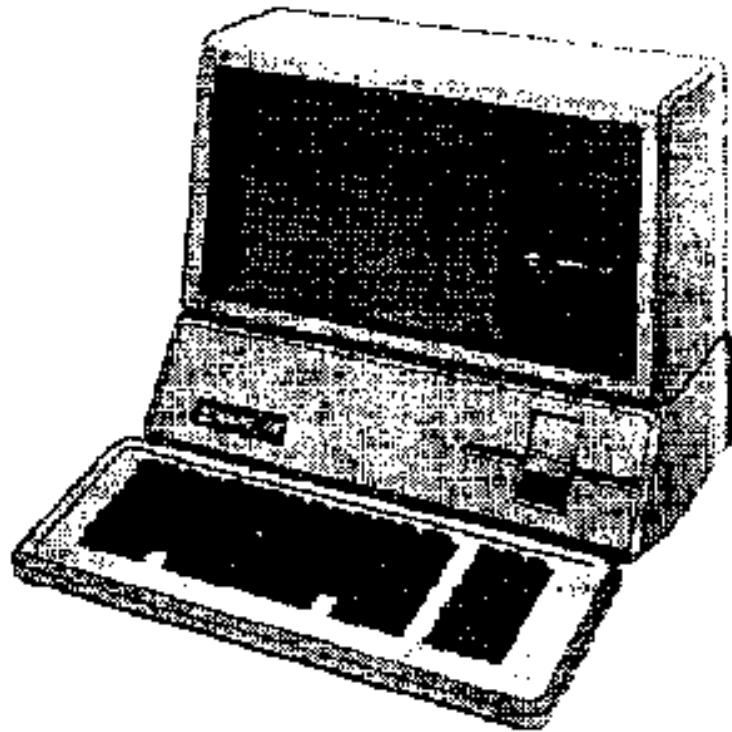




Apple /// Computer Technical  
Information

Apple ///  
Serial Printer Port  
Driver 1.30  
Source Code Listing



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# FORMATTED LISTING

```

; #####
; # PROJECT : Apple /// SOS Serial Printer Driver 1.30 (6502 Assembly Source Code)
; # FILE NAME: SERPRINT.text
; #####

000001 .TITLE "SOS Serial Printer Driver"
000002 .NOPATCHLIST
000003 .NOMACROLIST
000004
000005 ; -----
000006 ;
000007 ; SOS Serial Printer Driver
000008 ;
000009 ; Copyright (C) 1983 by Apple Computer Inc.
000010 ; All Rights Reserved
000011 ;
000012 ;
000013 ; Revisions:
000014 ;
000015 ; 1.00 14-Nov-80
000016 ;
000017 ; 1.10 14-Apr-81
000018 ; Bug fixes:
000019 ; Switch to 1 MHz for all ACIA references.
000020 ; Check buffer count and delay count for write completion.
000021 ;
000022 ; 1.30 05-Jan-83
000023 ; Bug fixes:
000024 ; Add XMIT flag for improved communications between Driver
000025 ; and Interrupt Handler.
000026 ;
000027 ; -----
000028
000029 DEVTYPE .EQU 41
000030 SUBTYPE .EQU 01
000031 APPLE .EQU 0001
000032 RELEASE .EQU 1300
000033 .PAGE
000034 ; -----
000035 ;
000036 ; The macro SWITCH performs an N way branch based on a switch index. The
000037 ; maximum value of the switch index is 127 with bounds checking provided
000038 ; as an option. The macro uses the A and Y registers and alters the C,
000039 ; Z, and N flags of the status register, but the X register is unchanged.
000040 ;
000041 ; SWITCH [index], [bounds], adrs_table, [*]
000042 ;
000043 ; index This is the variable that is to be used as the switch index.
000044 ; If omitted, the value in the accumulator is used.
