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                ttl     "tp I/065 Rom routines       %s                    Page %d"

        ;********** I/O Part variables **********

        ;       6502 I/O part DOS65 and bootstrap
        ;         Written by E.J.M. Visschedijk
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                pag     80

        ;Variables and definitions

0708    TOUTT   equ     1800            ;Time out for screen off in seconds

        ;Memory map definitions

E000    FDCPIA  equ     $E000           ;Pia address on fdc card
E004    FDCFDC  equ     $E004           ;FDC address on fdc card
E100    IOVIA1  equ     $E100           ;Via 1 address on cpu card
E110    IOVIA2  equ     $E110           ;Via 2 address on cpu card
E130    IOACIA  equ     $E130           ;Acia address on cpu card
E140    IOCRTC  equ     $E140           ;CRTC address on vdu card
E400    BTBLCKS equ     $E400           ;Temporary blocks for bootstrap
E700    IO_VARS equ     $E700           ;Variable area for I065
E800    VDORAM  equ     $E800           ;Start of 2Kbyte VDU-ram
F000    IO_BEG  equ     $F000           ;Begin of I065
FFF0    DTRAM   equ     $FFF0           ;DAT ram address for virtual disk

        ;Temporary variables on zeropage

0000    PTA     equ     $00
0002    PTB     equ     $02

        ;Bootstrap variables

00FB    SECC    equ     $FB             Current tsl
00FC    RPOIN   equ     $FC             Input data pointer
00FE    ERCNT   equ     $FE             Floppy errors read
00FF    ERC1    equ     $FF             Floppy dens/restore

        E700            org     IO_VARS         ;Start variable aria

E700            SAVSTACKP res   1               ;Software stackpointer
E701            STATTOG res     1               ;Kind of statusline
E702            CRPX    res     1               ;Print var. for cursor X position
E703            CRPY    res     1               ;Print var. for cursor Y position
E704            CURPX   res     1               ;Current cursor X position
E705            CURPY   res     1               ;Current cursor Y position
E706            CURP    res     1               ;Direct cursor addressing flag
E707            SCURPX  res     1               ;CURPX save address
E708            SCURPY  res     1               ;CURPY save address
E709            XTMP    res     1
E70A            XPSOLD  res     1
E70B            YPSOLD  res     1
E70C            OUTCHR  res     1
E70D            MAXSTL  res     1
E70E            HSFLG   res     1               ;^Q ^S flag
E70F            DEVCHOIC res    1               ;$00=select output, $01=select input
E710            DEVMODOUT res   1               ;Output device mode bits
E711            DEVMODINP res   1               ;Input device mode bits
E712            SDEVMODOUT res  1               ;DEVMODOUT saveaddress
E713            SDEVMODINP res  1               ;DEVMODINP saveaddress
E714            SDVOUT  res     1
E715            SDVINP  res     1
E716            OUTRET  res     1               ;Default output device bits
E717            INPRET  res     1               ;Default input device bits
E718            CLSEC   res     1               ;Variable for clock update
E719            FUNENA  res     1               ;Flag for next char. is function key
E71A            FNCEN   res     1               ;Disable function keys =(FF)
E71B            VIAVRA  res     1               ;Vialoop time out variable
E71C            GRFLG   res     1               ;Grafics flag
E71D            PNTXLSAVE res   1               ;Saveaddress for PNTXL
E71E            PNTXHSAVE res   1               ;Saveaddress for PNTXH
E71F            PNTX    res     1               ;Program in ram, self modifying
E720            PNTXL   res     1
E721            PNTXH   res     2               ;Also one byte for RTS
E723            DMPRAM  res     1               ;Program in ram, self modifying
E724            DUMPL   res     1
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E78B            DVI6VEC res     2               ;Input device 6 vector
E78D            DVO7VEC res     2               ;Output device 7 vector
E78F            DVI7VEC res     2               ;Input device 7 vector
E791            DVO8VEC res     2               ;Output device 8 vector
E793            DVI8VEC res     2               ;Input device 8 vector
                ;
                ;*** Software stack aria ***
                ;
E795            ASAVESTACK res  8               ;Accustack
E79D            XSAVESTACK res  8               ;Xreg stack
E7A5            YSAVESTACK res  8               ;Yreg stack
                ;
E7AD            START   res     2               ;Pointer to start of videoram
                ;
E7AF            UNRINT  res     2               ;Unrecognized interrupt vector
E7B1            NMIVECTOR res   2
E7B3            BRKVECTOR res   2
E7B5            IRQVECTOR res   2
                ;
                ;*** Buffer aria ***

E7B7            KEYPNT  res     1               ;Pointer from keyboardbuffer
E7B8            KEYBUF  res     40              ;Keyboardbuffer, 40 char.
          0028  MAXBUF  equ     40              ;Number of characters in buffer

                ;FDC COMMANDS

          0009  REST    equ     $09             ;12 MS
          0019  SEEKT   equ     $19             ;12ms for canon and others

          0080  RDSKT   equ     $80

          E400          org     BTBLCKS
                ;
E400            SYSB    res     256             ;Boot system blok
E500            TSLB    res     256             ;Boot tsl blok

                ;*** Addresses on floppydisk controller ***

                ;*** Pia addresses ***

          E000  PIA     equ     FDCPIA
          E000  PAD     equ     PIA             ;Data and datadirection A
          E001  PAC     equ     PIA+$01         ;Command register
          E002  PBD     equ     PIA+$02         ;Data and datadirection B
          E003  PBC     equ     PIA+$03         ;Command register

                ;*** Fdc addresses ***

          E004  FDC     equ     FDCFDC
          E004  CMR     equ     FDC             ;Command register
          E004  STR     equ     FDC             ;Status register
          E005  TKR     equ     FDC+$01         ;Track register
          E006  SCR     equ     FDC+$02         ;Sector register
          E007  DTR     equ     FDC+$03         ;Data register

                ;*** Via 1 addresses, A=keyboard, B=Centronics printer data ***

          E100  VIAA    equ     IOVIA1
          E100  VAPBD   equ     VIAA            ;Port B data
          E101  VAPAD   equ     VIAA+$01        ;Port A data
          E102  VAPBDD  equ     VIAA+$02        ;Port B data direction
          E103  VAPADD  equ     VIAA+$03        ;Port A data direction
          E104  VATACL  equ     VIAA+$04        ;T1, latch-low, counter low
          E105  VATACH  equ     VIAA+$05        ;T1, counter high
          E106  VATALL  equ     VIAA+$06        ;T1, latch low
          E107  VATALH  equ     VIAA+$07        ;T1, latch high
          E108  VATBCL  equ     VIAA+$08        ;T2, latch low, counter low
          E109  VATBCH  equ     VIAA+$09        ;T2, counter high
          E10A  VASR    equ     VIAA+$0A        ;Shift register
          E10B  VAACR   equ     VIAA+$0B        ;Auxiliary control register
          E10C  VAPCR   equ     VIAA+$0C        ;Peripheral control register
          E10D  VAIFR   equ     VIAA+$0D        ;Interrupt flag register
          E10E  VAIER   equ     VIAA+$0E        ;Interrupt enable register
          E10F  VAADN   equ     VIAA+$0F        ;Port A data, no handshake

                ;*** Via 2 addresses, A=Viacom, B3,4=Centronics printer ***
```

```
F00F 4C B8F3          JMP   ISLINE        Initialization of statusline right part
F012 4C EDF3          JMP   FILLNM        Put linenumber on statusline
F015 4C 24F4          JMP   FILFNM        Put filename on statusline
F018 4C 66F4          JMP   CSLPRT        Clear right part of statusline
F01B 4C 90F4          JMP   CWHSLN        Clear whole statusline
F01E 4C A1F4          JMP   MAKSLN        Make own statusline
F021 4C BBF4          JMP   NORSTAT       Reset normal statusline
F024 4C 67F9          JMP   POSIT         Position the cursor to X,Y
F027 4C 5FF9          JMP   UNPOS         Get old cursor position back
F02A 4C 16FB          JMP   SET65         Set CRTC to 6545, vertical blank active
F02D 6C B1E7  ENEMI   JMP   [NMIVECTOR]
F030 6C B5E7  IERQU   JMP   [IRQVECTOR]


              ;*** Main Reset routine ***

F033 D8       RESET   CLD                 First clear decimal
F034 78               SEI                 No interrupts

F035 A2 0F            LDX   #$0F          Initialize DATRAM
F037 8A       1       TXA
F038 49 0F            EOR   #$0F
F03A 9D F0FF          STA   DATRAM,X
F03D CA               DEX
F03E 10 F7            BPL   1.B

F040 A9 00            LDA   #$00          Reset all variables to $00
F042 A2 51            LDX   #NOVRS+1&255  X is the loopcounter
F044 9D FFE6  2       STA   IO_VARS-1,X   Reset variable
F047 CA               DEX
F048 D0 FA            BNE   2.B           Ready?

