| 4E75                                RTS                         ; return
30D6|
30D6|                                 .ENDC                   ;{USERINT}
30D6|                                 .IF  AAPL = 1
30D6|                                 .ENDC                   ;{USERINT}
30D6|                                 .IF  AAPL = 1
30D6|                                 .ENDC
30D6|                                 .ENDC                   ;{ROM4K}
30D6|
30D6|
30D6|                                 .INCLUDE RM248.G.TEXT
30D6|
```

```
30D6|                           .PAGE
30D6|                           .IF     EXTERNAL = 1
30D6|                           .IF  USERINT = 1
30D6|                         ;*********************************
30D6|                         ;  Mini-Graphics Package          *
30D6|                         ;  Contributed by Mike Urquhart   *
30D6|                         ;  Copyright 1983, 1984 Apple     *
30D6|                         ;*********************************
30D6|
30D6|                         ;_____________________________________________________________________
30D6|                         ;
30D6|                         ;       DRAWDESK:
30D6|                         ;
30D6|                         ;               this routine performs the following sequences:
30D6|                         ;
30D6|                         ;               1.      clears the screen to a white background.
30D6|                         ;               2.      makes a menu bar by drawing a single pixel horizontal
30D6|                         ;                       line across the screen.
30D6|                         ;               3.      fills the screen area below the menu bar with the stantard
30D6|                         ;                       gray shade.
30D6|                         ;
30D6|                         ;               Also has an entry point called CLRDESK that only does item (3).
30D6|                         ;
30D6|                         ;   Destroys regs D0-D2,A1,A5-A6
30D6|                         ;_____________________________________________________________________
30D6|
30D6|
30D6|                         ;
30D6|                         ;       1.      clear screen to white background
30D6|                         DRAWDESK
30D6| 4282                            clr.l   d2
30D8| 612E                            bsr.s   whiten
30DA|                         ;
30DA|                         ;       2.      make menu bar border
30DA|
30DA| 705A                    CLRDESK moveq   #ROWBYTES,d0    ;set length of line = 90 bytes
30DC| 74FF                            moveq   #-1,d2          ;draw a black pattern
30DE| 327C 05A0                       move.w  #MENULINE,A1    ;start at offset 1440 address
30E2| 7201                            moveq   #1,d1           ;draw only 1 pixel line
30E4| 6142                            bsr.s   paint_box
30E6|
30E6|                         ;
30E6|                         ;       set a6 to starting pixel address for grey routine below
30E6|                         ;       set a5 to limit
30E6|                         ;
30E6| 3C7C 05FA                       move    #DESKLINE,a6
30EA| 3A7C 7FF8                       move    #DESKLMT,a5     ;set limit
```

```
30EE|
30EE|                       ;
30EE|                       ;       3.      make the grey background: to make the gray background, alternating
30EE|                       ;               rows of $5555 and $AAAA starting with $AAAA are written to the
30EE|                       ;               screen area.
30EE|                       ;
30EE|
30EE| 243C AAAA 5555        gray    MOVE.L  #DESKPATRN,D2   ;set up grey pattern
30F4|
30F4| 4842                  gray1   swap    d2              ;start with the $AAAA pattern
30F6| 7201                          moveq   #1,d1           ;draw a one pixel high line
30F8| 224E                          move.l  a6,a1           ;starting pixel address must be in a1 for call
30FA| 6100 002C                    bsr     paint_box
30FE|
30FE| DCC0                  @1      add     d0,a6           ;bump to next pixel line
3100| BCCD                          cmp.w   a5,a6           ;is a6 less then max?
3102| 6DF0                          blt.s   gray1                 ;loop if yes
3104| 4E75                          rts                           ;else done
3106|
3106|                       ;_____________________________________________________________________
3106|                       ;
3106|                       ;       subroutine blacken and whiten: clears full screen to black or white
3106|                       ;
3106|                       ;       Calls:  bsr     blacken         (no parameters)
3106|                       ;
3106|                       ;               clr.l   d2
3106|                       ;               bsr     whiten
3106|                       ;
3106|                       ;       registers used:   d2.l - contains either FFFFFFFF or 0 on return
3106|                       ;                         d0.b - destroyed but contains $5A (90) on return
3106|                       ;                         d1.w - destroyed-->should contain 0 on return
3106|                       ;                         a1.l - destroyed
3106|                       ;
3106|                       ;
3106|                       ;       This routine calls paint_box, so other registers may be destroyed.
3106|                       ;
3106|                       ;
3106|                       ;_____________________________________________________________________
3106|
3106|                       BLACKEN
3106| 74FF                          moveq   #-1,d2                  ;black fill pattern
3108|
3108|                       whiten
3108| 323C 016B                     move.w  #MaxY-1,d1              ;number of pixels in screen box heigth
310C| 705A                          moveq   #ROWBYTES,d0            ;length of screen box is 90 bytes
310E| 93C9                          suba.l  A1,A1                   ;clear A1
3110| 6116                          bsr.s   paint_box
```

```
3112| 4E75                        rts
3114|
3114|                     ;---------------------------------------------------------------------
3114|                     ;  Subroutine to clear only menu bar on desktop
3114|                     ;  Inputs:
3114|                     ;       None
3114|                     ;  Outputs:
3114|                     ;       None
3114|                     ;  Side Effects:
3114|                     ;       None
3114|                     ;---------------------------------------------------------------------
3114|
3114| 48E7 E040           CLRMENU MOVEM.L D0-D2/A1,-(SP)  ;save regs
3118| 705A                        MOVEQ   #ROWBYTES,D0    ;width of menu bar is 90 bytes
311A| 7210                        MOVEQ   #MBARLEN,D1     ;heigth is 15 pixels
311C| 7400                        MOVEQ   #0,D2           ;set fill pattern
311E| 93C9                        SUBA.L  A1,A1           ;upper left corner is at offset 0
3120| 6106                        BSR.S   PAINT_BOX       ;go do it
3122| 4CDF 0207                   MOVEM.L (SP)+,D0-D2/A1  ;restore and
3126| 4E75                        RTS                     ; exit
3128|
3128|                     ;_____________________________________________________________________________
3128|                     ;
3128|                     ;       Routine paint_box
3128|                     ;
3128|                     ;       Call:       BSR   paint_box
3128|                     ;                 or
3128|                     ;                   BSR   paintb2
3128|                     ;
3128|                     ;       register setup:
3128|                     ;
3128|                     ;       D2 must contain a one word fill pattern.
3128|                     ;       D0 must contain the width of the box(horizontally) or the length of
3128|                     ;                       the line.
3128|                     ;       D1 must contain the heigth(vertically of the box) in horizontal pixel
3128|                     ;                       rows:
3128|                     ;       A1 must contains the screen displacement in the range 0..32670
3128|                     ;
3128|                     ;       ____________________________________
3128|                     ;       .                                   .
3128|                     ;       .           fill pattern            . <-------heigth in pixels
3128|                     ;       ____________________________________
3128|                     ;                       ^
3128|                     ;                       ........... length horizontally
3128|                     ;
3128|                     ;       Assumptions:  location SCRNBASE contains the video address
3128|                     ;       registers used-->D0-D3,A0-A2
```

```
3128|                       ;_____________________________________________________________________
3128|
3128|
3128|                       PAINT_BOX
3128|
3128| 49FA 0020             paintb1 lea     movinst,A4
312C| 6004                          bra.s   cont
312E|
312E| 49FA 001E             inverse lea     exclusive,A4
3132| D3F8 0110             cont    ADD.L   SCRNBASE,A1     ;add video address to starting pixel address offset.
3136|
3136|                       paintb2
3136| 2F0A                          MOVE.L  A2,-(SP)        ;save reg
3138|                       ;       do some setup steps
3138|                       ;
3138| 4283                          CLR.L   D3              ;clear for use
313A| 3600                          MOVE.W  D0,D3           ;modify width/length
313C| 4483                          NEG.l   D3              ;negate the width/length (D3 = -width/length)
313E|                       ;
313E|                       ;       add the length of one horizontal pixel row-2 to the -width/length
313E|                       ;       to derive an offset which can be added to the updated address pointer
313E|                       ;       (when it reflects the right corner or end point of the box/line)
313E|                       ;       in order to arrive at the next row starting address.
313E|                       ;
313E| 0683 0000 005A                ADDI.l   #ROWBYTES,D3   ;create displacement for following sequence
3144|                       ;
3144|                       ;
3144| 2449                          MOVE.L  A1,A2           ;create ending column check address
3146| D5C0                          ADD.L   D0,A2           ;add length of line to obtain ending column address
3148|                       ;
3148|                       ;       A1 now points to the left top coordinate of the box or line.
3148|                       ;       A2 now points to the right top coordinate of the box or line.
3148|                       ;
3148|                       startop
3148| 4ED4                          jmp     (A4)            ;execute the correct operation (EOR or MOVE)
314A|
314A|                       movinst
314A| 32C2                          MOVE.w  D2,(A1)+        ;start the sequence
314C| 6002                          bra.s   compare
314E|
314E|                       exclusive
314E| B559                          eor.w   D2,(A1)+
3150|
3150| B5C9                  compare CMP.L   A1,A2           ;reached the right most point?
3152| 6702                          BEQ.S   nextline        ;yes
3154| 60F2                          BRA.S   startop
3156|                       ;
```

```
3156|                       ;       YES
3156|                       ;
3156|                       nextline
3156| D3C3                          ADD.L   D3,A1           ;add 1 horizontal line length (5A) minus line length
3158| D4FC 005A                     ADDA    #ROWBYTES,A2    ;to reach the left most point of the box on the        RM000
315C| 5341                          SUBQ.W  #1,D1           ;next horizontal scan line.
315E| 66E8                          BNE.S   startop         ;loop until done.
3160|                       ;
3160| 245F                          MOVE.L (SP)+,A2         ;restore and
3162| 4E75                          RTS                     ;return
3164|
3164|                       ;---------------------------------------------------------------------
3164|                       ;  Entry point to set cursor ptrs and make alert box for power cycling
3164|                       ;---------------------------------------------------------------------
3164|
3164|                       MAKEPCALRT
3164| 7A59                          MOVEQ   #PCROW,D5       ;set row ptr
3166| 7C0C                          MOVEQ   #PCCOL,D6       ;and col ptr
3168|                                                       ;then drop into alert box routine
3168|                       ;_____________________________________________________________________
3168|                       ;
3168|                       ;       MAKEALERT
3168|                       ;
3168|                       ;               This routine creates an alert box with no title.
3168|                       ;_____________________________________________________________________
3168|
3168|                       MAKEALERT
3168| 48E7 C040                     movem.l d0-d1/a1,-(sp)
316C|
316C| 704E                          MOVEQ   #ALRTWIDTH,D0           ;set parameters for box
316E| 223C 0000 00A4                MOVE.L  #ALRTHIGH,D1
3174| 327C 1140                     MOVEA   #ALRTSTRT,A1
3178| 616C                          bsr.s   makebox
317A|
317A| 4CDF 0203                     movem.l (sp)+,d0-d1/a1
317E| 4E75                          rts
3180|
3180|                       ;_____________________________________________________________________
3180|                       ;
3180|                       ;       MAKETEST
3180|                       ;
3180|                       ;               This routine creates an alert box for test icon display.
3180|                       ;_____________________________________________________________________
3180|
3180|                       MAKETEST
3180| 48E7 C040                     movem.l d0-d1/a1,-(sp)
3184|
```

```
3184| 7046                    MOVEQ   #TSTWWIDTH,D0           ;set parameters for alert box
3186| 7254                    MOVEQ   #TSTWHIGH,D1
3188| 327C 1144               MOVEA   #TSTWSTRT,A1
318C| 6158                    BSR.S   MAKEBOX                 ;go draw box
318E|
318E| 7A40                    MOVEQ   #TSTMROW,D5             ;set cursor ptrs
3190| 7C0E                    MOVEQ   #TSTMCOL,D6
3192| 47FA 0CA6               LEA     CHKMSG,A3               ;set message ptr
3196| 72FF                    MOVEQ   #-1,D1                  ;append '...' string
3198| 6100 049A               BSR     DSPSTRING               ;and go display it
319C|
319C| 6100 03EA               BSR     DSPCPU                  ;display test icons
31A0| 6100 03FA               BSR     DSPIOB
31A4| 6100 03EC               BSR     DSPMBRD
31A8| 6100 03FC               BSR     DSPXCRD
31AC|
31AC| 4CDF 0203               movem.l (sp)+,d0-d1/a1
31B0| 4E75                    rts
31B2|
31B2|                   ;_____________________________________________________________________
31B2|                   ;
31B2|                   ;       MAKEDBOX
31B2|                   ;
31B2|                   ;               This routine creates a dialog box.
31B2|                   ;_____________________________________________________________________
31B2|
31B2|                   MAKEDBOX
31B2| 48E7 C040               movem.l d0-d1/a1,-(sp)
31B6|
31B6| 7042                    MOVEQ   #DBOXWIDTH,D0           ;set parameters for dialog box
31B8| 7214                    MOVEQ   #DBOXHIGH,D1
31BA| 327C 071E               MOVEA   #DBOXSTRT,A1
31BE| 6126                    bsr.s   makebox
31C0|
31C0| 4CDF 0203               movem.l (sp)+,d0-d1/a1
31C4| 4E75                    rts
31C6|
31C6|                   ;_____________________________________________________________________
31C6|                   ;
31C6|                   ;       routine makewindow
31C6|                   ;
31C6|                   ;               This routine creates a fixed window of the folder type.
31C6|                   ;               The calling routine must provide the address of the
31C6|                   ;               string which will be used to fill in the title box.
31C6|                   ;
31C6|                   ;       Call:
31C6|                   ;               move    <window width>,d0
```

```
31C6|                     ;               move    <window heigth>,d1
31C6|                     ;               move    <upper left corner address>,a1
31C6|                     ;               lea     <string address>,a3
31C6|                     ;               bsr     makewindow
31C6|                     ;
31C6|                     ;       This routine calls makebox
31C6|                     ;
31C6|                     ;_____________________________________________________________________
31C6|
31C6|                     MAKEWINDOW
31C6| 48E7 C040                   movem.l d0-d1/a1,-(sp)
31CA|
31CA| 611A                        bsr.s   makebox
31CC|
31CC|                     ;
31CC|                     ;       now draw the title box by drawing a single black line across
31CC|                     ;       the width of the window about 17 pixels from the top edge
31CC|                     ;
31CC|
31CC| 2F09                        MOVE.L  A1,-(SP)        ;save start point
31CE| D2FC 05A0                  add.w   #MENULINE,a1
31D2| 7201                        moveq   #1,d1           ;set heigth of one pixel
31D4| 74FF                        moveq   #-1,d2
31D6| 6100 FF50                  bsr.s   paint_box
31DA|
31DA| 225F                        MOVE.L  (SP)+,A1        ;restore start point
31DC| 6100 01DA                  bsr     writetitle
31E0|
31E0| 4CDF 0203                  movem.l (sp)+,d0-d1/a1  ;restore and return
31E4| 4E75                        rts
31E6|
31E6|                     ;_____________________________________________________________________
31E6|                     ;
31E6|                     ;       Routine makebox;
31E6|                     ;
31E6|                     ;               This routine creates a window of either the folder type
31E6|                     ;               or the dialog box type.  Is is the responsibility of
31E6|                     ;               the calling process to append the title box and title
31E6|                     ;               to the window if it is the folder type.
31E6|                     ;
31E6|                     ;       Call:
31E6|                     ;               move.w  <window width>,d0               (range 0..90) even
31E6|                     ;               move.w  <window heigth>,d1              (range 0..364)
31E6|                     ;               move.w  <startingpixeladdress>,a1       (range 0..32670)
31E6|                     ;               bsr     makebox
31E6|                     ;
31E6|                     ;       registers used: d0,d1,d2,d3,d4,a1,a2
```

```
31E6|                     ;_____________________________________________________________________
31E6|
31E6|
31E6|                     MAKEBOX
31E6|                     ;
31E6|                     ;       make the basic window--->no edges  D2 must be set to 0 on call
31E6|                     ;                                          d0 must be set to the width (90 maximum)
31E6|                     ;                                          d1 must be set to the heigth (364 maximum)
31E6|                     ;                                          A1 must be the offset address (0..32670)
31E6|                     ;
31E6|                     ;
31E6| 48E7 F878                   movem.l d0-d4/a1-a4,-(sp)
31EA| 48E7 C040                   movem.l d0-d1/a1,-(sp)     ;save the heigth and the starting pixel address
31EE|
31EE| 4282                         clr.l   d2                 ;the pattern
31F0| 6100 FF36                   bsr     paint_box
31F4|                     ;
31F4|                     ;       now draw the individual edges including the shadow edges on the right
31F4|                     ;       and bottom of the window
31F4|                     ;
31F4|
31F4|                     ;
31F4|                     ;       draw bottom horizontal edge
31F4|                     ;
31F4| 93C3                         sub.l   d3,a1
31F6| 93C0                         sub.l   d0,a1              ;a1 is currently equal to the lower right point
31F8|                                                        ; of the box so we can subtract the width to
31F8|                                                        ; calculate the lower left point of the box.
31F8|
31F8| 7201                         moveq   #1,d1              ;set 1 pixel heigth
31FA| 74FF                         moveq   #-1,d2             ;set the line pattern
31FC| 6100 FF38                   bsr     paintb2            ;remember a4 is set up to point to the move.w
3200|                                                        ; instruction
3200|                     ;
3200|                     ;       draw bottom horizontal shadow
3200| 5449                @1       addq    #2,a1              ;shadow begin offset by 2
3202| 7201                         moveq   #1,d1              ;draw a one pixel line
3204| 5540                         subq    #2,d0
3206| 6100 FF2E                   bsr     paintb2            ;go
320A|                     ;
320A|                     ;       draw top horizontal edge
320A|                     ;
320A| 4CDF 0203           @2       movem.l  (sp)+,d0-d1/a1 ;restore original parameters
320E| 48E7 4040                   movem.l  d1/a1,-(sp)
3212| 7201                         moveq   #1,d1              ;draw a 1 pixel line
3214| 6100 FF12                   bsr     paint_box
3218|                     ;
```

```
3218|                     ;       now draw the right edge plus the right edge's shadow, use a1
3218|                     ;       with a column parameter of 0
3218|                     ;
3218| 4CDF 0410                   movem.l  (sp)+,d4/a2
321C| 7401                        moveq    #1,d2
321E| 5544                        subq     #2,d4
3220| 5540                        subq     #2,d0
3222| D3C0                        add.l    d0,a1
3224|
3224| 2204                        move.l   d4,d1
3226| 4280                        clr.l    d0
3228| 6130                        bsr.s    paint_v
322A|
322A| 303C 00B6                   move.w   #182,d0         ;set one byte offset from right edge
322E| 7407                        moveq    #7,d2
3230| 2204                        move.l   d4,d1
3232| 6136                        bsr.s    paintbit        ;draw first pixel line of the right shadow
3234|
3234| 303C 0110                   move.w   #272,d0
3238| 7406                        moveq    #6,d2
323A| 2204                        move.l   d4,d1
323C| 5341                        subq     #1,d1           ;reduce heigth by 1 to compensate for shadow offset
323E| 612A                        bsr.s    paintbit
3240|
3240|                     ;
3240|                     ;       now draw the left vertical edge of the box
3240|                     ;
3240| 224A                        move.l   a2,a1           ;restore the starting pixel address
3242| D3F8 0110                   add.l    SCRNBASE,a1     ;add in video address
3246| 705A                        moveq    #90,d0
3248| D3C0                        add.l    d0,a1
324A| 343C 8000                   move     #32768,d2       ;set the pattern
324E|
324E| 2204                        move.l   d4,d1           ;the heigth minus two
3250| 4280                        clr.l    d0              ;column 0 offset
3252| 6106                        bsr.s    paint_v
3254| 4CDF 1E1F                   movem.l (sp)+,d0-d4/a1-a4
3258|
3258| 4E75                        rts
325A|
325A|                     ;_____________________________________________________________________
325A|                     ;
325A|                     ;       Routine paint_v
325A|                     ;
325A|                     ;       This routine "paints" a vertical column one word wide.
325A|                     ;
325A|                     ;       Call:   BSR     paint_v
```

```
325A|                       ;
325A|                       ;       register setup:
325A|                       ;
325A|                       ;       A1 must contain the screen base address.
325A|                       ;       D2 must contain a one word pattern.
325A|                       ;       D1 must contain the number of pixels in the vertical length of the line
325A|                       ;         in the range 1..364
325A|                       ;       D0 must contain the screen word column in the range 0..44
325A|                       ;
325A|                       ;       Assumptions:  location SCRNBASE contains the video address
325A|                       ;
325A|                       ;       registers used: D0-D1
325A|                       ;_______________________________________________________________________
325A|                       ;
325A|
325A|                       PAINT_V
325A|                       paintv1
325A|
325A| 3382 0000             @1      MOVE.W  D2,0(A1,D0.W)   ;write to screen
325E| 5341                          SUBQ.W  #1,D1           ;decrement count
3260| 6706                          BEQ.S   @2              ;return
3262| 0640 005A                     ADDI.W  #ROWBYTES,D0    ;bump to next horizontal line
3266| 60F2                          BRA.S   @1              ;loop to continue writing vertical.
3268|                       ;
3268| 4E75                  @2      RTS                     ;return
326A|
326A|                       ;_______________________________________________________________________
326A|                       ;
326A|                       ;       Routine paintbit
326A|                       ;
326A|                       ;       This routine "paints" a vertical line one bit wide.
326A|                       ;
326A|                       ;       Call:   BSR     paintbit
326A|                       ;       register setup:
326A|                       ;
326A|                       ;       A1 must contain the screen base address.
326A|                       ;       D2 must contain the bit number to set
326A|                       ;       D1 must contain the number of pixels in the vertical length of the line
326A|                       ;         in the range 1..364
326A|                       ;       D0 must contain the screen word column in the range 0..44
326A|                       ;
326A|                       ;       Assumptions:  location SCRNBASE contains the video address
326A|                       ;
326A|                       ;       registers used: D0-D1
326A|                       ;_______________________________________________________________________
326A|
326A|                       PAINTBIT
```