000045 ;
000046 ; bounds This is the maximum allowable value for index. If index
000047 ; exceeds this value, the carry bit will be set and execution
000048 ; will continue following the macro. If bounds is omitted,
000049 ; no bounds checking will be performed.
000050 ;
000051 ; adrs_table This is a table of addresses (low byte first) used by the
000052 ; switch. The first entry corresponds to index zero.
000053 ;
000054 ; * If an asterisk is supplied as the fourth parameter, the
000055 ; macro will push the switch address but will not exit to
000056 ; it; execution will continue following the macro. The
000057 ; program may then load registers or set the status before
000058 ; exiting to the switch address.
000059 ;
000060 ; -----
000061 ;
000062 .MACRO SWITCH
000063 .IF "%1" <> "" ;If PARM1 is present,
000064 LDA %1 ; Load A with switch index
000065 .ENDC
000066 .IF "%2" <> "" ;If PARM2 is present,
000067 CMP #%2+1 ; Perform bounds checking
000068 BCS $3579 ; on switch index
000069 .ENDC
000070 ASL A
000071 TAY
000072 LDA %3+1,Y ;Get switch address from table
000073 PHA ; and push onto stack
000074 LDA %3,Y
000075 PHA
000076 .IF "%4" <> "" ;If PARM4 is omitted,
000077 RTS ; Exit to code
000078 .ENDC ;Otherwise, drop through
000079 $3579 .ENDM
000080 .PROC SERPRNT
000081 .WORD 0FFFF
000082 .WORD 66.
000083 .ASCII "Serial Printer Driver -- "
000084 .ASCII "Copyright (C) 1983 by Apple Computer Inc."

```



```
000085
000086 ;-----
000087 ;
000088 ; Device Handler Identification Block
000089 ;
000090 ;-----
000091
000092 IDBLK          .WORD      0000          ;Link to next device handler
000093             .WORD      SP_MAIN        ;Entry point address
000094             .BYTE      8              ;Length of device name
000095             .ASCII     ".PRINTER      "
000096             .BYTE      80,00,00       ;Device, Slot & Unit numbers
000097             .BYTE      DEVTYPE
000098             .BYTE      SUBTYPE
000099             .BYTE      00
000100             .WORD      0000
000101             .WORD      APPLE
000102             .WORD      RELEASE
000103
000104 ;-----
000105 ;
000106 ;
000107 ; Device Handler Configuration Block
000108 ;
000109 ;-----
000110
000111             .WORD      05              ;Configuration block length
000112 DRATE          .BYTE      08          ;Data Rate
000113 DFORMAT        .BYTE      22          ;Data Format
000114 CRDELAY        .BYTE      00          ;Carriage return delay
000115 LFDELAY        .BYTE      00          ;Line feed delay
000116 FFDELAY        .BYTE      00          ;Form feed delay
000117             .PAGE
000118 ;-----
000119 ;
000120 ; SOS Global Data & Subroutines
000121 ;
000122 ;-----
000123
000124 ALLOCSIR       .EQU      1913
000125 DEALCSIR       .EQU      1916
000126 SYSERR         .EQU      1928
000127
000128 ;-----
000129 ;
000130 ;
000131 ; SOS Error Codes
000132 ;
000133 ;-----
000134
000135 XREQCODE       .EQU      20          ;Invalid request code
000136 XCTLCODE       .EQU      21          ;Invalid control/status code
000137 XNOTOPEN       .EQU      23          ;Device not open
000138 XNOTAVIL       .EQU      24          ;Device not available
000139 XNORESRC       .EQU      25          ;Resource not available
000140 XBADOP         .EQU      26          ;Invalid operation for device
000141
000142 ;-----
000143 ;
000144 ;
000145 ; Hardware I/O Addresses
000146 ;
000147 ;-----
000148
000149 ACIADATA        .EQU      0C0F0       ;ACIA data register
000150 ACIASTAT        .EQU      0C0F1       ;ACIA status register
000151 ACIACMD         .EQU      0C0F2       ;ACIA command register
000152 ACIACTL         .EQU      0C0F3       ;ACIA control register
000153 E_REG           .EQU      0FFDF       ;Environment register
000154 B_REG           .EQU      0FFEF       ;Bank register
000155
000156 ;-----
000157 ;
000158 ;
000159 ; Miscellaneous Equates
000160 ;
000161 ;-----
000162
000163 TRUE           .EQU      80
000164 FALSE          .EQU      00
000165 ASC_LF         .EQU      0A
000166 ASC_FF         .EQU      0C
000167 ASC_CR         .EQU      0D
000168 BITON4         .EQU      10
000169 BITON7         .EQU      80
000170             .PAGE
000171 ;-----
000172 ;
000173 ; SOS Device Handler Interface
000174 ;
000175 ;-----
000176
000177 SOSINT         .EQU      0C0
```



```
000178 REQCODE      .EQU          SOSINT+0          ;SOS request code
000179 BUFFER      .EQU          SOSINT+2          ;Buffer pointer
000180 REQCNT      .EQU          SOSINT+4          ;Requested count
000181 CTLSTAT     .EQU          SOSINT+2          ;Control/status code
000182 CSLIST      .EQU          SOSINT+3          ;Control/status list pointer
000183
000184
000185 ;-----
000186 ;
000187 ; Zero Page Storage
000188 ;
000189 ;-----
000190
000191 ZPGSAVE      .EQU          SOSINT+0A          ;Saved zero page storage
000192
000193 ZPGTEMP      .EQU          ZPGSAVE+00          ;Temporary zero page storage
000194 MOVCNT      .EQU          ZPGTEMP+00
000195
000196
000197 ;-----
000198 ;
000199 ; Private Variable Storage
000200 ;