F04A CA               DEX
F04B 9A               TXS                 Initiate the stackpointer

F04C A0 00            LDY   #$00
F04E B9 62F1  3       LDA   VART1,Y       Get offset
F051 F0 0A            BEQ   4.F           Branch if end
F053 AA               TAX
F054 B9 ADF1          LDA   VART2,Y       Get data
F057 9D 00E7          STA   IO_VARS,X     Set variable to initial value
F05A C8               INY
F05B D0 F1            BNE   3.B

F05D 20 D3F0  4       JSR   KBINIT        Keyboard init.
F060 20 2CF1          JSR   VDUINIT       Crtc init.
F063 20 2CFB          JSR   FORMFEED      Clear the screen

              ;Timer initialisation, software clock

F066 AD 0BE1          LDA   VAACR         Get old value
F069 09 40            ORA   #%01000000    Free running mode for timer 1
F06B 8D 0BE1          STA   VAACR
F06E A9 C3            LDA   #$C3          Interrupt every 1/20 second
F070 A0 50            LDY   #$50
F072 8C 04E1          STY   VATACL
F075 8D 05E1          STA   VATACH
F078 A9 C0            LDA   #$C0          Interrupts from timer 1
F07A 8D 0EE1          STA   VAIER

F07D 58               CLI                 Interrupts allowed now

F07E A2 01            LDX   #$01          Only on screen
F080 20 9DF7          JSR   PRTEXT        Print message
F083 0D492F4F20       fcc   '\rI/O 65  2.01\n\r'
F088 3635202032
F08D 2E30310A0D
F092 1B69202048       fcc   $1B,'i  HaViSoft  ',$1B,'n\n\r',0
F097 615669536F
F09C 667420201B
F0A1 6E0A0D00
F0A5 20 99F6  1       JSR   INP
F0A8 29 5F            AND   #%01011111    Accept lower and upper case
F0AA C9 42            CMP   #'B
F0AC D0 F7            BNE   1.B
F0AE 20 BFFD          JSR   BCNTR         Execute bootstrap
F0B1 4C A5F0          JMP   1.B
```

```
                ;*** By X selectable device initialization ***

F0B4 8A         INITS   TXA
F0B5 F0 1B              BEQ     2.F             Not correct input
F0B7 30 0C              BMI     1.F             Branch for input devices
F0B9 C9 09              CMP     #9
F0BB B0 15              BCS     2.F             Not correct input
F0BD 20 91F6            JSR     XTODEV
F0C0 A2 0F              LDX     #$0F            Offset for table
F0C2 4C 3DF7    3       JMP     STATHAND        Execute initialization routine
F0C5 29 7F      1       AND     #$7F
F0C7 C9 09              CMP     #9
F0C9 B0 07              BCS     2.F             Not correct input
F0CB 20 91F6            JSR     XTODEV
F0CE A2 17              LDX     #$17            Offset for table
F0D0 D0 F0              BNE     3.B
F0D2 60         2       RTS

                ;*** Keyboard initialisation subroutine ***

F0D3 A9 00      KBINIT  LDA     #$00
F0D5 8D B7E7            STA     KEYPNT
F0D8 8D 03E1            STA     VAPADD          Port A is input
F0DB AD 0CE1            LDA     VAPCR           Get old value
F0DE 09 0E              ORA     #%00001110      Set CA2 high
F0E0 29 FE              AND     #%11111110      Neg. edge CA1
F0E2 8D 0CE1            STA     VAPCR
F0E5 A9 82              LDA     #$82            Enable interrupts from CA1 only
F0E7 8D 0EE1            STA     VAIER
F0EA AD 0BE1            LDA     VAACR
F0ED 09 01              ORA     #%00000001      Latch mode port A
F0EF 8D 0BE1            STA     VAACR
F0F2 18         DUMRTS  CLC
F0F3 60                 RTS

                ;*** Centronics parallel printer initialisation subroutine ***

F0F4 A9 FF      PRINIT  LDA     #$FF
F0F6 8D 02E1            STA     VAPBDD          All outputs on port B
F0F9 AD 0CE1            LDA     VAPCR           Get old value
F0FC 09 A0              ORA     #%10100000      CB2=write handshake puls
F0FE 29 AF              AND     #%10101111      CB1=Neg. edge triggered
F100 8D 0CE1            STA     VAPCR
F103 AD 12E1            LDA     VBPBDD          Get old port B data direction register
F106 29 E7              AND     #%11100111      B3 and B4 inputs for 'select' and 'paper out'
F108 8D 12E1            STA     VBPBDD          Set data direction
F10B A9 00              LDA     #$00
F10D 8D 00E1            STA     VAPBD           Try to send $00 to device to get handshakepuls
F110 A0 C0              LDY     #$C0            Wait a while
F112 A2 FF      1       LDX     #$FF
F114 AD 0DE1    2       LDA     VAIFR           Read inter. flag register
F117 29 10              AND     #$10            Test only CB1 flag
F119 18                 CLC
F11A D0 0F              BNE     3.F             Then handshake received
F11C CA                 DEX                     Wait and
F11D D0 F5              BNE     2.B             Try again
F11F 88                 DEY                     Wait and
F120 D0 F0              BNE     1.B             Try again

                ;No handshake received, device not present!!!

F122 AD 10E7            LDA     DEVMODOUT       Get output device select bits
F125 29 BF              AND     #%10111111      Disable centronics par. output
F127 8D 10E7            STA     DEVMODOUT       Set bits
F12A 38                 SEC                     Error exit
F12B 60         3       RTS

                ;*** Initialise the CRT controller ***

F12C A2 0F      VDUINIT LDX     #15             16 registers to fill
F12E 8A         1       TXA
F12F 8D 40E1            STA     CRTCAR          Select register
F132 BD 41F1            LDA     CTB,X           Get value from table
F135 8D 41E1            STA     CRTCRF          Put value in register
F138 CA                 DEX                     Next register
F139 10 F3              BPL     1.B             Ready?
F13B E8                 INX
F13C 8E 71E7            STX     COUD
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F13F 18              CLC
F140 60              RTS

                ;*** CRTC register values ***

F141 7E         CTB  fcc  $7E          HOR TOT (N-1)
F142 50              fcc  $50          HOR DISP
F143 5F              fcc  $5F          HOR SYNC POS
F144 88              fcc  $88          H/V SYNC WIDTH
F145 1E              fcc  $1E          VERT TOT (N-1)
F146 05              fcc  $05          VERT TOT ADJ
F147 19              fcc  $19          VER DISP
F148 1C              fcc  $1C          VERT SYNC POS
F149 80              fcc  $80          MODE CONTROL
F14A 09              fcc  $09          SCANLINES (N-1)
F14B 00              fcc  $00          CUR START
F14C 09              fcc  $09          CUR END
F14D 00              fcc  $00          START HI
F14E 00              fcc  $00          START LO
F14F 00              fcc  $00          CUR HI
F150 00              fcc  $00          CUR LO

                ;*** Acia initialisation ***

F151 AD 35E7 RSINIT  LDA  ACCMD        Get value for commandregister
F154 8D 31E1         STA  ACIASR       First reset acia
F157 8D 32E1         STA  ACICMD       Set value in commandregister
F15A AD 34E7         LDA  ACCTL        Get value for controlregister
F15D 8D 33E1         STA  ACICTL       Set value in controlregister
F160 18              CLC
F161 60              RTS

                ;Offsettabel for variables

F162 10         VART1 fcc  DEVMODOUT
F163 11               fcc  DEVMODINP
F164 16               fcc  OUTRET
F165 17               fcc  INPRET
F166 45               fcc  INVST
F167 33               fcc  MONESC
F168 01               fcc  STATTOG
F169 72               fcc  TOUTIL
F16A 73               fcc  TOUTIH
F16B 74               fcc  TOUTL
F16C 75               fcc  TOUTH
F16D 38               fcc  TOUTF
F16E 89               fcc  DVO6VEC
F16F 8A               fcc  DVO6VEC+1
F170 8B               fcc  DVI6VEC
F171 8C               fcc  DVI6VEC+1
F172 8D               fcc  DVO7VEC
F173 8E               fcc  DVO7VEC+1
F174 8F               fcc  DVI7VEC
F175 90               fcc  DVI7VEC+1
F176 91               fcc  DVO8VEC
F177 92               fcc  DVO8VEC+1
F178 93               fcc  DVI8VEC
F179 94               fcc  DVI8VEC+1
F17A 23               fcc  DMPRAM
F17B 26               fcc  DMPRAM+3       RTS
F17C 27               fcc  LDALET
F17D 2A               fcc  LDALET+3       RTS
F17E 2B               fcc  FRWR
F17F 2E               fcc  FRWR+3         RTS
F180 2F               fcc  FRRE
F181 32               fcc  FRRE+3         RTS
F182 B5               fcc  IRQVECTOR
F183 B6               fcc  IRQVECTOR+1
F184 B1               fcc  NMIVECTOR
F185 B2               fcc  NMIVECTOR+1
F186 34               fcc  ACCTL
F187 35               fcc  ACCMD
F188 AD               fcc  START
F189 AE               fcc  START+1
F18A AF               fcc  UNRINT         Vector to unrec. interrupt
F18B B0               fcc  UNRINT+1
F18C 50               fcc  INTV1          Interruptvector 1
F18D 51               fcc  INTV1+1
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F18E 52              fcc     INTV2           Interruptvector 2
F18F 53              fcc     INTV2+1
F190 54              fcc     INTV3           Interruptvector 3
F191 55              fcc     INTV3+1
F192 56              fcc     INTV4           Interruptvector 4
F193 57              fcc     INTV4+1
F194 58              fcc     INTV5           Interruptvector 5
F195 59              fcc     INTV5+1
F196 5A              fcc     INTV6           Interruptvector 6
F197 5B              fcc     INTV6+1
F198 5C              fcc     INTV7           Interruptvector 7
F199 5D              fcc     INTV7+1
F19A 5E              fcc     INTV8           Interruptvector 8
F19B 5F              fcc     INTV8+1
F19C 60              fcc     INTV9           Interruptvector 9
F19D 61              fcc     INTV9+1
F19E 62              fcc     INTV10          Interruptvector 10
F19F 63              fcc     INTV10+1
F1A0 64              fcc     INTV11          Interruptvector 11
F1A1 65              fcc     INTV11+1
F1A2 66              fcc     INTV12          Interruptvector 12
F1A3 67              fcc     INTV12+1
F1A4 68              fcc     INTV13          Interruptvector 13
F1A5 69              fcc     INTV13+1
F1A6 6A              fcc     INTV14          Interruptvector 14
F1A7 6B              fcc     INTV14+1
F1A8 6C              fcc     INTV15          Interruptvector 15
F1A9 6D              fcc     INTV15+1
F1AA 6E              fcc     INTV16          Interruptvector 16
F1AB 6F              fcc     INTV16+1
F1AC 00              fcc     0               End of tabel