```
326A|
326A| 05F1 0000             @1      bset    d2,0(a1,d0.w)
326E| 5341                           subq.w  #1,d1           ;subtract one from heigth
3270| 6706                           beq.s   @2              ;done
3272|
3272| 0640 005A                     addi.w  #ROWBYTES,d0    ;increment to next pixel row.
3276| 60F2                           bra.s   @1
3278|
3278| 4E75                 @2        RTS                     ;return
327A|
327A|                      ;_____________________________________________________________________
327A|                      ;
327A|                      ;       Routine makebutton --> creates a black lined box of the size
327A|                      ;                              specified by the parameters with button
327A|                      ;                              "label" and description if specified.
327A|                      ;                              Also makes entries in active rectangle
327A|                      ;                              table for later use with mouse.
327A|                      ;
327A|                      ;                              the left top corner is addressed by a1,
327A|                      ;                              the alternate keycode is contained in d0.
327A|                      ;                              the description is in A3.
327A|                      ;                              description location is in A2.
327A|                      ;                              '...' string appended to message if d1 nonzero
327A|                      ;
327A|                      ;
327A|                      ;       Call:
327A|                      ;
327A|                      ;               move.w  <left/top corner point>,a1
327A|                      ;               move.b  <alternate keycode>,d0
327A|                      ;               lea     <button description>,a3
327A|                      ;               move.l  <description location>,a2
327A|                      ;               <set d1 for '...' string>
327A|                      ;               bsr     makebutn
327A|                      ;
327A|                      ;       Destroys regs D0-D2,D5,D6,A3
327A|                      ;_____________________________________________________________________
327A|
327A|
327A|                      MAKEBUTN
327A| 48E7 4020                     MOVEM.L D1/A2,-(SP)     ;save string indicator and location ptr
327E| 45F8 053A                     LEA     RectTable,A2    ;get ptr to active rect table
3282| 3412                           MOVE    (A2),D2         ;get current count of rect's
3284| C4FC 0005                     MULU    #5,D2           ;five entries per rect
3288| D442                           ADD     D2,D2           ;double for word index
328A| 525A                           ADDQ    #1,(A2)+        ;incr for new rect
328C| 3580 2000                     MOVE    D0,0(A2,D2.W)   ;save keycode id for new rect
3290| 6100 F488                     BSR     KeyToAscii      ;convert keycode to Ascii
```

```
3294| 3800                      MOVE    D0,D4           ;save for later display
3296|
3296|                    ;  compute X,Y pixel coordinates from starting address
3296|
3296| 6100 016E                 BSR     GETROWCOL       ;get pixel row, byte col
329A| CCFC 0008                 MULU    #8,D6           ;convert to pixel col
329E| 3586 2002                 MOVE    D6,2(A2,D2.W)   ;save upper left X
32A2| 3585 2004                 MOVE    D5,4(A2,D2.W)   ; and Y coordinates
32A6|
32A6| 700A                      MOVEQ   #BTNWIDTH,D0    ;set button parameters
32A8| 721C                      MOVEQ   #BTNHIGH,D1
32AA| 614C                      BSR.S   DRAWBUTN        ;draw the button
32AC|
32AC| 2F09                      MOVE.L  A1,-(SP)        ;save original val
32AE| 3278 052C                 MOVE    LwrRight,a1     ;compute lower right coordinates
32B2| 6100 0152                 BSR     GETROWCOL       ;get pixel row
32B6| CCFC 0008                 MULU    #8,D6           ;and pixel col
32BA| 3586 2006                 MOVE    D6,6(A2,D2.W)   ;save as X and
32BE| 3585 2008                 MOVE    D5,8(A2,D2.W)   ; Y coordinates
32C2| 225F                      MOVE.L  (SP)+,A1        ;restore starting value
32C4|
32C4|                    ;       Add the button label and description
32C4|
32C4| 48E7 F870                 movem.l d0-d4/a1-a3,-(sp)  ;save parameters
32C8| E288                      lsr.l   #1,d0           ;divide window width
32CA| 6100 013A                 bsr     getrowcol       ;get the row and column coordinate of
32CE|                                                   ;the window corner point
32CE| DC80                      add.l   d0,d6           ;adjust column pointer
32D0|
32D0| E289                      lsr.l   #1,d1           ;divide window heigth
32D2| 5981                      subq.l  #4,d1           ;decrement by half font heigth
32D4| DA81                      add.l   d1,d5           ;adjust row coordinate
32D6|
32D6| 5346                      SUBQ    #1,D6           ;go back 1 and
32D8| 4240                      CLR     D0              ;display apple icon
32DA| 6100 045E                 BSR     DSPVAL
32DE| 2004                      MOVE.L  D4,D0           ;get char to display
32E0| 6100 0458                 bsr     dspval          ;and go display alternate keycode
32E4|
32E4| 4CDF 0E1F                 movem.l (sp)+,d0-d4/a1-a3  ;retrieve parameters
32E8| 4CDF 0402                 MOVEM.L (SP)+,D1/A2        ;retrieve location and string indicator
32EC|
32EC| 224A                      MOVE.L  A2,A1           ;compute output pt for description
32EE| 6100 0116                 BSR     GETROWCOL
32F2| 6100 0340                 BSR     DSPSTRING       ;and display it
32F6|
32F6| 4E75                      RTS
```

```
32F8|                     ;_____________________________________________________________________
32F8|                     ;
32F8|                     ;       Routine drawbutton --> creates a black lined box of the size
32F8|                     ;                              specified by the parameters.
32F8|                     ;
32F8|                     ;                              the left top corner is addressed by a1,
32F8|                     ;                              the width is indicated by d0.
32F8|                     ;                              the heigth is indicated by d1.
32F8|                     ;
32F8|                     ;
32F8|                     ;             this routine calls paint_box, and paintbit.
32F8|                     ;
32F8|                     ;               inputs:         d0=window width in bytes (should be even)
32F8|                     ;                               d1=heigth in pixels
32F8|                     ;                               a1=window left/top corner point as a
32F8|                     ;                                  0..32670 screen offset address.
32F8|                     ;
32F8|                     ;       Call:
32F8|                     ;
32F8|                     ;               move.w  <left/top corner point>,a1
32F8|                     ;               move.w  <button width>,d0
32F8|                     ;               move.w  <button height>,d1
32F8|                     ;               bsr     drawbutn
32F8|                     ;_____________________________________________________________________
32F8|
32F8|                     DRAWBUTN
32F8| 48E7 F870                   movem.l d0-d4/a1-a3,-(sp)  ;stack the arguments
32FC|                     ;
32FC|                     ;
32FC|                     ;       draw the top edge of the button
32FC|                     ;
32FC|
32FC| 74FF                        moveq   #-1,d2          ;set the black bit pattern for paint_box
32FE| 7201                        moveq   #1,d1           ;set a 1 pixel line
3300| 6100 FE26                   bsr     paint_box
3304|                     ;
3304|                     ;       draw the right vertical edge of the button
3304|                     ;
3304| 93C3                        sub.l   d3,a1           ;on return from paint_box, a1 points to the
3306|                                                     ;real address of the left point of the next
3306|                                                     ;horizontal pixel line of the button, so d3,
3306|                                                     ;which contains the displacement to the prior
3306|                                                     ;lines right edge is added to the
3306|                                                     ;left point to obtain the correct
3306|                                                     ;address for the right edge.
3306| 222F 0004                   move.l  4(sp),d1        ;momentarily restore the heigth
330A| 4280                        clr.l   d0
```

```
330C| 7407                    moveq   #7,d2           ;set the 1 bit mask for paintbit
330E| 6100 FF5A                bsr.s   paintbit        ;draw the right edge
3312|
3312|                  ;
3312|                  ;       now draw the left edge of the button
3312| 226F 0014                move.l  20(sp),a1       ;restore the original corner point
3316| D3F8 0110                add.l   SCRNBASE,a1     ;add in the screen window address
331A|
331A| 222F 0004                move.l  4(sp),d1        ;restore the heigth
331E| 4280                     clr.l   d0
3320| 7407                    moveq   #7,d2           ;set the 1 bit mask for the left edge
3322| 6100 FF46                bsr.s   paintbit
3326|
3326|                  ;
3326|                  ;       now draw the bottom edge of the button
3326|                  ;
3326| D3C0                     add.l   d0,a1           ;add the displacement to the corner point to arrive
3328|                                                  ;at the correct address of the bottom left corner
3328| 2017                     move.l  (sp),d0         ;restore the width
332A| 7201                    moveq   #1,d1           ;set the heigth at 1.
332C| 74FF                    moveq   #-1,d2          ;set the line pattern to black
332E| 6100 FE06                bsr     paintb2
3332|                  ;
3332|                  ;       done - save lower right coordinate
3332|                  ;
3332| 93C3                     sub.l   d3,a1           ;get offset address for lower right corner
3334| 93F8 0110                sub.l   SCRNBASE,a1
3338| 31C9 052C                move    a1,LwrRight     ;save it
333C| 4CDF 0E1F                movem.l (sp)+,d0-d4/a1-a3
3340| 4E75                     rts
3342|
3342|                  ;_____________________________________________________________________
3342|                  ;       Routine to redraw the sides of a pulldown menu item.
3342|                  ;
3342|                  ;       Call:   move.w  <width of box>,d0
3342|                  ;               move.w  <heigth of box>,d1
3342|                  ;               move.l  <pixeladdress>,a1
3342|                  ;               jsr     inversmenuitem
3342|                  ;
3342|                  ;_____________________________________________________________________
3342|
3342|                  DRAWSIDES
3342| 48E7 C040                movem.l d0-d1/a1,-(sp)
3346|
3346|                  ;       redraw the left vertical edge of the pull down menu
3346|
3346| D3F8 0110                add.l   SCRNBASE,a1     ;add in the real video window address
```

```
334A| 7407                        moveq   #7,d2           ;set the bit for paintbit
334C| 4280                        clr.l   d0              ;remember to clear d0.
334E| 4EBA FF1A                   jsr     paintbit
3352|
3352|                     ;       redraw the right vertical edge of the pulldownmenu
3352|
3352| 2017                        move.l  (sp),d0         ;restore the width
3354| 222F 0004                   move.l  4(sp),d1        ;restore the heigth
3358| D3C0                        add.l   d0,a1           ;point the pixel address to the top edge of the right side
335A| 5349                        subq    #1,a1           ;adjust address to point to byte with actual right edge
335C| 4280                        clr.l   d0              ;remember to clear d0 on call.
335E| 4282                        clr.l   d2              ;set bit
3360|
3360| 4EBA FF08                   jsr     paintbit
3364|
3364| 4CDF 0203                   movem.l (sp)+,d0-d1/a1  ;restore the parameters
3368|
3368| 4E75                        rts
336A|                     ;_____________________________________________________________________
336A|                     ;               Displays pull down menu when called.  Also makes
336A|                     ;               entries in active rectangle table for each entry.
336A|                     ;  Inputs:  A1 = starting pixel address for menu "box"
336A|                     ;           A2 = starting pixel address for menu option message
336A|                     ;           A3 = ptr to menu strings
336A|                     ;           A4 = ptr to menu id's
336A|                     ;           D0 = menu "box" width
336A|                     ;           D1 = menu "box" heigth
336A|                     ;           D4 = # of menu entries
336A|                     ;
336A|                     ;_____________________________________________________________________
336A|
336A|                     MAKEMENU
336A| 48E7 F080                  MOVEM.L D0-D3/A0,-(SP)
336E|
336E|                           .IF  BMENU = 0
336E|                           .ENDC
336E|
336E| C0FC 0008                  MULU    #8,D0           ;convert width to pixel count
3372| 41F8 053A                  LEA     RectTable,A0    ;get ptr to active rectangle table
3376| 3218                        MOVE    (A0)+,D1        ;get rectangle count
3378| 4282                        CLR.L   D2              ;clear for use
337A| 263C 0000 03DE             MOVE.L  #MENUSPC,D3     ;space between menu entries
3380|
3380| 5241                  @1    ADDQ    #1,D1           ;incr rectangle count
3382| 141C                        MOVE.B  (A4)+,D2        ;get menu entry id
3384| 30C2                        MOVE    D2,(A0)+        ;save in table
3386| 617E                        BSR.S   GETROWCOL       ;convert address to X,Y coordinates
```

```
3388| CCFC 0008                 MULU    #8,D6           ;convert to pixels
338C| 30C6                     MOVE    D6,(A0)+        ;save upper X coordinate
338E| 30C5                     MOVE    D5,(A0)+        ;save upper Y coordinate
3390| DC40                     ADD     D0,D6           ;compute and save
3392| 30C6                     MOVE    D6,(A0)+        ;  lower X coordinate
3394| 0645 000B                ADD     #MENUSPC/90,D5  ;compute and save
3398| 30C5                     MOVE    D5,(A0)+        ; lower Y coordinate
339A| 2F09                     MOVE.L  A1,-(SP)        ;save "box" address
339C| 224A                     MOVE.L  A2,A1           ;get address for menu message
339E| 6166                     BSR.S   GETROWCOL       ;compute msg output pt
33A0| 6100 035E                BSR     DSPMSG          ;do display
33A4| 225F                     MOVE.L  (SP)+,A1        ;restore address for box
33A6| D3C3                     ADD.L   D3,A1           ;incr to next start pt for rectangle
33A8| D5C3                     ADD.L   D3,A2           ;also incr message address
33AA|
33AA| 5344                     SUBQ    #1,D4           ;loop until done
33AC| 66D2                     BNE.S   @1
33AE|
33AE| 31C1 053A                MOVE    D1,RectCnt      ;save new rectangle count
33B2| 4CDF 010F                MOVEM.L (SP)+,D0-D3/A0  ;restore regs and exit
33B6| 4E75                     RTS
33B8|                    ;_____________________________________________________________________
33B8|                    ;
33B8|                    ;       routine writetitle --> writes the title for the window whose
33B8|                    ;                              left top corner is addressed by a1,
33B8|                    ;                              whose width is indicated by d0.
33B8|                    ;
33B8|                    ;         To arrive at the correct address to write the title string,
33B8|                    ;         the window width and string length must be divided by 2, the
33B8|                    ;         result of the string division is subtracted from the width
33B8|                    ;         division to arrive at the general byte column position to
33B8|                    ;         begin writing the title.
33B8|                    ;
33B8|                    ;
33B8|                    ;               inputs:         d0=window width
33B8|                    ;                               a1=window left/top corner point as a
33B8|                    ;                                  0..32670 screen offset address.
33B8|                    ;                               a3=title string address
33B8|                    ;
33B8|                    ;               output:         all registers used are restored.
33B8|                    ;_____________________________________________________________________
33B8|
33B8|
33B8|                    WRITETITLE
33B8| 48E7 FEFE                  movem.l d0-d6/a0-a6,-(sp)       ;save as many registers as possible
33BC| 615A                       bsr.s   getlength               ;calculate the length of the string
33BE|
```

```
33BE| E288                    lsr.l   #1,d0                    ;divide window width
33C0| E28A                    lsr.l   #1,d2                    ;divide string length
33C2| 9082                    sub.l   d2,d0                  ;1/2 width - 1/2 length --->d0
33C4|
33C4| 6140                    bsr.s   getrowcol              ;get the row and column coordinate of
33C6|                                                        ;the window corner point
33C6| 5845                    addq    #4,d5                  ;adjust for 4 pixel rows
33C8| DC80                    add.l   d0,d6                  ;adjust column pointer
33CA|
33CA| 48E7 0600               movem.l d5/d6,-(sp)            ;stack line/column pointers for later ref
33CE|
33CE| 6100 0330               bsr     dspmsg
33D2|
33D2| 4CDF 0060               movem.l (sp)+,d5/d6            ;restore the parameters
33D6| 5945                    subq    #4,d5                  ;reduce the pixel pointer by 4
33D8| 5546                    subq    #2,d6                  ;backspace the column pointer by 2
33DA| 0246 FFFE               andi.w  #$FFFE,d6              ;round off to nearest word
33DE| 9DCE                    sub.l   a6,a6                  ;clear a6
33E0| 6100 033C               bsr     setcrsr2               ;convert standard row/col to pixel offset
33E4| 224E                    move.l  a6,a1                  ;move to a1
33E6|                  ;
33E6|                  ;       restore the string pointer so that its length can be recalculated.
33E6|                  ;
33E6| 266F 0028               move.l  40(sp),a3
33EA| 6100 002C               bsr     getlength              ;the length is returned in a2 and d2
33EE| 5242                    addq    #1,d2                  ;must round off the length to a word boundary
33F0| 0242 FFFE               andi.w  #$FFFE,d2
33F4| 2002                    move.l  d2,d0                  ;set width of inverted window to length..
33F6| 5840                    addq    #4,d0                  ;..of string plus 4
33F8| 720F                    moveq   #15,d1                 ;set the heigth of the window
33FA| 74FF                    moveq   #-1,d2                 ;set the mask
33FC| 6100 FD30               bsr     inverse                ;invert the title
3400|
3400| 4CDF 7F7F               movem.l (sp)+,d0-d6/a0-a6
3404| 4E75                    rts
3406|                  ;_____________________________________________________________________
3406|                  ;
3406|                  ;       routine getrowcol --> converts a screen address displacement
3406|                  ;                             to row and column coordinates.
3406|                  ;
3406|                  ;               inputs:       a1=screen address in the range 0..32759
3406|                  ;               outputs:      d5 set to row
3406|                  ;                             d6 set to byte col (the remainder)
3406|                  ;
3406|                  ;       registers used: d2 (but saved and restored)
3406|                  ;       registers destroyed: d5,d6 (set to new values)
3406|                  ;_____________________________________________________________________
```

```
3406|
3406|                         GETROWCOL
3406| 2F02                            move.l  d2,-(sp)        ;save d2
3408| 2409                            move.l  a1,d2           ;move the address to d2
340A| 84FC 005A                       divu    #ROWBYTES,d2    ;divide the address by 90 bytes
340E| 3A02                            move    d2,d5           ;new row
3410| 4842                            swap    d2
3412| 3C02                            move.w  d2,d6           ;remainder is column
3414|
3414|                         ;        MOVE.L  A1,D2           ;now calculate row
3414|                         ;        SUBI.L  #TOPOFFSET,D2   ;decr for offset
3414|                         ;        DIVU    #RBYTES,D2      ;divide by bytes per char row
3414|                         ;        MOVE    D2,D5
3414|                         ;        ADDQ    #1,D5           ;incr to next row
3414|
3414| 241F                            move.l  (sp)+,d2        ;restore d2
3416| 4E75                            rts                     ;return
3418|
3418|                         ;_______________________________________________________________________
3418|                         ;
3418|                         ;       routine getlength --> returns a value which is the length of
3418|                         ;                             the string referenced by a3.  The
3418|                         ;                             string is assumed to be terminated by
3418|                         ;                             the null character value.
3418|                         ;
3418|                         ;               inputs:       a3=string address
3418|                         ;               outputs:      d2,a2: string length
3418|                         ;
3418|                         ;       registers destroyed: d2,a2 (set to new values)
3418|                         ;_______________________________________________________________________
3418|
3418|                         GETLENGTH
3418| 244B                            move.l  a3,a2
341A| 141A                    @1      move.b  (a2)+,d2        ;read a byte
341C| 66FC                            bne.s   @1              ;continue
341E| 95CB                            sub.l   a3,a2           ;subtract the beginning from the end.
3420| 240A                            move.l  a2,d2           ;move it to d2 for reference
3422| 4E75                            rts                     ;return
3424|
3424|                         ;-----------------------------------------------------------------------
3424|                         ;
3424|                         ;  Routine to display uncompressed icon.                      CHG008
3424|                         ; INPUTS:
3424|                         ;       A2 = pointer to uncompressed icon  (48 x 32 bitmap)
3424|                         ;       A6 = pointer to (even!) screen address for upper left hand
3424|                         ;            corner of icon
3424|                         ; SIDE EFFECTS:
```

```
3424|                     ;       D0-D1 are trashed
3424|                     ;---------------------------------------------------------------------
3424|
3424|                     DSPRGICON
3424| 7005                        MOVEQ   #ICONWIDTH-1,D0 ;set default width              CHG008
3426| 721F                        MOVEQ   #ICONHIGH-1,D1  ; and heigth                    CHG008
3428| 6102                        BSR.S   OUTPUT          ;and do display                 CHG008
342A| 4E75                        RTS                     ;                               CHG008
342C|
342C|                     ;_____________________________________________________________________
342C|                     ;
342C|                     ;  Subroutine to display message or icon.
342C|                     ;
342C|                     ;       The calling routine must provide the pointer to the raw bit map.
342C|                     ;
342C|                     ;       Call:   load d0 with number of bytes - 1 in the x axis
342C|                     ;               load d1 with the number of pixels - 1 in the y axis
342C|                     ;
342C|                     ;               lea  sourcebytes,a2
342C|                     ;               lea  destination,a6
342C|                     ;               jsr or bsr output
342C|                     ;
342C|                     ;       Returns with d6 updated.
342C|                     ;
342C|                     ;---------------------------------------------------------------------
342C|
342C|                     OUTPUT
342C| 48E7 3802                   MOVEM.L D2-D4/A6,-(SP)  ;save regs
3430| 765A                        moveq   #90,d3
3432|
3432| 4284                loop0   clr.l   d4
3434| 3400                        move.w  d0,d2
3436| 6002                        bra.s   loop2
3438|
3438| 5244                loop1   addq    #1,d4
343A|
343A| 1D9A 4000           loop2   move.b  (a2)+,0(a6,d4)
343E| 51CA FFF8                   dbf     d2,loop1
3442|
3442| DDC3                        add.l   d3,a6
3444| 51C9 FFEC                   dbf     d1,loop0
3448| 5246                        addq    #1,d6
344A|
344A| 4CDF 401C                   MOVEM.L (SP)+,D2-D4/A6  ;restore
344E| 4E75                        rts
3450|
3450|                             .PAGE
```

