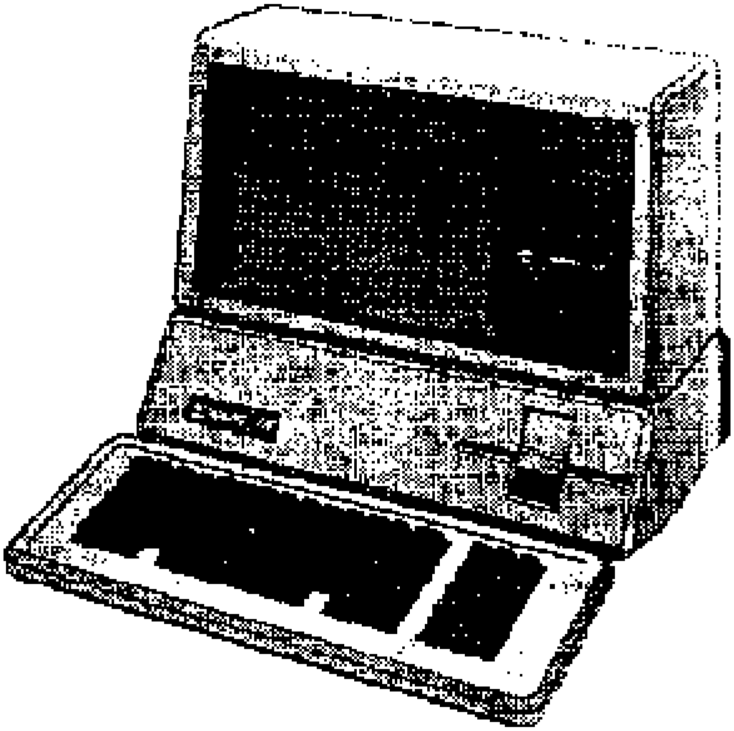
 Apple /// Computer Technical Information