000201 ;-----
000202
000203 SIRADDR      .WORD          SIRTABLE
000204 SIRTABLE     .BYTE          1,0                ;ACIA resource
000205 ACIAMIH     .WORD          0
000206 MIHBANK     .BYTE          0
000207 SIRCOUNT   .EQU          *-SIRTABLE
000208 OPENFLG     .BYTE          FALSE              ;Device open flag
000209 XMIT        .BYTE          FALSE              ;XMIT in progress flag
000210 DLYCNT      .BYTE          0                  ;Delay count for MIH
000211 BUFcnt     .BYTE          0                  ;Local buffer byte count
000212 BUFHEAD     .BYTE          0                  ;Local buffer head index
000213 BUFTAIL     .BYTE          0                  ;Local buffer tail index
000214 BUFSIZE     .EQU          110                ;Local buffer size
000215 LOCBUF      .EQU          *                    ;Local buffer
000216 CPYRGHTSIZ .ASCII          "Copyright (C) 1983 by Apple Computer Inc."
000217 CPYRGHTSIZ .EQU          *-LOCBUF
000218 CPYRGHTSIZ .BLOCK          BUFSIZE-CPYRGHTSIZ,0
000219 CPYRGHTSIZ .PAGE
000220 ;-----
000221 ;
000222 ; Serial Printer Driver -- Main entry point
000223 ;
000224 ;-----
000225
000226 SP_MAIN      .EQU          *
000227 SP_MAIN      SWITCH        REQCODE,8,SP_REQSW
000228
000229
000230 BADREQ      LDA            #XREQCODE          ;Invalid request code
000231 BADREQ      JSR            SYSERR
000232
000233
000234 NOTOPEN     LDA            #XNOTOPEN          ;Device not open
000235 NOTOPEN     JSR            SYSERR
000236
000237
000238 SP_REQSW    .EQU          *                    ;Serial Printer request switch
000239 SP_REQSW    .WORD          SP_READ-1
000240 SP_REQSW    .WORD          SP_WRITE-1
000241 SP_REQSW    .WORD          SP_STAT-1
000242 SP_REQSW    .WORD          SP_CNTL-1
000243 SP_REQSW    .WORD          BADREQ-1
000244 SP_REQSW    .WORD          BADREQ-1
000245 SP_REQSW    .WORD          SP_OPEN-1
000246 SP_REQSW    .WORD          SP_CLOSE-1
000247 SP_REQSW    .WORD          SP_INIT-1
000248 SP_REQSW    .PAGE
000249 ;-----
000250 ;
000251 ; Serial Printer Driver -- Initialization Request
000252 ;
000253 ;-----
000254
000255 SP_INIT     .EQU          *
000256 SP_INIT     LDA            #FALSE
000257 SP_INIT     STA            OPENFLG
000258 SP_INIT     LDA            DRATE
000259 SP_INIT     AND            #00F
000260 SP_INIT     STA            DRATE              ;Validate data rate
000261 SP_INIT     TAX
000262 SP_INIT     LDA            DFORMAT
000263 SP_INIT     AND            #0EE
000264 SP_INIT     ORA            #010
000265 SP_INIT     CPX            #03
000266 SP_INIT     BNE            $010              ;If data rate is 110 baud