```
3450|                     ;---------------------------------------------------------------------
3450|                     ;
3450|                     ;  Routine to display error icon with id #.
3450|                     ;
3450|                     ; INPUTS:
3450|                     ;       D1 = id # to display
3450|                     ;       A2 = pointer to compressed icon
3450|                     ;       A5 = upper left corner address for icon as
3450|                     ;            offset from screen address
3450|                     ;
3450|                     ; SIDE EFFECTS:
3450|                     ;       D5-D6 are trashed
3450|                     ;---------------------------------------------------------------------
3450|                     DSPNUMICON
3450| 6100 00DA                   BSR     DSPALRTICON     ;display the icon
3454| 3A7C 287E                   MOVE    #ERRSTRT,A5     ;get icon address offset
3458| 610A                        BSR.S   DSPNUM          ;display id # on icon
345A| DBF8 0110                   ADD.L   SCRNBASE,A5     ;get screen address
345E| 6100 008C                   BSR     DSPBAD          ;display bad mark over icon
3462| 4E75                        RTS
3464|
3464|                     ;---------------------------------------------------------------------
3464|                     ;
3464|                     ;  Routine to display icon id #.
3464|                     ; INPUTS:
3464|                     ;       D1 = id # to display
3464|                     ;       A2 = pointer to compressed icon
3464|                     ;       A5 = upper left corner address for icon as
3464|                     ;            offset from screen address
3464|                     ;
3464|                     ; SIDE EFFECTS:
3464|                     ;       D1/D5-D6/A2-A3 are trashed
3464|                     ;---------------------------------------------------------------------
3464|
3464| 2F00                DSPNUM  MOVE.L  D0,-(SP)        ;save reg
3466| 224D                        MOVE.L  A5,A1           ;convert icon address to row, col
3468| 619C                        BSR     GETROWCOL
346A|
346A| 47FA 05A8                   LEA     XCARD,A3        ;slot card icon?
346E| B7CA                        CMPA.L  A2,A3
3470| 6608                        BNE.S   @1              ;skip if not
3472| 0645 0016                   ADD     #SLOTROW,D5     ;add offsets for card id to cursor ptrs
3476| 5646                        ADDQ    #SLOTCOL,D6
3478| 6038                        BRA.S   @6
347A|
347A| 47FA 0552           @1      LEA     MEMBRD,A3       ;memory board?
347E| B7CA                        CMPA.L  A2,A3           ;
```

```
3480| 6608                        BNE.S   @2              ;skip if not
3482| 0645 0010                   ADD     #MEMROW,D5      ;add offsets for card id
3486| 5846                        ADDQ    #MEMCOL,D6
3488| 6028                        BRA.S   @6              ;and go display
348A|
348A| 4A38 02AF            @2     TST.B   SYSTYPE         ;Lisa 2 system?                 CHG009
348E| 6646                        BNE.S   @99             ;exit if yes - no id #'s        CHG009
3490|
3490| 47FA 088C                   LEA     DISKETTE,A3     ;diskette icon?
3494| B7CA                        CMPA.L  A2,A3
3498| 0645 0012                   ADD     #DISKROW,D5     ;compute posn for id #
349C| 5846                        ADDQ    #DISKCOL,D6
349E| 6012                        BRA.S   @6
34A0|
34A0| 47FA 067C            @3     LEA     DRIVEN,A3       ;drive icon?                    CHG009
34A4| B7CA                        CMPA.L  A2,A3           ;                               CHG009
34A6| 6606                        BNE.S   @4              ;skip if not                    CHG009
34A8| 5C45                        ADDQ    #DRVROW,D5      ;add offsets for id #           CHG009
34AA| 5646                        ADDQ    #DRVCOL,D6      ;                               CHG009
34AC| 6004                        BRA.S   @6              ;and go display                 CHG009
34AE|
34AE|                       @4
34AE| 5B45                        SUBQ    #INSRTROW,D5    ;must be insert icon            CHG009/CHG024
34B0| 5846                        ADDQ    #INSRTCOL,D6    ;                               CHG009
34B2|
34B2| 6100 0266            @6     BSR     SETCRSR         ;get screen address in A6
34B6| 5341                        SUBQ    #1,D1           ;check number to display
34B8| 6606                        BNE.S   @7
34BA| 45FA 0480                   LEA     ONE,A2          ;set ptr to # icon
34BE| 600E                        BRA.S   @9
34C0|
34C0| 5341                  @7    SUBQ    #1,D1           ;is it 2?
34C2| 6606                        BNE.S   @8
34C4| 45FA 047B                   LEA     TWO,A2
34C8| 6004                        BRA.S   @9
34CA|
34CA| 45FA 047A            @8     LEA     THREE,A2        ;must be 3
34CE|
34CE| 7000                  @9    MOVEQ   #0,D0           ;set width - 1
34D0| 7204                        MOVEQ   #4,D1           ;and heigth - 1
34D2| 6100 FF58                   BSR.S   OUTPUT          ;display it
34D6|
34D6| 201F                  @99   MOVE.L  (SP)+,D0        ;restore reg
34D8| 4E75                        RTS                     ;and exit
34DA|
34DA|                       ;---------------------------------------------------------------------
34DA|                       ;
```

```
34DA|                     ;  Routine to display error icon.
34DA|                     ;
34DA|                     ; INPUTS:
34DA|                     ;       A2 = pointer to compressed icon
34DA|                     ;
34DA|                     ; SIDE EFFECTS:
34DA|                     ;       A2/A6, D5-D6 are trashed
34DA|                     ;-------------------------------------------------------------------------
34DA|
34DA|                     DSPERRICON
34DA| 6100 FC8C                   BSR     MAKEALERT       ;open alert box
34DE| 7A73                        MOVEQ   #ERRROW,D5      ;set screen ptrs
34E0| 7C10                        MOVEQ   #ERRCOL,D6
34E2| 6100 0236                   BSR     SETCRSR         ;get screen address in A6
34E6| 2A4E                        MOVE.L  A6,A5           ;save it
34E8| 6100 00F8                   BSR     DSPICON         ;go do display of component icon
34EC|                     DSPBAD
34EC| 45FA 079A                   LEA     CHECKMRK,A2     ;get ptr to check icon
34F0| 6108                        BSR.S   MRGICON         ;do the merge
34F2| 45FA 07E2                   LEA     BADMRK,A2       ;get ptr to slash icon
34F6| 6102                        BSR.S   MRGICON         ;merge it
34F8| 4E75                        RTS                     ;and exit
34FA|
34FA|
34FA|                     ;-------------------------------------------------------------------------
34FA|                     ;
34FA|                     ;  Routine to merge two icons, one over the other.
34FA|                     ;
34FA|                     ; INPUTS:
34FA|                     ;       A2 = ptr to icon to be merged
34FA|                     ;       A5 = pointer to base icon
34FA|                     ;
34FA|                     ; SIDE EFFECTS:
34FA|                     ;       None
34FA|                     ;-------------------------------------------------------------------------
34FA|
34FA| 48E7 F006           MRGICON MOVEM.L D0-D3/A5-A6,-(SP) ;save regs
34FE| 2C4D                        MOVE.L  A5,A6           ;get start address
3500| 5C4E                        ADDQ    #6,A6           ;first display new icon next to other icon
3502| 48E7 0006                   MOVEM.L A5-A6,-(SP)     ;save ptrs
3506| 6100 00DA                   BSR     DSPICON
350A| 4CDF 6000                   MOVEM.L (SP)+,A5-A6     ;restore ptrs
350E|
350E| 7654                        MOVEQ   #ROWBYTES-6,D3  ;set up row offset constant
3510| 741F                        MOVEQ   #32-1,D2        ;icon heigth in pixel lines - 1
3512| 7202                 @1     MOVEQ   #3-1,D1         ;icon width in words - 1
3514| 3016                 @2     MOVE    (A6),D0         ;get from byte
```

```
3516| 815D                    OR      D0,(A5)+        ;do the merge
3518| 425E                    CLR     (A6)+           ;erase the old
351A| 51C9 FFF8                DBF     D1,@2           ;do full row
351E| DBC3                    ADDA.L  D3,A5           ;bump ptrs to next row
3520| DDC3                    ADDA.L  D3,A6
3522| 51CA FFEE                DBF     D2,@1           ;go to next row
3526|
3526| 4CDF 600F                MOVEM.L (SP)+,D0-D3/A5-A6 ;restore and exit
352A| 4E75                    RTS
352C|
352C|                    ;---------------------------------------------------------------------
352C|                    ;
352C|                    ;  Routine to display alert icon.
352C|                    ;
352C|                    ; INPUTS:
352C|                    ;       A2 = pointer to icon
352C|                    ;            MSB set if uncompressed icon, else compressed assumed      CHG008
352C|                    ;
352C|                    ; SIDE EFFECTS:
352C|                    ;       A6, D5-D6 are trashed
352C|                    ;---------------------------------------------------------------------
352C|
352C|                    DSPALRTICON
352C| 48E7 C020                MOVEM.L D0-D1/A2,-(SP)  ;save regs                              CHG008
3530| 6100 FC36                BSR     MAKEALERT       ;open alert box
3534| 7A73                    MOVEQ   #ALRTROW,D5     ;set screen ptrs
3536| 7C10                    MOVEQ   #ALRTCOL,D6
3538| 6100 01E0                BSR     SETCRSR         ;get screen address in A6
353C| 220A                    MOVE.L  A2,D1           ;check icon address                     CHG008
353E| 6A0C                    BPL.S   @1              ;skip if for compressed icon            CHG008
3540| 0881 001F                BCLR    #31,D1          ;clear indicator bit                    CHG008
3544| 2441                    MOVE.L  D1,A2           ;and restore ptr                        CHG008
3546| 6100 FEDC                BSR     DSPRGICON       ;display an uncompressed icon           CHG008
354A| 6004                    BRA.S   @2              ;skip to exit                           CHG008
354C| 6100 0094            @1      BSR     DSPICON         ;go do display                  CHG008
3550| 4CDF 0403            @2      MOVEM.L (SP)+,D0-D1/A2  ;restore regs                   CHG008
3554| 4E75                        RTS                     ;                               CHG008
3556|
3556|                    ;---------------------------------------------------------------------
3556|                    ;
3556|                    ;  Routine to display icon with question mark along side.
3556|                    ;
3556|                    ; INPUTS:
3556|                    ;       A2 = pointer to compressed icon
3556|                    ; OUTPUTS:
3556|                    ;       A5 = icon screen address
3556|                    ; SIDE EFFECTS:
```

```
3556|                     ;       A2/A6, D5-D6 are trashed
3556|                     ;-------------------------------------------------------------------------
3556|
3556|                     DSPQICON
3556| 6100 FC10                   BSR     MAKEALERT       ;open alert box
355A| 7A73                        MOVEQ   #ERRROW,D5      ;set screen ptrs
355C| 7C10                        MOVEQ   #ERRCOL,D6
355E| 6100 01BA                   BSR     SETCRSR         ;get screen address in A6
3562| 2A4E                        MOVE.L  A6,A5           ;save it
3564| 617C                        BSR.S   DSPICON         ;go do display of component icon
3566| 45FA 06FD                   LEA     QUESTION,A2     ;get ptr to ? icon
356A| 2C4D                        MOVE.L  A5,A6           ;restore start address
356C| DCFC 0006                   ADDA    #6,A6           ;display next to component              RM000
3570| 6170                        BSR.S   DSPICON
3572| 4E75                        RTS
3574|
3574|                     ;-------------------------------------------------------------------------
3574|                     ;
3574|                     ;  Routine to hilite (invert) a test icon.
3574|                     ;
3574|                     ; INPUTS:
3574|                     ;       A1 = address of icon
3574|                     ;
3574|                     ; SIDE EFFECTS:
3574|                     ;       None
3574|                     ;-------------------------------------------------------------------------
3574|
3574| 48E7 E000           INVICON MOVEM.L D0-D2,-(SP)     ;save regs
3578| 7006                        MOVEQ   #ICONWIDTH,D0   ;set parms for icon
357A| 7220                        MOVEQ   #ICONHIGH,D1
357C| 74FF                        MOVEQ   #-1,D2          ;set fill pattern
357E| 6100 FBAE                   BSR     INVERSE         ;and go invert selected one
3582| 4CDF 0007                   MOVEM.L (SP)+,D0-D2     ;restore
3586| 4E75                        RTS
3588|
3588|                     ;-------------------------------------------------------------------------
3588|                     ;
3588|                     ;  Routine to display test icons.
3588|                     ;
3588|                     ; INPUTS:
3588|                     ;       None
3588|                     ;
3588|                     ; SIDE EFFECTS:
3588|                     ;       A2/A6 trashed
3588|                     ;-------------------------------------------------------------------------
3588|
3588|                     DSPCPU
```

```
3588| 45FA 0401                   LEA     CPUBRD,A2       ;set ptr for CPU board icon
358C| 3C7C 1DF6                   MOVEA   #CPUSTRT,A6     ;and address
3590| 601C                       BRA.S   DODSPLY         ;go do display
3592|
3592|                         DSPMBRD
3592| 45FA 043A                   LEA     MEMBRD,A2       ;set ptr for Memory board icon
3596| 3C7C 1E04                   MOVEA   #MEMSTRT,A6     ;and address
359A| 6012                       BRA.S   DODSPLY         ;go do display
359C|
359C|                         DSPIOB
359C| 45FA 03AD                   LEA     IOBRD,A2        ;set ptr for I/O board icon
35A0| 3C7C 1E12                   MOVEA   #IOSTRT,A6      ;and address
35A4| 6008                       BRA.S   DODSPLY         ;go do display
35A6|
35A6|                         DSPXCRD
35A6| 45FA 046C                   LEA     XCARD,A2        ;set ptr for I/O slot card icon
35AA| 3C7C 1E20                   MOVEA   #XCRDSTRT,A6    ;and address
35AE|
35AE|                         DODSPLY
35AE| DDF8 0110                   ADDA.L  SCRNBASE,A6     ;compute screen address for display
35B2| 612E                       BSR.S   DSPICON         ;go do display
35B4| 4E75                       RTS
35B6|
35B6|                         ;---------------------------------------------------------------------
35B6|                         ;
35B6|                         ;  Routine to display icon with check mark.
35B6|                         ;
35B6|                         ;  Inputs:
35B6|                         ;       None
35B6|                         ;  Outputs:
35B6|                         ;       None
35B6|                         ; Side Effects:
35B6|                         ;       A6 trashed
35B6|                         ;---------------------------------------------------------------------
35B6|
35B6|                         CHKCPU
35B6| 61D0                       BSR.S   DSPCPU          ;redisplay CPU icon
35B8| 3A7C 1DF6                   MOVEA   #CPUSTRT,A5     ;get start address for it
35BC| 6016                       BRA.S   DSPCHECK        ;and go add check mark
35BE|
35BE|                         CHKMBRD
35BE| 61D2                       BSR.S   DSPMBRD         ;redisplay Memory board icon
35C0| 3A7C 1E04                   MOVEA   #MEMSTRT,A5     ;get start address for it
35C4| 600E                       BRA.S   DSPCHECK        ;and go add check mark
35C6|
35C6|                         CHKIOBRD
35C6| 61D4                       BSR.S   DSPIOB          ;redisplay I/O icon
```

```
35C8| 3A7C 1E12                MOVEA   #IOSTRT,A5      ;get start address for it
35CC| 6006                    BRA.S   DSPCHECK        ;and go add check mark
35CE|
35CE|                  CHKXCRD
35CE| 61D6                    BSR.S   DSPXCRD         ;redisplay I/O slot card icon
35D0| 3A7C 1E20                MOVEA   #XCRDSTRT,A5    ;get start address for it
35D4|
35D4|                  DSPCHECK
35D4| 45FA 06B2                LEA     CHECKMRK,A2     ;get ptr to check icon
35D8| DBF8 0110                ADDA.L  SCRNBASE,A5     ;compute screen address for display
35DC| 6100 FF1C                BSR     MRGICON         ;and go do merge
35E0| 4E75                    RTS
35E2|
35E2|                  ;---------------------------------------------------------------------
35E2|                  ;
35E2|                  ;  Routine to display compressed icon.
35E2|                  ;
35E2|                  ; INPUTS:
35E2|                  ;       A2 = pointer to compressed icon
35E2|                  ;       A6 = pointer to (even!) screen address for upper left hand
35E2|                  ;            corner of icon
35E2|                  ; SIDE EFFECTS:
35E2|                  ;       A6 is trashed
35E2|                  ;---------------------------------------------------------------------
35E2|
35E2|                  DSPICON
35E2| 48E7 E0A0                MOVEM.L D0-D2/A0/A2,-(SP)       ;                               CHG009
35E6| 204E                    MOVE.L  A6,A0                   ; save screen start address
35E8|
35E8| 7217                    MOVEQ   #23,D1                  ; There are 24 octals in an icon
35EA| 7405                    MOVEQ   #5,D2                   ; reset row bytes counter
35EC|
35EC| 303C 0100          DLOOP   MOVE    #$100,D0                ; prime D0 for 8 bit count count
35F0| 101A                    MOVE.B  (A2)+,D0                ; load map byte from compressed image
35F2|
35F2| E248                MLOOP   LSR.W   #1,D0                   ; shift off map bit
35F4| 6714                    BEQ.S   DONE                    ; byte done when = 0
35F6| 6404                    BCC.S   BLACK                   ; dispatch on the bit
35F8| 421E                    CLR.B   (A6)+                   ; store zero in new
35FA| 6002                    BRA.S   CHECK                   ; continue for all 8 bits
35FC| 1CDA                BLACK   MOVE.B  (A2)+,(A6)+             ; store byte in new
35FE|
35FE| 51CA FFF2          CHECK   DBF     D2,MLOOP                ; see if on scanline seam(every 6 bytes)
3602| DCFC 0054                ADDA    #90-6,A6                ; bump to next scanline         RM015
3606| 7405                    MOVEQ   #5,D2                   ; reset row bytes counter
3608| 60E8                    BRA.S   MLOOP                   ; continue for all 8 bits
360A|
```

```
360A| 51C9 FFE0            DONE    DBF     D1,DLOOP                ; do the rest of the octals in ICON
360E|
360E|                    ; Now unXOR the icon on the screen
360E| 2C48                        MOVE.L  A0,A6                   ; get screen pointer saved above
3610| 244E                        MOVE.L  A6,A2                   ; second pointer
3612| D4FC 005A                  ADDA    #90,A2                  ; scanline pointer              RM015
3616|
3616| 323C 001E                  MOVE    #30,D1                  ; do 31 scanlines
361A|                    ; This is the cause of the even destination restriction
361A| 201E                  XLOOP   MOVE.L  (A6)+,D0                ; get long from previous scanline
361C| B19A                        EOR.L   D0,(A2)+                ; xor into this scanline
361E| 301E                        MOVE.W  (A6)+,D0                ; get word from previous scanline
3620| B15A                        EOR.W   D0,(A2)+                ; xor into this scanline
3622| D4FC 0054                  ADDA    #90-6,A2                ; next scan line + rowbytes     RM015
3626| DCFC 0054                  ADDA    #90-6,A6                ; next scan line + rowbytes     RM015
362A|
362A| 51C9 FFEE                  DBF     D1,XLOOP
362E| 4CDF 0507                  MOVEM.L (SP)+,D0-D2/A0/A2       ;                               CHG009
3632| 4E75                        RTS
3634|
3634|                            .PAGE
3634|                    ;---------------------------------------------------------------------
3634|                    ;  Subroutine to display text string according to keyboard id
3634|                    ;  Inputs:
3634|                    ;       A3 = ptr to message
3634|                    ;       D1 = nonzero if '...' string to be appended
3634|                    ;  Outputs:
3634|                    ;       A2 = ptr to start of string
3634|                    ;       A3 = ptr to end of string
3634|                    ;  Side Effects:
3634|                    ;       D5-D6, A3 trashed
3634|                    ;---------------------------------------------------------------------
3634|
3634|                    DSPSTRING
3634| 48E7 A000                  MOVEM.L D0/D2,-(SP)     ;save regs
3638| 45FA 0887                  LEA     MENUHDG,A2      ;don't translate service mode messages
363C| B7CA                        CMPA.L  A2,A3
363E| 6770                        BEQ.S   DSPOUT          ;skip if it is
3640| 244B                        MOVE.L  A3,A2           ;else save starting point
3642| 1038 01B2                  MOVE.B  KEYID,D0        ;get keyboard id
3646| 6768                        BEQ.S   DSPOUT          ;skip if no id available
3648| 0200 003F                  ANDI.B  #$3F,D0         ;clear mfg code
364C| 1400                        MOVE.B  D0,D2           ;move to working reg
364E|
364E|                    ;  Search for US, UK or Canadian keyboard
364E|
364E| 0202 00F0                  ANDI.B  #$F0,D2         ;old US keyboard?
```