Apple ///
Console Driver 1.31
Source Code Listing



Created by David T. Craig
07 January 1998 • 71533.606@compuserve.com

FORMATTED LISTING

```
; ####################################################################################################
; #   PROJECT  :  Apple /// SOS Console Driver 1.31 (6502 Assembly Source Code)
; #   FILE NAME:  CONSOLE.TEXT
; ####################################################################################################

                .TITLE      "SOS Console Driver"
                .NOPATCHLIST
                .NOMACROLIST

;-----------------------------------------------------------------------
;
;               SOS Console Driver
;
;               Copyright (C) 1983 by Apple Computer Inc.
;               All Rights Reserved
;
;               Previous Copyright (C) 1980, 1981
;
;
;       Revisions:
;
;       1.00    14-Nov-80       Initial Release
;
;       1.12    23-Sep-81
;           Bug fixes:
;               Download 1-8 characters.
;               Download entire character set.
;               Include saved screen state in console state table.
;               Adjust all pointers for proper extended addressing.
;               Fix SYNC to monitor positive edge of vertical blanking.
;               Delete extraneous data returned by status calls 12, 13, & 14.
;               Fix erase option of character and line delete.
;           Extensions:
;               Add video toggle on control-5.
;               Add dump & restore contents of viewport.
;               Change keyboard transform table to include alpha-lock data.
;               Retain cursor on SYNC.
;
;       1.30    11-Jan-83
;           Bug fixes:
;               Wait for pending download on close.
;               Fix branch in 40 column horizontal shift right.
;               Fix cursor in dump & restore contents of viewport.
;               Disable interrupts while setting events and screen mode.
;           Extensions:
;               Turn on video iff buffer is empty.
;               Set bit 7 on control characters read from screen
;                   (applies to char copy and screen read status).
;               Don't dump viewport when displaying control characters.
;               Add status request 9, read screen with normal/inverse flag.
;       1.31    17-Mar-83
;               Fix VERIFY to eleminate noise when setting screen switches.
;
;-----------------------------------------------------------------------

DEVTYPE         .EQU        61
SUBTYPE         .EQU        01
APPLE           .EQU        0001
RELEASE         .EQU        1310
                .PAGE
;-----------------------------------------------------------------------
;
;  The macro SWITCH performs an N way branch based on a switch index.  The
;  maximum value of the switch index is 127 with bounds checking provided
;  as an option.  The macro uses the A and Y registers and alters the C,
;  Z, and N flags of the status register, but the X register is unchanged.
;
;               SWITCH  [index], [bounds], adrs_table, [*]
;
;       index   This is the variable that is to be used as the switch index.
;               If omitted, the value in the accumulator is used.
;
;      bounds   This is the maximum allowable value for index.  If index
;               exceeds this value, the carry bit will be set and execution
;               will continue following the macro.  If bounds is omitted,
;               no bounds checking will be performed.
;
;  adrs_table   This is a table of addresses (low byte first) used by the
;               switch.  The first entry corresponds to index zero.
;
;           *   If an asterisk is supplied as the fourth parameter, the
;               macro will push the switch address but will not exit to
;               it; execution will continue following the macro.  The
;               program may then load registers or set the status before
;               exiting to the switch address.
;
;-----------------------------------------------------------------------
;
                .MACRO      SWITCH
```

```
        .IF       "%1" <> ""          ;If PARM1 is present,
        LDA       %1                  ;  Load A with switch index
        .ENDC
        .IF       "%2" <> ""          ;If PARM2 is present,
        CMP       #%2+1               ;  Perform bounds checking
        BCS       $3579               ;  on switch index
        .ENDC
        ASL       A
        TAY
        LDA       %3+1,Y              ;Get switch address from table
        PHA                           ;  and push onto stack
        LDA       %3,Y
        PHA
        .IF       "%4" <> "*"         ;If PARM4 is omitted,
        RTS                           ;  Exit to code
        .ENDC                         ;Otherwise, drop through
        .IF       "%2" <> ""
$3579
        .ENDC
        .ENDM

        .INCLUDE  :CONS.DAT1.TEXT
        .INCLUDE  :CONS.DAT2.TEXT
        .INCLUDE  :CONS.DAT3.TEXT
        .INCLUDE  :CONS.MAIN.TEXT
        .INCLUDE  :CONS.READ.TEXT
        .INCLUDE  :CONS.WRIT.TEXT
        .INCLUDE  :CONS.FCTN.TEXT
        .INCLUDE  :CONS.STAT.TEXT
        .INCLUDE  :CONS.CNTL.TEXT
        .INCLUDE  :CONS.DNLD.TEXT
        .INCLUDE  :CONS.MISC.TEXT
        .INCLUDE  :CONS.UTL1.TEXT
        .INCLUDE  :CONS.UTL2.TEXT

        .END

; ####################################################################################################
; #   END OF FILE:  CONSOLE.TEXT
; #   LINES      :  121
; #   CHARACTERS :  6057
; #   Formatter  :  Assembly Language Reformatter 1.0.2 (07 January 1998)
; #   Author     :  David T. Craig -- 71533.606@compuserve.com -- Santa Fe, New Mexico USA
; ####################################################################################################
; ####################################################################################################
; #   PROJECT  :  Apple /// SOS Console Driver 1.31 (6502 Assembly Source Code)
; #   FILE NAME:  CONS.DAT1.TEXT
; ####################################################################################################

                .PROC        CONSOLE
                .WORD        0FFFF
                .WORD        59.
                .ASCII       "Console Driver -- "
                .ASCII       "Copyright (C) 1983 by Apple Computer Inc."
;---------------------------------------------------------------------
;
;  Device Handler Identification Block
;
;---------------------------------------------------------------------
;
IDBLK           .WORD        0000                      ;Link to next device handler
                .WORD        CNSLDH                    ;Entry point address
                .BYTE        8                         ;Length of device name
                .ASCII       ".CONSOLE       "
                .BYTE        80,00,00                  ;Device, Slot & Unit numbers
                .BYTE        DEVTYPE
                .BYTE        SUBTYPE
                .BYTE        00
                .WORD        0000
                .WORD        APPLE
                .WORD        RELEASE
                .WORD        00                        ;No configuration block
                .PAGE
;---------------------------------------------------------------------
;
;  Global Data:
;
;    SUSPFLSH:  Suspend and Flush Output Flags
;       7 => Suspend Output
;       6 => Flush Output
;
;    SCRNMODE:  Current Screen Mode
;       7 => Off / On
;       6 => Text / Graphics
;       2 => Page 1 / Page 2
;       1 => 40 Col / 80 Col
;       0 => B & W / Color
;
;
;  State Flags:
;
;    HMODE:  Hardware Mode
;       7 => 40 Col / 80 Col
;       1 => 40 Col / 80 Col
;       0 => B & W / Color
;
;    SMODE:  Software Mode
;       5 => Normal / Inverse
;       4 => Disable / Enable Cursor
;       3 => Disable / Enable Scroll
;       2 => Disable / Enable Auto Carriage Return
;       1 => Disable / Enable Auto Line Feed
;       0 => Disable / Enable Auto Advance
;
;
;  Permanant Zero Page Data:
;
;    BASE1, BASE2:  Screen Memory Pointers
;       The base pointers point to the beginning of the current line.  In
;       40 column mode, BASE1 points to the ASCII data while BASE2 points
;       to the color information.  In 80 column mode, BASE1 points to col-
;       umn 0 of the viewport while BASE2 points to column 1.
;
;
;  Temporary Zero Page Data:
;
;    WORK1, WORK2:
;       These pointers are used in conjunction with BASE1 and BASE2 for
;       scrolling, shifting, etc.
;
;    COUNT:
;       Number of bytes read or written.
;
;    ONEBYTE:
;       Boolean flag for single byte read requests.
;
;    BLANK:
;       Holds an ASCII space in the current video mode (normal or inverse)
;       for use in clearing the viewport.
;
;    TEMPX:
;       Temporary storage for X.
;
;    FLAGS:
;       Miscellaneous flags for use by SCROLL, SHIFT, SCRNDUMP, etc.
;
```

```
;    TEMP1, TEMP2, TEMP3, TEMP4:
;       General temporary storage for use by SCROLL, SHIFT, SCRNDUMP, etc.

; ####################################################################################################
; #   END OF FILE:  CONS.DAT1.TEXT
; #   LINES      :  89
; #   CHARACTERS :  3512
; #   Formatter  :  Assembly Language Reformatter 1.0.2 (07 January 1998)
; #   Author     :  David T. Craig -- 71533.606@compuserve.com -- Santa Fe, New Mexico USA
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; #   PROJECT  :  Apple /// SOS Console Driver 1.31 (6502 Assembly Source Code)
; #   FILE NAME:  CONS.DAT2.TEXT
; ####################################################################################################

                .PAGE
;
;  SOS Global Data & Subroutines
;
SUSPFLSH        .EQU         1902                      ;Suspend & Flush flags
SCRNMODE        .EQU         1906                      ;Current Screen Mode
ALLOCSIR        .EQU         1913
DEALCSIR        .EQU         1916
QUEEVENT        .EQU         191F
SYSERR          .EQU         1928
;
;  SOS Error Codes
;
XREQCODE        .EQU         20                        ;Invalid request code
XCTLCODE        .EQU         21                        ;Invalid controlstatus code
XCTLPARM        .EQU         22                        ;Invalid controlstatus parm
XNOTOPEN        .EQU         23                        ;Device not open
XNOTAVIL        .EQU         24                        ;Device not available
XNORESRC        .EQU         25                        ;Unable to obtain resource
;
;  Hardware I/O Addresses
;
KAPORT          .EQU         0C000
KBPORT          .EQU         0C008
KYBDSTRB        .EQU         0C010
KYBDCLR         .EQU         01                        ;Clear keyboard interrupt flag
KYBDDSBL        .EQU         01                        ;Disable keyboard interrupts
KYBDENBL        .EQU         81                        ;Enable keyboard interrupts
BELL            .EQU         0C040
VMODE0          .EQU         0C050                     ;Video mode switches
VMODE1          .EQU         0C052
VMODE2          .EQU         0C054
VMODE3          .EQU         0C056
SCRLDSBL        .EQU         0C0D8                     ;Disable graphics scroll
DNLDDSBL        .EQU         0C0DA                     ;Disable character download
DNLDENBL        .EQU         0C0DB                     ;Enable character download
VBLCLR          .EQU         18                        ;Clear both VBL interrupt flags
VBLDSBL         .EQU         18                        ;Disable both VBL interrupts
VBLENBL         .EQU         90                        ;Enable VBL interrupt on CB2
E_REG           .EQU         0FFDF                     ;Environment register
E_IORB          .EQU         0FFE0                     ;6522 input/output register B
E_PCR           .EQU         0FFEC                     ;6522 peripheral control register
E_IFR           .EQU         0FFED                     ;6522 interrupt flag register
E_IER           .EQU         0FFEE                     ;6522 interrupt mask register
B_REG           .EQU         0FFEF                     ;Bank register
;
;  ASCII Equates and Special Keys
;
ASC_NUL         .EQU         00                        ;Null
ASC_SOH         .EQU         01                        ;Start of Header
ASC_STX         .EQU         02                        ;Start of Text
ASC_ETX         .EQU         03                        ;End of Text
ASC_ENQ         .EQU         05                        ;Enquiry
ASC_ACK         .EQU         06                        ;Acknowledgement
ASC_BS          .EQU         08                        ;Backspace
ASC_HT          .EQU         09                        ;Horizontal Tab
ASC_LF          .EQU         0A                        ;Line Feed
ASC_VT          .EQU         0B                        ;Vertical Tab
ASC_FF          .EQU         0C                        ;Form Feed
ASC_CR          .EQU         0D                        ;Carriage Return
ASC_NAK         .EQU         15                        ;Negative Acknowledge
ASC_CAN         .EQU         18                        ;Cancel
ASC_ESC         .EQU         1B                        ;Escape
ASC_FS          .EQU         1C                        ;File Separator
ASC_GS          .EQU         1D                        ;Group Separator
ASC_US          .EQU         1F                        ;Unit Separator
ASC_SP          .EQU         20                        ;Space
LARROW          .EQU         ASC_BS                    ;Left Arrow
RARROW          .EQU         ASC_NAK                   ;Right Arrow
UARROW          .EQU         ASC_VT                    ;Up Arrow
DARROW          .EQU         ASC_LF                    ;Down Arrow
;
;  Miscellaneous Equates
;
TRUE            .EQU         80
FALSE           .EQU         00
BITON0          .EQU         01
BITON2          .EQU         04
BITON3          .EQU         08
BITON4          .EQU         10
BITON5          .EQU         20
BITON6          .EQU         40
BITON7          .EQU         80
BITOFF0         .EQU         0FE
BITOFF4         .EQU         0EF
BITOFF5         .EQU         0DF
BITOFF7         .EQU         07F
BUFMAX          .EQU         80                        ;Maximum buffer size
```

```
TEXTCSA         .EQU         0C00                      ;Text character set address
                .PAGE
;-----------------------------------------------------------------------
;
;   SOS Device Handler Interface
;
;-----------------------------------------------------------------------
;
SOSINT          .EQU         0C0
REQCODE         .EQU         SOSINT+0                  ;SOS request code
BUFFPTR         .EQU         SOSINT+2                  ;Buffer pointer
REQCNT          .EQU         SOSINT+4                  ;Requested count
RTNCNT          .EQU         SOSINT+8                  ;Returned count
SCCODE          .EQU         SOSINT+2                  ;Status / Control code
SCLIST          .EQU         SOSINT+3                  ;Status / Control list
;
;
;-----------------------------------------------------------------------
;
;  Zero Page Data (preserved) and Zero Page Save Area
;
;-----------------------------------------------------------------------
;
ZPDATA          .EQU         SOSINT+10.
BASEPTRS        .EQU         ZPDATA+0                  ;Screen memory base pointers
BASE1           .EQU         BASEPTRS+0                ;  even col. / text bytes
BASE2           .EQU         BASEPTRS+2                ;  odd col. / color bytes
ZPLENGTH        .EQU         4
;
ZPSAVE          .BLOCK       ZPLENGTH
;
;
;-----------------------------------------------------------------------
;
;  Zero Page Data (temporary)
;
;-----------------------------------------------------------------------
;
WORKPTRS        .EQU         ZPDATA+ZPLENGTH
WORK1           .EQU         WORKPTRS+0
WORK2           .EQU         WORKPTRS+2
COUNT           .EQU         WORKPTRS+4                ;Current I/O count
ONEBYTE         .EQU         COUNT+2                   ;One byte console read flag
BLANK           .EQU         ONEBYTE+1
TEMPX           .EQU         BLANK+1
FLAGS           .EQU         TEMPX+1
TEMP1           .EQU         FLAGS+1
TEMP2           .EQU         TEMP1+1
TEMP3           .EQU         TEMP2+1
TEMP4           .EQU         TEMP3+1

; ####################################################################################################
; #   END OF FILE:  CONS.DAT2.TEXT
; #   LINES      :  138
; #   CHARACTERS :  7595
; #   Formatter  :  Assembly Language Reformatter 1.0.2 (07 January 1998)
; #   Author     :  David T. Craig -- 71533.606@compuserve.com -- Santa Fe, New Mexico USA
; ####################################################################################################
; ##########################################################################################
; #   PROJECT  :  Apple /// SOS Console Driver 1.31 (6502 Assembly Source Code)
; #   FILE NAME:  CONS.DAT3.TEXT
; ##########################################################################################
```

```
                .PAGE
;--------------------------------------------------------------------
;
;  Console State Table
;
;--------------------------------------------------------------------
;
CONSTTBL        .EQU         *                         ;Console state table
;
ANYKYEVNT       .BLOCK       5                         ;Any Key Event parameters
ATTNEVNT        .BLOCK       5                         ;Attention Event parameters
ATTNCHAR        .BYTE        0                         ;Attention character
;
DFLTTBL         .EQU         *                         ;This block initialized from default values
;
KYBDMODE        .BYTE        0                         ;Console/Keyboard mode flag
NEWLINE         .BYTE        0                         ;New Line flag
NEWLNCHR        .BYTE        0                         ;New Line character
NOWAIT          .BYTE        0                         ;No Wait flag
ECHO            .BYTE        0                         ;Screen Echo flag
CHCPYFLG        .BYTE        0                         ;Character Copy flag
CHCPYCHR        .EQU         ASC_NAK                   ;Character Copy character
CHDELFLG        .BYTE        0                         ;Character Delete flag
CHDELCHR        .EQU         ASC_BS                    ;Character Delete character
LNDELFLG        .BYTE        0                         ;Line Delete flag
LNDELCHR        .EQU         ASC_CAN                   ;Line Delete character
ESCAPE          .BYTE        0                         ;Escape Mode flag
;
SCRSTTBL        .EQU         *                         ;Screen state table
;
HMODE           .BYTE        0                         ;Hardware mode
SMODE           .BYTE        0                         ;Software mode
TPX             .BYTE        0                         ;Text position
TPY             .BYTE        0
VPL             .BYTE        0                         ;Viewport
VPR             .BYTE        79.
VPT             .BYTE        0
VPB             .BYTE        23.
TCF             .BYTE        0F                        ;Text color
TCB             .BYTE        00
;
SCRSTLEN        .EQU         *-SCRSTTBL
;
DFLTLEN         .EQU         *-DFLTTBL
;
SCRSTSAV        .BLOCK       SCRSTLEN                  ;Saved screen state table
;
CONSTLEN        .EQU         *-CONSTTBL
                .PAGE
;-------------------------------------------------------------------
;
;  Default Values for State Table
;
;-------------------------------------------------------------------
;
DFLTVAL         .BYTE        FALSE                     ;Console / Keyboard flag
                .BYTE        FALSE                     ;Newline flag
                .BYTE        ASC_CR                    ;Newline character
                .BYTE        FALSE                     ;Nowait flag
                .BYTE        TRUE                      ;Screen echo flag
                .BYTE        TRUE                      ;Character copy flag
                .BYTE        TRUE                      ;Character delete flags
                .BYTE        TRUE                      ;Line delete flags
                .BYTE        TRUE                      ;Escape mode flags
                .BYTE        02                        ;Hardware mode
                .BYTE        0D                        ;Software mode
                .BYTE        0.                        ;Cursor position
                .BYTE        0.
                .BYTE        0.                        ;Viewport
                .BYTE        79.
                .BYTE        0.
                .BYTE        23.
                .BYTE        0F                        ;Text colors