                ;Datatabel for variables

F1AD 80         VART2   fcc     $80             DEVMODOUT
F1AE 80                 fcc     $80             DEVMODINP
F1AF 80                 fcc     $80             OUTRET
F1B0 80                 fcc     $80             INPRET
F1B1 80                 fcc     $80             INVST
F1B2 1E                 fcc     $1E             MONESC
F1B3 82                 fcc     $82             STATTO6
F1B4 09                 fcc     (TOUTT&255)+1   TOUTIL
F1B5 08                 fcc     (TOUTT>>8)+1    TOUTIH
F1B6 09                 fcc     (TOUTT&255)+1   TOUTL
F1B7 08                 fcc     (TOUTT>>8)+1    TOUTH
F1B8 FF                 fcc     $FF             TOUTF
F1B9 1EF8               fdb     RESODEV         Default to reset output
F1BB 28F8               fdb     RESIDEV         Default to reset input
F1BD 1EF8               fdb     RESODEV         Default to reset output
F1BF 28F8               fdb     RESIDEV         Default to reset input
F1C1 1EF8               fdb     RESODEV         Default to reset output
F1C3 28F8               fdb     RESIDEV         Default to reset input
F1C5 8D                 fcc     $8D             STA DMPRAM
F1C6 60                 fcc     $60             RTS
F1C7 AD                 fcc     $AD             LDA
F1C8 60                 fcc     $60             RTS
F1C9 8D                 fcc     $8D             STA FRWR
F1CA 60                 fcc     $60             RTS
F1CB AD                 fcc     $AD             LDA FRRE
F1CC 60                 fcc     $60             RTS
F1CD 2FF2               fdb     INT             IRQ vector
F1CF 70F3               fdb     UNNMI           NMI vector
F1D1 BA                 fcc     $BA             ACCTL
F1D2 05                 fcc     $05             ACCMD
F1D3 00E8               fdb     VDURAM          START
F1D5 57F3               fdb     UNINT           Interrupt ignored vector
F1D7 83F2               fdb     INT1-1
F1D9 F1F0               fdb     INT2-1
F1DB F1F0               fdb     INT3-1
F1DD F1F0               fdb     INT4-1
F1DF F1F0               fdb     INT5-1
F1E1 16F3               fdb     INT6-1
F1E3 F1F0               fdb     INT7-1
F1E5 F1F0               fdb     INT8-1
F1E7 F1F0               fdb     INT9-1
F1E9 F1F0               fdb     INT10-1
F1EB F1F0               fdb     INT11-1
F1ED F1F0               fdb     INT12-1
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F1EF F1F0             fdb     INT13-1
F1F1 F1F0             fdb     INT14-1
F1F3 27F3             fdb     INT15-1
F1F5 76F2             fdb     INT16-1

                ;*** Initialization for via I/O routines ***

F1F7 A9 EF      VOINIT LDA    #WBYTEF&255
F1F9 8D 85E7           STA    DVO4VEC
F1FC A9 F7             LDA    #WBYTEF>>8
F1FE 8D 86E7           STA    DVO4VEC+1
F201 A9 FF             LDA    #$FF            All outputs
F203 D0 0C             BNE    1.F

F205 A9 0F      VIINIT LDA    #RBYTE&255
F207 8D 87E7           STA    DVI4VEC
F20A A9 F8             LDA    #RBYTE>>8
F20C 8D 88E7           STA    DVI4VEC+1
F20F A9 00             LDA    #$00            All inputs
F211 8D 13E1    1      STA    VBPADD          Set data direction
F214 A9 F8             LDA    #$F8
F216 8D 1CE1           STA    VBPCR           Full auto handshake
F219 18                CLC
F21A 60                RTS

F21B A2 00      MOINIT LDX    #0
F21D BD 76E7    1      LDA    WRBEG,X         Copy beginaddress into selfmod. program
F220 9D 2CE7           STA    FRWR+1,X
F223 BD 77E7           LDA    WRBEG+1,X
F226 9D 2DE7           STA    FRWR+2,X
F229 18                CLC
F22A 60                RTS

F22B A2 04      MIINIT LDX    #4
F22D D0 EE             BNE    1.B

                cont   INTERRUPT.MAC
                ;********** INTERRUPT **********

                ;*** IRQ interrupt routine ***

F22F D8         INT    CLD
F230 8D 70E7           STA    SVAINT
F233 68                PLA
F234 48                PHA                    Get old processor status
F235 29 10             AND    #%00010000
F237 F0 04             BEQ    3.F             Branch if not a software interrupt
F239 A2 0F             LDX    #$0F            Table offset for software interrupt
F23B D0 3B             BNE    INTFUN

F23D AD 70E7    3      LDA    SVAINT
F240 48                PHA
F241 8A                TXA
F242 48                PHA                    Save all registers
F243 98                TYA
F244 48                PHA
F245 AD 0DE1           LDA    VAIFR           Interrupt from VIAA?
F248 30 11             BMI    VIAAINT
F24A AD 1DE1           LDA    VBIFR           Interrupt from VIAB?
F24D 30 13             BMI    VIABINT         Branch if yes
F24F 2C 31E1    INTA   BIT    ACIASR          Interrupt from acia?
F252 10 04             BPL    1.F
F254 A2 0E             LDX    #$0E            Table offset for acia interrupt
F256 D0 17             BNE    2.F
F258 6C AFE7    1      JMP    [UNRINT]        Jump for interrupt ignored

F25B 2D 0EE1    VIAAINT AND   VAIER
F25E A2 FF             LDX    #$FF            Table offset
F260 D0 05             BNE    INTHAN
F262 2D 1EE1    VIABINT AND   VBIER
F265 A2 06             LDX    #$06            Table offset
F267 0A         INTHAN ASLA
F268 F0 08             BEQ    INTEX
F26A 18                CLC
F26B 0A         INTLOP ASLA
F26C E8                INX
F26D 90 FC             BCC    INTLOP          Branch if not this interrupt
F26F 20 78F2    2      JSR    INTFUN          Execute interrupt routine
```

```
                ;               Return address for executed interrupt routine
F272 68         INTEX   PLA
F273 A8                 TAY
F274 68                 PLA
F275 AA                 TAX                     Restore registers
F276 68                 PLA
F277 40         DUMRTI  RTI

F278 8A         INTFUN  TXA
F279 0A                 ASLA
F27A AA                 TAX
F27B BD 51E7            LDA     INTV1+1,X       Get high byte
F27E 48                 PHA
F27F BD 50E7            LDA     INTV1,X         Get low byte
F282 48                 PHA
F283 60                 RTS                     Execute interrupt routine

                ;Clock update interrupt routine

F284 2C 04E1    INTTIM  BIT     VIACL           Reset timer interrupt flag
F287 A9 00              LDA     #$00            Update clock
                        TIME    SEC1.20,$14
F289 AE 37E7            LDX     SEC1.20
F28C E8                 INX
F28D 8E 37E7            STX     SEC1.20
F290 E0 14              CPX     #$14
F292 D0 76              BNE     INTND
F294 8D 37E7            STA     SEC1.20
F297 CE 1BE7            DEC     VIAVRA          Timer for vialoop
F29A 2C 38E7            BIT     TOUTF
F29D 10 0D              BPL     1.F
F29F CE 74E7            DEC     TOUTL           Timeout for screen off decrements
F2A2 D0 08              BNE     1.F
F2A4 CE 75E7            DEC     TOUTH
F2A7 D0 03              BNE     1.F
F2A9 8D 38E7            STA     TOUTF           Set flag
                1       TIME    SECONDS,$3C
F2AC AE 84E7            LDX     SECONDS
F2AF E8                 INX
F2B0 8E 84E7            STX     SECONDS
F2B3 E0 3C              CPX     #$3C
F2B5 D0 53              BNE     INTND
F2B7 8D 84E7            STA     SECONDS
                        TIME    MINUTES,$3C
F2BA AE 83E7            LDX     MINUTES
F2BD E8                 INX
F2BE 8E 83E7            STX     MINUTES
F2C1 E0 3C              CPX     #$3C
F2C3 D0 45              BNE     INTND
F2C5 8D 83E7            STA     MINUTES
                        TIME    HOURS,$18
F2C8 AE 82E7            LDX     HOURS
F2CB E8                 INX
F2CC 8E 82E7            STX     HOURS
F2CF E0 18              CPX     #$18
F2D1 D0 37              BNE     INTND
F2D3 8D 82E7            STA     HOURS

                ;End of day now

F2D6 AE 80E7            LDX     MONTH           What month is it?
F2D9 E0 02              CPX     #2
F2DB D0 0B              BNE     NOCHE

F2DD AD 81E7            LDA     YEAR            Something strange with february
F2E0 29 03              AND     #%00000011      Check for divisible by 4
F2E2 D0 04              BNE     NOCHE           Then not divisible
F2E4 A9 1D              LDA     #29             In those years febr. has 29 days
F2E6 D0 03              BNE     FEBCH           Continue elsewhere

F2E8 BD 0AF3    NOCHE   LDA     MONTAB-1,X      What day is it?
F2EB CD 7FE7    FEBCH   CMP     DAY             Check end of month
F2EE D0 12              BNE     DTUPDC          Then not on end of month

                ;End of month now

F2F0 A9 00              LDA     #0
F2F2 8D 7FE7            STA     DAY             First day 0
```

```
F2F5 E8              INX             Next month
F2F6 E0 0D           CPX   #13       Only 12 months
F2F8 D0 05           BNE   DTUPDB     Then not next year

                ;End of year now

F2FA A2 01           LDX   #1        Start with month 1
F2FC EE 81E7         INC   YEAR
F2FF 8E 80E7 DTUPDB  STX   MONTH     Set month

F302 EE 7FE7 DTUPDC  INC   DAY       Next day
F305 A9 FF           LDA   #$FF
F307 8D 7EE7         STA   DATUPD    Set flag for date updated

F30A 60         INTND RTS

F30B 1F         MONTAB fcc   31      January
F30C 1C                fcc   28      February
F30D 1F                fcc   31      March
F30E 1E                fcc   30      April
F30F 1F                fcc   31      May
F310 1E                fcc   30      June
F311 1F                fcc   31      July
F312 1F                fcc   31      August
F313 1E                fcc   30      September
F314 1F                fcc   31      October
F315 1E                fcc   30      November
F316 1F                fcc   31      December

                ;*** Interrupt from keyboard ***

F317 AD 01E1 KEYINT  LDA   VAPAD     Read key from via
F31A AE B7E7 KEYINTA LDX   KEYPNT    Keyboardbuffer pointer
F31D E0 28           CPX   #MAXBUF   Max. buffer
F31F F0 06           BEQ   BUFVOL

F321 9D B8E7 KEYINTB STA   KEYBUF,X  Put character in buffer
F324 EE B7E7         INC   KEYPNT
F327 60         BUFVOL RTS

                ;*** Acia interrupt routine ***

F328 AD 31E1 ACINT   LDA   ACIASR    Get statusregister
F32B 29 08           AND   #$08      Receiver interrupt?
F32D F0 1B           BEQ   TRMINT    Or transmitter interrupt?