```
3652| 675C                        BEQ.S   DSPOUT          ;yes - go do English display
3654| 0C02 0030                   CMPI.B  #$30,D2         ;US or Canadian layout?
3658| 6608                        BNE.S   @1
365A| 0C00 003D                   CMPI.B  #$3D,D0         ;Canadian?
365E| 6726                        BEQ.S   DSPALL          ;yes - display all languages
3660| 604E                        BRA.S   DSPOUT          ;else just English
3662|
3662| 0C02 0020             @1    CMPI.B  #$20,D2         ;European keyboard?
3666| 661E                        BNE.S   DSPALL          ;no - display all languages
3668| 0C00 002F                   CMPI.B  #$2F,D0         ;UK?
366C| 6742                        BEQ.S   DSPOUT          ;yes - display English
366E|
366E|                       ;  Search for German type keyboard
366E|
366E| 0C00 002E                   CMPI.B  #$2E,D0         ;German?
3672| 6732                        BEQ.S   DSPGERMN
3674| 0C00 0026                   CMPI.B  #$26,D0         ;Swiss-German?
3678| 672C                        BEQ.S   DSPGERMN
367A|
367A|                       ;  Search for French type keyboard
367A| 0C00 002D                   CMPI.B  #$2D,D0         ;French?
367E| 672A                        BEQ.S   DSPFRNCH
3680| 0C00 0027                   CMPI.B  #$27,D0         ;Swiss-French?
3684| 6724                        BEQ.S   DSPFRNCH
3686|
3686|                       ;  Display all languages for any other keyboard (e.g., Italian, Spanish, etc.)
3686|
3686| 0838 0007 02A2        DSPALL  BTST    #MENU,STATFLGS  ;doing menu?
368C| 6612                        BNE.S   @1              ;skip if yes
368E| 0445 000A                   SUB     #CHRSPC,D5      ;back up one row
3692| 6124                        BSR.S   DSPIT           ;display English string
3694| 0645 000A                   ADD     #CHRSPC,D5      ;incr to next row
3698| 611E                        BSR.S   DSPIT           ;display French translation
369A| 0645 000A                   ADD     #CHRSPC,D5      ;bump another row
369E| 6010                        BRA.S   DSPOUT          ;go do final display of German
36A0|
36A0| 6130                  @1    BSR.S   DSPMSLSH        ;display English followed by /
36A2| 612E                        BSR.S   DSPMSLSH        ;display French followed by /
36A4| 600A                        BRA.S   DSPOUT          ;and go do final German display
36A6|
36A6|                       DSPGERMN
36A6| 4A1B                        TST.B   (A3)+           ;skip two strings before output
36A8| 66FC                        BNE.S   DSPGERMN
36AA|
36AA|                       DSPFRNCH
36AA| 4A1B                        TST.B   (A3)+           ;skip one string before output
36AC| 66FC                        BNE.S   DSPFRNCH
```

```
36AE| 244B                    MOVE.L  A3,A2           ;save new beginning ptr
36B0|
36B0| 6106                DSPOUT  BSR.S   DSPIT           ;do display
36B2| 4CDF 0005                MOVEM.L (SP)+,D0/D2     ;restore regs
36B6| 4E75                    RTS                     ; and exit
36B8|
36B8|                     ;---------------------------------------------------------------------
36B8|                     ;  Subroutine to display text string followed by '...'
36B8|                     ;  Inputs:
36B8|                     ;       A3 = ptr to message
36B8|                     ;       D1 = nonzero if '...' string to be appended
36B8|                     ;  Outputs:
36B8|                     ;       None
36B8|                     ;  Side Effects:
36B8|                     ;       A3 updated to next location after 0 byte
36B8|                     ;---------------------------------------------------------------------
36B8|
36B8| 48E7 0600           DSPIT   MOVEM.L D5-D6,-(SP)     ;save cursor ptrs
36BC| 6142                    BSR.S   DSPMSG          ;output message
36BE| 2F0B                    MOVE.L  A3,-(SP)        ;save msg ptr
36C0| 4A41                    TST     D1              ;check if periods needed
36C2| 6706                    BEQ.S   @9              ;skip if not
36C4| 47FA 07F7                LEA     PERIODS,A3      ;else do display
36C8| 6136                    BSR.S   DSPMSG
36CA|                     @9
36CA| 265F                    MOVE.L  (SP)+,A3        ;restore regs and exit
36CC| 4CDF 0060                MOVEM.L (SP)+,D5-D6
36D0| 4E75                    RTS
36D2|
36D2|                     ;---------------------------------------------------------------------
36D2|                     ;  Subroutine to display text string followed by '/'
36D2|                     ;  Inputs:
36D2|                     ;       A3 = ptr to message
36D2|                     ;  Outputs:
36D2|                     ;       None
36D2|                     ;  Side Effects:
36D2|                     ;       A3 updated to next location after 0 byte
36D2|                     ;---------------------------------------------------------------------
36D2|
36D2|                     DSPMSLSH
36D2| 612C                    BSR.S   DSPMSG          ;output message
36D4| 702F                    MOVEQ   #'/',D0         ;display /
36D6| 6162                    BSR.S   DSPVAL
36D8| 4E75                    RTS
36DA|
36DA|                     ;---------------------------------------------------------------------
36DA|                     ;  Subroutine to display alert box message
```

```
36DA|                     ;  Inputs:
36DA|                     ;       A3 = ptr to message
36DA|                     ;  Outputs:
36DA|                     ;       None
36DA|                     ;-------------------------------------------------------------------------
36DA|
36DA|                     DSPALRTMSG
36DA| 48E7 0E00                   MOVEM.L D4-D6,-(SP)     ;save regs                              CHG005
36DE| 3A3C 007E                   MOVE    #MSGROW,D5      ;set screen ptrs
36E2| 7C18                       MOVEQ   #MSGCOL,D6
36E4| 3805                       MOVE    D5,D4           ;set left margin in case of CR          CHG005
36E6| 6118                       BSR.S   DSPMSG          ;go do display
36E8| 4CDF 0070                 MOVEM.L (SP)+,D4-D6     ;restore regs                           CHG005
36EC| 4E75                       RTS
36EE|
36EE|                     ;-------------------------------------------------------------------------
36EE|                     ;  Routine to convert row coordinate to pixel row coordinate before
36EE|                     ;  doing message display
36EE|                     ;
36EE|                     ;  Expects D5 = row coordinate from 0-32
36EE|                     ;-------------------------------------------------------------------------
36EE|
36EE|                     CONVRTD5
36EE| CAFC 000A                   MULU    #10,D5                  ;multiply by pixel lines per char row
36F2| 610C                       BSR.S   DSPMSG                  ;then go do message
36F6|                           RTS
36F6|                           .ENDC                           ;{USERINT}
36F6|                     ;-------------------------------------------------------------------------
36F6|                     ;  Subroutine to display message followed by a line feed, CR.
36F6|                     ;  Calls DSPMSG routine, with same assumptions as that routine.
36F6|                     ;-------------------------------------------------------------------------
36F6|
36F6| 6108                DSPMSGR BSR.S   DSPMSG          ;go display msg
36F8|
36F8|                           .IF USERINT = 0
36F8|                           .ELSE
36F8| 0645 000A                 ADD     #CHRSPC,D5      ;do "line feed"
36FC|                           .ENDC
36FC|
36FC| 7C01                       MOVEQ   #1,D6           ;and "carriage return"
36FE| 4E75                       RTS
3700|
3700|                     ;-------------------------------------------------------------------------
3700|                     ; Subroutine to display message on screen.
3700|                     ; Requires inputs:
3700|                     ;       A3 - ptr to ASCII character string ended by 0 byte
3700|                     ;       D4 = left margin if message has a CR
```

```
3700|                     ;       D5 = cursor row position (0 - 32 decimal)
3700|                     ;       D6 = cursor column position (1 - 88 decimal)
3700|                     ; Uses regs:
3700|                     ;       D0 - for character to display
3700|                     ;
3700|                     ; NOTE: ONLY UPPER CASE ALPHA, NUMERIC AND CERTAIN SPECIAL CHARS SUPPORTED!
3700|                     ;-----------------------------------------------------------------------------
3700|
3700| 2F00                DSPMSG  MOVE.L  D0,-(SP)                ;save reg
3702|
3702|                             .IF     ROM4K = 0
3702| 0C45 014C           @1      CMPI    #LASTROW,D5             ;check if out of bounds
3706| 6F04                        BLE.S   @2                      ;skip if OK
3708| 6100 F3FE                   BSR     SCROLL                  ;else scroll page
370C|                               .ENDC
370C|
370C| 4280                @2      CLR.L   D0                      ;clear for use
370E| 101B                        MOVE.B  (A3)+,D0                ;get a char to display
3710| 6704                        BEQ.S   DSPDONE                 ;exit if done
3712| 6126                        BSR.S   DSPVAL                  ;go do display
3714| 60EC                        BRA.S   @1                      ;continue until done
3716| 201F                DSPDONE MOVE.L  (SP)+,D0                ;restore and exit
3718| 4E75                        RTS
371A|
371A|                             .PAGE
371A|                     ;-----------------------------------------------------------------------
371A|                     ; Subroutine to set cursor position in video page for message display.
371A|                     ; Requires inputs:
371A|                     ;       D5 = row position (0 - 32 decimal)
371A|                     ;       D6 = column position (1 - 88 decimal)
371A|                     ;       location SCRNBASE = base address for video page
371A|                     ; Provides output:
371A|                     ;       A6 = address for new cursor location
371A|                     ;-----------------------------------------------------------------------
371A|
371A|                     SETCRSR
371A| 2C78 0110                   MOVE.L  SCRNBASE,A6             ;get base address for screen
371E|                     SETCRSR2
371E| 2F00                        MOVE.L  D0,-(SP)                ;save reg
3720| 4280                        CLR.L   D0                      ;use as working reg
3722|
3722|                             .IF  USERINT = 0
3722|                             .ELSE
3722| 3005                        MOVE    D5,D0                   ;get pixel row
3724|                             .ENDC
3724| C0FC 005A                   MULU    #RBYTES,D0              ;compute byte offset
3728|
```

```
3728|                          ;        .IF  USERINT = 0
3728| 0640 005A                        ADD     #RBYTES,D0              ;add one more
372C|                          ;        .ELSE
372C|                          ;        ADD     #TOPOFFSET,D0           ;adjust for offset from top of screen
372C|                          ;        .ENDC
372C|
372C| D08E                             ADD.L   A6,D0                   ;add in base screen address
372E| 2C40                             MOVE.L  D0,A6                   ;and save new value
3730| 4280                             CLR.L   D0
3732|
3732|                                  .IF  USERINT = 0
3732|                                  .ELSE
3732| 3006                             MOVE    D6,D0                   ;get pixel col
3734|                                  .ENDC
3734|
3734| DDC0                             ADDA.L  D0,A6                   ;add to cursor address
3736| 201F                             MOVE.L  (SP)+,D0                ;restore and exit
3738| 4E75                             RTS
373A|
373A|                          ;-------------------------------------------------------------------------
373A|                          ; Subroutine to display single ASCII character.
373A|                          ; Requires input:
373A|                          ;       D0 = character to display
373A|                          ;       D4 = left margin if CR char
373A|                          ;       D5 = cursor row position (0 - 32 decimal)
373A|                          ;       D6 = cursor column position (1 - 88 decimal)
373A|                          ; Returns output:
373A|                          ;       D6 = new cursor col position (incremented by 1)
373A|                          ;-------------------------------------------------------------------------
373A|
373A| 48E7 C022                DSPVAL  MOVEM.L A2/A6/D0-D1,-(SP)       ;save regs
373E| 61DA                             BSR.S   SETCRSR                 ;set cursor position
3740| 0240 007F                        ANDI    #$7F,D0                 ;ensure valid
3744|                                  .IF  USERINT = 1
3744| 4A00                             TST.B   D0                      ;apple icon?
3746| 6738                             BEQ.S   @4
3748|                                  .ENDC
3748|
3748|                                  .IF  ROM4K = 0
3748| 0C00 0020                        CMPI.B  #$20,D0                 ;space?
374C| 672C                             BEQ.S   @3                      ;skip if yes
374E| 0C00 000D                        CMPI.B  #RET,D0                 ;carriage return?
3752| 6732                             BEQ.S   @5                      ;skip if yes
3754| 0C00 003F                        CMPI.B  #QUESTN,D0              ;'?' char?
3758| 6734                             BEQ.S   @6
375A|
375A| 0400 002D                        SUB.B   #$2D,D0                 ;else check if in table
```

```
375E| 6D14                          BLT.S   @1
3760| 0C00 000C                     CMPI.B  #$C,D0                  ;numeric char?
3764| 6F2E                          BLE.S   @2                      ;skip if yes
3766| 5F00                          SUB.B   #7,D0                   ;else decr for alpha check
3768| 0C00 000D                     CMPI.B  #$D,D0                  ;check if in alpha range
376C| 6D06                          BLT.S   @1                      ;skip if invalid
376E| 0C00 0026                     CMPI.B  #$26,D0                 ;last valid char = 'Z'
3772| 6F20                          BLE.S   @2
3774|                                                   ;skip if OK
3774|                               .ELSE
3774|                               .ENDC
3774|
3774|                               .IF  USERINT = 0
3774|                               .ELSE
3774|
3774| 45FA 013A             @1      LEA     INVCHAR,A2              ;else set for invalid character
3778| 6026                          BRA.S   OUT
377A|
377A| 45FA 003E             @3      LEA     SPACE,A2                ;set ptr to space char
377E| 6020                          BRA.S   OUT
3780|
3780| 45FA 0134             @4      LEA     APPLICON,A2             ; display apple icon
3784| 601A                          BRA.S   OUT
3786|
3786| 0645 000A             @5      ADD     #CHRSPC,D5              ;set cursor for next row
378A| 3C04                          MOVE    D4,D6                   ;set to left margin
378C| 6026                          BRA.S   DSPVXIT
378E|
378E| 45FA 011A             @6      LEA     QUESTCH,A2              ;set ptr to '?' char
3792| 600C                          BRA.S   OUT
3794|
3794| 3200                  @2      MOVE    D0,D1                   ;convert for table (multiply by 6)  CHG017
3796| E748                          LSL     #3,D0                   ;mult by 8
3798| 9041                          SUB     D1,D0                   ; then subtract twice
379A| 9041                          SUB     D1,D0                   ;                                   CHG017
379C|
379C| 45FB 0022                     LEA     FONTTBL(D0),A2          ;get ptr to char in table
37A0|
37A0| 4280                  out     clr.l   d0                      ;set number of bytes-1 in x direction
37A2| 7205                          moveq   #5,d1                   ;set number of pixels-1 in y direction  CHG017
37A4| 4216                          MOVE.B  #0,R0(A6)               ;first line always 0                    CHG017
37A6| DDFC 0000 005A               ADDA.L  #RBYTES,A6              ;bump ptr to next row                   CHG017
37AC| 6100 FC7E                     bsr     output                  ;output char
37B0| 422E 0276                     MOVE.B  #0,R7(A6)               ;and add final 0 byte
37B4|                               .ENDC
37B4|
37B4|                   DSPVXIT
```

```
37B4| 4CDF 4403                    MOVEM.L (SP)+,A2/A6/D0-D1       ;restore and exit
37B8| 4E75                         RTS
37BA|
37BA|                             .IF     EXTERNAL = 1
37BA|                             .ENDC
37BA|                             .PAGE
37BA|                         ;-------------------------------------------------------------------------
37BA|                         ; CHARACTER FONT TABLE
37BA|                         ;-------------------------------------------------------------------------
37BA|                         SPACE
37BA| 00 00 00 00 00 00           .BYTE    $00,$00,$00,$00,$00,$00   ;  (space)
37C0|
37C0|                         FONTTBL
37C0|                           .IF  ROM4K = 0
37C0| 00 00 00 7C 00 00           .BYTE    $00,$00,$00,$7C,$00,$00   ; code =  45 '-'
37C6| 00 00 00 00 00 30           .BYTE    $00,$00,$00,$00,$00,$30   ; code =  46 '.'
37CC| 04 08 10 20 40 80           .BYTE    $04,$08,$10,$20,$40,$80   ; code =  47 '/'
37D2|                           .ENDC
37D2|
37D2| 38 44 44 44 44 38           .BYTE    $38,$44,$44,$44,$44,$38   ; code =  48 '0'
37D8| 08 38 08 08 08 08           .BYTE    $08,$38,$08,$08,$08,$08   ; code =  49 '1'
37DE| 38 44 08 10 20 7C           .BYTE    $38,$44,$08,$10,$20,$7C   ; code =  50 '2'
37E4| 38 44 18 04 44 38           .BYTE    $38,$44,$18,$04,$44,$38   ; code =  51 '3'
37EA| 08 18 28 48 7C 08           .BYTE    $08,$18,$28,$48,$7C,$08   ; code =  52 '4'
37F0| 7C 40 78 04 44 38           .BYTE    $7C,$40,$78,$04,$44,$38   ; code =  53 '5'
37F6| 38 40 78 44 44 38           .BYTE    $38,$40,$78,$44,$44,$38   ; code =  54 '6'
3802| 38 44 38 44 44 38           .BYTE    $38,$44,$38,$44,$44,$38   ; code =  56 '8'
3808| 38 44 44 3C 04 38           .BYTE    $38,$44,$44,$3C,$04,$38   ; code =  57 '9'
380E|
380E| 30 48 84 FC 84 84           .BYTE    $30,$48,$84,$FC,$84,$84   ; code =  65 'A'
3814| F8 84 F8 84 84 F8           .BYTE    $F8,$84,$F8,$84,$84,$F8   ; code =  66 'B'
381A| 78 84 80 80 84 78           .BYTE    $78,$84,$80,$80,$84,$78   ; code =  67 'C'
3820| F8 84 84 84 84 F8           .BYTE    $F8,$84,$84,$84,$84,$F8   ; code =  68 'D'
3826| FC 80 F8 80 80 FC           .BYTE    $FC,$80,$F8,$80,$80,$FC   ; code =  69 'E'
382C| FC 80 F8 80 80 80           .BYTE    $FC,$80,$F8,$80,$80,$80   ; code =  70 'F'
3832| 78 84 80 9C 84 7C           .BYTE    $78,$84,$80,$9C,$84,$7C   ; code =  71 'G'
3838| 84 84 FC 84 84 84           .BYTE    $84,$84,$FC,$84,$84,$84   ; code =  72 'H'
383E| 38 10 10 10 10 38           .BYTE    $38,$10,$10,$10,$10,$38   ; code =  73 'I'
3844| 1C 08 08 08 88 70           .BYTE    $1C,$08,$08,$08,$88,$70   ; code =  74 'J'
384A| 88 90 A0 D0 88 84           .BYTE    $88,$90,$A0,$D0,$88,$84   ; code =  75 'K'
3850| 80 80 80 80 80 FC           .BYTE    $80,$80,$80,$80,$80,$FC   ; code =  76 'L'
3856| 84 CC B4 84 84 84           .BYTE    $84,$CC,$B4,$84,$84,$84   ; code =  77 'M'
385C| 84 C4 A4 94 8C 84           .BYTE    $84,$C4,$A4,$94,$8C,$84   ; code =  78 'N'
3862| 78 84 84 84 84 78           .BYTE    $78,$84,$84,$84,$84,$78   ; code =  79 'O'
3868| F8 84 84 F8 80 80           .BYTE    $F8,$84,$84,$F8,$80,$80   ; code =  80 'P'
386E| 78 84 84 84 94 78           .BYTE    $78,$84,$84,$84,$94,$78   ; code =  81 'Q'
3874| F8 84 84 F8 88 84           .BYTE    $F8,$84,$84,$F8,$88,$84   ; code =  82 'R'
```