000267 SP_INIT     ORA            #080              ; force two stop bits
000268 SP_INIT     $010      STA            DFORMAT
000269 SP_INIT     CLC
000270 SP_INIT     RTS
```



```
000271          .PAGE
000272 ;-----
000273 ;
000274 ; Serial Printer Driver -- Open Request
000275 ;
000276 ;-----
000277
000278 SP_OPEN      .EQU      *
000279             BIT      OPENFLG      ;Serial Printer open?
000280             BPL      $010         ; No
000281             LDA      #XNOTAVIL
000282             JSR      SYSERR
000283
000284 $010        LDA      E_REG
000285             AND      #0F
000286             STA      MIHBANK      ;Set interrupt handler bank
000287             LDA      #SIRCOUNT
000288             LDX      SIRADDR
000289             LDY      SIRADDR+1
000290             JSR      ALLOCSIR      ;Allocate the ACIA
000291             BCS      $020
000292
000293             LDA      #FALSE
000294             STA      XMIT
000295             JSR      CNTL00        ;Set up ACIA
000296             LDA      #TRUE
000297             STA      OPENFLG      ;Set serial printer open
000298             RTS
000299
000300 $020        LDA      #XNORESRC
000301             JSR      SYSERR
000302             .PAGE
000303 ;-----
000304 ;
000305 ; Serial Printer Driver -- Close Request
000306 ;
000307 ;-----
000308
000309 SP_CLOSE     .EQU      *
000310             ASL      OPENFLG      ;Serial Printer open?
000311             BCS      $010         ; Yes
000312             JMP      NOTOPEN
000313
000314 $010        BIT      XMIT          ;Wait for write completion
000315             BMI      $010
000316             PHP
000317             SEI
000318             LDA      E_REG
000319             TAX
000320             ORA      #BITON7
000321             STA      E_REG        ;Switch to 1 MHz
000322             STA      ACIASTAT     ;Reset the ACIA
000323             STX      E_REG
000324             PLP
000325             LDA      #SIRCOUNT
000326             LDX      SIRADDR
000327             LDY      SIRADDR+1
000328             JSR      DEALCSIR     ;Deallocate the ACIA
000329             RTS
000330             .PAGE
000331 ;-----
000332 ;
000333 ; Serial Printer Driver -- Read Request
000334 ;
000335 ;-----
000336
000337 SP_READ      .EQU      *
000338             BIT      OPENFLG      ;Serial Printer open?
000339             BMI      $010
000340             JMP      NOTOPEN
000341             LDA      #XBADOP
000342             JSR      SYSERR
000343             .PAGE
000344 ;-----
000345 ;
000346 ; Serial Printer Driver -- Write Request
000347 ;