                ;Receiver register full

F32F AD 30E1         LDA   RECREG    Read acia receiverregister
F332 C9 13           CMP   #$13      ^S stop for handshake?
F334 D0 06           BNE   3.F
F336 A9 FF           LDA   #$FF      Set that handshake flag
F338 8D 0EE7 2       STA   HSFLG
F33B 60              RTS

F33C C9 11 3         CMP   #$11      ^Q continue for handshake
F33E D0 04           BNE   4.F       It was a normal character
F340 A9 00           LDA   #$00      Reset handshake flag and
F342 F0 F4           BEQ   2.B       continue elsewhere
F344 AD 30E1 4       LDA   RECREG    Read character from acia
F347 4C 1AF3         JMP   KEYINTA   Continue as a keyboard input

                ;Transmit register empty

F34A AD 31E1 TRMINT  LDA   ACIASR    Get the statusregister
F34D 29 10           AND   #$10      Was it a transmitter interrupt?
F34F F0 05           BEQ   1.F       Not a transmitter interrupt
F351 A9 00           LDA   #$00
F353 8D 39E7         STA   TREMP     Reset transmitterreg. empty flag
F356 60         1    RTS


                ;It was an unrecognized interrupt!!!!

F357 A2 00      UNINT LDX   #$00     Select active output device
F359 20 9DF7          JSR   PRTEXT   Print errormessage
F35C 070A0D4952       fcc   7,'\n\rIRQ ignored\n\r',0
F361 512069676E
```

```
F366 6F7265640A
F36B 0D00
F36D 4C 72F2          JMP     INTEX

                ;It was an NMI!!!!

F370 A2 00      UNNMI   LDX     #$00            Select active output device
F372 20 9DF7            JSR     PRTEXT          Print message
F375 070A0D4E4D         fcc     7,'\n\rNMI ignored\n\r',0
F37A 492069676E
F37F 6F7265640A
F384 0D00
F386 40                 RTI

                        cont    STATUSLN.MAC
                ;*********** STATUSLN **********

                ;Statusline routines

F387 20 67F9    PSSEL   JSR     POSIT           First posit the cursor
F38A 38         SELSTL  SEC                     Select local status line
F38B 6E 42E7            ROR     STATFG
F38E AD 42E7            LDA     STATFG
F391 C9 80              CMP     #$80
F393 D0 0C              BNE     1.F

F395 AE 43E7    SETINV  LDX     INVERS
F398 8E 44E7            STX     INVERSS
F39B AE 45E7            LDX     INVST
F39E 8E 43E7            STX     INVERS
F3A1 60         1       RTS

F3A2 18         UNSELS  CLC                     Unselect local status line
F3A3 2E 42E7            ROL     STATFG
F3A6 AD 42E7            LDA     STATFG
F3A9 D0 F6              BNE     1.B

F3AB AE 44E7    PRSEND  LDX     INVERSS         Reset the invers video mode
F3AE 8E 43E7            STX     INVERS
F3B1 60                 RTS

F3B2 20 A2F3    UNSLPS  JSR     UNSELS
F3B5 4C 5FF9            JMP     UNPOS

                ;       Initialize part of statusline

F3B8 08         ISLINE  PHP
F3B9 78                 SEI
F3BA 48                 PHA
F3BB 8A                 TXA
F3BC 48                 PHA
F3BD 98                 TYA
F3BE 48                 PHA
F3BF A2 32              LDX     #50
F3C1 A0 19              LDY     #25
F3C3 20 87F3            JSR     PSSEL
F3C6 A9 20              LDA     #32             Clear right part of statusline
F3C8 8D 0DE7            STA     MAXSTL
F3CB 20 85F4            JSR     CLSPRT4
F3CE 20 9DF7            JSR     PRTEXT
F3D1 1432194C6E         fcc     20,50,25,'Ln:       Fn:',0
F3D6 3A20202020
F3DB 2020202046
F3E0 6E3A00
F3E3 20 B2F3            JSR     UNSLPS
F3E6 68                 PLA
F3E7 A8                 TAY
F3E8 68                 PLA
F3E9 AA                 TAX
F3EA 68                 PLA
F3EB 28                 PLP
F3EC 60                 RTS

                ;*** Set linenumber in statusline ***

F3ED 8D 3EE7    FILLNM  STA     LNRH
F3F0 8C 3DE7            STY     LNRL
F3F3 8A                 TXA
```

```
F3F4 48              PHA
F3F5 08              PHP
F3F6 78              SEI
F3F7 A2 36           LDX    #54
F3F9 A0 19           LDY    #25
F3FB 20 87F3         JSR    PSSEL
F3FE 20 9DF7         JSR    PRTEXT        Print text
F401 2020202020      fcc    '     '       Delete old characters
F406 20
F407 14361900        fcc    20,54,25,0    Reposition cursor
F40B AD 3EE7         LDA    LNRH          Get highbyte linenumber
F40E AE 3DE7         LDX    LNRL          Get lowbyte linenumber
F411 20 02FF         JSR    CONVER        Convert 2 bytes hex to 3 bytes dec.
F414 20 41FF         JSR    PRIDEC        Print decimal numbers, only to screen
F417 20 B2F3         JSR    UNSLPS
F41A 28              PLP
F41B 68              PLA
F41C AA              TAX
F41D AD 3EE7         LDA    LNRH
F420 AC 3DE7         LDY    LNRL
F423 60              RTS

                ;*** Put filename (pointed by A,Y) in statusline ***

F424 8C 20E7    FILFNM STY    PNTXL         Lowbyte pointer
F427 8D 21E7           STA    PNTXH         Highbyte pointer
F42A 08                PHP                  Save processorstatus
F42B 78                SEI
F42C 20 5CF6           JSR    SAVEREGS      Save all registers
F42F 20 CCFF           JSR    ADPNTX        Setup a selfmodifying program
F432 A9 0E             LDA    #14
F434 A2 41             LDX    #65
F436 A0 19      FILFL5 LDY    #25
F438 8D 0DE7    FILFL0 STA    MAXSTL
F43B 20 87F3           JSR    PSSEL
F43E 20 1FE7    FILFL1 JSR    PNTX          Get character
F441 F0 11             BEQ    FILFL2        Stop on $00
F443 C9 0D             CMP    #$0D
F445 F0 0D             BEQ    FILFL2        Stop on CR
F447 20 DDF6           JSR    OUT           Set on statusline
F44A 20 B1FF           JSR    PNTXINC       Increase pointers
F44D CE 0DE7           DEC    MAXSTL        Maximum characters for this statusline
F450 D0 EC             BNE    FILFL1        Ready?
F452 F0 0A             BEQ    FILFL4        Continue elsewhere
F454 A9 20      FILFL2 LDA    #' '          Space in A
F456 20 DDF6    FILFL3 JSR    OUT           Fill rest with spaces
F459 CE 0DE7           DEC    MAXSTL
F45C D0 F8             BNE    FILFL3        Ready?
F45E 20 B2F3    FILFL4 JSR    UNSLPS
F461 20 78F6           JSR    RESTOREGS     Restore all registers
F464 28                PLP                  Also processorstatus
F465 60                RTS

                ;*** Clear part of statusline ***

F466 08         CSLPRT PHP
F467 78                SEI
F468 20 5CF6           JSR    SAVEREGS
F46B 20 73F4           JSR    CLSPRT1
F46E 20 78F6           JSR    RESTOREGS
F471 28                PLP
F472 60                RTS

F473 A9 20      CLSPRT1 LDA    #32
F475 A2 30              LDX    #48           X position on statusline
F477 A0 19      CLSPRT3 LDY    #25
F479 8D 0DE7    CLSPRT2 STA    MAXSTL
F47C 20 87F3            JSR    PSSEL
F47F 20 85F4            JSR    CLSPRT4
F482 4C B2F3            JMP    UNSLPS

F485 A9 20      CLSPRT4 LDA    #' '
F487 20 DDF6            JSR    OUT
F48A CE 0DE7            DEC    MAXSTL
F48D D0 F6              BNE    CLSPRT4
F48F 60                 RTS

                ;*** Clear whole statusline ***
```

```
F490 08        CWHSLN  PHP
F491 78                SEI
F492 20 5CF6           JSR     SAVEREGS
F495 A9 50             LDA     #80
F497 A2 01             LDX     #1              X,Y position
F499 20 77F4           JSR     CLSPRT3
F49C 20 78F6           JSR     RESTOREGS
F49F 28                PLP
F4A0 60                RTS

               ;*** Print user defined (pointed by A,Y) statusline ***

F4A1 8C 20E7   MAKSLN  STY     PNTXL           Lowbyte pointer
F4A4 8D 21E7           STA     PNTXH           Highbyte pointer
F4A7 08                PHP                     Save processorstatus
F4A8 78                SEI
F4A9 20 5CF6           JSR     SAVEREGS        Save all registers
F4AC 20 CCFF           JSR     ADPNTX          Setup a selfmodifying program
F4AF A9 83             LDA     #$83
F4B1 8D 01E7           STA     STATTO6
F4B4 A9 50             LDA     #80
F4B6 A2 01             LDX     #1              X,Y position
F4B8 4C 36F4           JMP     FILFL5          Continue elsewhere

F4BB 08        NORSTAT PHP
F4BC 78                SEI
F4BD 48                PHA
F4BE A9 82             LDA     #$82
F4C0 8D 01E7           STA     STATTO6
F4C3 A9 02             LDA     #$02
F4C5 20 CBF4           JSR     PRSTAT
F4C8 68                PLA
F4C9 28                PLP
F4CA 60                RTS

               ;*** Print a statusline pointed by A ***

F4CB A8        PRSTAT  TAY                     Set flags
F4CC F0 09             BEQ     OUTPSTAT        Output device statusline
F4CE C9 01             CMP     #$01
F4D0 F0 46             BEQ     INPSTAT         Input device statusline
F4D2 C9 02             CMP     #$02
F4D4 F0 7F             BEQ     HLPSTAT         Normal help statusline
F4D6 60                RTS