```
387A| 78 84 60 18 84 78         .BYTE    $78,$84,$60,$18,$84,$78   ; code =  83 'S'
3880| FE 10 10 10 10 10         .BYTE    $FE,$10,$10,$10,$10,$10   ; code =  84 'T'
3886| 84 84 84 84 84 78         .BYTE    $84,$84,$84,$84,$84,$78   ; code =  85 'U'
388C| 44 44 28 28 10 10         .BYTE    $44,$44,$28,$28,$10,$10   ; code =  86 'V'
3892| 82 82 92 AA 44 44         .BYTE    $82,$82,$92,$AA,$44,$44   ; code =  87 'W'
3898| 44 28 10 28 44 82         .BYTE    $44,$28,$10,$28,$44,$82   ; code =  88 'X'
389E| 82 44 28 10 10 10         .BYTE    $82,$44,$28,$10,$10,$10   ; code =  89 'Y'
38A4| FC 08 10 20 40 FC         .BYTE    $FC,$08,$10,$20,$40,$FC   ; code =  90 'Z'
38AA|
38AA|                          .IF  ROM4K = 0
38AA|                         QUESTCH
38AA| 38 44 08 10 00 10         .BYTE    $38,$44,$08,$10,$00,$10   ; code =  63 '?'
38B0|                          .ENDC
38B0|
38B0|                         INVCHAR
38B0| C7 BB F7 EF FF EF         .BYTE    $C7,$BB,$F7,$EF,$FF,$EF   ;  inverse of ?
38B6|
38B6|                             .IF  ROM4K = 0
38B6|                         APPLICON
38B6| 08 77 FE FE 7F 3E         .BYTE    $08,$77,$FE,$FE,$7F,$3E   ; apple icon
38BC|
38BC|                             .PAGE
38BC|                             .ALIGN 2
38BC|                         ;-------------------------------------------------------------------------
38BC|                         ;  Keycode to Ascii Table  (assumes alpha-lock so upper case only)
38BC|                         ;-------------------------------------------------------------------------
38BC|
38BC|                         AsciiTable                                        ;                                        RM000
38BC| 1B 2D 11 12 37 38 39    .BYTE   $1B,$2D,$11,$12,$37,$38,$39,$14           ;Pad : Clear - Left Right 789 Up
38C3| 14
38C4| 34 35 36 13 2E 32 33    .BYTE   $34,$35,$36,$13,$2E,$32,$33,$03           ;Pad : 456 Down .23 Enter
38CB| 03
38CC| 00 00 00 00 00 00 00    .BYTE   $00,$00,$00,$00,$00,$00,$00,$00           ;unused
38D3| 00
38D4| 00 00 00 00 00 00 00    .BYTE   $00,$00,$00,$00,$00,$00,$00,$00           ;unused
38DB| 00
38DC| 2D 3D 00 00 50 08 00    .BYTE   $2D,$3D,$00,$00,$50,$08,$00,$00           ;- = 2*unused P BackSp 2*unused
38E3| 00
38E4| 0D 30 00 00 2F 31 00    .BYTE   $0D,$30,$00,$00,$2F,$31,$00,$00           ;Ret Pad:0 2*unused / Pad:1 2*unused
38EB| 00
38EC| 39 30 55 49 4A 4B 5B    .BYTE   $39,$30,$55,$49,$4A,$4B,$5B,$5D           ;90UIJK[]
38F3| 5D
38F4| 4D 4C 3B 27 20 2C 2E    .BYTE   $4D,$4C,$3B,$27,$20,$2C,$2E,$4F           ;ML;' Space ,.O
38FB| 4F
38FC| 45 36 37 38 35 52 54    .BYTE   $45,$36,$37,$38,$35,$52,$54,$59           ;E6785RTY
3903| 59
3904| 00 46 47 48 56 43 42    .BYTE   $00,$46,$47,$48,$56,$43,$42,$4E           ;Option FGHVCBN
```

```
390B| 4E
390C| 41 32 33 34 31 51 53   .BYTE   $41,$32,$33,$34,$31,$51,$53,$57         ;A2341QSW
3914| 00 5A 58 44 00 00 00   .BYTE   $00,$5A,$58,$44,$00,$00,$00,$00         ;Tab ZXD unused Alpha Shift Cmd
391C|
391C|                        .ENDC
391C|                        .IF  USERINT = 1
391C|                      ;-------------------------------------------------------------------------
391C|                      ;  Icons
391C|                      ;-------------------------------------------------------------------------
391C|
391C|                      CrsrData                                          ;arrow for mouse cursor
391C|                      CrsrMask                                          ;same for mask
391C| 8000 C000 E000 F000          .WORD   $8000,$C000,$E000,$F000
3924| F800 FC00 FE00 FF00          .WORD   $F800,$FC00,$FE00,$FF00
392C| F800 F800 CC00 8C00          .WORD   $F800,$F800,$CC00,$8C00
3934| 0600 0600 0300 0300          .WORD   $0600,$0600,$0300,$0300
393C|
393C| E0 60 60 60 F0        ONE     .BYTE   $E0,$60,$60,$60,$F0               ;icon id = 1
3941| E0 30 60 C0 F0        TWO     .BYTE   $E0,$30,$60,$C0,$F0               ;icon id = 2
3946| E0 30 60 30 E0        THREE   .BYTE   $E0,$30,$60,$30,$E0               ;icon id = 3
394B|
394B| FF FF FF 3F 03 FF 00  IObrd     .BYTE $FF,$FF,$FF,$3F,$03,$FF,$00,$FF
3952| FF
3953| FF FF E0 01 FF FF FF           .BYTE $FF,$FF,$E0,$01,$FF,$FF,$FF,$E4
395A| E4
395B| FF C0 70 2F F9 50 66           .BYTE $FF,$C0,$70,$2F,$F9,$50,$66,$9E
3962| 9E
3963| C0 01 80 F7 03 79 56           .BYTE $C0,$01,$80,$F7,$03,$79,$56,$06
396A| 06
396B| 74 FE 0F FF FF FF FF           .BYTE $74,$FE,$0F,$FF,$FF,$FF,$FF,$FF
3973| FF FF 3F 01 AA 60 AA           .BYTE $FF,$FF,$3F,$01,$AA,$60,$AA,$AF
397A| AF
397B| FF C0 03 07 C4 FF E0           .BYTE $FF,$C0,$03,$07,$C4,$FF,$E0,$55
3983| 55 50 F1 FF FF F8 FF           .BYTE $55,$50,$F1,$FF,$FF,$F8,$FF,$FF
398A| FF
398B|
398B| FF FF FF 3F 03 FF 00  CPUbrd    .BYTE $FF,$FF,$FF,$3F,$03,$FF,$00,$FF
3992| FF
3993| FF FF E0 01 FF FF FF           .BYTE $FF,$FF,$E0,$01,$FF,$FF,$FF,$C4
399A| C4
399B| FF C0 79 F2 40 F9 38           .BYTE $FF,$C0,$79,$F2,$40,$F9,$38,$E0
39A2| E0
39A3| BF E0 EF F0 71 38 01           .BYTE $BF,$E0,$EF,$F0,$71,$38,$01,$80
39AA| 80
39AB| 79 FC 03 C0 FF FF FF           .BYTE $79,$FC,$03,$C0,$FF,$FF,$FF,$FF
39B2| FF
39B3| FF FF FF 3F 01 FE C0           .BYTE $FF,$FF,$FF,$3F,$01,$FE,$C0,$AA
```

```
39BA| AA
39BB| AA BF C0 03 FC 84 1F            .BYTE $AA,$BF,$C0,$03,$FC,$84,$1F,$E0
39C2| E0
39C3| 01 55 55 40 E1 03 FF            .BYTE $01,$55,$55,$40,$E1,$03,$FF,$FF
39CE|                                 .BYTE $E0,$FF,$FF
39CE| FF FF FF FF FF FF C3  MEMbrd    .BYTE $FF,$FF,$FF,$FF,$FF,$FF,$C3,$1F
39D5| 1F
39D6| FF FF C0 80 0F FF FF            .BYTE $FF,$FF,$C0,$80,$0F,$FF,$FF,$80
39DE| 07 FF E0 E3 03 FF F0            .BYTE $07,$FF,$E0,$E3,$03,$FF,$F0,$FF
39E5| FF
39E6| FF FF 71 04 5E 88 02            .BYTE $FF,$FF,$71,$04,$5E,$88,$02,$1C
39ED| 1C
39EE| 8E 50 03 8C 70 C7 01            .BYTE $8E,$50,$03,$8C,$70,$C7,$01,$0C
39F5| 0C
39F6| 20 7B 0E 04 0C 5E 88            .BYTE $20,$7B,$0E,$04,$0C,$5E,$88,$03
39FE| FF D5 57 00 FF 80 07            .BYTE $FF,$D5,$57,$00,$FF,$80,$07,$FF
3A06| 80 03 FF C0 F3 2A A8            .BYTE $80,$03,$FF,$C0,$F3,$2A,$A8,$FC
3A0D| FC
3A0E| 7F FC FF FF FF FF               .BYTE $7F,$FC,$FF,$FF,$FF,$FF
3A14|
3A14| FF FF FF FF FF FF E1  Xcard     .BYTE $FF,$FF,$FF,$FF,$FF,$FF,$E1,$01
3A1C| FF FF 80 FC FF FF FF            .BYTE $FF,$FF,$80,$FC,$FF,$FF,$FF,$FF
3A24| FF FF FF FF FF FF FF            .BYTE $FF,$FF,$FF,$FF,$FF,$FF,$FF,$FF
3A2C| FF FF DF 03 63 EA AD            .BYTE $FF,$FF,$DF,$03,$63,$EA,$AD,$80
3A34| 01 3C C0 06 15 50 CF            .BYTE $01,$3C,$C0,$06,$15,$50,$CF,$3F
3A3B| 3F
3A3C| F8                              .BYTE $F8
3A3D| FF FF FF 61 1F FF FF  waiticon  .BYTE $FF,$FF,$FF,$61,$1F,$FF,$FF,$F8
3A45| 0F 18 FF FF F0 0F FF            .BYTE $0F,$18,$FF,$FF,$F0,$0F,$FF,$FF
3A4D| 86 F0 11 FF FF 88 6D            .BYTE $86,$F0,$11,$FF,$FF,$88,$6D,$05
3A54| 05
3A55| A0 02 18 80 01 40 01            .BYTE $A0,$02,$18,$80,$01,$40,$01,$4F
3A5C| 4F
3A5D| F2 CE 80 A8 15 F3 54            .BYTE $F2,$CE,$80,$A8,$15,$F3,$54,$2A
3A64| 2A
3A65| 3C 2A 54 14 28 CF 08            .BYTE $3C,$2A,$54,$14,$28,$CF,$08,$10
3A6C| 10
3A6D| FF 3C 08 10 14 28 CF            .BYTE $FF,$3C,$08,$10,$14,$28,$CF,$28
3A74| 28
3A75| 14 F3 50 0A 1C A0 05            .BYTE $14,$F3,$50,$0A,$1C,$A0,$05,$01
3A7C| 01
3A7D| 46 62 86 80 02 88 11            .BYTE $46,$62,$86,$80,$02,$88,$11,$40
3A84| 40
3A85| 61 05 10 08 A0 11 18            .BYTE $61,$05,$10,$08,$A0,$11,$18,$E0
3A8C| E0
3A8D| 07 88 0F FF FF 86 F0            .BYTE $07,$88,$0F,$FF,$FF,$86,$F0,$0F
3A94| 0F
```

```
3A95| FF FF F0 E1 1F FF FF            .BYTE $FF,$FF,$F0,$E1,$1F,$FF,$FF,$F8
3A9C| F8
3A9D| FF FF                          .BYTE $FF,$FF
3A9F|
3A9F| FF FF FF FF FF FF FF  proicon   .BYTE $FF,$FF,$FF,$FF,$FF,$FF,$FF,$FF
3AA6| FF
3AA7| FF 00 1F FF FF FF FF            .BYTE $FF,$00,$1F,$FF,$FF,$FF,$FF,$F8
3AAE| F8
3AAF| 3F FF F0 FF FF FF FC            .BYTE $3F,$FF,$F0,$FF,$FF,$FF,$FC,$FF
3AB7| CC 03 7F 01 80 CF 03            .BYTE $CC,$03,$7F,$01,$80,$CF,$03,$7F
3ABE| 7F
3ABF| FC 01 80 00 3F FF FF            .BYTE $FC,$01,$80,$00,$3F,$FF,$FF,$FF
3AC6| FF
3AC7| FF FC 1C FF 60 FF F3            .BYTE $FF,$FC,$1C,$FF,$60,$FF,$F3,$FF
3ACE| FF
3ACF| 38 03 0C FD C0 FF FF            .BYTE $38,$03,$0C,$FD,$C0,$FF,$FF,$FF
3AD6| FF
3AD7| FF FF FF                        .BYTE $FF,$FF,$FF
3ADA| FF FF FF FF FF FF FF  upper     .BYTE $FF,$FF,$FF,$FF,$FF,$FF,$FF,$FF         ;CHG024
3AE1| FF
3AE2| FF 2F 08 1F FF 08 FF            .BYTE $FF,$2F,$08,$1F,$FF,$08,$FF,$FC
3AE9| FC
3AEA| 10 1F FF FF FC 02 20            .BYTE $10,$1F,$FF,$FF,$FC,$02,$20,$1F
3AF1| 1F
3AF2| FF FF FC 47 F8 20 1F            .BYTE $FF,$FF,$FC,$47,$F8,$20,$1F,$FF
3AF9| FF
3AFA| FF FC 80 1F FF 08 FF            .BYTE $FF,$FC,$80,$1F,$FF,$08,$FF,$FC
3B01| FC
3B02| 80 1F FF FF FC 80 47            .BYTE $80,$1F,$FF,$FF,$FC,$80,$47,$F8
3B09| F8
3B0A| 1F FF FF FC 20 E0 1F            .BYTE $1F,$FF,$FF,$FC,$20,$E0,$1F,$FF
3B11| FF
3B12| FF FC 10 FB 08 FF FF            .BYTE $FF,$FC,$10,$FB,$08,$FF,$FF,$FF
3B19| FF
3B1A| FF FF FF FF                    .BYTE $FF,$FF,$FF,$FF
3B1E|
3B1E| FF FF FF FF FF FF FF  driven    .BYTE $FF,$FF,$FF,$FF,$FF,$FF,$FF,$FF         ;CHG024
3B25| FF
3B26| FF EF 02 38 03 FF 04            .BYTE $FF,$EF,$02,$38,$03,$FF,$04,$07
3B2D| 07
3B2E| FF 22 88 3F FF F8 11            .BYTE $FF,$22,$88,$3F,$FF,$F8,$11,$FE
3B35| FE
3B36| E8 7F FF FC 20 8B 20            .BYTE $E8,$7F,$FF,$FC,$20,$8B,$20,$7F
3B3D| 7F
3B3E| FF FC A0 11 FE 3F FF            .BYTE $FF,$FC,$A0,$11,$FE,$3F,$FF,$F8
3B46| 08 E3 07 FF 84 F8 03            .BYTE $08,$E3,$07,$FF,$84,$F8,$03,$FF
3B4D| FF
```

```
3B4E| 02 FF FF FF FF FF FF            .BYTE $02,$FF,$FF,$FF,$FF,$FF,$FF,$FF
3B55| FF
3B56|
3B56| FF 79 07 FE 0F C6 FF  insertd   .BYTE $FF,$79,$07,$FE,$0F,$C6,$FF,$7F
3B5D| 7F
3B5E| FF F0 71 FF FF F8 0A            .BYTE $FF,$F0,$71,$FF,$FF,$F8,$0A,$18
3B65| 18
3B66| AA AA A8 FA AA AA F6            .BYTE $AA,$AA,$A8,$FA,$AA,$AA,$F6,$A0
3B6D| A0
3B6E| 60 E3 03 C0 07 38 04            .BYTE $60,$E3,$03,$C0,$07,$38,$04,$20
3B75| 20
3B76| 06 08 10 FF F3 08 10            .BYTE $06,$08,$10,$FF,$F3,$08,$10,$3C
3B7D| 3C
3B7E| 04 20 03 C0 FF FF FF            .BYTE $04,$20,$03,$C0,$FF,$FF,$FF,$FF
3B85| FF
3B86| 61 1F FF FF F8 0F 38            .BYTE $61,$1F,$FF,$FF,$F8,$0F,$38,$FF
3B8D| FF
3B8E| FF F0 01 80 CF 02 40            .BYTE $FF,$F0,$01,$80,$CF,$02,$40,$F3
3B95| F3
3B96| 04 20 3C 08 10 10 08            .BYTE $04,$20,$3C,$08,$10,$10,$08,$CF
3B9E| 1C 38 FF FF CF 03 C0            .BYTE $1C,$38,$FF,$FF,$CF,$03,$C0
3BA5| CF 01 C0 FF 3F 0E 38  keybdout  .BYTE $CF,$01,$C0,$FF,$3F,$0E,$38,$CF
3BAD| 08 08 F3 04 10 3C 02            .BYTE $08,$08,$F3,$04,$10,$3C,$02,$20
3BB4| 20
3BB5| 01 40 DF 80 F3 01 C0            .BYTE $01,$40,$DF,$80,$F3,$01,$C0,$3F
3BBC| 3F
3BBD| 01 40 20 1B 6D B6 DB            .BYTE $01,$40,$20,$1B,$6D,$B6,$DB,$60
3BC4| 60
3BC5| 16 DB 08 6D B6 DF 3B            .BYTE $16,$DB,$08,$6D,$B6,$DF,$3B,$6D
3BCC| 6D
3BCD| B6 DB 80 67 80 06 DB            .BYTE $B6,$DB,$80,$67,$80,$06,$DB,$6D
3BD4| 6D
3BD5| B6 D8 FF 0F 4F FF FF            .BYTE $B6,$D8,$FF,$0F,$4F,$FF,$FF,$FF
3BDC| FF
3BDD| 00 FF F0 FF FF FF FF            .BYTE $00,$FF,$F0,$FF,$FF,$FF,$FF,$FF
3BE5| F8 00 1B 6D B6 D8 36            .BYTE $F8,$00,$1B,$6D,$B6,$D8,$36,$C0
3BED| 1B 6D 00 B6 D8 36 C0            .BYTE $1B,$6D,$00,$B6,$D8,$36,$C0,$1B
3BF5| 6D B6 D8 00 36 C0 1B            .BYTE $6D,$B6,$D8,$00,$36,$C0,$1B,$6D
3BFD| B6 D8 36 C0 00 1B 6D            .BYTE $B6,$D8,$36,$C0,$00,$1B,$6D,$B6
3C04| B6
3C05| D8 36 C0 1B 6D 00 B6            .BYTE $D8,$36,$C0,$1B,$6D,$00,$B6,$D8
3C0D| 36 C0 1B FF FF D8 00            .BYTE $36,$C0,$1B,$FF,$FF,$D8,$00,$36
3C15| C0 1B FF FF D8 36 C0            .BYTE $C0,$1B,$FF,$FF,$D8,$36,$C0,$00
3C1D| FF FF FF FF FF F8 7F            .BYTE $FF,$FF,$FF,$FF,$FF,$F8,$7F,$FF
3C24| FF
3C25| F0 FF FF FF F0 FF               .BYTE $F0,$FF,$FF,$FF,$F0,$FF
3C2B| FD E0 FF F3 07 1C 3C  mouseout  .BYTE $FD,$E0,$FF,$F3,$07,$1C,$3C,$04
```

```
3C3A| A0                              .BYTE $04,$02,$08,$CF,$01,$10,$F7,$A0
3C3B| 3D 40 01 E0 FF F3 01           .BYTE $3D,$40,$01,$E0,$FF,$F3,$01,$20
3C42| 20
3C43| 7F 3F 9C FF 80 FF FE           .BYTE $7F,$3F,$9C,$FF,$80,$FF,$FE,$FF
3C4A| FF
3C4B| FF 3C 7E 7C FF FE CF           .BYTE $FF,$3C,$7E,$7C,$FF,$FE,$CF,$1F
3C52| 1F
3C53| F0 F3 0F E0 3C 0F E0           .BYTE $F0,$F3,$0F,$E0,$3C,$0F,$E0,$1F
3C5B| F0 FF FF FF FF FF FF           .BYTE $F0,$FF,$FF,$FF,$FF,$FF,$FF,$CF
3C62| CF
3C63| FF FE                         .BYTE $FF,$FE
3C65|
3C65| FF FF FF FF FF FF FF  Question .BYTE $FF,$FF,$FF,$FF,$FF,$FF,$FF,$FF
3C6C| FF
3C6D| CF 0F E0 F3 03 80 FE           .BYTE $CF,$0F,$E0,$F3,$03,$80,$FE,$0C
3C74| 0C
3C75| CF 03 80 F7 E0 BF 03           .BYTE $CF,$03,$80,$F7,$E0,$BF,$03,$EF
3C7D| 03 FF FE 03 FF FF FF           .BYTE $03,$FF,$FE,$03,$FF,$FF,$FF,$FF
3C84| FF
3C85| FF FF FF                      .BYTE $FF,$FF,$FF
3C88| CF 07 80 F3 0E 80 BE  checkmrk .BYTE $CF,$07,$80,$F3,$0E,$80,$BE,$1B
3C8F| 1B
3C90| 36 EF 6C 7B D8 01 9E           .BYTE $36,$EF,$6C,$7B,$D8,$01,$9E,$B0
3C98| 03 60 E7 06 C0 79 0D           .BYTE $03,$60,$E7,$06,$C0,$79,$0D,$80
3C9F| 80
3CA0| 1B DF 36 F7 6C 3D D8           .BYTE $1B,$DF,$36,$F7,$6C,$3D,$D8,$01
3CA7| 01
3CA8| B0 CF 03 60 F3 06 C0           .BYTE $B0,$CF,$03,$60,$F3,$06,$C0,$BC
3CAF| BC
3CB0| 0D 80 1B EF 36 FB 6C           .BYTE $0D,$80,$1B,$EF,$36,$FB,$6C,$9E
3CB8| D8 01 B0 E7 03 60 38           .BYTE $D8,$01,$B0,$E7,$03,$60,$38,$F8
3CBF| F8
3CC0| 06 C0 DC 0D CE 80 36           .BYTE $06,$C0,$DC,$0D,$CE,$80,$36,$1B
3CC8| F3 1B 36 3C 0D EC 06           .BYTE $F3,$1B,$36,$3C,$0D,$EC,$06,$D8
3CD0| CF 03 30 F3 01 E0              .BYTE $CF,$03,$30,$F3,$01,$E0
3CD6|
3CD6| 3C 03 C0 02 E0 CF 01  badmrk  .BYTE $3C,$03,$C0,$02,$E0,$CF,$01,$B0
3CDD| B0
3CDE| F7 D8 7D 6C 36 DF 1B           .BYTE $F7,$D8,$7D,$6C,$36,$DF,$1B,$E7
3CE5| E7
3CE6| 0D 80 79 06 C0 03 9E           .BYTE $0D,$80,$79,$06,$C0,$03,$9E,$60
3CEE| 01 B0 EF D8 FB 6C BE           .BYTE $01,$B0,$EF,$D8,$FB,$6C,$BE,$36
3CF6| 1B CF 0D 80 F3 06 C0           .BYTE $1B,$CF,$0D,$80,$F3,$06,$C0,$3C
3CFE| 03 60 01 B0 DF D8 F7           .BYTE $03,$60,$01,$B0,$DF,$D8,$F7,$6C
3D05| 6C
3D06| 7D 36 1B 9F 0D 80 E7           .BYTE $7D,$36,$1B,$9F,$0D,$80,$E7,$06
3D0E| C0 79 03 60 01 BE B0           .BYTE $C0,$79,$03,$60,$01,$BE,$B0,$D8
```