                .BYTE        00
                .PAGE
;--------------------------------------------------------------------
;
;   Private Variable Storage
;
;--------------------------------------------------------------------
;
KYBDBUFS        .EQU         01500                     ;Type ahead buffers
KABUF           .EQU         KYBDBUFS
KBBUF           .EQU         KYBDBUFS+BUFMAX
XFORMTBL        .EQU         01700                     ;Keyboard transform table
;
KADATA          .BYTE        0                         ;Temp Storage
KBDATA          .BYTE        0                         ;  for Interrupt Processing
```

```
;
KEYCNT          .BYTE        0                         ;Buffered keystroke count
BUFSIZ          .BYTE        0                         ;Current buffer size
BUFHEAD         .BYTE        0                         ;Index of first character
BUFTAIL         .BYTE        0                         ;Index of last character
;
OPENFLG         .BYTE        0                         ;Device open flag
READING         .BYTE        0                         ;Read in progress flag
DSPLYCTL        .BYTE        0                         ;Display control characters
;
SMFLAGS         .EQU         *
SMINV           .BYTE        0                         ;Inverse video
SMCURSOR        .BYTE        0                         ;Cursor enabled
SMSCROLL        .BYTE        0                         ;Scroll flag
SMAUTOCR        .BYTE        0                         ;Auto CR
SMAUTOLF        .BYTE        0                         ;Auto LF
SMAUTOADV       .BYTE        0                         ;Auto advance
;
VPHMAX          .BYTE        79.                       ;viewport maximum horizontal index
VPVMAX          .BYTE        23.                       ;viewport maximum vertical index
TCOLOR          .BYTE        0F0                       ;text fg/bg color byte
;
CTLINDX         .BYTE        0                         ;function buffer index
CTLBUFF         .BLOCK       8                         ;control function buffer
CTLQUOTA        .BYTE        0                         ;parameter quota
;
DNLDFLG         .BYTE        00                        ;Bit 7=Active, Bit 6=Request
DNLDCEL         .BYTE        00                        ;Current download cell number
DNLDCHR         .BYTE        00                        ;Current download ASCII code
DNLDIMG         .WORD        0000                      ;Pointer to character image
                .PAGE
;----------------------------------------------------------------------
;
;  Addresses used as subroutine parameters and SIR request tables
;
;----------------------------------------------------------------------
;
ANYKYPARM       .WORD        ANYKYEVNT
ATTNPARM        .WORD        ATTNEVNT
;
KYBDSADR        .WORD        KYBDSTBL
KYBDSTBL        .BYTE        2,0                       ;Keyboard interrupt
                .WORD        KYBDMIH
KYBDBANK        .BYTE        0
KYBDSSIZ        .EQU         *-KYBDSTBL
;
DNLDSADR        .WORD        DNLDSTBL
DNLDSTBL        .BYTE        5,0,0,0,0                 ;VBL positive
                .BYTE        6,0                       ;VBL negative
                .WORD        DNLDINT
DNLDBANK        .BYTE        0
                .BYTE        10,0,0,0,0                ;Character download / Graphics scroll
DNLDSSIZ        .EQU         *-DNLDSTBL
;
SYNCSADR        .WORD        SYNCSTBL
SYNCSTBL        .BYTE        5,0,0,0,0                 ;VBL positive
SYNCSSIZ        .EQU         *-SYNCSTBL
;
;
;---------------------------------------
;
;   Base Calculator Address Tables
;
;---------------------------------------
;
BASL            .BYTE        000,080,000,080
                .BYTE        000,080,000,080
                .BYTE        028,0A8,028,0A8
                .BYTE        028,0A8,028,0A8
                .BYTE        050,0D0,050,0D0
                .BYTE        050,0D0,050,0D0
BASH            .BYTE        004,004,005,005
                .BYTE        006,006,007,007
                .BYTE        004,004,005,005
                .BYTE        006,006,007,007
                .BYTE        004,004,005,005
                .BYTE        006,006,007,007
                .PAGE
;----------------------------------------------------------------------
;
;  Escape Command and Escape Operator Tables
;
;----------------------------------------------------------------------
;
ESCCMD          .BYTE        "B"                       ;Viewport bottom right
                .BYTE        "T"                       ;Viewport top left
                .BYTE        "V"                       ;Clear Viewport
                .BYTE        "S"                       ;Clear Screen
                .BYTE        "P"                       ;Clear to End of Page
                .BYTE        "L"                       ;Clear to End of Line
                .BYTE        "H"                       ;Home Cursor
                .BYTE        ASC_BS                    ;Move left
                .BYTE        ASC_NAK                   ;Move right
                .BYTE        ASC_VT                    ;Move up
                .BYTE        ASC_LF                    ;Move down
ECMDCNT         .EQU         *-ESCCMD
;
ESCOP           .BYTE        ASC_ETX
                .BYTE        ASC_STX
                .BYTE        ASC_SOH
                .BYTE        ASC_FS
                .BYTE        ASC_GS
                .BYTE        ASC_US
                .BYTE        ASC_FF
                .BYTE        ASC_BS
                .BYTE        ASC_HT
                .BYTE        ASC_VT
                .BYTE        ASC_LF

; ####################################################################################################
; #   END OF FILE:  CONS.DAT3.TEXT
; #   LINES      :  197
; #   CHARACTERS :  10599
; #   Formatter  :  Assembly Language Reformatter 1.0.2 (07 January 1998)
; #   Author     :  David T. Craig -- 71533.606@compuserve.com -- Santa Fe, New Mexico USA
; ####################################################################################################
```

```
                .PAGE
;----------------------------------------------------------------------
;
;  Console Device Handler
;
;  This is the device handler's entry point.  It sets the extended
;  addressing bytes to zero and moves in the permanant zero page
;  data, then switches to the appropriate request handler.  If the
;  request handler modifies the permanant zero page data, it must
;  call ZPOUT before it exits to SOS.
;
;----------------------------------------------------------------------
;
CNSLDH          .EQU         *
                LDX          #0FF-ZPDATA
                LDY          #00
                TYA
$010            STA          1400+ZPDATA,X             ;Set extend bytes to zero
                CPX          #ZPLENGTH
                BCS          $020
                LDA          ZPSAVE,X
                STA          ZPDATA,X                  ;Set up zero page data
                TYA
$020            DEX
                BPL          $010
;
                SWITCH       REQCODE,8,CREQSW
;
;
CBADREQ         LDA          #XREQCODE                 ;Invalid request code
                JSR          SYSERR
;
CNOTOPEN        LDA          #XNOTOPEN                 ;Console is not open
                JSR          SYSERR
;
CREQSW          .WORD        CNSLREAD-1
                .WORD        CNSLWRIT-1
                .WORD        CNSLSTAT-1
                .WORD        CNSLCNTL-1
                .WORD        CBADREQ-1
                .WORD        CBADREQ-1
                .WORD        CNSLOPEN-1
                .WORD        CNSLCLOS-1
                .WORD        CNSLINIT-1
                .PAGE
;----------------------------------------------------------------------
;
;  Keyboard Interrupt Handler
;
;----------------------------------------------------------------------
;
KYBDMIH         .EQU         *
;
;  Read keyboard data and clear interrupt
;
                LDX          #KYBDCLR
                LDA          KAPORT                    ;Read data port
                BMI          $010
                STX          E_IFR                     ;No data ready -- clear
                RTS                                    ;  interrupt and exit
$010            AND          #BITOFF7
                STA          KADATA
                LDA          KBPORT                    ;Read status port
                EOR          #3C
                STA          KBDATA
                STX          E_IFR                     ;Clear interrupt
                STX          KYBDSTRB                  ;  and keyboard strobe
                BMI          KIHSPCL
                LDA          KADATA
                CMP          #ASC_CR
                BNE          KIHXFORM
                LDA          KBDATA
                AND          #BITON2                   ;Transform CR iff
                BNE          KIHXFORM                  ;  CTRL is held down
                JMP          KIHA1KY
;
;  Special key
;    Check for console control commands
;    Do not transform character code
;
KIHSPCL         AND          #36                       ;Isolate A1, A2, CTRL, & SHIFT
                CMP          #BITON2
                BEQ          $050
$010            JMP          KIHA1KY                   ;Not a console control command
$050            LDA          KADATA
                CMP          #"5"                      ;Toggle video?
                BCC          $010
                BNE          $060
                LDA          SCRNMODE
                EOR          #BITON7
                STA          SCRNMODE
                RTS
$060            CMP          #"6"                      ;Flush input buffer?
                BNE          $070
                LDA          #00
                STA          KEYCNT
                STA          BUFHEAD
                STA          BUFTAIL
                RTS
$070            CMP          #"7"                      ;Suspend screen output?
                BNE          $080
                LDA          SUSPFLSH
                EOR          #BITON7
                STA          SUSPFLSH
                RTS
$080            CMP          #"8"                      ;Display control characters?
                BNE          $090
                LDA          DSPLYCTL
                EOR          #BITON7
                STA          DSPLYCTL
                RTS
$090            CMP          #"9"                      ;Flush screen output?
                BNE          KIHA1KY
                LDA          SUSPFLSH
                AND          #BITOFF7
                EOR          #BITON6
                STA          SUSPFLSH
                RTS
;
;  Standard key
;    Transform character code
;    Check for alpha lock
;
KIHXFORM        LDA          KADATA
$010            CMP          #7B                       ;Convert ASCII code to
                BCC          $030                      ;  transform table index
                CMP          #7E
                BCC          $020
                EOR          #0C0
                BNE          $040
$020            AND          #5F
$030            ORA          #0C0
$040            TAX
                LDA          KBDATA                    ;Get control & shift keys
                LSR          A
                AND          #03
                ORA          XFORMTBL,X                ;OR in key number
                TAX
                LDA          XFORMTBL,X                ;Need to test alpha lock?
                BPL          $050
                LDA          KBDATA                    ;Check alpha lock key
                AND          #BITON3
                BEQ          $050
                TXA
                ORA          #BITON0                   ;Force shift key on
                TAX
$050            LDA          XFORMTBL,X                ;Get key code
                AND          #BITOFF7
                STA          KADATA
;
;  Set bit 7 according to Apple 1 key
;
KIHA1KY         LDA          KBDATA
                AND          #BITON4
                BEQ          KIHCKEV
                LDA          KADATA
                ORA          #BITON7
                STA          KADATA
;
;  Check for Any Key and Attention events
;
KIHCKEV         BIT          READING                   ;If reading,
                BMI          $010                      ;  ignore Any Key event
                LDA          ANYKYEVNT                 ;Check Any Key Event
                BEQ          $010
                LDX          ANYKYPARM
                LDY          ANYKYPARM+1
                JSR          QUEEVENT                  ;Queue the event
                LDA          #FALSE
                STA          ANYKYEVNT                 ;Disable Any Key event
                BEQ          $020
$010            LDA          ATTNEVNT                  ;Check Attention Event
                BEQ          KIHBFCH
                LDA          KADATA
                CMP          ATTNCHAR
                BNE          KIHBFCH
                LDX          ATTNPARM
                LDY          ATTNPARM+1
                JSR          QUEEVENT                  ;Queue the event
                LDA          #FALSE
                STA          ATTNEVNT                  ;Disable Attention event
```

```
$020            STA          READING                   ;Terminate any read in progress
                STA          KEYCNT                    ;Flush the input buffer
                STA          BUFHEAD
                STA          BUFTAIL
                STA          SUSPFLSH                  ;Clear suspend & flush flags
;
;  Buffer the character
;
KIHBFCH         LDX          BUFSIZ                    ;Buffering enabled?
                BEQ          $030
                DEX
                CPX          KEYCNT                    ;Any room in buffer?
                BCS          $010
                BIT          BELL                      ;Buffer overflow
                BCC          $030
$010            INC          KEYCNT                    ;Bump the key count
                LDX          BUFTAIL
                LDA          KADATA
                STA          KABUF,X                   ;Buffer the keystroke
                LDA          KBDATA
                STA          KBBUF,X
                INX
                CPX          BUFSIZ                    ;Bump buffer tail pointer
                BCC          $020
                LDX          #0
$020            STX          BUFTAIL
$030            RTS
                .PAGE
;---------------------------------------------------------------------
;
;  Subroutine GETKEY
;
;  This subroutine gets the next keystroke from the type ahead buffer.
;  On entry, the interrupt system must be enabled but the keyboard
;  interrupt must be masked.  On exit, if carry is clear, A contains
;  the keyboard A port data and X contains the keyboard B port data;
;  Y is undefined.  If carry is set, no data is returned; either the
;  buffer was empty and the NOWAIT flag is true, or the read was
;  terminated by the interrupt handler.
;
;---------------------------------------------------------------------
;
GETKEY          .EQU         *
                LDA          KEYCNT                    ;Anything in the buffer?
                BNE          $030                      ;  Yes
                PHP
                SEI
                LDA          SCRNMODE
                ORA          #BITON7
                STA          SCRNMODE                  ;Turn on video
                LDA          E_REG
                ORA          #BITON5
                STA          E_REG
                PLP
                BIT          NOWAIT                    ;Check the NOWAIT flag
                BPL          $010
                ASL          READING                   ;Clear the READING flag,
                RTS                                    ;  set carry, and exit
;
$010            LDX          BUFSIZ                    ;Preserve buffer size in X
                LDA          #1                        ;Set buffer size to 1
                STA          BUFSIZ
                LDA          #KYBDENBL                 ;Unmask the keyboard
                STA          E_IER
                BIT          ESCAPE                    ;In ESCAPE mode?
                BVC          $020                      ;  No
                CLC
                LDA          TPX                       ;Preserve current cursor and
                LDY          HMODE                     ;  replace it with plus sign
                BPL          $015
                LSR          A
                BCC          $015
                TAY
                LDA          (BASE2),Y
                PHA
                AND          #BITON7
                ORA          #2B
                STA          (BASE2),Y
                BCS          $020
$015            TAY
                LDA          (BASE1),Y
                PHA
                AND          #BITON7
                ORA          #2B
                STA          (BASE1),Y
$020            LDA          KEYCNT                    ;Wait for a keystroke
                BEQ          $020
                BVC          $026                      ;Not in ESCAPE mode
                PLA                                    ;Restore original cursor
                BCC          $024
                STA          (BASE2),Y
                BCS          $026
$024            STA          (BASE1),Y
```

```
$026            LDA          #KYBDDSBL                 ;Mask the keyboard
                STA          E_IER
                STX          BUFSIZ                    ;Restore the buffer size
                SEC
                BIT          READING                   ;Check the reading flag
                BPL          $060                      ;  Exit with carry set
;
$030            LDY          BUFHEAD                   ;Get buffer index of keystroke
                DEC          KEYCNT
                BNE          $040                      ;If KEYCNT = 0
                LDA          #0
                STA          BUFHEAD                   ;  then BUFHEAD := BUFTAIL := 0
                STA          BUFTAIL
                BEQ          $050
$040            INC          BUFHEAD                   ;  else BUFHEAD := BUFHEAD + 1
                LDA          BUFHEAD
                CMP          BUFSIZ                    ;If BUFHEAD >= BUFSIZ
                BCC          $050
                LDA          #0                        ;  then BUFHEAD := 0
                STA          BUFHEAD
$050            LDA          KABUF,Y                   ;Load the A and B port data
                LDX          KBBUF,Y
                CLC
$060            RTS
                .PAGE
;-----------------------------------------------------------------------
;
;  Subroutine SCRNECHO
;
;  This subroutine writes a single character to the screen.  On entry,
;  the character must be in A.  On exit, all registers are undefined.
;
;-----------------------------------------------------------------------
SCRNECHO        .EQU         *
                BIT          ECHO                      ;Screen Echo enabled?
                BPL          $010
                PHA
                JSR          CURSOR                    ;Remove cursor
                PLA
                JSR          PRINT                     ;Print the character
                JSR          CURSOR                    ;Restore cursor
$010            RTS
;
;
;-----------------------------------------------------------------------
;
;  Subroutine BACKSP
;
;  This subroutine performs the screen backspace when the console
;  deletes an input character.  On entry, the input buffer pointer
;  must point to the character to be deleted and the overflow flag
;  must be set to indicate that the character should be erased, or
;  clear to indicate that it should be left on the screen.  On exit,
;  all registers are undefined.
;
;-----------------------------------------------------------------------
BACKSP          .EQU         *
                LDA          ECHO
                BPL          $020                      ;Screen Echo not enabled
                LDY          #0
                LDA          (BUFFPTR),Y               ;Printable character?
                CMP          #ASC_SP
                BCC          $020
                PHP                                    ;Save overflow flag
                JSR          CURSOR                    ;Remove cursor
                LDA          #ASC_BS
                JSR          PRINT                     ;Backspace
                PLP