               ;*** Statusline for outputdevice selection ***

F4D7 A9 80     OUTPSTAT LDA    #$80
F4D9 8D 01E7           STA     STATTO6
F4DC 20 90F4           JSR     CWHSLN          Clear the line
F4DF A2 06             LDX     #6
F4E1 A0 19             LDY     #25
F4E3 20 87F3           JSR     PSSEL
F4E6 20 9DF7           JSR     PRTEXT          Print text
F4E9 4F75747075        fcc     'Output devices ',0
F4EE 7420646576
F4F3 6963657320
F4F8 00
F4F9 AD 10E7           LDA     DEVMODOUT       What are the active devices?
F4FC A8        ODSTA   TAY                     Keep them in Y reg.
F4FD A2 31             LDX     #'1             Start with device 1
F4FF A9 20     PRST    LDA     #' 
F501 20 DDF6           JSR     OUT             Print a space
F504 8A                TXA                     Get device number
F505 20 DDF6           JSR     OUT             Print device number
F508 98                TYA                     Active devices in A
F509 18                CLC
F50A 0A                ASLa                    Shift most significant device in carry
F50B A8                TAY                     Keep rest of devices in Y
F50C 20 3FF5           JSR     PRONOFF         Print 'on' (C=1), 'off' (C=0)
F50F E8                INX                     Get next device number
F510 E0 39             CPX     #'9             Device 9 doesn't exist
F512 D0 EB             BNE     PRST            Continue for rest of the devices
F514 20 A2F3           JSR     UNSELS
F517 60                RTS

               ;*** Statusline for inputdevice selection ***
```

```
F518 A9 81      INPSTAT LDA     #$81
F51A 8D 01E7            STA     STATTOG
F51D 20 90F4            JSR     CWHSLN          Clear the line
F520 A2 07              LDX     #7
F522 A0 19              LDY     #25
F524 20 87F3            JSR     PSSEL
F527 20 9DF7            JSR     PRTEXT          Print text
F52A 496E707574         fcc     'Input devices ',0
F52F 2064657669
F534 6365732000
F539 AD 11E7            LDA     DEVMODINP       What are the active devices
F53C 4C FCF4            JMP     ODSTA           Continue elsewhere

                ;*** Print 'on' or 'off' ***

F53F 90 0A      PRONOFF BCC     PROFF           if C=0 then 'off'
F541 20 9DF7            JSR     PRTEXT          Print text
F544 3D6F6E2020         fcc     '=on  ',0
F549 00
F54A 60                 RTS
F54B 20 9DF7    PROFF   JSR     PRTEXT          Print text
F54E 3D6F666620         fcc     '=off ',0
F553 00
F554 60                 RTS

                ;*** Print normal statusline ***

F555 20 40F6    HLPSTAT JSR     SVPXY           Save X,Y cursorpointers
F558 20 90F4            JSR     CWHSLN          Clear the line
F55B A2 02              LDX     #2
F55D A0 19              LDY     #25
F55F 20 87F3            JSR     PSSEL
F562 20 9DF7            JSR     PRTEXT          Print text
F565 54696D6520         fcc     'Time ',0
F56A 00
F56B 20 83F5            JSR     PRTIM           Print the time
F56E 20 B5F5            JSR     PRDAT           Print the date
F571 20 12F6            JSR     ST2UD           Print rest of the line
F574 20 A2F3            JSR     UNSELS
F577 4C B3FD            JMP     SF1ENDD         Reset rest of registers etc.

F57A A9 2D      PRSTRP  LDA     #'-
F57C D0 02              BNE     1.F
F57E A9 3A      PRTIMB  LDA     #':
F580 4C DDF6    1       JMP     OUT             Print a '-' or a ':'

                ;*** Print the time ***

F583 20 8AF3    PRTIM   JSR     SELSTL
F586 20 02FB            JSR     VERBLANK        Wait for vertical blank
F589 20 9DF7            JSR     PRTEXT
F58C 14071900           fcc     20,7,25,0       Set pointer to Time position
F590 AD 82E7            LDA     HOURS
F593 20 8EFF            JSR     PRHD            Print the hours
F596 20 7EF5            JSR     PRTIMB          Print a ':'
F599 AD 83E7            LDA     MINUTES
F59C 20 ABF5            JSR     PRTIMA          Print the minutes
F59F 20 7EF5            JSR     PRTIMB          Print a ':'
F5A2 AD 84E7            LDA     SECONDS         Print the seconds
F5A5 20 ABF5            JSR     PRTIMA
F5A8 4C A2F3            JMP     UNSELS

                ;*** Print a hex byte as two decimal nibbles ***

F5AB 20 A2FF    PRTIMA  JSR     HEXDE           Convert hex to decimal
F5AE 20 76FF            JSR     PRNIBL          Print a nibble
F5B1 98                 TYA
F5B2 4C 76FF            JMP     PRNIBL          Print second nibble

                ;*** Print the date ***

F5B5 20 8AF3    PRDAT   JSR     SELSTL
F5B8 20 9DF7            JSR     PRTEXT          Print text
F5BB 1411194461         fcc     20,17,25,'Date ',0
F5C0 74652000
F5C4 AD 7FE7            LDA     DAY             Get day
F5C7 20 ABF5            JSR     PRTIMA          Print day
```

```
F5CA 20 7AF5          JSR    PRSTRP        Print a '-'
F5CD AD 80E7          LDA    MONTH         Get month
F5D0 20 ABF5          JSR    PRTIMA        Print month
F5D3 20 7AF5          JSR    PRSTRP        Print a'-'
F5D6 AD 81E7          LDA    YEAR          Get year
F5D9 20 ABF5          JSR    PRTIMA        Print year
F5DC 4C A2F3          JMP    UNSELS

                ;*** Update the clock and the date on the statusline ***

F5DF AD 01E7  CLCKUP  LDA    STATTOG       Get kind of statusline
F5E2 C9 82            CMP    #$82
F5E4 D0 2B            BNE    2.F           Only in this mode
F5E6 AE 84E7          LDX    SECONDS       Get seconds
F5E9 EC 18E7          CPX    CLSEC         Only once per second an update
F5EC F0 23            BEQ    2.F           Then already done this second
F5EE AC 05E7          LDY    CURPY         Get cursor Y position
F5F1 C0 18            CPY    #24           Compare with statusline position
F5F3 F0 1C            BEQ    2.F           Don't update when you're in this line
F5F5 8E 18E7          STX    CLSEC         Keep this second
F5F8 AE 04E7          LDX    CURPX         Get cursor X position
F5FB 20 5CF6          JSR    SAVEREGS      Save all registers
F5FE 20 83F5          JSR    PRTIM         Print the time
F601 2C 7EE7          BIT    DATUPD        Also update date? (Only once a day)
F604 10 08            BPL    1.F           Than no update
F606 20 B5F5          JSR    PRDAT         Update date
F609 A9 00            LDA    #$00
F60B 8D 7EE7          STA    DATUPD        Reset the flag
F60E 4C B3FD  1       JMP    SF1ENDD       Reset registers etc.
F611 60       2       RTS

                ;*** Update normal statusline ***

F612 20 8AF3  ST2UD   JSR    SELSTL
F615 20 9DF7          JSR    PRTEXT        Print text
F618 142019436F       fcc    20,32,25,'Col: ',0
F61D 6C3A2000
F621 AE 02E7          LDX    CRPX          Get old curs X pos. (current is on statusline)
F624 E8               INX                  Because first column is 1
F625 8A               TXA
F626 20 8EFF          JSR    PRHD          Print it

F629 20 9DF7          JSR    PRTEXT        Print text
F62C 142919526F       fcc    20,41,25,'Row: ',0
F631 773A2000
F635 AE 03E7          LDX    CRPY          Get old curs Y pos. (current is on statusline)
F638 E8               INX                  Because first row is 1
F639 8A               TXA
F63A 20 8EFF          JSR    PRHD          Print it
F63D 4C A2F3          JMP    UNSELS

                ;*** Save cursor pointers ***

F640 AE 04E7  SVPXY   LDX    CURPX         Get X pointer
F643 AC 05E7          LDY    CURPY         Get Y pointer
F646 4C 5CF6          JMP    SAVEREGS      Save them

                ;*** Print the old statusline ***

F649 AD 01E7  STATOUD LDA    STATTOG       What was the old mode?
F64C 29 7F            AND    #$7F          MSB is the on/off bit
F64E 20 CBF4          JSR    PRSTAT        Print the line
F651 AD 01E7          LDA    STATTOG       Was line on or off?
F654 10 03            BPL    STATO         Than line was off
F656 4C 2AFD          JMP    STATAAN       Put line on
F659 4C 35FD  STATO   JMP    STATUIT       Turn line off

                cont   IO_ROUTS.MAC
                ;************ IO_ROUTS *************

                ;*** Save A, X and Y registers on a software stack ***

F65C 48       SAVEREGS PHA                 First save the accu
F65D 8A                TXA                 Save X in the accu
F65E AE 00E7           LDX    SAVSTACKP    Get the software stackpointer
F661 9D 9DE7           STA    XSAVESTACK,X Save X on xstack
F664 68                PLA                 Get old accu
F665 9D 95E7           STA    ASAVESTACK,X Save A on accustack
```

```
F668 98                 TYA                     Get Y in accu
F669 9D A5E7            STA     YSAVESTACK,X    Save Y on ystack
F66C EE 00E7            INC     SAVSTACKP       Increase the stackpointer
F66F AD 00E7            LDA     SAVSTACKP
F672 29 07              AND     #$07
F674 8D 00E7            STA     SAVSTACKP
F677 60                 RTS

                ;*** Restore A,X and Y registers from software stack ***

F678 CE 00E7    RESTOREGS DEC   SAVSTACKP       Decrease the stackpointer
F67B AD 00E7            LDA     SAVSTACKP
F67E 29 07              AND     #$07
F680 8D 00E7            STA     SAVSTACKP
F683 AA                 TAX                     Get the stackpointer
F684 BC A5E7            LDY     YSAVESTACK,X    Restore Y
F687 BD 95E7            LDA     ASAVESTACK,X    Get A and
F68A 48                 PHA                     save it
F68B BD 9DE7            LDA     XSAVESTACK,X    Get X
F68E AA                 TAX                     Restore X
F68F 68                 PLA                     Restore A
F690 60                 RTS

                ;       Convert value in X to devicebit in accu

F691 38         XTODEV  SEC
F692 A9 00              LDA     #$00
F694 6A         1       RORA
F695 CA                 DEX
F696 D0 FC              BNE     1.B
F698 60                 RTS

                ;*** Input from active input device ***

F699 20 5CF6    INP     JSR     SAVEREGS
F69C A2 00              LDX     #0
F69E 20 A7F6            JSR     INPX
F6A1 48                 PHA
F6A2 20 78F6            JSR     RESTOREGS
F6A5 68                 PLA
F6A6 60                 RTS