```
3D15| D8
3D16| EF 6C FB 36 3E 1B 0E            .BYTE $EF,$6C,$FB,$36,$3E,$1B,$0E,$80
3D1D| 80
3D1E| FF FF FF FF 1F 03 FF  diskette  .BYTE $FF,$FF,$FF,$FF,$1F,$03,$FF,$FF
3D25| FF
3D26| 86 F8 07 FF FF F4 EF            .BYTE $86,$F8,$07,$FF,$FF,$F4,$EF,$0A
3D2D| 0A
3D2E| FB 05 BC 02 80 01 FF            .BYTE $FB,$05,$BC,$02,$80,$01,$FF,$7D
3D36| 78 84 CF 01 02 FF 7C            .BYTE $78,$84,$CF,$01,$02,$FF,$7C,$01
3D3D| 01
3D3E| 02 84 DF 78 FF FF FF           .BYTE $02,$84,$DF,$78,$FF,$FF,$FF,$7F
3D45| 7F
3D46| 07 10 FF FF FF 80 03            .BYTE $07,$10,$FF,$FF,$FF,$80,$03,$FF
3D4D| FF
3D4E| FF FE FF FF FF FF               .BYTE $FF,$FE,$FF,$FF,$FF,$FF
3D54|
3D54| FF 0F 03 FF FF FF 00  lisa      .BYTE $FF,$0F,$03,$FF,$FF,$FF,$00,$FF
3D5B| FF
3D5C| C0 07 FF FF FF FF E0            .BYTE $C0,$07,$FF,$FF,$FF,$FF,$E0,$10
3D64| 0C FF FF F0 30 01 FF            .BYTE $0C,$FF,$FF,$F0,$30,$01,$FF,$70
3D6B| 70
3D6C| FF F8 07 80 01 9E FF            .BYTE $FF,$F8,$07,$80,$01,$9E,$FF,$01
3D73| 01
3D74| FF CF 07 80 FF 3F 07            .BYTE $FF,$CF,$07,$80,$FF,$3F,$07,$80
3D7C| E7 01 FF 09 01 FF 01            .BYTE $E7,$01,$FF,$09,$01,$FF,$01,$FF
3D83| FF
3D8B| FF                              .BYTE $FF,$F8,$40,$07,$80,$0C,$FF,$FF
3D8C| F0 30 00 07 FF FF FF           .BYTE $F0,$30,$00,$07,$FF,$FF,$FF,$FF
3D94| E0 03 FF 00 FF FF FF           .BYTE $E0,$03,$FF,$00,$FF,$FF,$FF,$C0
3D9B| C0
3D9C| 03 FF FF FF 00 FF E0            .BYTE $03,$FF,$FF,$FF,$00,$FF,$E0,$07
3DA3| 07
3DA4| FF FF FF FF F0 61 AA            .BYTE $FF,$FF,$FF,$FF,$F0,$61,$AA,$AA
3DAB| AA
3DAC| AA 95 FF 18 FF FF 9F            .BYTE $AA,$95,$FF,$18,$FF,$FF,$9F,$5F
3DB3| 5F
3DB4| FF FD 86 1F 0A AA A8            .BYTE $FF,$FD,$86,$1F,$0A,$AA,$A8,$15
3DBB| 15
3DBC| 3F 07 FF 00 FF FF FF           .BYTE $3F,$07,$FF,$00,$FF,$FF,$FF,$F0
3DC3| F0
3DC4| 03 FF FF FF FC FF E0            .BYTE $03,$FF,$FF,$FF,$FC,$FF,$E0,$FF
3DCB| FF
3DCC| FF FF                           .BYTE $FF,$FF
3DCE|
3DCE|                              .ENDC
3DCE|
3DCE|                              .PAGE
```

```
3DCE|                           .LIST
3DCE|                       ;-------------------------------------------------------------------------
3DCE|                       ;  Message Table
3DCE|                       ;-------------------------------------------------------------------------
3DCE|
3DCE|                           .IF  USERINT = 0
3DCE|                           .ENDC                           ;{USERINT}
3DCE|                           .IF     BURNIN = 1
3DCE|
3DCE| 50 4F 57 45 52 20 43  BRNMSG  .ASCII  'POWER CYCLING AT '
3DDC| 41 54 20
3DDF| 00                            .BYTE   0
3DE0| 54 49 4D 45 20 49 53  TIMMSG  .ASCII  'TIME IS '                            ; RM000
3DE7| 20
3DE8| 00                            .BYTE   0
3DE9| 44 52 49 56 45 20 54  TWGMSG  .ASCII  'DRIVE TEST'                          ; RM000
3DF0| 45 53 54
3DF3| 00                            .BYTE   0
3DF4| 4C 4F 4F 50 20 43 4F  LOOPMSG .ASCII  'LOOP COUNT IS '
3DFB| 55 4E 54 20 49 53 20
3E02| 00                            .BYTE   0
3E03| 50 4D 20 42 55 53 20  PMMSG   .ASCII  'PM BUS ERROR'
3E0F| 00                            .BYTE   0
3E10| 46 4C 4F 50 50 59 20  TWGFAIL .ASCII  'FLOPPY TEST FAILED'
3E1E| 49 4C 45 44
3E22| 00                            .BYTE   0
3E23| 46 4C 4F 50 50 59 20  TWGRSLT .ASCII  'FLOPPY ERROR COUNT IS '
3E31| 4F 55 4E 54 20 49 53
3E38| 20
3E39| 00                            .BYTE   0
3E3A|
3E3A|                           .ENDC
3E3A|
3E3A|                           .IF  ROM4K = 0
3E3A|                           .IF  USERINT = 0
3E3A|                           .ELSE
3E3A|
3E3A| 54 45 53 54 49 4E 47  CHKMSG  .ASCII  'TESTING'
3E41| 00                            .BYTE   0
3E42| 54 45 53 54                   .ASCII  'TEST'                  ;French translation
3E46| 00                            .BYTE   0
3E47| 45 53 20 57 49 52 44         .ASCII  'ES WIRD GETESTET'      ;German translation
3E4E| 20 47 45 54 45 53 54
3E55| 45 54
3E57| 00                            .BYTE   0
3E58| 52 45 53 54 41 52 54  RTRYMSG .ASCII  'RESTART'
3E5F| 00                            .BYTE   0
```

```
3E60| 52 45 43 4F 4D 4D 45          .ASCII  'RECOMMENCER'           ;French
3E67| 4E 43 45 52
3E6B| 00                            .BYTE   0
3E6C| 4E 45 55 20 53 54 41          .ASCII  'NEU STARTEN'           ;German
3E73| 52 54 45 4E
3E77| 00                            .BYTE   0
3E78|
3E78| 43 4F 4E 54 49 4E 55  CONTMSG .ASCII  'CONTINUE'
3E7F| 45
3E80| 00                            .BYTE   0
3E81| 43 4F 4E 54 49 4E 55          .ASCII  'CONTINUER'             ;French
3E88| 45 52
3E8A| 00                            .BYTE   0
3E8B| 57 45 49 54 45 52 4D          .ASCII  'WEITERMACHEN'          ;German
3E92| 41 43 48 45 4E
3E97| 00                            .BYTE   0
3E98|
3E98| 53 54 41 52 54 55 50  STRTMSG .ASCII  'STARTUP FROM'
3EA4| 00                            .BYTE   0
3EA5| 44 45 4D 41 52 52 45          .ASCII  'DEMARRER DE'           ;French
3EAC| 52 20 44 45
3EB0| 00                            .BYTE   0
3EB1| 53 54 41 52 54 45 4E          .ASCII  'STARTEN VON'           ;German
3EB8| 20 56 4F 4E
3EBD|                               .BYTE   0
3EBD| 2E 2E 2E              PERIODS .ASCII  '...'
3EC0| 00                            .BYTE   0
3EC1|
3EC1| 4F 50 54 49 4F 4E 53  MENUHDG .ASCII  'OPTIONS'
3EC8| 00                            .BYTE   0
3EC9|
3EC9| 44 49 53 50 4C 41 59  DISPMSG .ASCII  'DISPLAY MEM   1'
3ED0| 20 4D 45 4D 20 20 20
3ED7| 31
3ED8| 00                            .BYTE   0
3ED9| 53 45 54 20 4D 45 4D  SETMSG  .ASCII  'SET MEMORY    2'
3EE7| 32
3EE8| 00                            .BYTE   0
3EE9| 43 41 4C 4C 20 50 52  CALLMSG .ASCII  'CALL PROGRAM  3'
3EF0| 4F 47 52 41 4D 20 20
3EF7| 33
3EF8| 00                            .BYTE   0
3EF9|                               .IF  ROM16K = 1
3EF9| 4C 4F 4F 50 20 4F 4E  LPMSG   .ASCII  'LOOP ON TEST  4'
3F00| 20 54 45 53 54 20 20
3F07| 34
3F08| 00                            .BYTE   0
```