                BVC          $010                      ;Don't erase
                LDA          #ASC_SP
                JSR          PRINT                     ;Erase the character
                LDA          #ASC_BS
                JSR          PRINT
$010            JSR          CURSOR                    ;Restore cursor
$020            RTS

; ####################################################################################################
; #   END OF FILE:  CONS.MAIN.TEXT
; #   LINES      :  349
; #   CHARACTERS :  17347
; #   Formatter  :  Assembly Language Reformatter 1.0.2 (07 January 1998)
; #   Author     :  David T. Craig -- 71533.606@compuserve.com -- Santa Fe, New Mexico USA
; ####################################################################################################
; ####################################################################################################
; #   PROJECT  :  Apple /// SOS Console Driver 1.31 (6502 Assembly Source Code)
; #   FILE NAME:  CONS.READ.TEXT
; ####################################################################################################

                .PAGE
;----------------------------------------------------------------------
;
;  Console Read Request
;
;    Parameters:
;       BUFFPTR:  Pointer to caller's data buffer
;       REQCNT:  Requested read count
;       RTNCNT:  Pointer to actual read count
;
;    Zero Page Temporary Storage
;       COUNT:  Number of bytes read
;       ONEBYTE:  TRUE if REQCNT = 1
;
;  If the ECHO or ESCAPE functions are enabled, this segment will call
;  PRINT to display a character or perform a screen control function.
;
;----------------------------------------------------------------------
;
CNSLREAD        .EQU         *
;
;  Initialize read variables
;
                BIT          OPENFLG
                BMI          $010
                JMP          CNOTOPEN
$010            BIT          KYBDMODE                  ;Keyboard mode?
                BMI          $030
                LDA          SMCURSOR                  ;Save cursor status
                PHA
                BMI          $020
                LDA          #ASC_ENQ                  ;Turn on cursor
                JSR          SCRNECHO
$020            LDA          #FALSE
                STA          ONEBYTE                   ;Clear one byte read flag
                LDA          REQCNT+1
                BNE          $040
                LDA          REQCNT
                CMP          #1
                BNE          $040
                ROR          ONEBYTE                   ;Set one byte read flag
                BMI          $040
;
$030            LDA          REQCNT                    ;Make requested count even
                AND          #BITOFF0
                STA          REQCNT
;
$040            LDA          ESCAPE
                AND          #BITON7
                STA          ESCAPE                    ;Clear escape pending
                LDA          #0
                STA          COUNT
                STA          COUNT+1                   ;Zero bytes read count
                PHP
                SEI
                STA          SUSPFLSH                  ;Clear suspend & flush flags
                LDA          #KYBDDSBL
                STA          E_IER                     ;Mask the keyboard
                LDA          #TRUE
                STA          READING                   ;Set the READING flag
                PLP
;
;  Main read loop
;
CNSLLOOP        LDA          COUNT                     ;If COUNT >= REQCNT
                CMP          REQCNT                    ;  then goto CNSLEXIT
                LDA          COUNT+1
                SBC          REQCNT+1
                BCC          $020
$010            JMP          CNSLEXIT
;
$020            JSR          GETKEY                    ;Get next keystroke
                BCS          $010
                BIT          KYBDMODE                  ;Console or Keyboard mode?
                BPL          TSTESCAPE
;
;  Keyboard mode read
;
KYBDRDY         PHA                                    ;Save ASCII byte
                LDY          #0
                STA          (BUFFPTR),Y               ;Store data byte in buffer
                INY
                TXA
                STA          (BUFFPTR),Y               ;Store status byte in buffer
                LDA          #02
                JMP          BUMPCNT                   ;Go update COUNT and BUFFPTR
;
;  Console mode read
```

```
;
TSTESCAPE       BIT          ECHO                      ;Test for Escape Mode
                BPL          TSTCHDEL
                BIT          ESCAPE
                BPL          TSTCHDEL
                BVC          $040                      ;Escape not pending
                LDY          #ECMDCNT-1
                CMP          #"a"
                BCC          $010
                CMP          #"{"
                BCS          $010
                AND          #BITOFF5                  ;Upshift lower case alpha
$010            CMP          ESCCMD,Y                  ;Search for escape command
                BEQ          $020
                DEY
                BPL          $010
                ASL          ESCAPE                    ;Not found -- clear pending flag
                BCS          $030
$020            LDA          ESCOP,Y                   ;Get screen control character
                JSR          SCRNECHO
$030            JMP          CNSLLOOP
;
$040            CMP          #ASC_ESC                  ;Is this an ESC?
                BNE          TSTCHDEL
                ROR          ESCAPE                    ;Set escape pending
                BMI          $030
;
TSTCHDEL        BIT          ONEBYTE                   ;Test for character delete
                BMI          TSTLNDEL
                BIT          CHDELFLG
                BPL          TSTLNDEL
                CMP          #CHDELCHR
                BNE          TSTLNDEL
                LDA          COUNT                     ;Anything to delete?
                ORA          COUNT+1
                BEQ          $030
                LDA          COUNT
                BNE          $010
                DEC          COUNT+1                   ;Decrement current read count
$010            DEC          COUNT
                LDA          BUFFPTR
                BNE          $020
                DEC          BUFFPTR+1                 ;Decrement buffer pointer
$020            DEC          BUFFPTR
                JSR          BACKSP                    ;Backspace
$030            JMP          CNSLLOOP
;
TSTLNDEL        BIT          ONEBYTE                   ;Test for line delete
                BMI          TSTCHCPY
                BIT          LNDELFLG
                BPL          TSTCHCPY
                CMP          #LNDELCHR
                BNE          TSTCHCPY
                LDA          ECHO
                BPL          $050
                BVC          $040
;
$010            LDA          COUNT                     ;Anything to delete?
                ORA          COUNT+1
                BEQ          $060
                LDA          COUNT
                BNE          $020
                DEC          COUNT+1                   ;Decrement current read count
$020            DEC          COUNT
                LDA          BUFFPTR
                BNE          $030
                DEC          BUFFPTR+1                 ;Decrement buffer pointer
$030            DEC          BUFFPTR
                BIT          LNDELFLG
                JSR          BACKSP                    ;Backspace
                JMP          $010
;
$040            LDA          #"\"
                JSR          SCRNECHO                  ;Write "\ CR LF"
                LDA          #ASC_CR
                JSR          SCRNECHO
                LDA          #ASC_LF
                JSR          SCRNECHO
$050            SEC
                LDA          BUFFPTR                   ;Reset buffer pointer
                SBC          COUNT
                STA          BUFFPTR
                LDA          BUFFPTR+1
                SBC          COUNT+1
                STA          BUFFPTR+1
                LDA          #0                        ;Reset current read count
                STA          COUNT
                STA          COUNT+1
$060            JMP          CNSLLOOP
;
TSTCHCPY        BIT          ECHO                      ;Test for character copy
                BPL          CNSLRDY
                BIT          CHCPYFLG
                BPL          CNSLRDY
                CMP          #CHCPYCHR
                BNE          CNSLRDY
                JSR          SCRNPICK                  ;Copy character from screen
                ASL          A
                CMP          #40
                ROR          A
                EOR          #BITON7
;
CNSLRDY         PHA                                    ;Save character for new line test
                LDY          #0
                STA          (BUFFPTR),Y               ;Store character in buffer
;
                BIT          ECHO                      ;Echo enabled?
                BPL          $020
                BVS          $010
                CMP          #20                       ;Check for control character
                BCC          $020
$010            JSR          SCRNECHO
$020            LDA          #01
;
BUMPCNT         PHA
                CLC
                ADC          COUNT                     ;Update current read count
                STA          COUNT
                BCC          $010
                INC          COUNT+1
$010            PLA
                CLC
                ADC          BUFFPTR                   ;Update buffer pointer
                STA          BUFFPTR
                BCC          TSTNEWLN
                INC          BUFFPTR+1
                LDA          BUFFPTR+1
                CMP          #0FF
                BCC          TSTNEWLN
                SBC          #080                      ;Wrap buffer at FF page
                STA          BUFFPTR+1
                INC          1400+BUFFPTR+1
;
TSTNEWLN        PLA                                    ;Test for New Line
                BIT          NEWLINE
                BPL          $010
                CMP          NEWLNCHR
                BEQ          CNSLEXIT
$010            JMP          CNSLLOOP
;
CNSLEXIT        ASL          READING                   ;Clear the READING flag
                LDA          #KYBDENBL
                STA          E_IER                     ;Unmask the keyboard
                LDY          #0
                LDA          COUNT                     ;Return the actual byte count
                STA          (RTNCNT),Y
                INY
                LDA          COUNT+1
                STA          (RTNCNT),Y
                BIT          KYBDMODE
                BMI          $020
                PLA
                BMI          $010
                LDA          #ASC_ACK                  ;Turn off cursor
                JSR          SCRNECHO
$010            JSR          ZPOUT
$020            RTS

; ####################################################################################################
; #   END OF FILE:  CONS.READ.TEXT
; #   LINES      :  245
; #   CHARACTERS :  11718
; #   Formatter  :  Assembly Language Reformatter 1.0.2 (07 January 1998)
; #   Author     :  David T. Craig -- 71533.606@compuserve.com -- Santa Fe, New Mexico USA
; ####################################################################################################
; ######################################################################################################
; #   PROJECT  :  Apple /// SOS Console Driver 1.31 (6502 Assembly Source Code)
; #   FILE NAME:  CONS.WRIT.TEXT
; ######################################################################################################

                .PAGE
;-----------------------------------------------------------------------
;
;  Console Write Request
;
;    Parameters:
;       BUFFPTR:  Pointer to caller's data buffer
;       REQCNT:  Number of bytes to write
;
;    Zero Page Temporary Storage
;       COUNT:  Number of bytes written
;
;       Additional zero page data may be used to perform screen
;       control functions.
;
;-----------------------------------------------------------------------
;
CNSLWRIT        .EQU         *
                BIT          OPENFLG
                BMI          $010
                JMP          CNOTOPEN
$010            JSR          CURSOR                    ;Remove Cursor
                LDA          #0
                STA          COUNT                     ;Zero COUNT
                STA          COUNT+1
;
$020            LDA          COUNT                     ;Check for end of buffer
                CMP          REQCNT
                LDA          COUNT+1
                SBC          REQCNT+1
                BCS          $060                      ;Go Exit
$030            BIT          SUSPFLSH                  ;Check suspend and flush flags
                BMI          $030                      ;  Suspend
                BVS          $050                      ;  Flush
                LDY          #0
                LDA          (BUFFPTR),Y               ;Get next byte
                JSR          PRINT                     ;Print the byte
                INC          BUFFPTR
                BNE          $040                      ;Bump pointer
                INC          BUFFPTR+1
                BNE          $040
                LDA          #80
                STA          BUFFPTR+1                 ;Process buffer wrap around
                INC          1400+BUFFPTR+1
$040            INC          COUNT
                BNE          $020                      ;Bump bytes read count
                INC          COUNT+1
                JMP          $020
;
$050            LDA          #00
                STA          CTLINDX                   ;Clear any pending cntl function
;
$060            JSR          CURSOR                    ;Restore cursor
                JMP          ZPOUT                     ;Save Zero Page data and exit
                .PAGE
;-----------------------------------------------------------------------
;
;  Subroutine PRINT
;
;  This routine processes a single byte of output.  Characters are
;  printed by calling DISPLAY.  Screen control functions are processed
;  by accumulating any required parameters in CTLBUFF then switching
;  to the appropriate screen control routine.
;
;    Parameters:
;       A:  The byte to process
;
;    Exit:
;       A, X, Y:  Undefined
;
;-----------------------------------------------------------------------
;
PRINT           .EQU         *
                LDY          CTLINDX                   ;Get control function index
                BNE          $010
                ORA          DSPLYCTL
                CMP          #ASC_SP                   ;Display or control?
                BCS          DISPLAY
                TAX
                LDA          QUOTATBL,X                ;Get function quota
                BEQ          $020
                STA          CTLQUOTA
                TXA
$010            STA          CTLBUFF,Y                 ;Save function character
                INY
                STY          CTLINDX                   ;Update buffer index
                CPY          CTLQUOTA                  ;See if quota filled
                BCC          $020
                LDY          #0
                STY          CTLINDX                   ;Zero buffer index
                SWITCH       CTLBUFF,,CTLSWTBL,*
$020            RTS
                .PAGE
;----------------------------------------------------------------------
;
;  Subroutine DISPLAY
;
;  This routine displays a single character.  If auto advance is
;  enabled, it calls CF_HT to advance the cursor.
;
;    Parameters:
;       A:  The character to be displayed
;
;    Exit:
;       A, X, Y:  Undefined
;
;----------------------------------------------------------------------
;
DISPLAY         .EQU         *
                ORA          #80                       ;set hi-bit
                EOR          SMINV                     ;set normal or inverse
                PHA                                    ;(for safe keeping)
                BIT          HMODE                     ;80 column text?
                BPL          $010
                LDA          TPX
                LSR          A                         ;80 col: X=TPX/2
                TAY                                    ;carry bit clear?
                BCC          $020                      ;yes: use page 1
                PLA
                STA          (BASE2),Y                 ;80 col page two
                BCS          $030
$010            LDY          TPX                       ;40 col: X=TPX
                LDA          TCOLOR
                STA          (BASE2),Y                 ;set color byte
$020            PLA
                STA          (BASE1),Y                 ;80 col page one
$030            BIT          SMAUTOADV                 ;if auto advance,
                BPL          $040
                JMP          CF_HT                     ;advance cursor
$040            RTS
                .PAGE
;----------------------------------------------------------------------
;
;   Control Function Quota and Switch Tables
;
;----------------------------------------------------------------------
QUOTATBL        .EQU         *                         ;The Control Function Quota Table
                .BLOCK       1,0                       ;  contains the total number of
                .BLOCK       15.,1                     ;  bytes required by the function,
                .BLOCK       1,2                       ;  including the function character
                .BLOCK       2,1                       ;  itself.  A zero indicates that
                .BLOCK       2,2                       ;  the function is unimplemented.
                .BLOCK       1,2
                .BLOCK       1,1
                .BLOCK       3,2
                .BLOCK       1,3
                .BLOCK       1,0
                .BLOCK       4,1
CTLSWTBL        .EQU         *
                .WORD        CF_NUL-1                  ;00  no-op
                .WORD        CF_SOH-1                  ;01  Save Environment & Release Viewport
                .WORD        CF_STX-1                  ;02  Set Viewport Upper Left
                .WORD        CF_ETX-1                  ;03  Set Viewport Lower Right
                .WORD        CF_EOT-1                  ;04  Restore Environment
                .WORD        CF_ENQ-1                  ;05  Cursor On
                .WORD        CF_ACK-1                  ;06  Cursor Off
                .WORD        CF_BEL-1                  ;07  Audible signal
                .WORD        CF_BS-1                   ;08  Backspace
                .WORD        CF_HT-1                   ;09  Forward Space
                .WORD        CF_LF-1                   ;0A  Line Feed
                .WORD        CF_VT-1                   ;0B  Reverse Line Feed
                .WORD        CF_FF-1                   ;0C  Home Cursor
                .WORD        CF_CR-1                   ;0D  Carriage Return
                .WORD        CF_SO-1                   ;0E  Screen Off
                .WORD        CF_SI-1                   ;0F  Screen On
                .WORD        CF_DLE-1                  ;10  Set Text Mode
                .WORD        CF_DC1-1                  ;11  Normal Video
                .WORD        CF_DC2-1                  ;12  Inverse Video
                .WORD        CF_DC3-1                  ;13  Foreground Color
                .WORD        CF_DC4-1                  ;14  Background Color
                .WORD        CF_NAK-1                  ;15  Set Text Options
                .WORD        CF_SYN-1                  ;16  Sync on VBL
                .WORD        CF_ETB-1                  ;17  Horizontal Shift
                .WORD        CF_CAN-1                  ;18  Go to X
                .WORD        CF_EM-1                   ;19  Go to Y
                .WORD        CF_SUB-1                  ;1A  Go to X,Y
                .WORD        CF_ESC-1                  ;1B  No-op
                .WORD        CF_FS-1                   ;1C  Clear Screen
                .WORD        CF_GS-1                   ;1D  Clear to End of Screen
                .WORD        CF_RS-1                   ;1E  Clear Line
                .WORD        CF_US-1                   ;1F  Clear to End of Line
```