000348 ;-----
000349
000350 SP_WRITE     .EQU      *
000351             BIT      OPENFLG      ;Serial Printer open?
000352             BMI      $010
000353             JMP      NOTOPEN
000354             LDA      #BUFSIZE/2   ;Set MOVCNT to the lesser
000355             LDY      REQCNT+1     ; of BUFSIZE/2 and REQCNT.
000356             BNE      $020
000357             CMP      REQCNT
000358             BCC      $020
000359             LDA      REQCNT
000360             BNE      $020
000361             RTS                  ;Count = zero -- all done!
000362             $020        STA      MOVCNT
000363
```



```
000364 LDA BUFFER+1 ;Check for buffer
000365 CMP #0FF ; address overflow
000366 BCC $030
000367 SBC #080
000368 STA BUFFER+1
000369 INC 1401+BUFFER
000370
000371 $030 SEC
000372 LDA #BUFSIZE
000373 SBC MOVCNT
000374 $040 CMP BUF CNT ;Wait for room in buffer
000375 BCC $040
000376
000377 LDY #0
000378 LDX BUFTAIL
000379 $050 LDA (BUFFER),Y ;Move data to local buffer
000380 STA LOCBUF,X
000381 INX
000382 CPX #BUFSIZE
000383 BCC $060
000384 LDX #0
000385 $060 INY
000386 CPY MOVCNT
000387 BCC $050
000388 STX BUFTAIL
000389
000390 PHP
000391 SEI ;Shut down interrupts
000392 CLC
000393 LDA BUF CNT
000394 ADC MOVCNT ;Bump buffer count
000395 STA BUF CNT
000396
000397 BIT XMIT ;Already transmitting?
000398 BVS $070 ; Yes
000399 LDA #0C0
000400 STA XMIT ;Set transmitting flag
000401 LDA E_REG
000402 PHA
000403 ORA #BITON7 ;Switch to 1 MHz
000404 STA E_REG
000405 LDY ACIASTAT ;Fake an interrupt to start
000406 JSR ACIAMIH ; the interrupt handler.
000407 PLA
000408 STA E_REG ;Switch back to 2 MHz
000409 $070 PLP
000410
000411 CLC
000412 LDA BUFFER
000413 ADC MOVCNT ;Fix up buffer pointer
000414 STA BUFFER
000415 BCC $080
000416 INC BUFFER+1
000417
000418 $080 SEC
000419 LDA REQCNT
000420 SBC MOVCNT ;Fix up requested count
000421 STA REQCNT
000422 BCS $010
000423 DEC REQCNT+1
000424 JMP $010 ;Loop back for more
000425 .PAGE
000426 ;-----
000427 ;
000428 ; ACIA Master Interrupt Handler
000429 ;
000430 ;-----
000431
000432 ACIAMIH .EQU *
000433 LDA E_REG
000434 ORA #BITON7 ;Set 1 MHz mode
000435 STA E_REG
000436
000437 TYA ;Check DSR and DCD status
000438 AND #60 ; bits for printer hand shake
000439 BNE $080
000440
000441 TYA ;Check transmit register
000442 AND #BITON4 ; empty status bit
000443 BEQ $060
000444
000445 LDA DLYCNT ;Any transmit delay in progress?
000446 BEQ $010 ; no
000447 DEC DLYCNT
000448 JMP $060
000449
000450 $010 LDA BUF CNT ;Any data to transmit?