```
3F09|                                .ENDC
3F09|
3F09| 41 44 4A 55 53 54 20  VIDMSG  .ASCII  'ADJUST VIDEO  5'
3F10| 56 49 44 45 4F 20 20
3F17| 35
3F18| 00                             .BYTE   0
3F19|
3F19|                                .IF  BURNIN = 1
3F19| 50 4F 57 45 52 20 43  CYCLMSG .ASCII  'POWER CYCLE   6'
3F20| 59 43 4C 45 20 20 20
3F27| 36
3F28| 00                             .BYTE   0
3F29|                                .ENDC
3F29|
3F29| 51 55 49 54 20 20 20  QUITMSG .ASCII  'QUIT          7'
3F30| 20 20 20 20 20 20 20
3F37| 37
3F38| 00                             .BYTE   0
3F39|
3F39| F4 F1 F2               MENUID  .BYTE   KEY1,KEY2,KEY3                  ;menu id table
3F3C|
3F3C|                                .IF  ROM16K = 1
3F3C| F3                             .BYTE   KEY4
3F3D|                                .ENDC
3F3D|
3F3D| E4                             .BYTE   KEY5
3F3E|
3F3E|                                .IF  BURNIN = 1
3F3E| E1                             .BYTE   KEY6
3F3F|                                .ENDC
3F3F|
3F3F| E2                             .BYTE   KEY7
3F40|
3F40|                                .ENDC
3F40|                                .IF  ROM16K = 1
3F40|                                .IF  FULLSCC = 0
3F40|                                .ENDC
3F40| 31 20 2D 20 52 4F 4D  TSTMENU .ASCII  '1 - ROM'
3F47| 0D                             .BYTE   RET
3F48| 32 20 2D 20 4D 4D 55          .ASCII  '2 - MMU'
3F4F| 0D                             .BYTE   RET
3F50| 33 20 2D 20 56 49 44          .ASCII  '3 - VIDEO'                     ;RM000
3F57| 45 4F
3F59| 0D                             .BYTE   RET
3F5A| 34 20 2D 20 50 41 52          .ASCII  '4 - PARITY'                    ;RM000
3F61| 49 54 59
3F64| 0D                             .BYTE   RET
```

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3F65| 35 20 2D 20 50 41 52          .ASCII  '5 - PARA VIA'                  ;RM000
3F6C| 41 20 56 49 41
3F71| 0D                            .BYTE   RET
3F72| 36 20 2D 20 4B 59 42          .ASCII  '6 - KYBD VIA'                  ;RM000
3F79| 44 20 56 49 41
3F7E| 0D                            .BYTE   RET
3F7F| 37 20 2D 20 43 4F 50          .ASCII  '7 - COPS'
3F86| 53
3F87| 0D                            .BYTE   RET
3F88| 38 20 2D 20 53 43 43          .ASCII  '8 - SCC'
3F8F| 0D                            .BYTE   RET
3F90| 39 20 2D 20 44 49 53          .ASCII  '9 - DISK'
3F97| 4B
3F98| 0D                            .BYTE   RET
3F99| 41 20 2D 20 43 4C 4F          .ASCII  'A - CLOCK'
3FA0| 43 4B
3FA2| 0D                            .BYTE   RET
3FA3| 42 20 2D 20 4D 45 4D          .ASCII  'B - MEMORY'
3FAA| 4F 52 59
3FAD| 0D                            .BYTE   RET
3FAE| 43 20 2D 20 49 4F 20          .ASCII  'C - IO SLOTS'
3FB5| 53 4C 4F 54 53
3FBA| 00                            .BYTE   0
3FBB|                               .ENDC
3FBB|
3FBB|                               .IF  USERINT = 0
3FBB|                               .ELSE
3FBB| 41 44 44 52 45 53 53  ADDRMSG .ASCII  'ADDRESS ?'
3FC2| 20 3F
3FC4| 00                            .BYTE   0
3FC5| 44 41 54 41 20 3F     DATAMSG .ASCII  'DATA ?'
3FCB| 00                            .BYTE   0
3FCC| 43 4F 55 4E 54 20 3F  CNTMSG  .ASCII  'COUNT ?'
3FD3| 00                            .BYTE   0
3FD4| 54 45 53 54 20 3F     TSTMSG  .ASCII  'TEST ?'
3FDA| 00                            .BYTE   0
3FDB|
3FDB|                               .ENDC
3FDB| 57 48 41 54 20 3F     WHATMSG .ASCII  'WHAT ?'
3FE1| 00                            .BYTE   0
3FE2|
3FE2|                               .ENDC                           ;{ROM4K}
3FE2|
3FE2|                               .ENDCROM4K = 1
3FE2|
3FE2|                               .IF  ROM8K = 1
3FE2|                               .ENDC
```

```
3FE2|
3FE2|                                .IF  ROM16K = 1
3FE2| 00 00 00 00 00 00 00           .ORG    $3FF4           ;                                CHG005
3FF4|
3FF4|                           ;************ COPYRIGHT NOTICE ************************************
3FF4| 43 38 34 41 50 50 4C  HDGMSG  .ASCII  'C84APPLE'      ;                                CHG005
3FFB| 45
3FFC|                           ;*****************************************************************
3FFC|
3FFC| 02                       VRSN    .BYTE   $02             ;version 2                       CHG001
3FFD| 48                       REV     .ASCII  'H'             ; rev H                          CHG001
3FFE|                                .ENDC
3FFE|
3FFE|
3FFE| 0000                     LAST    .WORD   $0000           ;checksum word for ROM test
4000|                                .END

------------------------------------------------------------------- SYMBOLTABLE DUMP

AB - Absolute     LB - Label     UD - Undefined     MC - Macro
RF - Ref          DF - Def       PR - Proc          FC - Func
A5 - A5 Global    32 - 32-bit Global

A6SAV    AB 000001F8|  AAPL     AB 00000000|  ACHK1    LB 00000286
ACHK2    LB 0000029C|  ACR1     AB 00000016|  ACTADDR  AB 00000270
ACTDATA  AB 00000274|  ACTL     AB 00000002|  ADDRMSG  LB 00003FBB
ADR128K  AB 00020000|  ADRCHK   LB 00000EF6|  ADRCLR   LB 00000F00
ADREXCP  AB 00000006|  ADRLTCH  AB 000001AA|  ADRMSK   AB 00000003
ADRREGS  AB 000001E0|  ADRTST   LB 00000EE6|  ADRVCT   LB 0000000C
ADRVCTR  AB 0000000C|  AERR     LB 0000074E|  AKEY     AB 000000F0
ALBOXCOL AB 00000006|  ALBOXROW AB 00000031|  ALPHA    LB 000016A8
ALPHKEY  AB 000000FD|  ALRMSAV  AB 00FCC1B1|  ALRTCOL  AB 00000010
ALRTHIGH AB 000000A4|  ALRTROW  AB 00000073|  ALRTSTRT AB 00001140
ALRTWIDT AB 0000004E|  ALTBMSK  AB 70000000|  ALTBOOT  AB 0000001C
ALTCOL   AB 00000014|  ALTKYADD AB 00000445|  APPLENET AB 00008001
APPLICON LB 000038B6|  APPLQUAL AB 00009FFF|  ASCIITAB LB 000038BC
B96DATA  LB 00001038|  B96LTH   AB 00000010|  BADBRD   LB 000021A2
BADHDR   AB 00000054|  BADMRK   LB 00003CD6|  BADRSP   AB 00000052
BADSM    AB 0000005C|  BADST    AB 0000005D|  BADTHDR  AB 00000026
BASE     LB 00000000|  BASICTST LB 00000E6A|  BEEP     LB 00000AE8
BEGIN    LB 000000F6|  BEGIN2   LB 00000152|  BEGIN3   LB 0000018A
BERR     LB 00000742|  BFAIL2   LB 00001F3E|  BKEY     AB 000000EE
BLACK    LB 000035FC|  BLACKEN  LB 00003106|  BLKH     AB 00000001
BLKL     AB 00000003|  BLKM     AB 00000002|  BLKNUM   AB 00000536
BLKSIZE  AB 00000200|  BMENU    AB 00000001|  BMENULEN AB 00000022
BMENUSPC AB 00000BF4|  BMENUWID AB 00000012|  BOOTCHK  LB 000016E6
BOOTDATA AB 000001B4|  BOOTDVCE AB 000001B3|  BOOTFAIL LB 00001F3A
```

```
BOOTMEM  AB 00000188|  BOOTMENU LB 000018F8|  BOOTMSK  AB 008FFFFF
BOOTPAT  AB 0000AAAA|  BOTSIDE  AB 00000001|  BOUNDS   LB 00002F7C
BRNMSG   LB 00003DCE|  BS       AB 00000008|  BSR2     MC --------
BSR4     MC --------|  BSR6     MC --------|  BSRS2    MC --------
BSRS4    MC --------|  BSRS6    MC --------|  BSY      AB 00000001
BSYTIME  AB 00000500|  BTENTRY  AB 00020002|  BTERR    LB 00001D2A
BTMENU   AB 0000001D|  BTN      AB 00000006|  BTN1MSG  AB 00001C08
BTN3MSG  AB 00003DC8|  BTN3STRT AB 00003A36|  BTNCOL   AB 00000034
BTNHIGH  AB 0000001C|  BTNMSPC  AB 00000392|  BTNROW   AB 00000045
BTNSPC   AB 000010E0|  BTNWIDTH AB 0000000A|  BURNIN   AB 00000001
BUSEXCP  AB 00000005|  BUSVCT   LB 00000008|  BUSVCTR  AB 00000008
BUTN     AB 00000003|  BUTN1    AB 00000001|  BUTN2    AB 00000005
BYTESPER AB 00000007|  CALL3    LB 00000E6C|  CALLBASE AB 00000480
CALLMSG  LB 00003EE9|  CALLRTN  LB 00002908|  CFGEXIT  LB 00001370
CHARROWS AB 0000001B|  CHECK    LB 000035FE|  CHECKMRK LB 00003C88
CHECKSUM LB 00000CB2|  CHKBASE  LB 0000025E|  CHKBSY   LB 00001F82
CHKCMD   AB 00000005|  CHKCNT   AB 000000BA|  CHKCNT2  AB 000000C4
CHKCPU   LB 000035B6|  CHKDRIVE LB 00001D5C|  CHKFDIR  LB 00001E96
CHKFIN   LB 00001E3E|  CHKHI    LB 000004E2|  CHKICONS LB 00001B68
CHKID    LB 00001380|  CHKINPUT LB 00002EA2|  CHKIOBRD LB 000035C6
CHKIT    LB 00002C52|  CHKIT2   LB 00002CBE|  CHKLO    LB 0000045E
CHKMADR  LB 0000153C|  CHKMBRD  LB 000035BE|  CHKMEM   LB 00000508
CHKMSG   LB 00003E3A|  CHKPAS2  LB 00002244|  CHKPASS  LB 0000223A
CHKPM    LB 00001836|  CHKPOSN  LB 00002E46|  CHKPROFI LB 00001A36
CHKPXIT  LB 00002E9C|  CHKROW   AB 0000004B|  CHKRW    LB 000002B4
CHKS2    LB 000019EE|  CHKS3    LB 00001A00|  CHKSLOT  LB 00001B44
CHKSXIT  LB 00001B94|  CHKTIM   LB 0000229A|  CHKVCT   LB 00000018
CHKXCRD  LB 000035CE|  CHRHIGH  AB 00000008|  CHRSPC   AB 0000000A
CHRWIDTH AB 00000001|  CKEY     AB 000000ED|  CKLOOP   LB 00001890
CKXIT    LB 000018AE|  CLAMP    AB 00000009|  CLICK    LB 00000AEE
CLK      AB 0000000E|  CLKDATA  AB 000001BA|  CLKERR   LB 000012E2
CLKSAVE  AB 00FCC1A1|  CLKTST   LB 0000128C|  CLMPERR  AB 00000016
CLOCKBYT AB 00000480|  CLRDBOX  LB 00002C28|  CLRDESK  LB 000030DA
CLRFDIR  LB 00001E72|  CLRINT   LB 00001C24|  CLRIT    LB 00002B7A
CLRMENU  LB 00003114|  CLRPM    LB 00002250|  CLRRST   LB 00000AC4
CLRSCRN  LB 000026F0|  CLRSTAT  AB 00000085|  CMD      AB 00000002
CMDBUFR  AB 00000304|  CMDCHK   LB 00001E04|  CMDDWN   AB 000000FF
CMDERR   LB 0000245E|  CMDFLG   AB 00000003|  CMDKEY   AB 000000FF
CMDTIME  AB 00120000|  CMDUP    AB 0000007F|  CNFRM    AB 0000000E
CNTINC   LB 0000238A|  CNTMSG   LB 00003FCC|  COARSE   LB 00002F6C
CODECOL  AB 00000012|  CODEROW  AB 00000097|  COL1STRT AB 00001B72
COL2MID  AB 000039BC|  COL2STRT AB 00001B7E|  COL3STRT AB 00001B8A
COMPARE  LB 00003150|  CONCHK   LB 00000410|  CONFIG   LB 000012EE
CONFIG2  LB 000012F6|  CONOFF   LB 00000800|  CONOK    LB 0000043E
CONSET   LB 000007FA|  CONSET2  LB 00000802|  CONT     LB 00003132
CONTCHK  LB 0000265E|  CONTMSG  LB 00003E78|  CONTMSK  AB 001E3FFA
CONTXT   AB 00000538|  CONVERT  LB 00002BF4|  CONVRTD5 LB 000036EE
```

```
COPS0    LB 00002D38|  COPS1    LB 00002D48|  COPS2    LB 00002D5C
COPS4    LB 00002D9E|  COPSBAD  LB 0000090A|  COPSCHK  LB 000011C0
COPSCMD  LB 00000956|  COPSENBL LB 000008EA|  COPSVCT  LB 00000916
COPY6    LB 00002092|  COPY6LP  LB 000020A0|  CPIOMSK  AB 001FFFFF
CPSINIT  LB 00000920|  CPUBRD   LB 0000398B|  CPUINTR  AB 00000004
CPUMSK   AB 0000000F|  CPUSEL   AB 00000001|  CPUSTRT  AB 00001DF6
CRSRBUSY AB 0000049B|  CRSRDATA LB 0000391C|  CRSRHEIG AB 00000494
CRSRHIDD AB 0000049E|  CRSRHOTX AB 00000490|  CRSRHOTY AB 00000492
CRSRMASK LB 0000391C|  CRSROBSC AB 000004A0|  CRSRTRAC AB 0000049A
CRSRVISI AB 0000049C|  CRSRX    AB 00000496|  CRSRY    AB 00000498
CRTCOL   AB 00000302|  CRTROW   AB 00000300|  CSBIT    AB 00000005
CSTRB    AB 00FCD01C|  CURSORDI LB 0000300E|  CURSORHI LB 00002FEA
CURSORIN LB 00002FCC|  CYCLCNT  AB 00FCC1C1|  CYCLMSG  LB 00003F19
CYCLVAL  AB 00FCC1C3|  D7SAV    AB 000001AC|  DATABFR  AB 00020000
DATAMSG  LB 00003FC5|  DATARGS  AB 000001C0|  DBOXCOL  AB 00000018
DBOXDSPL LB 00002C0A|  DBOXHIGH AB 00000014|  DBOXLEFT AB 00000014
DBOXROW  AB 00000018|  DBOXSTRT AB 0000071E|  DBOXTOP  AB 00000168
DBOXWIDT AB 00000042|  DDRA1    AB 00000006|  DDRA2    AB 00000018
DDRB1    AB 00000004|  DDRB2    AB 00000010|  DEBUG    AB 00000000
DEFCOL   AB 0000003E|  DEFROW   AB 000000A4|  DEFSTRT  AB 000039E6
DEFVID   AB 0000002F|  DEFVID2  AB 000000AF|  DELAY    LB 00000AE2
DELAY5   LB 00000AD4|  DELAY_1  LB 00000ACC|  DESKLINE AB 000005FA
DESKLMT  AB 00007FF8|  DESKPATR AB AAAA5555|  DG2OFF   AB 00FCE004
DG2ON    AB 00FCE006|  DIAGS    AB 00000001|  DIE      AB 00000089
DISABLE  MC --------|  DISINT   LB 00002364|  DISK     AB 00000011
DISKCOL  AB 00000004|  DISKETTE LB 00003D1E|  DISKMEM  AB 00FCC001
DISKROM  AB 00FCC031|  DISKROW  AB 00000012|  DISPMSG  LB 00003EC9
DIV0VCT  LB 00000014|  DLCNT    AB FFFFFFFC|  DLOOP    LB 000035EC
DLYCNST  AB 00000009|  DLYTIME  AB 00100000|  DOBOOT   LB 000016E2
DOCRES   LB 00002146|  DODSPLY  LB 000035AE|  DOMENU   LB 000025EC
DONE     LB 0000360A|  DOREAD   LB 00001C2C|  DORESET  LB 00002652
DOSUM    LB 0000019E|  DRAWBUTN LB 000032F8|  DRAWDESK LB 000030D6
DRAWSIDE LB 00003342|  DRIVE    AB 00000535|  DRIVEN   LB 00003B1E
DRV      AB 00000004|  DRV1     AB 00000000|  DRV2     AB 00000080
DRVCOL   AB 00000003|  DRVERR   AB 00000007|  DRVROW   AB 00000006
DRVTYPE  AB 00FCC015|  DRWHORZ  LB 00002A26|  DRWVERT  LB 00002A40
DSABLDSK LB 00001D46|  DSABLINT AB 00000087|  DSAVARRY AB FFFFFFF8
DSCONT   LB 000023FC|  DSCRACH  AB FFFFFF18|  DSK1IN   AB 00000000
DSK2IN   AB 00000004|  DSKBAD   LB 00001CAA|  DSKBSY   AB 00000051
DSKBUFF  AB 000003E8|  DSKCHK   LB 00001C9A|  DSKCNTH  AB 00FCC19D
DSKCNTL  AB 00FCC19F|  DSKDATA  AB 00000400|  DSKDIAG  AB 00000006
DSKDIS   LB 00001CC0|  DSKERR   LB 00001CC4|  DSKERR2  LB 00001D0E
DSKERR3  LB 00001D14|  DSKIN    AB 00000002|  DSKOUT   LB 00001CBC
DSKRSLT  AB 000002AE|  DSKSIZE  AB 000006A6|  DSKTIMER LB 00001C98
DSKTMOUT AB 001C8000|  DSKTST   LB 0000110C|  DSKVCT   LB 00001186
DSKXIT   LB 00001180|  DSPALL   LB 00003686|  DSPALRTI LB 0000352C
DSPALRTM LB 000036DA|  DSPBAD   LB 000034EC|  DSPCH    LB 000016B0
```

```
DSPCHECK LB 000035D4|  DSPCLK   LB 000024CA|  DSPCODE  LB 00001622
DSPCPU   LB 00003588|  DSPCPURM LB 000008DC|  DSPCXIT  LB 00001668
DSPDEC   LB 00001630|  DSPDONE  LB 00003716|  DSPERR   LB 0000244E
DSPERRIC LB 000034DA|  DSPFRNCH LB 000036AA|  DSPGERMN LB 000036A6
DSPICON  LB 000035E2|  DSPIOB   LB 0000359C|  DSPIT    LB 000036B8
DSPMBRD  LB 00003592|  DSPMEM   LB 00002836|  DSPMENU  LB 00002744
DSPMENUB LB 000027D0|  DSPMNTRY LB 00001A94|  DSPMSG   LB 00003700
DSPMSGR  LB 000036F6|  DSPMSLSH LB 000036D2|  DSPNUM   LB 00003464
DSPNUMIC LB 00003450|  DSPOUT   LB 000036B0|  DSPQICON LB 00003556
DSPRGICO LB 00003424|  DSPSTRIN LB 00003634|  DSPTIM   LB 00002398
DSPVAL   LB 0000373A|  DSPVXIT  LB 000037B4|  DSPWTICO LB 00001EA6
DSPXCRD  LB 000035A6|  DSTACK   AB FFFFFF18|  DVCCODE  AB 00FCC189
DVCECHK  LB 00001754|  EADREXCP AB 0000002E|  EBOOT    AB 0000004B
EBUSEXCP AB 0000002D|  ECLK     AB 00000036|  ECPAR    AB 0000002B
ECPUINTR AB 0000002C|  ECPUSEL  AB 00000029|  EDISK    AB 00000039
EILLEXCP AB 00000030|  EIOCOP   AB 00000034|  EIOCOP2  AB 0000003B
EIOEXCP  AB 0000003A|  EIOKBD   AB 0000003C|  EJCTDSK  LB 00001E56
EJCTTIME AB 00180000|  EKBDCOP  AB 00000035|  EMEM     AB 00000046
EMISEXCP AB 0000002F|  EMMU     AB 00000028|  ENABLE   MC --------
ENBLDRVS LB 00002E2A|  ENBLINT  AB 00000086|  ENDPM    AB 00FCC1FF
ENQKBD   LB 00002B86|  ENTRKEY  AB 000000AF|  EPAR     AB 00000047
ERRCOL   AB 00000010|  ERRDISP  LB 000014EA|  ERRMSK   AB 0E7FFFFF
ERRROW   AB 00000073|  ERRSTRT  AB 0000287E|  ERS232A  AB 00000037
ERS232B  AB 00000038|  ETRPEXCP AB 00000031|  EVIA1    AB 00000032
EVIA2    AB 00000033|  EVID     AB 0000002A|  EXCADR   AB 00000282
EXCFC    AB 00000280|  EXCHK    LB 0000140E|  EXCIR    AB 00000286
EXCLUSIV LB 0000314E|  EXCP0    LB 00000758|  EXCP1    LB 00000764
EXCPC    AB 0000028A|  EXCPERR  LB 00000030|  EXCSR    AB 00000288
EXCTYPE  AB 0000028E|  EXIT     LB 00000CF8|  EXMEM    AB 00000006
EXMSK    AB 000003F0|  EXPAND   LB 000018B0|  EXRW     AB 00000081
EXTERNAL AB 00000000|  FASTMR   AB 00000006|  FDIR     AB 00000004
FDIRTIME AB 00C00000|  FILEID   AB 00000004|  FINDD2   LB 000020BC
FINDERR  LB 000020E6|  FINDSYNC LB 00000D0A|  FINE     LB 00002F56
FINKBD   AB 00000001|  FINLISA  AB 00000000|  FIRSTCOL AB 00000018
FIRSTROW AB 0000003E|  FIVESEC  AB 001312D0|  FMT      AB 00000003
FMTTIME  AB 01800000|  FNDXIT   LB 000020F6|  FONTTBL  LB 000037C0
FULLSCC  AB 00000001|  GET0     LB 000009F0|  GET1     LB 00002C4E
GET2     LB 00002CBA|  GET3     LB 00002D0C|  GETA     LB 00002BA4
GETBITS1 LB 00000C1C|  GETBITS2 LB 00000C50|  GETBYTES LB 00000C82
GETCH    LB 00002B96|  GETDATA  LB 00000A7E|  GETDIG   LB 00001634
GETERR   LB 000026E6|  GETEXIT  LB 00002BE8|  GETINPUT LB 00002C46
GETIT    LB 00000AA2|  GETJMP   LB 00000A38|  GETL1    LB 0000262A
GETL1XIT LB 000026DA|  GETLENGT LB 00003418|  GETLEV2  LB 0000274C
GETNIBBL LB 00000D34|  GETNTRY  LB 00002E5A|  GETPADDR LB 00000FF0
GETPARM  LB 00002BB2|  GETROWCO LB 00003406|  GETRSP   LB 000020CE
GETSTAT  LB 00002060|  GETXIT2  LB 00002BF2|  GLOBALS  AB 00000480
GOTOMON  LB 000015CC|  GRAY     LB 000030EE|  GRAY1    LB 000030F4
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```
HALFMEG  AB 00080000|  HALFSEC  AB 0001E848|  HALFSIZE AB 00000070
HDERR2   LB 00001F5E|  HDERR3   LB 00001F66|  HDGMSG   LB 00003FF4
HDRBUFR  AB 0001FFEC|  HDRLEN   AB 0000000C|  HDRSIZE  AB 00000014
HDSKERR  LB 00001F10|  HEX128K  AB 00020000|  HEX2K    AB 00000800
HEX32K   AB 00008000|  HEX512K  AB 00080000|  HEX8K    AB 00002000
HEX96K   AB 00018000|  HIPTCH   LB 000016C8|  HOUR     AB 000001BC
HOURSAV  AB 00FCC193|  ICBIT    AB 0000000D|  ICERR    AB 000000FE
ICONADDR AB 00000532|  ICONCHK  LB 00001986|  ICONCNT  AB 00000534
ICONCSPC AB 00001680|  ICONHIGH AB 00000020|  ICONMENU LB 00001AAA
ICONMSPC AB 00000440|  ICONPTR  AB 00020004|  ICONRSPC AB 0000000C
ICONWIDT AB 00000006|  IER1     AB 0000001C|  IERR     LB 000006F8
IFR1     AB 0000001A|  ILLEXCP  AB 00000008|  ILLVCT   LB 00000010
ILLVCTR  AB 00000010|  INCSR    AB 00000004|  INDATA   AB 00000000
INIT1    LB 00002544|  INIT2    LB 0000255C|  INIT3    LB 00002570
INITB2   LB 000010CE|  INITB2L  AB 00000002|  INITBDAT LB 000010CA
INITBLTH AB 00000004|  INITFLG  AB 00FCC191|  INITMEM  LB 0000066C
INITMON  LB 00002534|  INITVCT  LB 000006A6|  INSERTD  LB 00003B56
INSRTCOL AB 00000004|  INSRTROW AB 00000005|  INSRTTIM AB 00C00000
INTERR   LB 00001174|  INTLV    AB 00000012|  INTSTAT  AB 0000005E
INV      AB 0000005B|  INVALID  LB 00002A74|  INVCHAR  LB 000038B0
INVERSE  LB 0000312E|  INVERT   LB 00002EC2|  INVERTCK AB 00000000
INVICON  LB 00003574|  INVID    LB 0000219E|  INVIDBIT AB 00000006
INVPAG   AB 00000C00|  INVPARM  LB 00002BEE|  INVSUM   LB 0000222A
INVTST   LB 000008A2|  INVXIT   LB 00002A86|  IO1ERR   AB 00000019
IO1ID    AB 00000298|  IO1PORT1 AB 00000003|  IO1PORT2 AB 00000004
IO1STAT  AB 0000029E|  IO2ERR   AB 0000001A|  IO2ID    AB 0000029A
IO2PORT1 AB 00000006|  IO2PORT2 AB 00000007|  IO2STAT  AB 0000029F
IO3ERR   AB 0000001B|  IO3ID    AB 0000029C|  IO3PORT1 AB 00000009
IO3PORT2 AB 0000000A|  IO3STAT  AB 000002A0|  IOBRD    LB 0000394B
IOCERR   LB 00000A66|  IOCHK    LB 0000145E|  IOCOPS   AB 0000000C
IOCOPS2  AB 00000013|  IOEXCP   AB 00000012|  IOKBD    AB 00000014
IOLMT    AB 00000900|  IOLMT2   AB 00000901|  IOMSK    AB 001FDC00
IOROM    AB 000002A1|  IOS1     AB 00000034|  IOS2     AB 00000037
IOS3     AB 00000041|  IOSBOOT  LB 0000215E|  IOSCHK   LB 00001590
IOSMSK   AB 0E000000|  IOSPACE  AB 00FC0000|  IOSTRT   AB 00001E12
IOTST    LB 00001000|  IOVCT    LB 00000918|  IRA2     AB 00000008
IRB2     AB 00000000|  JMPTBL   LB 00000080|  KBDBFR   AB 000002C0
KBDCHK   LB 000014F8|  KBDCOPS  AB 0000000D|  KBDDELAY LB 00000ADC
KBDDLY   AB 00067C28|  KBDEND   AB 00000300|  KBDOUT   AB 00000017
KBDQ     AB 000002B0|  KBDQPTR  AB 00000260|  KCERR    AB 000000FF
KEY1     AB 000000F4|  KEY2     AB 000000F1|  KEY3     AB 000000F2
KEY4     AB 000000F3|  KEY5     AB 000000E4|  KEY6     AB 000000E1
KEY7     AB 000000E2|  KEY8     AB 000000E3|  KEY9     AB 000000D0
KEYBDOUT LB 00003BA5|  KEYID    AB 000001B2|  KEYSCAN  LB 000011EA
KEYTBL   LB 0000127A|  KEYTOASC LB 0000271A|  KUNPLG   AB 000000FD
L10VCT   LB 00000028|  L10VCTR  AB 00000028|  L11VCT   LB 0000002C
L11VCTR  AB 0000002C|  LAST     LB 00003FFE|  LASTBLK  AB 000006A6
```

```
LASTCOL  AB 00000058|  LASTROW  AB 0000014C|  LCNTHI   AB 00FCC195
LCNTLO   AB 00FCC197|  LEV1LOOP LB 000026DE|  LEV2LOOP LB 00002A82
LEVEL1   LB 000025A4|  LEVEL2   LB 0000273C|  LISA     LB 00003D54
LISAROM  PR --------|  LOADLMT  LB 00000316|  LOADORG  LB 000002E4
LOADPGM  LB 000021EA|  LOMEM    AB 00000800|  LOOP     AB 0000001F
LOOP0    LB 00003432|  LOOP1    LB 00003438|  LOOP2    LB 0000343A
LOOPMSG  LB 00003DF4|  LOOPTBL  LB 000029DC|  LOOPTST  LB 00002934
LOPTCH   LB 000016CC|  LOTONE   LB 00000554|  LPMSG    LB 00003EF9
LPTEST   LB 00001054|  LSTCHK   LB 0000182E|  LVL1VCT  LB 00000064
LVL2VCT  LB 00000068|  LVL3VCT  LB 0000006C|  LVL4VCT  LB 00000070
LVL5VCT  LB 00000074|  LVL6VCT  LB 00000078|  LVL7VCT  LB 0000007C
LWRRIGHT AB 0000052C|  MADRERR  LB 000002B0|  MAKEALER LB 00003168
MAKEBOX  LB 000031E6|  MAKEBUTN LB 0000327A|  MAKEDBOX LB 000031B2
MAKEMENU LB 0000336A|  MAKEPCAL LB 00003164|  MAKESVCW LB 00002814
MAKETEST LB 00003180|  MAKEWIND LB 000031C6|  MAPINV   LB 000005A4
MAXADR   AB 00200000|  MAXMEM   AB 00000294|  MAXTEST  AB 0000000C
MAXX     AB 000002D0|  MAXY     AB 0000016C|  MBARLEN  AB 00000010
MEALTCH  AB 00FCF000|  MEM      AB 00000015|  MEMBRD   LB 000039CE
MEMCHK   LB 00001514|  MEMCODE  AB 00FCC18D|  MEMCOL   AB 00000004
MEMERR   LB 00001582|  MEMLMT   AB 00000700|  MEMLOOP  LB 00000E0E
MEMMSK   AB 00600000|  MEMROW   AB 00000010|  MEMRSLT  AB 00000186
MEMSIZ   LB 00000446|  MEMSLOT  AB 000002AD|  MEMSTRT  AB 00001E04
MEMTST1  LB 00000620|  MEMTST2  LB 00000E02|  MEMTST3  LB 000029CA
MENU     AB 00000007|  MENU1MSG AB 00000658|  MENUBASE AB 00000530
MENUEND  AB 000020B4|  MENUHDG  LB 00003EC1|  MENUID   LB 00003F39
MENULEN  AB 0000000B|  MENULINE AB 000005A0|  MENULOC  AB 00000111
MENUSPC  AB 000003DE|  MENUSTRT AB 000005A2|  MENUWIDT AB 00000012
MERRCHK  LB 00001572|  MIDALCOL AB 0000002D|  MIDALROW AB 00000083
MIDTSTRO AB 0000005B|  MINCNT   AB 00FCC1C5|  MINMEM   AB 000002A4
MINSAV   AB 00FCC19B|  MINUTE   AB 000001BD|  MISC     LB 000006EC
MISEXCP  AB 00000007|  MITEMS   AB 00000007|  MLOOP    LB 000035F2
MMU      AB 00000000|  MMU0B    AB 00008008|  MMU0L    AB 00008000
MMU126B  AB 00FC8008|  MMU126L  AB 00FC8000|  MMU127B  AB 00FE8008
MMU127L  AB 00FE8000|  MMUACHK  LB 00000270|  MMUEADRB AB 00FE8008
MMUEADRL AB 00FE8000|  MMUERR   LB 000001D8|  MMUERR2  LB 000003F4
MMUERR3  LB 000003FA|  MMUINIT  LB 00000216|  MMULP    LB 000001E0
MMULPCHK LB 00000408|  MMURSLT  AB 000001B0|  MMURW    LB 0000022A
MMUSADRB AB 00008008|  MMUSADRL AB 00008000|  MMUSET   LB 00000290
MMUTST   LB 000001B0|  MMUTST2  LB 00000348|  MMUTSTE1 LB 000029C0
MON      AB 00000010|  MONITOR  LB 0000259C|  MOUSDWN  AB 00000086
MOUSDX   AB 0000048A|  MOUSDY   AB 0000048B|  MOUSE    AB 00000004
MOUSEMOV LB 00002F2A|  MOUSEON  AB 00000007|  MOUSEOUT LB 00003C2B
MOUSINIT LB 00002FB2|  MOUSOUT  AB 00000018|  MOUSSCAL AB 0000048C
MOUSTHRE AB 0000048E|  MOUSUP   AB 00000006|  MOUSX    AB 00000486
MOUSY    AB 00000488|  MOVINST  LB 0000314A|  MPAR     AB 00000016
MRGICON  LB 000034FA|  MSBUTN   AB 00000002|  MSCHK    LB 00000A52
MSGCOL   AB 00000018|  MSGLEN   AB 0000052E|  MSGROW   AB 0000007E
```

```
MSPLG    AB 00000087| MSRCHSZ  AB 00000040| MSUNPLG  AB 00000007
NEWLISA  AB 00000001| NEWTWIG  AB 00000001| NEXTLINE LB 00003156
NIOLMT   AB 000006FF| NMEMLMT  AB 000008FF| NMI      LB 00000704
NMIEXCP  LB 000000CA| NMIVCT   AB 0000007C| NOC      AB 0000005A
NOCHG    LB 000023BE| NOCONT   AB 00000001| NOCRD    LB 00002194
NOCRD1   LB 00001332| NOCRD2   LB 00001350| NOCRD3   LB 0000136E
NODISK   AB 00000007| NODSK    AB 00000050| NOIO     LB 00000B5A
NOIO2    LB 00000B76| NOIO3    LB 00000B8E| NORESET  AB 00000001
NORSTRT  AB 00000000| NOTIFY   LB 000016B8| NOTPE    LB 00000730
NROWS    AB 0000001B| NSPLMT   AB 000000FF| OCD      AB 00000000
OK       AB 000000FF| OKCH     LB 00002BDC| ONE      LB 0000393C
ONEHOUR  AB 00E0F000| ONEMEG   AB 00100000| ONEMIN   AB 0003C000
ONESEC   AB 0003D090| ORA1     AB 00000002| ORA2     AB 00000008
ORB1     AB 00000000| ORB2     AB 00000000| OTHER    LB 000015E6
OTHRBTNS LB 000025EC| OTHRMSK  AB 01800000| OUT      LB 000037A0
OUTCH    LB 00001678| OUTCHR   LB 0000166E| OUTCSR   AB 00000006
OUTDATA  AB 00000002| OUTNIB   LB 00001696| OUTPUT   LB 0000342C
PAG128K  AB 00000100| PAINTB1  LB 00003128| PAINTB2  LB 00003136
PAINTBIT LB 0000326A| PAINTV1  LB 0000325A| PAINT_BO LB 00003128
PAINT_V  LB 0000325A| PAR      AB 00000003| PARERR   LB 00000DD2
PAROFF   AB 00FCE01C| PARON    AB 00FCE01E| PARTST   LB 00000D5C
PARXIT   LB 00000DE8| PATRN    AB AA55A55A| PATRN2   AB 0000A55A
PBIT     AB 00000001| PBOOT    LB 00001EFC| PC       AB 0000000F
PCCOL    AB 0000000C| PCERR    LB 00000FD0| PCHIGH   AB 000000C0
PCHIP    AB 0000027D| PCHPROW  AB 0000027C| PCMD     AB 00000000
PCMDSZ   AB 00000005| PCR1     AB 00000018| PCR2     AB 00000060
PCROW    AB 00000059| PCSTRT   AB 0000070A| PCWIDTH  AB 00000056
PEADDR   AB 000001A6| PEADR2   AB 00000278| PERIODS  LB 00003EBD
PHYTOLOG AB 00080000| PIABASE  AB 00FCA001| PKEY     AB 000000C4
PMCHKSM  AB 00FCC1FD| PMERR    LB 00001820| PMEXIT   LB 00001818
PMMSG    LB 00003E03| PMSTRT   AB 00FCC181| PMVCT    LB 000015DC
PMWRDS   AB 00000020| PORTA1   AB 0000001E| PORTA2   AB 00000078
POWERCYC LB 00002A6C| POWEROFF LB 00002DD8| PRIVCT   LB 00000020
PRIXIT   LB 00000FC6| PRO      AB 00000033| PROBOOT  LB 00001ECE
PROERR   LB 00001FDE| PROFILE  AB 00000002| PROFLE   AB 00000001
PROICON  LB 00003A9F| PROINIT  LB 00001FF0| PROMPT   LB 00002A92
PROREAD  LB 00001F70| PROXIT   LB 00001FE6| PROXIT2  LB 00001FEA
PRTYINT1 LB 00000F14| PRTYINT2 LB 00000F72| PUTBS    LB 00002B6C
PUTLF    LB 00002B50| QEND     AB 000002C0| QTRMEG   AB 00040000
QTRSEC   AB 0000F424| QUESTCH  LB 000038AA| QUESTION LB 00003C65
QUESTN   AB 0000003F| QUITMSG  LB 00003F29| R0       AB 00000000
R1       AB 0000005A| R2       AB 000000B4| R3       AB 0000010E
R4       AB 00000168| R5       AB 000001C2| R6       AB 0000021C
R7       AB 00000276| RAMCHK2  LB 00000ECC| RAMNXT   LB 00000EDE
RAMRW    LB 00000EC0| RAMTEST  LB 00000EB0| RBYTES   AB 0000005A
RCNT     AB 0000000A| RDCLK0   LB 000012B2| RDCLK1   LB 000012D4
RDCNT    LB 0000285E| RDDATA   LB 00001FD2| RDDTA    LB 000028C6
```

```
RDENTRY  LB 00002EAC|  RDERR    LB 00000F0C|  RDINPUT  LB 00002ABA
RDIOSLT  LB 000021CC|  RDIOXIT  LB 00002234|  RDRETRY  LB 00001C48
RDSCTR1  LB 00001C6C|  RDSERN   LB 00000BF6|  RDSLOTS  LB 00001306
RDSLT    LB 00001B9A|  RDTIME   AB 00180000|  RDWRERR  AB 00000017
READCLK  LB 000012A0|  READCOPS LB 00002DBE|  READIN   LB 00002AC4
READIT   LB 00002032|  READKEY  LB 00002702|  READMMU  LB 000005D0
READQ    LB 00002BB6|  READS    AB 00000000|  RECTCNT  AB 0000053A
RECTTABL AB 0000053A|  REGTST   LB 00000202|  REMAP    LB 00000590
RET      AB 0000000D|  RETRY    AB 00000004|  RETRYCNT AB 00000020
REV      LB 00003FFD|  RLONGS   AB 000000E1|  ROM16K   AB 00000001
ROM4K    AB 00000000|  ROM8K    AB 00000000|  ROMBASE  AB 00FE0000
ROMIDCOL AB 00000050|  ROMIDROW AB 00000003|  ROMSLCT  AB 000000FE
ROMTST   LB 00000194|  ROMV     AB 00000030|  ROW2ADR  AB 00020000
ROWBYTES AB 0000005A|  ROWLEN   AB 00000042|  ROWLINES AB 0000000A
ROWSLEFT AB 0000012C|  RS232A   AB 0000000F|  RS232B   AB 00000010
RSPOK    LB 000020DC|  RSPTIME  AB 0000FFFF|  RST0     LB 000009DC
RST1     LB 00000A06|  RST2     LB 000009F6|  RSTCODE  AB 00000080
RSTKBD   LB 00000AAA|  RSTLMT   AB 00000FFE|  RSTMMU   LB 00000566
RSTRTIME AB 00900000|  RSTSCAN  LB 000009C2|  RSTSCC   LB 000010D0
RSTXIT   LB 00000A3C|  RTRYCNT  AB 00000058|  RTRYMSG  LB 00003E58
RTS2     MC --------|  RTS4     MC --------|  RTS6     MC --------
RUNTESTS LB 00000E6A|  RWCHK1   LB 0000023C|  RWCHK2   LB 0000024C
RWCHK3   LB 00000254|  RWERR    LB 000002C2|  RWF1     AB 00000002
RWF2     AB 00000006|  RXBF     AB 00000000|  SAV2PM   LB 0000184E
SAVEDADD AB 00000528|  SAVEDDAT AB 000004A2|  SAVEDROW AB 00000526
SAVEDX   AB 00000522|  SAVEDY   AB 00000524|  SAVEHI   LB 000004FA
SAVELO   LB 000004BC|  SAVEREG2 LB 0000003E|  SAVEREGS LB 0000003A
SAVERR   LB 0000222C|  SAVEXCP  LB 00001D1C|  SAVRSLT  LB 00000E98
SCALE    LB 00002F42|  SCANCPS  LB 000011E2|  SCANERR  LB 00000A60
SCANMSK  AB 00183000|  SCANXIT  LB 00000A6A|  SCCBCTL  AB 00FCD241
SCCDATA  AB 00000004|  SCCEXIT  LB 0000108E|  SCCIN    LB 0000107A
SCCLERR  LB 0000108C|  SCCLOOP  LB 00001058|  SCCLOOP2 LB 0000106C
SCCLXIT  LB 0000108A|  SCCOUT   LB 00001066|  SCCRSLT  AB 000002AC
SCCSET   LB 00000774|  SCCTEST  LB 00001008|  SCCVCT   LB 000010EE
SCNRSLTS LB 0000154C|  SCNSLTS  LB 000019D6|  SCRACHSI AB 000000E0
SCRNBASE AB 00000110|  SCRNERR  LB 0000086A|  SCRNOK   LB 0000086C
SCRNSAV  LB 00000874|  SCRNTST  LB 00000822|  SCROLL   LB 00002B08
SCTR     AB 00000008|  SEARCH   LB 000018D6|  SECLEN   AB 00000200
SEEK     AB 00000083|  SEG1OFF  AB 00FCE008|  SEG1ON   AB 00FCE00A
SEG2OFF  AB 00FCE00C|  SEG2ON   AB 00FCE00E|  SELF     LB 00002444
SENDMSG  LB 000021A6|  SENDRSP  LB 0000210E|  SERNUM   AB 00000240
SERR1    AB 0000003D|  SERR2    AB 0000003E|  SET1     AB 00000000
SET2     AB 10000000|  SETBUSVC LB 000006E2|  SETCRSR  LB 0000371A
SETCRSR2 LB 0000371E|  SETDUR   LB 000016CE|  SETERR1  LB 00002448
SETERR2  LB 0000244C|  SETMEM   LB 000028A2|  SETMMU   LB 000002C6
SETMSG   LB 00003ED9|  SETSCC   LB 00001048|  SETTYPE  LB 00001198
SETUP    AB 00FCE012|  SETUPON  AB 00FCE010|  SETVCTRS LB 000006AC
```

```
SETVLTCH LB 00000886|  SETXIT   LB 0000247C|  SFER     AB 00000000
SHFTKEY  AB 000000FE|  SHR1     AB 00000014|  SHUTDOWN LB 000023E8
SIDE     AB 00000006|  SILENCE  LB 00000B52|  SIZRSLT  AB 00000184
SIZXIT   LB 00000502|  SKEY     AB 000000F6|  SLEEP    AB 00000088
SLOT1L   AB 00FC0001|  SLOT2    LB 00001334|  SLOT2L   AB 00FC4001
SLOT3    LB 00001352|  SLOT3L   AB 00FC8001|  SLOTCOL  AB 00000003
SLOTMR   AB 00000005|  SLOTROW  AB 00000016|  SNDR1    LB 000020DE
SNUM     AB 00FE8000|  SPACE    LB 000037BA|  SPEED    AB 0000000C
SPIN     LB 000000C8|  SPLMT    AB 00000F00|  SPURVCT  LB 00000060
SQUAWK   LB 0000270C|  START    LB 00000440|  STARTOP  LB 00003148
STAT     AB 00000010|  STAT01   LB 00002076|  STAT1    AB 000001B4
STAT2    AB 000001B5|  STAT3    AB 000001B6|  STAT4    AB 000001B6
STATBFR  AB 000001B4|  STATERR  LB 000020B2|  STATFLGS AB 000002A2
STATMSK  AB C140C000|  STATNZ   AB 00000053|  STATOK   LB 00002186
STATREG  AB 00FCF801|  STATSAV  AB 00FCC161|  STATSTRT AB 00FCC161
STATSUM  AB 00FCC17D|  STATUS   AB 00000180|  STATWRDS AB 00000008
STATXIT  LB 000020B6|  STBIT    AB 0000000E|  STENTRY  AB 00020000
STKBASE  AB 00000480|  STRTBOOT LB 00001C82|  STRTIME  AB 01200000
STRTMSG  LB 00003E98|  STRTRD   LB 00002048|  STRTXIT  LB 00002074
STST     AB 00000016|  SUPSTK   AB 00000290|  SVCHIGH  AB 00000140
SVCLEFT  AB 00000014|  SVCMSG   LB 00000052|  SVCSTRT  AB 00000EDA
SVCTOP   AB 000007BC|  SVCWIDTH AB 00000042|  SYSOK    LB 000016DE
SYSTYPE  AB 000002AF|  T1LH1    AB 0000000E|  T1LH2    AB 00000038
T1LL1    AB 0000000C|  T1LL2    AB 00000030|  T2CH1    AB 00000012
T2CH2    AB 00000048|  T2CL1    AB 00000010|  T2CL2    AB 00000040
TAG      LB 00000D58|  TBLEND   LB 0000128B|  TBOOTERR LB 00001D0A
TCNT     AB 00000003|  TENSECS  AB 00009000|  TERR     LB 000024C4
THREE    LB 00003946|  THRESH   AB 00000005|  TIMFLG   AB 00FCC199
TIMMSG   LB 00003DE0|  TIMOUT   AB 00000027|  TKILLER  AB 000000AC
TMOUT    AB 00000055|  TNTHSEC  AB 000061A8|  TODSET   LB 00002466
TONE     LB 00000AF6|  TONE2    LB 00000B06|  TONEDLY  LB 00000654
TOOLONG  LB 000024C2|  TOPOFFSE AB 0000010E|  TOPSIDE  AB 00000000
TOTLMEM  AB 000002A8|  TRAK     AB 0000000A|  TRAPVCT  LB 0000001C
TRCVCT   LB 00000024|  TRK1     AB 00000001|  TRPERR   LB 00000736
TRPEXCP  AB 00000009|  TRPVCT0  AB 00000080|  TRYRD    LB 00001F90
TST2     LB 000013AA|  TSTBIT   AB 0000000C|  TSTCHK   LB 0000139A
TSTCOL   AB 0000000A|  TSTCRD   AB 00001000|  TSTDONE  LB 00000E4E
TSTERR   LB 00002344|  TSTHI    LB 000004CE|  TSTICOL  AB 00000014
TSTINIT  LB 00000E84|  TSTIROW  AB 00000055|  TSTISPC  AB 0000000E
TSTLOOP  LB 00000200|  TSTMCOL  AB 0000000E|  TSTMENU  LB 00003F40
TSTMROW  AB 00000040|  TSTMSG   LB 00003FD4|  TSTQUAL  AB 00001800
TSTROW   AB 00000031|  TSTSTAT  LB 00000F68|  TSTWHIGH AB 00000054
TSTWSTRT AB 00001144|  TSTWWIDT AB 00000046|  TSTXIT   LB 000015C0
TSTXIT2  LB 000015C4|  TURNON   LB 0000093E|  TWG1     AB 00000031
TWG2     AB 00000032|  TWGBOOT  LB 00001BCC|  TWGCHK   LB 000022EA
TWGDATA  AB 00020000|  TWGDSP   LB 00002510|  TWGERR   LB 00001DF2
TWGFAIL  LB 00003E10|  TWGHDR   AB 0001FFF4|  TWGLOOP  LB 0000249A
```