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; ####################################################################################################
; #   END OF FILE:  CONS.WRIT.TEXT
; #   LINES      :  182
; #   CHARACTERS :  10016
; #   Formatter  :  Assembly Language Reformatter 1.0.2 (07 January 1998)
; #   Author     :  David T. Craig -- 71533.606@compuserve.com -- Santa Fe, New Mexico USA
; ####################################################################################################
; ####################################################################################################
; #   PROJECT  :  Apple /// SOS Console Driver 1.31 (6502 Assembly Source Code)
; #   FILE NAME:  CONS.FCTN.TEXT
; ####################################################################################################

                .PAGE
;----------------------------------------------------------------------
;
;  Screen Control Functions
;
;  These routines perform all screen control functions.
;
;    Parameters:
;       All parameters are accumulated in CTLBUFF
;
;    Exit:
;       A, X, Y:  Undefined
;
;----------------------------------------------------------------------
;
CF_NUL          .EQU         *
CF_ESC          .EQU         *
                RTS                                       ;NO-OP
;
CF_SOH          .EQU         *                            ;Save & Release Viewport
                LDY          #SCRSTLEN
$010            LDA          SCRSTTBL-1,Y
                STA          SCRSTSAV-1,Y
                DEY
                BNE          $010
                CLC
                LDA          TPX
                ADC          VPL
                STA          TPX                          ;retain X posn
                LDA          TPY
                ADC          VPT
                STA          TPY                          ;retain y posn
                LDA          #0
                STA          VPL                          ;zero left margin
                STA          VPT                          ;zero top margin
                LDA          #0FF
                STA          VPR                          ;Let VERIFY set the right edge
                STA          VPB                          ;  and bottom margin
                JMP          VERIFY
;
CF_STX          .EQU         *                            ;SET VIEWPORT UPPER LEFT
                CLC
                LDA          VPL
                ADC          TPX                          ;at cursor posn
                STA          VPL                          ;set left margin
                LDA          VPT
                ADC          TPY
                STA          VPT                          ;set top margin
                LDA          #0
                STA          TPX                          ;reset cursor X
                STA          TPY                          ;  and cursor Y
                JMP          VERIFY                       ;and verify
;
CF_ETX          .EQU         *                            ;SET VIEWPORT LOWER RIGHT
                CLC
                LDA          TPX
                ADC          VPL
                STA          VPR                          ;set left margin
                LDA          TPY
                ADC          VPT                          ;& bottom margin
                STA          VPB
                JMP          VERIFY                       ;and verify
;
CF_EOT          .EQU         *                            ;RESTORE VIEWPORT
                LDY          #SCRSTLEN
$010            LDA          SCRSTSAV-1,Y
                STA          SCRSTTBL-1,Y
                DEY
                BNE          $010
                JMP          VERIFY
;
CF_ENQ          .EQU         *                            ;ENABLE CURSOR
                LDA          SMODE
                ORA          #BITON4
                STA          SMODE
                LDA          #TRUE
                STA          SMCURSOR
                RTS
;
CF_ACK          .EQU         *                            ;DISABLE CURSOR
                LDA          SMODE
                AND          #BITOFF4
                STA          SMODE
                LDA          #FALSE
                STA          SMCURSOR
                RTS
;
CF_BEL          .EQU         *                            ;Sound Bell
```

```
                BIT          BELL
                RTS
;
CF_BS           .EQU         *                         ;BACKSPACE
                DEC          TPX
                BPL          $020
                BIT          SMAUTOCR                  ;BS at left:
                BPL          $010
                LDA          VPHMAX                    ;Wrap to right
                STA          TPX                       ;  edge of viewport
                JMP          CF_VT
$010            INC          TPX
$020            RTS
;
CF_HT           .EQU         *                         ;ADVANCE
                LDA          TPX
                CMP          VPHMAX
                BCS          $010                      ;at edge?
                INC          TPX                       ;no: advance
                RTS
$010            BIT          SMAUTOCR                  ;auto CR on?
                BPL          CF_EXIT
                LDA          #0                        ;yes: wrap to
                STA          TPX                       ;left margin
                JMP          CF_LF                     ;& line feed
;
CF_LF           .EQU         *                         ;LINE FEED
                LDA          TPY
                CMP          VPVMAX
                BCS          $010                      ;at edge?
                INC          TPY                       ;no: move down
                JMP          TBASCAL                   ;calc base address
$010            BIT          SMSCROLL                  ;auto scroll?
                BPL          CF_EXIT
                LDA          #00
                JMP          SCROLL                    ;yes: go to it
;
CF_VT           .EQU         *                         ;REVERSE LINE FEED
                LDA          TPY
                BEQ          $010                      ;at top?
                DEC          TPY                       ;no: do it
                JMP          TBASCAL                   ;calc base address
$010            BIT          SMSCROLL                  ;auto scroll?
                BPL          CF_EXIT
                LDA          #80
                JMP          SCROLL
;
CF_FF           .EQU         *                         ;FORM FEED
                LDA          #0
                STA          TPX                       ;reset TPX
                STA          TPY                       ;  and TPY
                JMP          TBASCAL                   ;calc base address
;
CF_CR           .EQU         *                         ;CARRIAGE RETURN
                LDA          #0
                STA          TPX                       ;reset TPX
                BIT          SMAUTOLF                  ;auto LF set?
                BPL          CF_EXIT
                JMP          CF_LF                     ;yes: go to it
;
CF_SO           .EQU         *                         ;SCREEN OFF
                LDA          #FALSE
                STA          SCRNMODE
                JMP          VERIFY
;
CF_SI           .EQU         *                         ;SCREEN ON
                LDA          #TRUE
                STA          SCRNMODE
                JMP          VERIFY
;
CF_DLE          .EQU         *                         ;SET HARDWARE MODE
                LDA          CTLBUFF+1
                STA          HMODE
                JMP          VERIFY
;
CF_DC1          .EQU         *                         ;NORMAL VIDEO
                LDA          SMODE
                AND          #BITOFF5                  ;reset INVERSE bit
                STA          SMODE
                LDA          #FALSE
                STA          SMINV
CF_EXIT         RTS
;
CF_DC2          .EQU         *                         ;INVERSE VIDEO
                LDA          SMODE
                ORA          #BITON5                   ;set INVERSE bit
                STA          SMODE
                LDA          #TRUE
                STA          SMINV
                RTS
;
CF_DC3          .EQU         *                         ;FOREGROUND COLOR
                LDA          CTLBUFF+1
                STA          TCF
                JMP          VERIFY                    ;set TCOLOR
;
CF_DC4          .EQU         *                         ;BACKGROUND COLOR
                LDA          CTLBUFF+1
                STA          TCB
                JMP          VERIFY                    ;set TCOLOR
;
CF_NAK          .EQU         *                         ;SET SOFTWARE MODE
                LDA          CTLBUFF+1
                AND          #0F
                STA          CTLBUFF+1
                LDA          SMODE                     ;Save bits 7-4
                AND          #0F0
                ORA          CTLBUFF+1
                STA          SMODE
                JMP          VERIFY
;
CF_SYN          .EQU         *                         ;SYNCHRONIZE WITH VBL
                LDA          #SYNCSSIZ
                LDX          SYNCSADR
                LDY          SYNCSADR+1
                JSR          ALLOCSIR                  ;Allocate CB2 for VBL
                BCS          CF_EXIT
                JSR          CURSOR                    ;Restore cursor while waiting
                PHP
                SEI
                LDA          E_PCR
                AND          #1F
                ORA          #60                       ;Set up CB2 to monitor
                STA          E_PCR                     ;  VBL positive edge
                LDA          #08
                STA          E_IER
                STA          E_IFR
                PLP
$010            BIT          E_IFR                     ;Wait for VBL edge
                BEQ          $010
                JSR          CURSOR                    ;Remove cursor
                LDA          #SYNCSSIZ
                LDX          SYNCSADR
                LDY          SYNCSADR+1
                JMP          DEALCSIR                  ;Release CB2 resource
;
CF_ETB          .EQU         *                         ;HORIZONTAL SCROLL
                LDA          CTLBUFF+1
$010            JMP          SHIFT
;
CF_CAN          .EQU         *                         ;Go To X
                LDA          CTLBUFF+1
                CMP          VPHMAX                    ;out of range?
                BCC          $010
                LDA          VPHMAX                    ;Set to right margin
$010            STA          TPX
                RTS
;
CF_EM           .EQU         *                         ;Go To Y
                LDA          CTLBUFF+1
                CMP          VPVMAX                    ;out of range?
                BCC          $010
                LDA          VPVMAX                    ;Set to top
$010            STA          TPY
                JMP          TBASCAL                   ;get base address
;
CF_SUB          .EQU         *                         ;Go To X, Y
                JSR          CF_CAN
                LDA          CTLBUFF+2
                STA          CTLBUFF+1
                JMP          CF_EM
;
CF_FS           .EQU         *                         ;CLEAR SCREEN
                JSR          CF_FF
                JMP          CLREOS
;
CF_GS           .EQU         *                         ;CLEAR TO EOS
                JMP          CLREOS
;
CF_RS           .EQU         *                         ;CLEAR LINE
                LDA          #0
                STA          TPX
                JMP          CLREOL
;
CF_US           .EQU         *                         ;CLEAR TO EOL
                JMP          CLREOL


; ####################################################################################################
; #   END OF FILE:  CONS.FCTN.TEXT
; #   LINES      :  265
; #   CHARACTERS :  12878
; #   Formatter  :  Assembly Language Reformatter 1.0.2 (07 January 1998)
; #   Author     :  David T. Craig -- 71533.606@compuserve.com -- Santa Fe, New Mexico USA
; ####################################################################################################
; ####################################################################################################
; #   PROJECT  :  Apple /// SOS Console Driver 1.31 (6502 Assembly Source Code)
; #   FILE NAME:  CONS.STAT.TEXT
; ####################################################################################################

                .PAGE
;---------------------------------------------------------------------
;
;  Console Status Request
;
;    Parameters:
;       SCCODE:  Status / Control code
;       SCLIST:  Pointer to caller's status / control list
;
;       Before switching to the appropriate request handling code,
;       Y is set to zero.
;
;---------------------------------------------------------------------
;
CNSLSTAT        .EQU         *
                BIT          OPENFLG                   ;Is the Console open?
                BMI          $010
                JMP          CNOTOPEN
$010            SWITCH       SCCODE,18.,CSTATSW,*
                BCS          CBADCTL
                LDY          #0
                RTS
;
CBADCTL         LDA          #XCTLCODE                 ;Invalid control code
                JSR          SYSERR
;
CSTATSW         .WORD        CSTAT00-1
                .WORD        CSTAT01-1
                .WORD        CSTAT02-1
                .WORD        CSTAT03-1
                .WORD        CSTAT04-1
                .WORD        CSTAT05-1
                .WORD        CSTAT06-1
                .WORD        CBADCTL-1
                .WORD        CSTAT08-1
                .WORD        CSTAT09-1
                .WORD        CSTAT10-1
                .WORD        CSTAT11-1
                .WORD        CSTAT12-1
                .WORD        CSTAT13-1
                .WORD        CSTAT14-1
                .WORD        CSTAT15-1
                .WORD        CSTAT16-1
                .WORD        CSTAT17-1
                .WORD        CSTAT18-1
;
CSTAT00         RTS                                    ;0 -- NOP
;
CSTAT01         .EQU         *                         ;1 -- Console Status Table
                LDA          (SCLIST),Y
                CMP          #CONSTLEN
                BCS          $010
                LDA          #XCTLPARM
                JSR          SYSERR
$010            LDA          #CONSTLEN
                STA          (SCLIST),Y
                TAY
$020            LDA          CONSTTBL-1,Y
                STA          (SCLIST),Y
                DEY
                BNE          $020
                RTS
;
CSTAT02         .EQU         *                         ;2 -- New Line
                LDA          NEWLINE
                STA          (SCLIST),Y
                INY
                LDA          NEWLNCHR
                STA          (SCLIST),Y
                RTS
;
CSTAT03         .EQU         *                         ;3 -- Console / Keyboard mode
                LDA          KYBDMODE
                STA          (SCLIST),Y
                RTS
;
CSTAT04         .EQU         *                         ;4 -- Buffer Size
                LDA          BUFSIZ
                STA          (SCLIST),Y
                RTS
;
CSTAT05         .EQU         *                         ;5 -- Current Key Count
                LDA          KEYCNT
                STA          (SCLIST),Y
                RTS
;
CSTAT06         LDY          #5                        ;6 -- Attention Event
$010            LDA          ATTNEVNT,Y
```

```
                STA          (SCLIST),Y
                DEY
                BPL          $010
                RTS
;
CSTAT08         LDY          #4                        ;8 -- Any Key Event
$010            LDA          ANYKYEVNT,Y
                STA          (SCLIST),Y
                DEY
                BPL          $010
                RTS
;
CSTAT09         .EQU         *                         ;09 -- Read Screen with norm/inv
                JSR          SCRNPICK
                EOR          #BITON7
                EOR          SMCURSOR
                LDY          #0
                STA          (SCLIST),Y
                RTS
;
CSTAT10         .EQU         *                         ;10 -- No Wait Input
                LDA          NOWAIT
                STA          (SCLIST),Y
                RTS
;
CSTAT11         .EQU         *                         ;11 -- Screen Echo
                LDA          ECHO
                STA          (SCLIST),Y
                RTS
;
CSTAT12         .EQU         *                         ;12 -- Character Copy
                LDA          CHCPYFLG
                STA          (SCLIST),Y
                RTS
;
CSTAT13         .EQU         *                         ;13 -- Character Delete
                LDA          CHDELFLG
                STA          (SCLIST),Y
                RTS
;
CSTAT14         .EQU         *                         ;14 -- Line Delete
                LDA          LNDELFLG
                STA          (SCLIST),Y
                RTS
;
CSTAT15         .EQU         *                         ;15 -- Escape Functions
                LDA          ESCAPE
                STA          (SCLIST),Y
                RTS
;
CSTAT16         .EQU         *                         ;16 -- Cursor Position
                LDA          TPX
                STA          (SCLIST),Y
                INY
                LDA          TPY
                STA          (SCLIST),Y
                RTS
;
CSTAT17         .EQU         *                         ;17 -- Pick Character
                JSR          SCRNPICK
                ASL          A
                CMP          #40
                ROR          A
                EOR          #BITON7
                LDY          #0
                STA          (SCLIST),Y
                RTS
;
CSTAT18         .EQU         *                         ;18 -- Screen Dump
                LDA          HMODE
                STA          (SCLIST),Y
                INY
                LDA          VPHMAX
                STA          (SCLIST),Y
                INY
                LDA          VPVMAX
                STA          (SCLIST),Y
                LDA          #00
                BIT          DSPLYCTL
                BMI          $010
                JMP          SCRNDUMP
$010            STA          (SCLIST),Y                ;If control characters are being
                DEY                                    ;  displayed, dump a null viewport
                STA          (SCLIST),Y
                RTS