F6A7 AD 11E7    INPX    LDA     DEVMODINP
F6AA 8D 15E7            STA     SDVINP          Save current active input devicebit
F6AD 8A                 TXA
F6AE F0 0C              BEQ     1.F
F6B0 C9 09              CMP     #9
F6B2 F0 23              BEQ     2.F             Get evt. as.
F6B4 B0 06              BCS     1.F             Branch if no special device selected
F6B6 20 91F6            JSR     XTODEV          Convert X to devicebit in accu
F6B9 8D 11E7            STA     DEVMODINP
F6BC A2 07      1       LDX     #$07            Offset for table
F6BE AD 11E7            LDA     DEVMODINP       Which device is active?
F6C1 D0 03              BNE     INPA
F6C3 20 28F8            JSR     RESIDEV         At least 1 device must be active
F6C6 18         INPA    CLC
F6C7 0A         INPB    ASLa                    If C=1 then device is active
F6C8 E8                 INX
F6C9 90 FC              BCC     INPB            Look for active device
F6CB 20 4EF7            JSR     FUNTAB          Get character from active device
F6CE AA         3       TAX
F6CF AD 15E7            LDA     SDVINP          Get old active inputdevice
F6D2 8D 11E7            STA     DEVMODINP
F6D5 8A                 TXA
F6D6 60                 RTS

F6D7 20 1BF9    2       JSR     GETEVTAS        Get key if depressed
F6DA 4C CEF6            JMP     3.B

                ;*** Output to active output device ***

F6DD 48         OUT     PHA
F6DE 20 5CF6            JSR     SAVEREGS
F6E1 2C 42E7            BIT     STATFG
F6E4 10 07              BPL     1.F
F6E6 68                 PLA                     If local statusline selected
F6E7 20 59FB            JSR     PRVDU
F6EA 4C 78F6            JMP     RESTOREGS
```

```
F6ED 68          1      PLA
F6EE A2 00              LDX     #0
F6F0 20 F6F6            JSR     OUTX
F6F3 4C 78F6            JMP     RESTOREGS

F6F6 8D 0CE7    OUTX    STA     OUTCHR          Save character to print
F6F9 AD 10E7            LDA     DEVMODOUT       Save output devicebits
F6FC 8D 14E7            STA     SDVOUT
F6FF 8A                 TXA
F700 F0 27              BEQ     3.F             No special output device selected
F702 C9 09              CMP     #9
F704 F0 0B              BEQ     2.F             Branch if on statusline
F706 B0 21              BCS     3.F             No special output device selected
F708 20 91F6            JSR     XTODEV          X to devicebit in accu
F70B 8D 10E7            STA     DEVMODOUT
F70E 4C 29F7            JMP     3.F             Perform output
F711 C0 81      2       CPY     #$81
F713 B0 14              BCS     3.F             Branch if position not correct
F715 68                 PLA
F716 98                 TYA
F717 AA                 TAX                     X position
F718 A0 19              LDY     #25             Y position
F71A 20 83F9            JSR     PNTCUR
F71D 20 95F3            JSR     SETINV          Invers for statusline
F720 AD 0CE7            LDA     OUTCHR
F723 20 59FB            JSR     PRVDU           Print the character
F726 4C ABF3            JMP     PRSEND          Reset invers

F729 A2 FF      3       LDX     #$FF            Table offset
F72B AD 10E7            LDA     DEVMODOUT       Which device is active?
F72E D0 03              BNE     4.F
F730 20 1EF8            JSR     RESODEV         At least 1 device must be active
F733 20 3DF7    4       JSR     STATHAND        Output character with table handler routine
F736 AD 14E7            LDA     SDVOUT
F739 8D 10E7            STA     DEVMODOUT       Restore old output devicebits
F73C 60                 RTS

                ;*** Table handler ***

F73D 18         STATHAND CLC
F73E 0A         1       ASLa                    If C=1 then active
F73F E8                 INX                     Increase loopcounter
F740 90 FC              BCC     1.B             Next bit
F742 48                 PHA                     Save current devices and counter
F743 8A                 TXA
F744 48                 PHA
F745 20 4EF7            JSR     FUNTAB          Execute routine from table

                ;This is the returnaddress after execution
                ;of a routine called by FUNTAB

F748 68                 PLA
F749 AA                 TAX                     Restore current devices and counter
F74A 68                 PLA
F74B D0 F0              BNE     STATHAND        There is also another device active
F74D 60                 RTS

                ;*** Execute a routine from the table ***

F74E 8A         FUNTAB  TXA
F74F 0A                 ASLa                    Calculate table offset
F750 AA                 TAX                     Offset in X
F751 BD 5EF7            LDA     TABEL+$01,X     Get highbyte
F754 48                 PHA                     Push on stack
F755 BD 5DF7            LDA     TABEL,X         Get lowbyte
F758 48                 PHA                     Push on stack
F759 AD 0CE7            LDA     OUTCHR          Get character to print for output routines
F75C 60                 RTS                     Call the routine from the table

F75D 58FB       TABEL   fdb     DVO1-$01        Output devices
F75F 8BF8               fdb     DVO2-$01
F761 4BF9               fdb     DVO3-$01
F763 EBF7               fdb     DVO4-$01
F765 45F8               fdb     DVO5-$01
F767 79F8               fdb     DVO6-$01
F769 7FF8               fdb     DVO7-$01
F76B 85F8               fdb     DVO8-$01
```

```
F76D ABF8              fdb     DVI1-$01        Input devices
F76F F1F0              fdb     DVI2-$01
F771 44F9              fdb     DVI3-$01
F773 0BF8              fdb     DVI4-$01
F775 5EF8              fdb     DVI5-$01
F777 7CF8              fdb     DVI6-$01
F779 82F8              fdb     DVI7-$01
F77B 88F8              fdb     DVI8-$01

F77D F1F0              fdb     IT1-$01         Init. output devices
F77F F3F0              fdb     IT2-$01
F781 50F1              fdb     IT3-$01
F783 F6F1              fdb     IT4-$01
F785 1AF2              fdb     IT5-$01
F787 F1F0              fdb     IT6-$01
F789 F1F0              fdb     IT7-$01
F78B F1F0              fdb     IT8-$01

F78D D2F0              fdb     IP1-$01         Init. input devices
F78F F1F0              fdb     IP2-$01
F791 50F1              fdb     IP3-$01
F793 04F2              fdb     IP4-$01
F795 2AF2              fdb     IP5-$01
F797 F1F0              fdb     IP6-$01
F799 F1F0              fdb     IP7-$01
F79B F1F0              fdb     IP8-$01

F79D 2C 42E7   PRTEXT  BIT     STATFG
F7A0 30 0B             BMI     3.F             Branch if local st.line selected
F7A2 8E 09E7           STX     XTMP
F7A5 E0 09             CPX     #9
F7A7 D0 04             BNE     3.F
F7A9 88                DEY
F7AA 8C 04E7           STY     CURPX
F7AD 68        3       PLA                     Get returnaddres
F7AE 8D 28E7           STA     LETADRL         Set pointer lowbyte
F7B1 68                PLA
F7B2 8D 29E7           STA     LETADRH         Set pointer highbyte

F7B5 EE 28E7   2       INC     LETADRL         Increase low byte pointer
F7B8 D0 03             BNE     PRTEXTB
F7BA EE 29E7           INC     LETADRH         If necessary also increase highbyte

F7BD 20 27E7   PRTEXTB JSR     LDALET          Get character
F7C0 F0 21             BEQ     3.F             End of text?
F7C2 2C 06E7           BIT     CURP            Test for cursor addressing active
F7C5 D0 04             BNE     1.F             Branch if active
F7C7 C9 0C             CMP     #$0C            Formfeed not allowed
F7C9 F0 EA             BEQ     2.B
F7CB 2C 42E7   1       BIT     STATFG
F7CE 10 06             BPL     8.F             Branch if no local st.line selected
F7D0 20 DDF6           JSR     OUT
F7D3 4C B5F7           JMP     2.B
F7D6 AE 09E7   8       LDX     XTMP
F7D9 AC 04E7           LDY     CURPX
F7DC C8                INY
F7DD 20 F6F6           JSR     OUTX            Output character to devices
F7E0 4C B5F7           JMP     2.B             Back in loop
F7E3 AD 29E7   3       LDA     LETADRH         Restore returnaddress highbyte
F7E6 48                PHA
F7E7 AD 28E7           LDA     LETADRL         Restore returnaddress lowbyte
F7EA 48                PHA
F7EB 60                RTS                     That was all

               ;*** Via communication routines called 'viacom' ***

F7EC 6C 85E7   VIAOUT  JMP     [DVO4VEC]       Output via a vector

F7EF 8D 11E1   WBYTEF  STA     VBPAD           Write first byte without handshake

               ;Change the vector for rest of the bytes

F7F2 A9 FD             LDA     #WBYTE&255
F7F4 8D 85E7           STA     DVO4VEC
F7F7 A9 F7             LDA     #WBYTE>>8
F7F9 8D 86E7           STA     DVO4VEC+$01
F7FC 60                RTS
```

```
                ;Write rest of the bytes with handshake

F7FD 48         WBYTE   PHA                     First save A
F7FE 20 32F8            JSR     VIALOOP         Wait for the handshake
F801 D0 04              BNE     WBYTEND         Handshake received?

                ;No handshake received

F803 68                 PLA                     Restore A
F804 4C 1EF8            JMP     RESODEV         Reset Output devices

                ;Handshake received

F807 68         WBYTEND PLA
F808 8D 11E1            STA     VBPAD           Put character in dataregister
F80B 60                 RTS

F80C 6C 87E7    VIAINP  JMP     [DVI4VEC]       Input via a vector

F80F 20 32F8    RBYTE   JSR     VIALOOP         Wait for handshake
F812 D0 06              BNE     RBYTEND         Handshake received?