000451 BEQ $070 ; no -- wait for completion
000452 LDX BUFHEAD
000453 LDA LOCBUF,X
000454 STA ACIADATA ;Transmit one character
000455 INX
000456 CPX #BUFSIZE
```



```
000457          BCC          $020
000458          LDX          #0
000459 $020      STX          BUFHEAD          ;Update buffer index
000460          DEC          BUFcnt          ; and count
000461
000462          CMP          #ASC_CR          ;Check for any delay
000463          BEQ          $040
000464          BCS          $060
000465          CMP          #ASC_LF
000466          BNE          $030
000467          LDA          LFDELAY
000468          BCS          $050
000469 $030      CMP          #ASC_FF
000470          BNE          $060
000471          LDA          FFDELAY
000472          BCS          $050
000473 $040      LDA          CRDELAY
000474 $050      STA          DLYCNT
000475          .PAGE
000476 $060      LDA          ACIACMD
000477          AND          #0E0          ;Enable transmit interrupt
000478          ORA          #007
000479          STA          ACIACMD
000480          RTS
000481
000482 $070      ASL          XMIT
000483          BMI          $060          ;Still not done
000484
000485 $080      LDA          ACIACMD
000486          AND          #0E0          ;Disable transmit interrupt
000487          ORA          #00B
000488          STA          ACIACMD
000489          RTS
000490          .PAGE
000491 ;-----
000492 ;
000493 ; Serial Printer Driver -- Status Request
000494 ;
000495 ;-----
000496
000497 SP_STAT      .EQU          *
000498          BIT          OPENFLG          ;Serial Printer open?
000499          BMI          $010
000500          JMP          NOTOPEN
000501 $010      SWITCH      CTLSTAT,2,STATSW
000502
000503
000504 BADCTL      LDA          #XCTLCODE          ;Invalid control code
000505          JSR          SYSERR
000506
000507
000508 STATSW      .WORD          STAT00-1
000509          .WORD          STAT01-1
000510          .WORD          STAT02-1
000511
000512
000513 STAT00      RTS          ;0 -- NOP
000514
000515
000516 STAT01      LDY          #0          ;1 -- Status Table
000517          LDA          #0
000518          STA          (CSLIST),Y
000519          RTS
000520
000521
000522 STAT02      LDY          #0          ;2 -- New Line
000523          LDA          #FALSE
000524          STA          (CSLIST),Y
000525          RTS
000526          .PAGE
000527 ;-----
000528 ;
000529 ; Serial Printer Driver -- Control Request
000530 ;
000531 ;-----
000532
000533 SP_CNTL      .EQU          *
000534          BIT          OPENFLG          ;Serial Printer open?
000535          BMI          $010          ; Ok
000536          JMP          NOTOPEN
000537 $010      SWITCH      CTLSTAT,2,CNTLSW
000538          JMP          BADCTL
000539
000540 CNTLSW      .WORD          CNTL00-1
000541          .WORD          CNTL01-1
000542          .WORD          CNTL02-1
000543
000544 CNTL00      .EQU          *          ;0 -- Reset
000545 $010      BIT          XMIT          ;Wait for write completion
000546          BMI          $010
000547          LDA          #0
000548          STA          BUFHEAD
000549          STA          BUFTAIL
```



```
000550          PHP
000551          SEI
000552          LDA          E_REG
000553          TAX
000554          ORA          #BITON7
000555          STA          E_REG          ;Switch to 1 MHz
000556          STA          ACIASTAT      ;Reset ACIA
000557          LDA          DFORMAT
000558          AND          #0F0
000559          ORA          DRATE
000560          STA          ACIACTL      ;Set up ACIA control register
000561          LDA          DFORMAT
000562          ASL          A
000563          ASL          A
000564          ASL          A
000565          ASL          A
000566          ORA          #00B
000567          STA          ACIACMD      ;Set up ACIA command register
000568          STX          E_REG      ;Switch back to 2 MHz
000569          PLP
000570          RTS
000571
000572 CNTL01      .EQU          *          ;1 -- Serial Printer Status Table
000573          RTS
000574
000575 CNTL02      .EQU          *          ;2 -- New Line
000576          RTS
000577          .END
000578

; #####
; #   END OF FILE:  SERPRINT.text
; #   LINES       :  578
; #   CHARACTERS  : 26582
; #   Formatter   : Assembly Language Reformatter 1.0.2 (07 January 1998)
; #   Author      : David T. Craig -- 71533.60@compuserve.com -- Santa Fe, New Mexico USA
; #####

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