; ####################################################################################################
; #   END OF FILE:  CONS.STAT.TEXT
; #   LINES      :  174
; #   CHARACTERS :  7340
; #   Formatter  :  Assembly Language Reformatter 1.0.2 (07 January 1998)
; #   Author     :  David T. Craig -- 71533.606@compuserve.com -- Santa Fe, New Mexico USA
; ####################################################################################################
; ####################################################################################################
; #   PROJECT  :  Apple /// SOS Console Driver 1.31 (6502 Assembly Source Code)
; #   FILE NAME:  CONS.CNTL.TEXT
; ####################################################################################################

                .PAGE
;----------------------------------------------------------------------
;
;  Console Control Request
;
;    Parameters:
;       SCCODE:  Status / Control code
;       SCLIST:  Pointer to caller's status / control list
;
;       Before switching to the appropriate request handler, Y is
;       set to zero and A is loaded with the first byte of the list.
;
;----------------------------------------------------------------------
;
CNSLCNTL        .EQU         *
                BIT          OPENFLG                   ;Console open?
                BPL          $010
                SWITCH       SCCODE,18.,CCNTLSW,*
                BCS          $020
                LDY          #00
                LDA          (SCLIST),Y
                RTS
;
$010            JMP          CNOTOPEN
;
$020            JMP          CBADCTL
;
CCNTLSW         .WORD        CCNTL00-1
                .WORD        CCNTL01-1
                .WORD        CCNTL02-1
                .WORD        CCNTL03-1
                .WORD        CCNTL04-1
                .WORD        CCNTL05-1
                .WORD        CCNTL06-1
                .WORD        CBADCTL-1
                .WORD        CCNTL08-1
                .WORD        CBADCTL-1
                .WORD        CCNTL10-1
                .WORD        CCNTL11-1
                .WORD        CCNTL12-1
                .WORD        CCNTL13-1
                .WORD        CCNTL14-1
                .WORD        CCNTL15-1
                .WORD        LOADSET-1
                .WORD        LOAD8-1
                .WORD        CCNTL18-1
;
CCNTL00         LDA          E_IER                     ;0 -- Reset
                PHA                                    ;Save current interrupt state
                LDA          #KYBDDSBL                 ;  and mask off interrupts
                STA          E_IER
                LDA          #BUFMAX
                STA          BUFSIZ                    ;Set buffer size to maximum
                LDA          #00
                STA          KEYCNT                    ;Flush buffer
                STA          BUFHEAD
                STA          BUFTAIL
                STA          READING                   ;No read in progress
                STA          ANYKYEVNT                 ;Disable any key event
                STA          ATTNEVNT                  ;Disable attention event
                STA          CTLINDX                   ;Abort control function in progress
                STA          DSPLYCTL                  ;Clear display control char. flag
                STA          SUSPFLSH                  ;Clear suspend & flush output flags
                JSR          CURSOR                    ;Remove cursor
                LDX          #DFLTLEN
$010            LDA          DFLTVAL-1,X               ;Copy configuration block
                STA          DFLTTBL-1,X
                DEX
                BNE          $010
                JSR          CF_SOH                    ;Save screen state & verify
                JSR          CURSOR                    ;Restore the cursor
                JSR          ZPOUT                     ;Save screen zero page
                PLA
                AND          #KYBDENBL                 ;Restore previous interrupt state
                ORA          #BITON7
                STA          E_IER
                RTS
;
CCNTL01         .EQU         *                         ;1 -- Console Status Table
                CMP          #CONSTLEN
                BEQ          $010
                LDA          #XCTLPARM
                JSR          SYSERR
$010            JSR          CURSOR
                LDY          #CONSTLEN
$020            LDA          (SCLIST),Y
                DEY
                STA          CONSTTBL,Y
                BNE          $020
                JSR          VERIFY
                JSR          CURSOR
                JSR          ZPOUT
                RTS
;
CCNTL02         .EQU         *                         ;2 -- New Line
                AND          #BITON7
                STA          NEWLINE
                INY
                LDA          (SCLIST),Y
                STA          NEWLNCHR
                RTS
;
CCNTL03         .EQU         *                         ;3 -- Console / Keyboard mode
                AND          #BITON7
                STA          KYBDMODE
                RTS
;
CCNTL04         .EQU         *                         ;4 -- Buffer Size
                CMP          #BUFMAX+1
                BCC          $010
                LDA          #XCTLPARM
                JSR          SYSERR
$010            LDX          #KYBDDSBL
                STX          E_IER
                STY          KEYCNT
                STY          BUFHEAD
                STY          BUFTAIL
                STA          BUFSIZ
                LDX          #KYBDENBL
                STX          E_IER
                RTS
;
CCNTL05         LDA          E_IER                     ;5 -- Flush Buffer
                PHA
                LDA          #KYBDDSBL
                STA          E_IER
                STY          KEYCNT
                STY          BUFHEAD
                STY          BUFTAIL
                PLA
                AND          #KYBDENBL
                ORA          #BITON7
                STA          E_IER
                RTS
;
CCNTL06         PHP                                    ;6 -- Attention Event
                SEI
                LDY          #5
$010            LDA          (SCLIST),Y
                STA          ATTNEVNT,Y
                DEY
                BPL          $010
                PLP
                RTS
;
CCNTL08         PHP                                    ;8 -- Any Key Event
                SEI
                LDY          #4
$010            LDA          (SCLIST),Y
                STA          ANYKYEVNT,Y
                DEY
                BPL          $010
                PLP
                RTS
;
CCNTL10         .EQU         *                         ;10 -- No Wait Input
                AND          #BITON7
                STA          NOWAIT
                RTS
;
CCNTL11         .EQU         *                         ;11 -- Screen Echo
                AND          #BITON7+BITON6
                STA          ECHO
                RTS
;
CCNTL12         .EQU         *                         ;12 -- Character Copy
                AND          #BITON7
                STA          CHCPYFLG
                RTS
;
CCNTL13         .EQU         *                         ;13 -- Character Delete
                AND          #BITON7+BITON6
                STA          CHDELFLG
                RTS
;
CCNTL14         .EQU         *                         ;14 -- Line Delete
                AND          #BITON7+BITON6
                STA          LNDELFLG
                RTS
;
CCNTL15         .EQU         *                         ;15 -- Escape Functions
```

```
                AND          #BITON7
                STA          ESCAPE
                RTS
;
CCNTL18         .EQU         *                         ;18 -- Restore contents of viewport
                BIT          DSPLYCTL
                BMI          $020
                INY
                EOR          HMODE
                BMI          $010
                LDA          (SCLIST),Y
                CMP          VPHMAX
                BNE          $010
                INY
                LDA          (SCLIST),Y
                CMP          VPVMAX
                BNE          $030
                LDA          #80
                JMP          SCRNDUMP
;
$010            LDA          (SCLIST),Y
                INY
                ORA          (SCLIST),Y
                BNE          $030
$020            RTS
;
$030            LDA          #XCTLPARM
                JSR          SYSERR

; ##########################################################################################################
; #   END OF FILE:  CONS.CNTL.TEXT
; #   LINES      :  210
; #   CHARACTERS :  9290
; #   Formatter  :  Assembly Language Reformatter 1.0.2 (07 January 1998)
; #   Author     :  David T. Craig -- 71533.606@compuserve.com -- Santa Fe, New Mexico USA
; ##########################################################################################################
```

```
                .PAGE
;----------------------------------------------------------------------
;
;  Subroutine LOADCHR
;
;  This subroutine is called to load an ASCII code and a character
;  image into one of the character download cells in the text pages.
;
;  LOADCHR requires four bytes of zero page storage for pointers. In
;  order to make it callable from either a device handler or an
;  interrupt processor, all zero page references are indexed by X.
;  On entry, the X register must contain the zero page offset to the
;  character image pointer.  The two bytes following the image
;  pointer are used to address the download locations in the text
;  page.
;
;     Input Parameters:
;        DNLDCEL  -- character download cell number: [0,7]
;        DNLDCHR  -- ASCII character code: [0,7F]
;        X reg    -- zero page offset to pointers
;                    (0,X) image pointer set by caller
;                    (2,X) download cell pointer set by LOADCHR
;
;  On exit, DNLDCEL, DNLDCHR, and X will be unchanged.  The image
;  pointer will have been incremented by eight.  A and Y are destroyed.
;
;----------------------------------------------------------------------
;
DIMGPTR         .EQU         00                        ;Zero page pointer to image
DCELPTR         .EQU         02                        ;Zero page pointer to cell
;
LOADCHR         .EQU         *
                LDY          #00                       ;Use Y for row counter
$010            LDA          DNLDCEL                   ;Set up cell pointer
                AND          #03                       ;  for ASCII code
                ORA          DCPTRL,Y
                STA          DCELPTR,X
                LDA          DNLDCEL
                LSR          A
                LSR          A
                CPY          #04
                ROL          A
                ORA          #08
                STA          DCELPTR+1,X
                LDA          DNLDCHR                   ;Store ASCII code into
                STA          (DCELPTR,X)               ;  download cell
                LDA          DCELPTR+1,X               ;Fix cell pointer
                EOR          #0C                       ;  for character image
                STA          DCELPTR+1,X
                LDA          (DIMGPTR,X)               ;Store character image
                STA          (DCELPTR,X)               ;  into download cell
                INC          DIMGPTR,X                 ;Increment the image pointer
                BNE          $020
                INC          DIMGPTR+1,X
$020            INY                                    ;Increment the row number
                CPY          #08
                BCC          $010                      ;Not done yet
                RTS
;
DCPTRL          .EQU         *                         ;Table of download cell addresses
                .BYTE        078,07C,0F8,0FC
                .BYTE        078,07C,0F8,0FC
                .PAGE
;----------------------------------------------------------------------
;
;  Subroutine DNLDINT
;
;  This subroutine processes the VBL interrupt that signals the
;  completion of a character download cycle.  If the REQUEST bit of
;  DNLDFLG is set, another block of eight characters will be
;  downloaded; otherwise, the CB1 and CB2 resources will be
;  released and the ACTIVE bit will be cleared.  DNLDINT assumes
;  that the X register points to a four byte area on the zero page
;  that can be used for LOADCHR.
;
;----------------------------------------------------------------------
;
DNLDINT         .EQU         *
                BIT          DNLDDSBL                  ;Disable download
                LDA          #VBLDSBL
                STA          E_IER                     ;Mask VBL interrupts
                BIT          DNLDFLG                   ;Test REQUEST bit
                BVC          $030
                CLI                                    ;Enable interrupts
                LDA          #07
                STA          DNLDCEL                   ;Start with cell 7
                LDA          DNLDIMG
                STA          DIMGPTR,X                 ;Set up IMAGE pointer
                LDA          DNLDIMG+1
                STA          DIMGPTR+1,X
$010            JSR          LOADCHR                   ;Load one character image
                INC          DNLDCHR                   ;Bump character code
                BPL          $020
                ASL          DNLDFLG                   ;Clear REQUEST bit
$020            DEC          DNLDCEL                   ;Bump cell number
                BPL          $010                      ;More to do
                LDA          DIMGPTR,X
                STA          DNLDIMG                   ;Save IMAGE pointer
                LDA          DIMGPTR+1,X
                STA          DNLDIMG+1
                JMP          DNLD_GO                   ;Enable downloading
;
$030            ASL          DNLDFLG                   ;Clear ACTIVE bit
                LDA          #DNLDSSIZ
                LDX          DNLDSADR
                LDY          DNLDSADR+1
                JSR          DEALCSIR                  ;Deallocate SIRs
                RTS
                .PAGE
;---------------------------------------------------------------------
;
;  Subroutine GETSIRS
;
;  This subroutine allocates SIRs 5 & 6 and initializes them to
;  monitor VBL for character downloading.  If the SIRs can not be
;  allocated, it sets an error code and returns directly to the
;  dispatcher.
;
;---------------------------------------------------------------------
;
GETSIRS         .EQU         *
                BIT          DNLDFLG                   ;Wait for any previous
                BMI          GETSIRS                   ;  request to finish
                LDA          #DNLDSSIZ
                LDX          DNLDSADR
                LDY          DNLDSADR+1
                JSR          ALLOCSIR
                BCS          $010
                PHP
                SEI
                LDA          E_PCR                     ;Set CB1 to monitor VBL
                AND          #0F                       ;  negative edge and
                ORA          #60                       ;  CB2 to monitor
                STA          E_PCR                     ;  positive edge
                LDA          #VBLDSBL
                STA          E_IER
                PLP
                RTS
;
$010            PLA                                    ;  pull caller's
                PLA                                    ;  address, and
                LDA          #XNORESRC                 ;  return to dispatcher
                JSR          SYSERR                    ;  with an error
                .PAGE
;---------------------------------------------------------------------
;
;  Subroutine LOADSET
;
;  This subroutine is called to initiate downloading of the entire
;  text screen character set.  LOADSET calls GETSIRS to set up the
;  6522 to monitor VBL and interrupt on the negative edge.  It then
;  copys the character set to the screen's local data area, sets the
;  request bit, and enables the VBL interrupt.  The VBL interrupt
;  processor, DNLDINT, will complete the actual downloading.
;
;    Parameters:
;       SCLIST:  Pointer to caller's 1024 byte character set
;
;    Zero Page Temporary Storage:
;       WORK1:  Pointer to system's character set
;
;---------------------------------------------------------------------
;
LOADSET         .EQU         *
                JSR          GETSIRS
                LDA          #TEXTCSA%100
                STA          WORK1
                STA          DNLDIMG
                LDA          #TEXTCSA/100
                STA          WORK1+1
                STA          DNLDIMG+1
                LDA          #ASC_NUL
                STA          DNLDCHR
                LDX          #4                        ;Set X to move 4 pages
                LDY          #0                        ;Set Y to move full page
                LDA          SCLIST+1
                CMP          #0FB
                BCC          $010
                SBC          #080                      ;Adjust address to avoid
                STA          SCLIST+1                  ;  bank wrap around
                INC          1400+SCLIST+1
```