                ;No handshake received

F814 20 28F8            JSR     RESIDEV         Reset Input devices
F817 A9 0D              LDA     #$0D
F819 60                 RTS

                ;Handshake received

F81A AD 11E1    RBYTEND LDA     VBPAD           Get character from dataregister
F81D 60                 RTS

                ;Reset the I/O devices

F81E AD 16E7    RESODEV LDA     OUTRET          Get default output device
F821 8D 10E7            STA     DEVMODOUT       Set output device
F824 8D 14E7            STA     SDVOUT
F827 60                 RTS

F828 AD 17E7    RESIDEV LDA     INPRET          Get default input device
F82B 8D 11E7            STA     DEVMODINP       Set input device
F82E 8D 15E7            STA     SDVINP
F831 60                 RTS

F832 A9 0A      VIALOOP LDA     #$0A            Set to 10 seconds
F834 8D 1BE7            STA     VIAVRA
F837 AD 1DE1    VIAL    LDA     VBIFR           Read via interrupt flag register
F83A 29 02              AND     #$02            Check only CA1 flag
F83C D0 07              BNE     1.F             Branch if handshake received?
F83E 2C 1BE7            BIT     VIAVRA
F841 10 F4              BPL     VIAL            Branch if time not out
F843 A9 00              LDA     #$00            Error exit, Z=0
F845 60         1       RTS                     Normal exit Z=1

                ;*** Memory as I/O device routines ***

F846 20 2BE7    MEMOUT  JSR     FRWR            Write character in memory
F849 AD 79E7            LDA     WREND+1
F84C CD 2DE7            CMP     FRWRH           Test for end with highbyte
F84F D0 0B              BNE     1.F             Then not yet on end
F851 AD 78E7            LDA     WREND           Else also
F854 CD 2CE7            CMP     FRWRL           test for end with lowbyte
F857 D0 03              BNE     1.F             Then not on end yet
F859 4C 1EF8            JMP     RESODEV         Reset the Output devices
F85C 4C BAFF    1       JMP     FRWRINC         Increase the pointers

F85F 20 2FE7    MEMINP  JSR     FRRE            Read character from memory
F862 48                 PHA                     Save it
F863 AD 7DE7            LDA     REEND+1
F866 CD 31E7            CMP     FRREH           Test for end with highbyte
F869 D0 0B              BNE     1.F             Then not yet on end
F86B AD 7CE7            LDA     REEND           Else also
F86E CD 30E7            CMP     FRREL           test for end with lowbyte
F871 D0 03              BNE     1.F             Then not on end yet
F873 20 28F8            JSR     RESIDEV         Reset the Input devices
F876 68         1       PLA
```

```
F877 4C C3FF          JMP     FRREINC         Increase pointers

                ;*** Indirect jumps to user defined I/O devices ***

F87A 6C 89E7    FREEO1  JMP     [DVO6VEC]       Output device 6
F87D 6C 8BE7    FREEI1  JMP     [DVI6VEC]       Input device 6
F880 6C 8DE7    FREEO2  JMP     [DVO7VEC]       Output device 7
F883 6C 8FE7    FREEI2  JMP     [DVI7VEC]       Input device 7
F886 6C 91E7    FREEO3  JMP     [DVO8VEC]       Output device 8
F889 6C 93E7    FREEI3  JMP     [DVI8VEC]       Input device 8

                ;*** Centronics printer output routine ***

F88C 48         PROUT   PHA                     Save the character
F88D AD 10E1    PROUTA  LDA     VBPBD           Check SELECT
F890 29 08              AND     #$08            Printer selected?
F892 F0 F9              BEQ     PROUTA          No, then wait
F894 AD 10E1            LDA     VBPBD           Check PE
F897 29 10              AND     #$10            Paper empty?
F899 D0 F2              BNE     PROUTA          Yes, then wait
F89B AD 0DE1    WACHTACK LDA    VAIFR           Wait for acknowledge
F89E 29 10              AND     #$10            Check only CB1 flag
F8A0 F0 F9              BEQ     WACHTACK        Wait until set
F8A2 68                 PLA                     Restore the character to print
F8A3 8D 00E1            STA     VAPBD           Send character and reset CB1 and CB2 flags
F8A6 60         PRITEND RTS

F8A7 A9 FF      2       LDA     #$FF            Set flag
F8A9 8D 19E7            STA     FUNENA          Then next character is function key

                ;*** Get a char. from the keyboardbuffer, check for functions ***

F8AC 20 CBF8    GETASKEY JSR    GETKEY          Get a key from buffer
F8AF 2C 19E7            BIT     FUNENA          Test for function flag
F8B2 10 0B              BPL     1.F
F8B4 A2 00              LDX     #$00            It was a function key
F8B6 8E 19E7            STX     FUNENA          Reset the flag
F8B9 20 FDFC            JSR     FUNTOETSEN      Perform functionkey routine
F8BC 4C ACF8            JMP     GETASKEY        Continue after function execution
F8BF 2C 1AE7    1       BIT     FNCEN           Are function keys allowed?
F8C2 10 01              BPL     3.F             Branch if allowed
F8C4 60                 RTS                     Return with character in accu
F8C5 CD 33E7    3       CMP     MONESC          Was it the entry to a functionkey?
F8C8 F0 DD              BEQ     2.B             Check normal/functionentry
F8CA 60                 RTS                     It was a normal key