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TWGMSG   LB 00003DE9|  TWGOK    LB 00001DFA|  TWGOUT   LB 00001DF0
TWGRD    LB 00001D70|  TWGREAD  LB 00001D76|  TWGRSLT  LB 00003E23
TWGRXIT  LB 00001DFE|  TWGTST   LB 0000247E|  TWIG1    AB 00000000
TWIG2    AB 00000001|  TWIGGY   AB 00000001|  TWO      LB 00003941
TWOSEC   AB 0007A120|  TXBE     AB 00000002|  TYPE     AB 00000014
UCLMPERR AB 00000019|  UNCLAMP  AB 00000002|  UPPER    LB 00003ADA
USERINT  AB 00000001|  USPSAV   AB 000001FC|  VCTRINIT LB 00001EB0
VECTLOOP LB 0000101A|  VFY      AB 00000004|  VFYCHKSM LB 0000188C
VFYTIME  AB 01800000|  VIA1     AB 0000000A|  VIA1BASE AB 00FCDD81
VIA1CHK  LB 000008B0|  VIA1TST  LB 000008A2|  VIA1VCT  LB 00000DF8
VIA2     AB 0000000B|  VIA2BASE AB 00FCD901|  VIA2CHK  LB 00000780
VIA2TST  LB 00000780|  VIA2VCT  LB 000007AE|  VIAFAIL  LB 000007F4
VIARW    LB 000007D0|  VIARWEND LB 000007F6|  VIATST   LB 000007B8
VID      AB 00000002|  VIDAJST  LB 000029F4|  VIDBIT   AB 00000004
VIDCHK   LB 00000BA2|  VIDERR   LB 00000BD4|  VIDLTCH  AB 00FCE800
VIDMSG   LB 00003F09|  VIDTST   LB 00000B96|  VIDXIT   LB 00000BE0
VMSK     AB FFFF8000|  VRBIT    AB 00000002|  VRSN     LB 00003FFC
VSRCHSZ  AB 00008000|  VTIRDIS  AB 00FCE018|  VTIRENB  AB 00FCE01A
W14COL   AB 00000017|  W34COL   AB 00000041|  WAIT2    LB 00002CBA
WAIT3    LB 00002D0E|  WAITALRT LB 00001EA6|  WAITICON LB 00003A3D
WCOL     AB 00000002|  WFBSY    LB 000020FC|  WFBSY1   LB 00002100
WFNBSY   LB 00002122|  WFNBSY1  LB 00002138|  WFNBSY2  LB 0000212A
WFNBSY3  LB 00002132|  WHATMSG  LB 00003FDB|  WHITEN   LB 00003108
WINDHIGH AB 00000140|  WINDSTRT AB 0000070A|  WINDWIDT AB 00000056
WMIDCOL  AB 0000002D|  WMIDROW  AB 000000B4|  WORDSPER AB 0000000E
WRAPXIT  LB 00000500|  WRITESCC LB 000010BE|  WRITETIT LB 000033B8
WRMSTRT  AB 0000001E|  WROW     AB 00000014|  WRPERR   AB 00000014
WRT      AB 00000001|  WRTMENU  LB 000027A0|  WRTMMU   LB 000005BA
WRTMSG   LB 00002376|  WRTSCRN  LB 000026F2|  WRTSUM   LB 0000187E
WT4BOOT  LB 00001A14|  WT4INPUT LB 00002D38|  WWPERR   LB 00000DF4
XCARD    LB 00003A14|  XCRDSTRT AB 00001E20|  XFRDATA  LB 00001DCE
XFRHDR   LB 00001DB4|  XLATE    LB 0000125E|  XLOOP    LB 0000361A
XPCTADDR AB 00000268|  XPCTDATA AB 0000026C|

Assembly complete:     11840 lines
         0 Warnings
         0 Errors

------------------------------------------------------------------- ASSEMBLY COMPLETE.

;================================
;APPLE LISA COMPUTER 16K ROM DUMP
;================================
;
;CREATED BY DAVID T CRAIG
;71533.606@COMPUSERVE.COM
;09 JUNE 1998

;ROM NOTES:
;
;  O STARTING ADDRESS IS $FE0000
;
;  O ROM IS 16K BYTES IN SIZE
;

;  O ROM MAPPED TO ADDRESS $0
;    WHEN LISA STARTS SO THAT
;    KEY VALUES AT THE START OF
;    THE ROM OCCUPY THE 68000
;    CPU'S LO-MEM VECTOR TABLE
;
;  O THIS ROM HAS VERSION 2.48
```

```
;    WHICH IS ALSO SEEN AS 2.H
;
;    (SEE THE 2ND 2-BYTE WORD
;     FROM THE ROM'S END, 0248)
;
;  O LAST 2-BYTE WORD IS THE
;    ROM CHECKSUM WHICH IN THIS
;    DUMP IS INCORRECT AT $0000
;
;    (USE A REAL LISA AND ITS
;     BUILT-IN "SERVICE MODE" TO
;     PEEK AT THE ROM AND FIND
;     WHAT THE CHECKSUM SHOULD
;     BE - OR LOOK IN THE ROM
;     SOURCE FOR HOW THE CHECKSUM
;     IS USED)
;
;    CHECKSUM IS $3F7B
;
0000048000FE00F600FE003000FE0030
00FE003000FE003000FE003000FE0030
00FE003000FE003000FE003000FE0030
3E7C048042876000015C21CF029021CE
01F84E6E21CE01FC3C7C01F848E6FFFC
4E7553455256494345204D4F44450000
00FE003000FE003000FE003000FE0030
00FE003000FE003000FE003000FE00CA
4EFA25D04EFA24AE4EFA36644EFA052C
4EFA1EDE4EFA1CE04EFA0E164E714E75
4E714E754EFA052A4EFA08AC4EFA11F2
4EFA157E4EFA074C4EFA0A3C4EFA17CE
4EFA17BC4EFA0B3060FE423900FCE012
0839000100FCF801661431F900FCF000
01AA4A3900FCE01C4A3900FCE01E4A39
00FCE0104E73303900FC800002400FFF
0C400901664C02790FFF00FC80086642
33FC07000000800033FC090100FC8000
33FC0F0000FE8000427900FE80084239
00FCE01221CF02903E7C04806100FF00
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23F44287303900FE800002400FFF0C40
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661649FA0004604E4DFA0006600000A2
6604600000F246474A4767024E704E70
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21C8007C41FA006021C8002821C8002C
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31DF028631DF028821DF028A31C0028E
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