```
$010            LDA          (SCLIST),Y                ;Copy character set to
                STA          (WORK1),Y                 ;  text char set buffer
                INY
                BNE          $010
                INC          SCLIST+1
                INC          WORK1+1
                DEX
                BNE          $010
                LDA          #0C0                      ;Set download active
                STA          DNLDFLG                   ;  and request flags
                LDA          #VBLENBL
                STA          E_IER                     ;Enable interrupts in VBL neg
                RTS
                .PAGE
;-------------------------------------------------------------------
;
;  Subroutine LOAD8
;
;  This subroutine is called to download up to eight text character
;  images.  LOAD8 calls GETSIRS to set up the 6522 to monitor VBL
;  and interrupt on the negative edge.  It then loads the character
;  images into the screen's download cells and enables downloading
;  and the VBL interrupt.  The download operation is completed by
;  the interrupt processor DNLDINT.
;
;    Parameters:
;       SCLIST:  Pointer to caller's character sets
;
;    Zero Page Temporary Data:
;       COUNT:  Number of characters to download
;       WORK1:  Pointer to character image for LOADCHR
;       WORK2:  Work area for LOADCHR
;
;-------------------------------------------------------------------
;
LOAD8           .EQU         *
                CMP          #01                       ;Check download count
                BCS          $010
                RTS
;
$010            CMP          #09
                BCC          $020
                LDA          #XCTLPARM                 ;Too many
                JSR          SYSERR
;
$020            STA          COUNT
                JSR          GETSIRS
;
                INC          SCLIST                    ;Bump list address
                BNE          $030                      ;  to first character
                INC          SCLIST+1
;
$030            LDA          #08
                STA          DNLDCEL
;
$040            LDY          #00
                LDA          (SCLIST),Y                ;Get character code
                STA          DNLDCHR
                INC          SCLIST                    ;Bump list address
                BNE          $050                      ;  to character image
                INC          SCLIST+1
;
$050            LDA          #03
                STA          WORK1+1
                LDA          DNLDCHR
                ASL          A
                ASL          A
                ROL          WORK1+1                   ;Set up address of character
                ASL          A                         ;  image in C00 to FFF space
                ROL          WORK1+1
                STA          WORK1
;
                LDY          #07
$060            LDA          (SCLIST),Y                ;Copy character image
                STA          (WORK1),Y                 ;  to C00 image space
                DEY
                BPL          $060
;
                DEC          DNLDCEL
                LDX          #WORK1
                JSR          LOADCHR                   ;Download this character
;
                LDA          DNLDCEL
                CMP          COUNT
                BCS          $050                      ;Do same character again
                LDA          #08
                ADC          SCLIST                    ;Bump list address
                STA          SCLIST                    ;  to next character
                BCC          $070
                INC          SCLIST+1
$070            DEC          COUNT
                BNE          $040
;
```

```
                LDA          #080                      ;Set download active
                STA          DNLDFLG
DNLD_GO         BIT          DNLDENBL
                LDA          #VBLCLR
                STA          E_IFR                     ;Clear both VBL flags
$080            BIT          E_IORB                    ;Check composite blanking
                BVC          $090
                BIT          E_IFR                     ;Check VBL flags
                BEQ          $080
$090            STA          E_IFR                     ;Clear VBL flags
                LDA          #VBLENBL                  ;Enable VBL interrupt
                STA          E_IER
                RTS

; ######################################################################################################
; #   END OF FILE:  CONS.DNLD.TEXT
; #   LINES      :  288
; #   CHARACTERS :  14806
; #   Formatter  :  Assembly Language Reformatter 1.0.2 (07 January 1998)
; #   Author     :  David T. Craig -- 71533.606@compuserve.com -- Santa Fe, New Mexico USA
; ######################################################################################################
; ####################################################################################################
; #   PROJECT  :  Apple /// SOS Console Driver 1.31 (6502 Assembly Source Code)
; #   FILE NAME:  CONS.MISC.TEXT
; ####################################################################################################

                .PAGE
;----------------------------------------------------------------------
;
;  Console Open Request
;
;----------------------------------------------------------------------
;
CNSLOPEN        .EQU         *
                BIT          OPENFLG                   ;Console open?
                BPL          $010                      ;  No
                LDA          #XNOTAVIL
                JSR          SYSERR
;
$010            LDA          #KYBDSSIZ                 ;Allocate the keyboard interrupt
                LDX          KYBDSADR
                LDY          KYBDSADR+1
                JSR          ALLOCSIR
                BCS          $020
                LDA          #TRUE
                STA          OPENFLG                   ;Set console open
                JSR          CCNTL00                   ;Reset console parameters
                PHP
                SEI
                LDA          E_PCR
                AND          #0F1
                ORA          #002                      ;Set up keyboard interrupt
                STA          E_PCR
                PLP
                LDA          #KYBDCLR
                STA          E_IFR                     ;Clear keyboard flag
                BIT          KYBDSTRB                  ;Clear the keyboard strobe
                LDA          #KYBDENBL
                STA          E_IER                     ;Unmask keyboard interrupts
                CLC
                RTS
;
$020            LDA          #XNORESRC                 ;Couldn't get keyboard resource
                JSR          SYSERR
                .PAGE
;----------------------------------------------------------------------
;
;  Console Close Request
;
;----------------------------------------------------------------------
;
CNSLCLOS        .EQU         *
                ASL          OPENFLG                   ;Console open?
                BCS          $010                      ;  Yes
                JMP          CNOTOPEN
;
$010            BIT          DNLDFLG                   ;Wait for pending download
                BMI          $010
                LDA          #KYBDDSBL
                STA          E_IER                     ;Mask keyboard interrupts
                BIT          KYBDSTRB                  ;Clear the keyboard strobe
                LDA          #KYBDSSIZ
                LDX          KYBDSADR
                LDY          KYBDSADR+1
                JSR          DEALCSIR                  ;Deallocate the keyboard interrupt
                RTS
                .PAGE
;----------------------------------------------------------------------
;
;  Console Initialization Request
;
;----------------------------------------------------------------------
;
CNSLINIT        .EQU         *
                LDA          #FALSE
                STA          OPENFLG
                LDA          B_REG                     ;Set bank register for
                STA          KYBDBANK                  ;  keyboard and download
                STA          DNLDBANK                  ;  interrupt handlers
                LDA          #TEXTCSA%100              ;Set up character download call
                STA          SCLIST
                LDA          #TEXTCSA/100
                STA          SCLIST+1
                LDA          #00
                STA          1400+SCLIST+1
                JSR          LOADSET
                CLC
                RTS


; ####################################################################################################
; #   END OF FILE:  CONS.MISC.TEXT
; #   LINES      :  83
; #   CHARACTERS :  4017
; #   Formatter  :  Assembly Language Reformatter 1.0.2 (07 January 1998)
; #   Author     :  David T. Craig -- 71533.606@compuserve.com -- Santa Fe, New Mexico USA
; ####################################################################################################
; ####################################################################################################
; #   PROJECT  :  Apple /// SOS Console Driver 1.31 (6502 Assembly Source Code)
; #   FILE NAME:  CONS.UTL1.TEXT
; ####################################################################################################

                .PAGE
;----------------------------------------------------------------------
;
;   Subroutine VERIFY
;
;  This subroutine checks the screen's hardware mode, software mode,
;  and viewport parameters for self consistency.  It also sets the
;  screen switches and the following internal variables:
;       HMODE, SMINV, SMCURSOR, SMSCROLL, SMAUTOCR, SMAUTOLF,
;       SMAUTOADV, VPHMAX, VPVMAX, and TCOLOR
;
;    Parameters:  none
;
;    Exit:
;       A, X, Y:  Undefined
;
;----------------------------------------------------------------------
;
VERIFY          .EQU         *
                LDA          HMODE                     ;Validate HMODE
                AND          #03                       ;  and set 80 column
                ASL          A                         ;  flag in bit 7
                CMP          #04
                BCC          $010
                LDA          #04
$010            ROR          A
                STA          HMODE
                LDY          SMODE                     ;Preserve SMODE
                LDA          #00
                LDX          #5
$020            STA          SMFLAGS,X
                LSR          SMODE                     ;Set SMODE flags
                ROR          SMFLAGS,X
                DEX
                BPL          $020
                STY          SMODE
                LDA          #79.
                BIT          HMODE                     ;Screen width := If 80 column,
                BMI          $100                      ;  then 79.
                LDA          #39.                      ;  else 39.
$100            CMP          VPR                       ;VPR <= Screen width
                BCS          $110
                STA          VPR
$110            LDA          VPR
                CMP          VPL                       ;VPL <= VPR
                BCS          $120
                STA          VPL
$120            SEC
                LDA          VPR                       ;VPHMAX :=
                SBC          VPL                       ;  VPR - VPL
                STA          VPHMAX
                CMP          TPX                       ;TPX <= VPHMAX
                BCS          $200
                STA          TPX
$200            LDA          #23.
                CMP          VPB                       ;VPB <= Screen height
                BCS          $210
                STA          VPB
$210            LDA          VPB
                CMP          VPT                       ;VPT <= VPB
                BCS          $220
                STA          VPT
$220            SEC
                LDA          VPB                       ;VPVMAX :=
                SBC          VPT                       ;  VPB - VPT
                STA          VPVMAX
                CMP          TPY                       ;TPY <= VPVMAX
                BCS          $300
                STA          TPY
$300            LDA          TCB
                AND          #0F                       ;TCB=TCB MOD 16
                STA          TCB
                LDA          TCF
                AND          #0F                       ;TCF=TCF MOD 16
                STA          TCF
                ASL          A
                ASL          A
                ASL          A                         ;SET TCOLOR :=
                ASL          A
                ORA          TCB                       ;TCF * 16 + TCB
                STA          TCOLOR
                PHP
                SEI
                LDA          SCRNMODE                  ;Check screen mode
                ASL          A
                BMI          $500                      ;  Graphics
                LDA          E_REG
                ORA          #BITON5
                BCS          $400
                AND          #BITOFF5
$400            STA          E_REG
                LDA          HMODE
                AND          #03
                BCC          $410
                ORA          #BITON7
$410            STA          SCRNMODE                  ;Set screen mode
                LSR          A
                AND          #01
                TAY
                LDA          #00
                ROL          A
                TAX
                LDA          VMODE0,X                  ;B&W / Color
                LDA          VMODE1,Y                  ;40 / 80 Column
                BIT          VMODE2                    ;Page 1 always
                BIT          VMODE3                    ;Text of course
$500            PLP
                JSR          TBASCAL                   ;New base addr.
                RTS
                .PAGE
;----------------------------------------------------------------------
;
;  Subroutine CURSOR
;
;  This subroutine displays or removes the cursor by inverting the
;  character at the current cursor position.
;
;    Parameters:  none
;
;    Exit:
;       A, X, Y:  Undefined
;
;----------------------------------------------------------------------
;
CURSOR          .EQU         *
                BIT          SMCURSOR                  ;is cursor enabled?
                BPL          $020                      ;if not, exit
                LDA          TPX
                BIT          HMODE
                BPL          $010                      ;40 col: X=TPX
                LSR          A                         ;80 col: X=TPX/2
                BCC          $010
                TAY
                LDA          (BASE2),Y                 ;get character
                EOR          #80                       ;and invert it
                STA          (BASE2),Y                 ;put it back
                RTS
$010            TAY
                LDA          (BASE1),Y                 ;get character
                EOR          #80                       ;and invert it
                STA          (BASE1),Y                 ;put it back
$020            RTS
                .PAGE
;----------------------------------------------------------------------
;
;  Single Character Screen Read   (Console character copy)
;
;  This subroutine returns the character at the current cursor position.
;
;    Parameters:  none
;
;    Exit:
;       A:  character
;       X, Y:  Undefined
;
;
;----------------------------------------------------------------------
;
SCRNPICK        .EQU         *
                LDA          TPX
                TAY
                BIT          HMODE
                BPL          $010                      ;40 Col -- Y := TPX
                LSR          A                         ;80 Col -- Y := TPX/2
                TAY
                BCC          $010
                LDA          (BASE2),Y                 ;Read odd text page
                BCS          $020
$010            LDA          (BASE1),Y                 ;Read even text page
$020            RTS
                .PAGE
;----------------------------------------------------------------------
;
;  Subroutine TBASCAL -- Text Base Address Calculator
;
;  This subroutine sets the base address registers, BASE1 and BASE2,
;  to point to the current line in screen memory.  BASE1 always points
;  to column 0 of the current viewport while BASE2 points to column 1.
;
;  Entry TBASCAL:
;    Parameters:  none
```

```
;
;  Entry TBASCAL1:
;    Parameters:
;       X:  Absolute screen line number
;
;  Exit (either entry point):
;       A:  Undefined
;       X:  Absolute screen line number
;       Y:  Unchanged
;
;----------------------------------------------------------------------
;
TBASCAL         .EQU         *
                CLC
                LDA          TPY                       ;vertical position
                ADC          VPT                       ; + viewport top
                TAX
TBASCAL1        .EQU         *
                CLC
                LDA          VPL                       ;viewport left:
                BIT          HMODE
                BPL          $010                      ;if 80 column mode,
                LSR          A                         ;then divide by two
$010            PHP
                ADC          BASL,X                    ;base address (LO)
                STA          BASE1                     ;same for both pages
                STA          BASE2
                LDA          BASH,X                    ;base address (HI)
                PLP
                BCC          $020
                DEC          BASE1                     ;Odd window adjustment
                EOR          #0C
$020            STA          BASE1+1                   ;even page address
                EOR          #0C
                STA          BASE2+1                   ;odd page address
                RTS
                .PAGE
;----------------------------------------------------------------------
;
;  Subroutine CLREOL -- Clear to End of Line
;
;  This subroutine clears the current line from the current cursor
;  position to the end of the line.  The starting position may be
;  passed in Y using the CLREOL1 entry point.  The text base address
;  pointers, BASE1 and BASE2, must point to the current line.
;
;  Entry CLREOL:
;    Parameters:  none
;
;  Entry CLREOL1:
;    Parameters:
;       Y:  Starting horizontal position
;
;  Zero Page Temporary Storage:
;       BLANK, TEMPX
;
;  Exit (either entry point):
;       A, Y:  Undefined
;       X:  Preserved
;
;----------------------------------------------------------------------
;
CLREOL          .EQU         *
                LDY          TPX                       ;horizontal position
CLREOL1         .EQU         *
                LDA          #80+ASC_SP                ;Set up a blank
                EOR          SMINV
                STA          BLANK
                BIT          HMODE
                BPL          $200
                TYA
                BNE          $150
;
;  80 column clear full line
;
                LDA          VPHMAX                    ;Start at right edge
                LSR          A
                TAY
                LDA          BLANK                     ;Load the blank
                BCC          $110
$100            STA          (BASE2),Y                 ;Clear odd column
$110            STA          (BASE1),Y                 ;  then even column
                DEY
                BPL          $100                      ;Repeat to BOL
                RTS
;
;  80 column clear to end of line
;
$150            STX          TEMPX                     ;Save X
                CLC
                SBC          VPHMAX                    ;Calculate negative number
                TAX                                    ;  of bytes to blank
                TYA
                LSR          A
                TAY
                LDA          BLANK                     ;Load the blank
                BCS          $170
$160            STA          (BASE1),Y
                INX
                BPL          $180
$170            STA          (BASE2),Y
                INY
                INX
                BMI          $160
$180            LDX          TEMPX                     ;Restore X
                RTS
;
;  40 column clear to end of line
;
$200            LDA          BLANK
                STA          (BASE1),Y
                LDA          TCOLOR
                STA          (BASE2),Y
                CPY          VPHMAX
                INY
                BCC          $200
                RTS

```

```
; ####################################################################################################
; #   END OF FILE:  CONS.UTL1.TEXT
; #   LINES      :  299
; #   CHARACTERS :  13475
; #   Formatter  :  Assembly Language Reformatter 1.0.2 (07 January 1998)
; #   Author     :  David T. Craig -- 71533.606@compuserve.com -- Santa Fe, New Mexico USA
; ####################################################################################################
; ##################################################################################################
; #   PROJECT  :  Apple /// SOS Console Driver 1.31 (6502 Assembly Source Code)
; #   FILE NAME:  CONS.UTL2.TEXT
; ##################################################################################################
```

```
                .PAGE
;---------------------------------------------------------------------
;
;  Subroutine CLREOS -- Clear to End of Screen
;
;  This subroutine clears the screen from the current cursor position
;  to the end of the viewport.  The CLREOS1 entry allows the line number
;  to be passed in X and the starting column number in Y.
;
;  Entry CLREOS:
;    Parameters:  none
;
;  Entry CLREOS1:
;    Parameters:
;       X:  Starting absolute line number
;       Y:  Starting column number
;
;  Exit:
;       A, X, Y:  Undefined
;
;---------------------------------------------------------------------
;
CLREOS          .EQU         *
                CLC
                LDA          TPY
                ADC          VPT
                TAX                                    ;Get starting line number
                LDY          TPX                       ;Get starting cursor position
CLREOS1         .EQU         *
$010            JSR          TBASCAL1
                JSR          CLREOL1                   ;Clear this line
                LDY          #0                        ;Reset starting column
                CPX          VPB
                INX
                BCC          $010
                JMP          TBASCAL                   ;Reset base address
                .PAGE
;----------------------------------------------------------------------
;
;  Scroll Text Viewport
;
;  This subroutine scrolls the text within the viewport up or down by
;  one line.  On entry, A must contain an UP/DOWN flag ( $00 => UP,
;  $80 => DOWN ).
;
;  Parameters:
;       A:  Up / Down flag
;
;  Zero Page Temporary Storage:
;       WORK1, WOR2:  Screen pointers
;       FLAGS:  Bit 7 -- even / odd flag for scroll loop
;               Bit 6 -- up / down flag
;       TEMP1:  Starting Y index for scroll loop
;
;  Subroutines called:
;       TBASCAL1, CLREOL1
;
;  Exit:
;       A, X, Y:  Undefined
;
;----------------------------------------------------------------------
;
SCROLL          .EQU         *
                STA          FLAGS                     ;Save UP/DOWN flag
                SEC
                LDA          VPHMAX
                BIT          HMODE
                BPL          $010
                LSR          A
$010            STA          TEMP1                     ;Get starting loop index
                ROR          FLAGS                     ;Save even/odd flag
                LDX          VPT
                BIT          FLAGS
                BVC          $020
                LDX          VPB
$020            JSR          TBASCAL1                  ;Get starting base addresses
;
$030            BIT          FLAGS
                BVC          $040
                CPX          VPT                       ;Scroll down
                BEQ          $080                      ;  All done
                DEX                                    ;  Go up one line
                BPL          $050
$040            CPX          VPB                       ;Scroll up
                BEQ          $080                      ;  All done
                INX                                    ;  Go down one line
;
$050            LDA          BASE1
```

```
                LDY          BASE1+1                   ;Copy source address
                STA          WORK1                     ;  to destination address
                STY          WORK1+1
                LDA          BASE2
                LDY          BASE2+1
                STA          WORK2
                STY          WORK2+1
                JSR          TBASCAL1                  ;Get next source address
                LDY          TEMP1
                BIT          FLAGS
                BPL          $070
$060            LDA          (BASE2),Y                 ;Scroll this line
                STA          (WORK2),Y                 ;  move odd column
$070            LDA          (BASE1),Y                 ;  move even column
                STA          (WORK1),Y
                DEY
                BPL          $060
                BMI          $030
;
$080            LDY          #0
                JSR          CLREOL1                   ;Clear last line
                JMP          TBASCAL
                .PAGE
;-----------------------------------------------------------------------
;
;   Horizontal Shift
;
;  This subroutine shifts the text within the viewport left or right.
;  On entry, A must contain an eight bit signed shift offset, negative
;  for left shifts and positive for right shifts.
;
;  Parameters:
;       A:  Signed shift offset
;
;  Zero Page Temporary Storage:
;       BLANK, TEMPX
;       WORK1, WORK2:  Screen pointers
;       FLAGS:  Bit 7 -- right / left flag
;               Bit 6 -- odd / even flag for shift right
;       TEMP1:  Positive shift offset
;       TEMP2:  Absolute shift column
;       TEMP3:  shift right -- starting shift index
;               shift left -- shift count
;       TEMP4:  shift right -- starting clear index
;               shift left -- column for clear
;
;  Subroutines Called:
;       CLREOS1, CLREOL1
;
;  Exit:
;       A, X, Y:  Undefined
;
;-----------------------------------------------------------------------
;
SHIFT           .EQU         *
                TAY
                BEQ          $020                      ;Nothing to do
                AND          #BITON7
                STA          FLAGS                     ;Set right / left flag
                TYA
                CMP          #80
                BCC          $010
                EOR          #0FF                      ;Make shift count positive
$010            ADC          #00
                STA          TEMP1                     ;Absolute shift offset
                ADC          VPL                       ;Absolute column number
                STA          TEMP2                     ;  for base address
                LDX          VPT
                SEC
                LDA          VPHMAX
                SBC          TEMP1
                BCS          $030
                LDY          #00                       ;Shift entire viewport
                JSR          CLREOS1
$020            RTS
$030            BIT          FLAGS
                BMI          $060
;
                SEC                                    ;Set up for shift right
                BIT          HMODE
                BPL          $040
                LSR          A
$040            STA          TEMP3                     ;Set starting index for shifting
                LDA          #BITON6
                BCS          $050
                LDA          #00
$050            ORA          FLAGS                     ;Set odd / even flag
                STA          FLAGS
                LDY          TEMP1
                DEY
                STY          TEMP4                     ;Set index for clearing
                LDA          #80+ASC_SP
                EOR          SMINV
                STA          BLANK                     ;Set up space character
                JMP          SHIFT1
;
$060            TAY                                    ;Set up for shift left
                BIT          HMODE
                BMI          $070
                SEC
                ROL          A
$070            STA          TEMP3                     ;Set count for shifting
                INY
                STY          TEMP4                     ;Set index for clearing
;
SHIFT1          JSR          TBASCAL1                  ;Get base address
                CLC
                LDA          TEMP2
                BIT          HMODE
                BPL          $010
                LSR          A
$010            PHP
                ADC          BASL,X
                STA          WORK1                     ;Get shifted base address
                STA          WORK2
                LDA          BASH,X
                PLP
                BCC          $020
                DEC          WORK1
                EOR          #0C
$020            STA          WORK1+1
                EOR          #0C
                STA          WORK2+1
                BIT          FLAGS
                BMI          SHFTLF
;
SHFTRT          LDY          TEMP3                     ;Shift this line right
                BVC          $020
$010            LDA          (BASE2),Y
                STA          (WORK2),Y
$020            LDA          (BASE1),Y
                STA          (WORK1),Y
                DEY
                BPL          $010
                LDA          TEMP4                     ;Clear beginning of line
                BIT          HMODE
                BPL          $050
                LSR          A
                TAY
                LDA          BLANK
                BCC          $040
$030            STA          (BASE2),Y
$040            STA          (BASE1),Y
                DEY
                BPL          $030
                BMI          SHIFT2
$050            TAY
$060            LDA          BLANK
                STA          (BASE1),Y
                LDA          TCOLOR
                STA          (BASE2),Y
                DEY
                BPL          $060
;
SHIFT2          CPX          VPB
                INX                                    ;Go to next line
                BCC          SHIFT1
                JMP          TBASCAL
;
SHFTLF          LDY          #00                       ;Shift this line left
                STX          TEMPX
                LDX          TEMP3                     ;Get shift count
$010            LDA          (WORK1),Y
                STA          (BASE1),Y
                DEX
                BMI          $020
                LDA          (WORK2),Y
                STA          (BASE2),Y
                INY
                DEX
                BPL          $010
$020            LDX          TEMPX
                LDY          TEMP4
                JSR          CLREOL1
                JMP          SHIFT2
                .PAGE
;-----------------------------------------------------------------------
;
;  Dump and Restore Contents of Viewport
;
;  This subroutine will dump or restore the contents of the viewport to
;  or from the caller's buffer.  On entry,  A must contain a dump/restore
;  flag.  ($00 => Dump  $80 => Restore)
;
;  Parameters:
;       A:  Dump / Restore flag
```

```
;
;  Zero Page Temporary Storage:
;       WORK1, WORK2:  Extended pointers to caller's buffer
;       FLAGS:  Bit 7 -- odd / even move count flag
;               Bit 6 -- dump / restore flag
;       TEMP1:  Starting move index
;       TEMP2:  Move count
;
;  Exit:
;       A, X, Y:  Undefined
;
;---------------------------------------------------------------------
;
SCRNDUMP        .EQU         *
                STA          FLAGS
                JSR          CURSOR                     ;Turn cursor off
                LDA          VPHMAX
                STA          TEMP2
                INC          TEMP2
                BIT          HMODE
                BMI          $010
                ASL          TEMP2
                ASL          A
$010            LSR          A
                STA          TEMP1
                ROR          FLAGS
                CLC
                LDA          SCLIST
                ADC          #03                        ;Set work pointers to
                STA          WORK1                      ;  to caller's buffer
                LDA          SCLIST+1
                ADC          #00
                CMP          #0F0
                LDX          1401+SCLIST
                BCC          $020
                SBC          #80                        ;Adjust extended address
                INX
$020            STA          WORK1+1
                STX          1401+WORK1
                LDA          TEMP2
                LSR          A
                ADC          WORK1
                STA          WORK2
                LDA          WORK1+1
                ADC          #00
                STA          WORK2+1
                STX          1401+WORK2
;
;  Copy the contents of the window
;
                LDX          VPT
$100            JSR          TBASCAL1
                LDY          TEMP1
                BIT          FLAGS
                BVS          $120
;
                BPL          $115
$110            LDA          (BASE2),Y
                STA          (WORK2),Y
$115            LDA          (BASE1),Y
                STA          (WORK1),Y
                DEY
                BPL          $110
                BMI          $140
;
$120            BPL          $135
$130            LDA          (WORK2),Y
                STA          (BASE2),Y
$135            LDA          (WORK1),Y
                STA          (BASE1),Y
                DEY
                BPL          $130
;
$140            CLC
                LDA          WORK1
                ADC          TEMP2
                STA          WORK1
                BCC          $150
                INC          WORK1+1
$150            CLC
                LDA          WORK2
                ADC          TEMP2
                STA          WORK2
                BCC          $160
                INC          WORK2+1
$160            CPX          VPB
                INX
                BCC          $100
;
                JSR          TBASCAL
                JSR          CURSOR                     ;Restore cursor
                RTS
                .PAGE
```

```
;----------------------------------------------------------------------
;
;  ZPOUT
;
;  This subroutine saves the driver's zero page data.
;
;----------------------------------------------------------------------
;
ZPOUT           LDX          #ZPLENGTH-1               ;Zero Page save area length
$010            LDA          ZPDATA,X
                STA          ZPSAVE,X
                DEX
                BPL          $010
                RTS

```

```
; ####################################################################################################
; #   END OF FILE:  CONS.UTL2.TEXT
; #   LINES      :  382
; #   CHARACTERS :  16487
; #   Formatter  :  Assembly Language Reformatter 1.0.2 (07 January 1998)
; #   Author     :  David T. Craig -- 71533.606@compuserve.com -- Santa Fe, New Mexico USA
; ####################################################################################################

###
```