                ;*** Get a character from keyboardbuffer ***

F8CB AD 01E7    GETKEY  LDA     STATTOG         Check statusline mode
                        CASE2   $82,GTKY        Do I have to update the statusline?
F8CE C9 82              CMP     #$82
F8D0 D0 19              BNE     GTKY
F8D2 AC 05E7            LDY     CURPY           Get the Y cursorpointer
F8D5 C0 18              CPY     #24             In statusline yet?
F8D7 F0 12              BEQ     GTKY            Then don't update statusline now
F8D9 AE 04E7            LDX     CURPX           Get also X cursorpointer
F8DC 8E 02E7            STX     CRPX            Copy pointers to new variables
F8DF 8C 03E7            STY     CRPY            Because pointers change in next calls
F8E2 20 5CF6            JSR     SAVEREGS        Save old position
F8E5 20 12F6            JSR     ST2UD           Update the statusline now
F8E8 20 B3FD            JSR     SF1ENDD         Restore pointers etc.
F8EB 20 20FB    GTKY    JSR     CURSOUD         Get old cursor mode
F8EE 20 DFF5    GTKYA   JSR     CLCKUP          Update the time every second
F8F1 20 21F9            JSR     TOFFSC          Screen off if time out
F8F4 AC B7E7            LDY     KEYPNT          Get keyboardbuffer pointer
F8F7 F0 F5              BEQ     GTKYA           Buffer empty, so wait
F8F9 20 2FF9            JSR     TONSC           Turn screen on
F8FC 20 1CFB            JSR     CURSUIT         No cursor
F8FF AD B8E7    GTKYB   LDA     KEYBUF          Get character from buffer
F902 48                 PHA                     Save it
F903 08                 PHP                     Save status
F904 78                 SEI                     No interrupts now
F905 A2 01              LDX     #$01            Last position possible
F907 EC B7E7    GTKYD   CPX     KEYPNT          What is current position
F90A F0 09              BEQ     GTKYC           That was the end
F90C BD B8E7            LDA     KEYBUF,X        Get first character
F90F 9D B7E7            STA     KEYBUF-$01,X    Shift one position to the left
F912 E8                 INX                     New position
```

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F913 D0 F2              BNE     GTKYD           Jump always
F915 CE B7E7    GTKYC   DEC     KEYPNT          Current position
F918 28                 PLP                     Interrupts are allowed now
F919 68                 PLA                     Restore character
F91A 60                 RTS

                ;*** Get character from buffer if there is one ***

F91B AD B7E7    GETEVTAS LDA    KEYPNT          Get pointer
F91E D0 DF              BNE     GTKYB           Continue elsewhere if there was one
F920 60                 RTS                     Buffer empty, return with A=00

                ;*** Screen off if time out ***

F921 AD 38E7    TOFFSC  LDA     TOUTF
F924 D0 08              BNE     1.F             Branch if time not out yet
F926 A2 01      2       LDX     #1              Accu was 0
F928 8E 40E1            STX     CRTCAR
F92B 8D 41E1            STA     CRTCRF          Turn off screen
F92E 60         1       RTS

                ;*** Turn screen on after depressing key ***

F92F 08         TONSC   PHP
F930 78                 SEI
F931 A2 01              LDX     #1
F933 BD 72E7    3       LDA     TOUTIL,X        Re-initialize the timer
F936 9D 74E7            STA     TOUTL,X
F939 CA                 DEX
F93A 10 F7              BPL     3.B
F93C 8E 38E7            STX     TOUTF           Set flag off
F93F 28                 PLP
F940 AD 42F1            LDA     CTB+1           Get register value
F943 D0 E1              BNE     2.B

                ;*** RS232 input routine ***

F945 AD B7E7    RS232I  LDA     KEYPNT          Get pointer in keyboard
F948 F0 FB              BEQ     RS232I          Buffer empty, so wait
F94A D0 B3              BNE     GTKYB           Continue elsewhere

                ;*** RS232 output routine with ^S and ^Q handshake ***

F94C 2C 39E7    RS232O  BIT     TREMP           Wait for transmit register empty
F94F 30 FB              BMI     RS232O          Then not empty yet
F951 2C 0EE7    RSO1    BIT     HSFLG           Stop for handshake?
F954 30 FB              BMI     RSO1            Wait until control Q is received
F956 8D 30E1            STA     TRAREG          Transmit character
F959 A9 FF              LDA     #$FF
F95B 8D 39E7            STA     TREMP           Set transmit reg. full flag
F95E 60                 RTS

                cont    VDU_ROUTS.MAC
                ;************* VDU_ROUTS **************

F95F AE 0AE7    UNPOS   LDX     XPSOLD          Place cursor to position before
F962 E8                 INX
F963 AC 0BE7            LDY     YPSOLD          the POSIT call
F966 C8                 INY
F967 48         POSIT   PHA                     Place cursor on X,Y position
F968 AD 04E7            LDA     CURPX
F96B 8D 0AE7            STA     XPSOLD
F96E AD 05E7            LDA     CURPY
F971 8D 0BE7            STA     YPSOLD
F974 A9 80      1       LDA     #$80
F976 8D 06E7            STA     CURP
F979 8A                 TXA
F97A 20 59FB            JSR     PRVDU
F97D 98                 TYA
F97E 20 59FB            JSR     PRVDU
F981 68                 PLA
F982 60                 RTS

F983 48         PNTCUR  PHA
F984 4C 74F9            JMP     1.B

F987 29 EF      INRNG   AND     #VDURAM+$700>>8 Maximum
F989 09 08              ORA     #$08            This bit is always set
```

```
F98B 60                 RTS

                ;*** Calculate DUMPH and DUMPL from CURPX and CURPY ***

F98C 18         CNVXYD  CLC                     Prepare addition
F98D AD ADE7            LDA     START           Get lowbyte START (= position 0,0)
F990 6D 04E7            ADC     CURPX           Add X position
F993 8D 24E7            STA     DUMPL           Temporary result in DUMPL
F996 AD AEE7            LDA     START+1         Get highbyte START
F999 69 00              ADC     #0              Add the carry, if there is one
F99B 8D 25E7            STA     DUMPH           Temporary result in DUMPH

                ;Add number of lines * 80 addresses

F99E AC 05E7            LDY     CURPY           What is the current line?
F9A1 18                 CLC
F9A2 F0 11      3       BEQ     2.F             Jump if on line 0
F9A4 AD 24E7            LDA     DUMPL           For every line add 80
F9A7 69 50              ADC     #80             80 characters per line
F9A9 8D 24E7            STA     DUMPL           Result is DUMPL
F9AC 90 04              BCC     1.F             Add carry in DUMPH
F9AE 18                 CLC
F9AF EE 25E7            INC     DUMPH           Increase DUMPH after carry
F9B2 88         1       DEY                     To next line
F9B3 90 ED              BCC     3.B             Branch always
F9B5 AD 25E7    2       LDA     DUMPH           Get DUMPH
F9B8 20 87F9            JSR     INRNG
F9BB 8D 25E7            STA     DUMPH           Result is DUMPH
F9BE 60                 RTS

                ;*** Calculate DUMPH and DUMPL, then convert ***
                ;*** DUMPL/H to cursorregister values in CRT ***

F9BF 20 8CF9    CNVCLH  JSR     CNVXYD          First calculate DUMPL/H
                ;Next routine follows automatically

                ;*** Convert DUMPL/H to cursorregister values in CRT ***

F9C2 A0 0F      DLHCLH  LDY     #$0F            Number of register in CRT
F9C4 8C 40E1            STY     CRTCAR          Select cur lo
F9C7 AD 24E7            LDA     DUMPL           Get DUMPL value
F9CA 8D 41E1            STA     CRTCRF          Dumpl in cur lo
F9CD CD ADE7            CMP     START           16 bit substr.
F9D0 AD 25E7            LDA     DUMPH           Then highbyte
F9D3 AA                 TAX
F9D4 ED AEE7            SBC     START+1         Highbyte START
F9D7 90 04              BCC     1.F             If START>DUMP then normal exit
F9D9 8A                 TXA
F9DA 29 07              AND     #$07
F9DC 24                 fcc     $24             Skip next instruction
F9DD 8A         1       TXA                     Get DUMPH for normal exit
F9DE 29 0F              AND     #$0F            Strip 5 most significant bits
F9E0 88                 DEY
F9E1 8C 40E1            STY     CRTCAR          Select cur hi
F9E4 8D 41E1            STA     CRTCRF          DUMPH in cur hi
F9E7 60                 RTS

                ;*** Scroll in opposit direction (down) ***

F9E8 38         SCRLDWN SEC
F9E9 A5 00      1       LDA     PTA
F9EB 48                 PHA
F9EC A5 01              LDA     PTA+1
F9EE 48                 PHA
F9EF A5 02              LDA     PTB
F9F1 48                 PHA
F9F2 A5 03              LDA     PTB+1
F9F4 48                 PHA
F9F5 90 43              BCC     2.F
F9F7 AD ADE7            LDA     START           Calculate new START address
F9FA AA                 TAX                     Save old START lowbyte
F9FB E9 50              SBC     #80             (old START-80=new START) address
F9FD 8D ADE7            STA     START
FA00 8D 24E7            STA     DUMPL           This value also in DUMPL, writepos. is 0,0 !!
FA03 48                 PHA                     Save START low for CRT register
FA04 AD AEE7            LDA     START+1         Get highbyte
FA07 A8                 TAY                     Save old START highbyte
FA08 E9 00              SBC     #0              Substract the carry
```

```
FA0A 20 87F9          JSR     INRNG
FA0D 8D AEE7          STA     START+1         Result is new START highbyte
FA10 8D 25E7          STA     DUMPH           And also new DUMP highbyte
FA13 29 07            AND     #$07            Strip for crtc
FA15 48               PHA                     Save START high for CRT register

                ;Calculate statusline position: START+$0780

FA16 18               CLC
FA17 8A               TXA                     Get old START lowbyte
FA18 69 80            ADC     #$80            Calculate lowbyte
FA1A 85 00            STA     PTA             Result in zeropage pointer
FA1C 98               TYA                     Get old START highbyte
FA1D 69 07            ADC     #$07            Calculate highbyte
FA1F 20 87F9          JSR     INRNG
FA22 85 01            STA     PTA+1           Result in zeropage pointer

                ;Calculate last line position: START+$0730

FA24 18               CLC
FA25 8A               TXA                     Get old START lowbyte
FA26 69 30            ADC     #$30            Calculate lowbyte
FA28 85 02            STA     PTB             Result in zeropage pointer
FA2A 98               TYA                     Get old START highbyte
FA2B 69 07            ADC     #$07            Calculate highbyte
FA2D 20 87F9          JSR     INRNG
FA30 85 03            STA     PTB+1           Result in zeropage pointer

FA32 A0 00            LDY     #0
FA34 4C 77FA          JMP     CPSTLL          Continue elsewhere

                ;*** Scroll the screen up one line ***

FA37 18         SCROLL  CLC
FA38 90 AF              BCC     1.B
FA3A AD ADE7    2       LDA     START           Calculate new START address
FA3D AA                 TAX                     Save old START address lowbyte
FA3E 69 50              ADC     #80             (old START+80=new START) address
FA40 8D ADE7            STA     START
FA43 48                 PHA                     Save START low for CRT register
FA44 AD AEE7            LDA     START+1         Get high byte
FA47 A8                 TAY                     Save old START highbyte
FA48 69 00              ADC     #0              Add the carry if there was one
FA4A 20 87F9            JSR     INRNG
FA4D 8D AEE7            STA     START+1         Result is new START highbyte
FA50 29 07              AND     #$07            Strip for crtc
FA52 48                 PHA                     Save START high for CRT register

                ;Calculate last line position: START+$0780

FA53 18               CLC
FA54 8A               TXA                     Get old START lowbyte
FA55 69 80            ADC     #$80            Calculate lowbyte
FA57 85 00            STA     PTA             Result in zeropage pointer
FA59 8D 24E7          STA     DUMPL           Also in new DUMPL
FA5C 98               TYA                     Get old START highbyte
FA5D 69 07            ADC     #$07            Calculate highbyte
FA5F 20 87F9          JSR     INRNG
FA62 85 01            STA     PTA+1           Result in zeropage pointer
FA64 8D 25E7          STA     DUMPH           Also in DUMPH, writepos. is 0,24!!!

                ;Calculate statusline position :START+$07D0

FA67 18               CLC
FA68 8A               TXA                     Get old START lowbyte
FA69 69 D0            ADC     #$D0            Calculate lowbyte
FA6B 85 02            STA     PTB             Result in zeropage pointer
FA6D 98               TYA                     Get old START highbyte
FA6E 69 07            ADC     #$07            Calculate highbyte
FA70 20 87F9          JSR     INRNG
FA73 85 03            STA     PTB+1           Result in zeropage pointer

FA75 A0 17            LDY     #23
FA77 A2 00      CPSTLL  LDX     #0              Set X,Y cursorpointer
FA79 8E 04E7            STX     CURPX
FA7C 8C 05E7            STY     CURPY

                ;Copy calculated values in CRT registers
```

```
FA7F A0 00              LDY     #0
FA81 A2 0C              LDX     #$0C            Number of START HI register
FA83 20 02FB            JSR     VERBLANK        Wait for vertical blank if CRT=6545
FA86 8E 40E1            STX     CRTCAR          Select START HI register
FA89 68                 PLA                     Get value
FA8A 8D 41E1            STA     CRTCRF          First set START HI
FA8D E8                 INX                     Number of next register
FA8E 8E 40E1            STX     CRTCAR          Select START LO register
FA91 68                 PLA                     Get value
FA92 8D 41E1            STA     CRTCRF          Then set START LO

                ;Copy statusline into last line on screen

FA95 A2 50              LDX     #$50            Only 80 characters
FA97 B1 00      MVR     LDA     [PTA],Y         Get statusline character
FA99 91 02              STA     [PTB],Y
FA9B A9 20              LDA     #' '            Get space character
FA9D 91 00              STA     [PTA],Y         Fill old statusline with spaces
FA9F E6 00              INC     PTA             Increase statuslinepointer lowbyte
FAA1 F0 16              BEQ     HGA             If zero then also highbyte
FAA3 E6 02      HGC     INC     PTB             Increase lastlinepointer lowbyte
FAA5 F0 1D              BEQ     HGB             If zero also highbyte
FAA7 CA         HGD     DEX                     Ready?
FAA8 D0 ED              BNE     MVR             If not all characters done then continue

FAAA 68                 PLA
FAAB 85 03              STA     PTB+1
FAAD 68                 PLA
FAAE 85 02              STA     PTB
FAB0 68                 PLA
FAB1 85 01              STA     PTA+1
FAB3 68                 PLA
FAB4 85 00              STA     PTA
FAB6 4C C2F9            JMP     DLHCLH          Calculate new cursoraddress and ready!!!

FAB9 E6 01      HGA     INC     PTA+1           Increase also highbyte
FABB A5 01              LDA     PTA+1
FABD 20 87F9            JSR     INRNG
FAC0 85 01              STA     PTA+1           Store new value
FAC2 D0 DF              BNE     HGC             Branch always
FAC4 E6 03      HGB     INC     PTB+1           Increase also highbyte
FAC6 A5 03              LDA     PTB+1
FAC8 20 87F9            JSR     INRNG
FACB 85 03              STA     PTB+1           Store new value
FACD D0 D8              BNE     HGD             Branch always

                ;*** Place cursor on next position, eventually ***
                ;*** new line or scroll.                       ***

FACF EE 04E7    CURVER  INC     CURPX           First increase X pointer
FAD2 AE 04E7            LDX     CURPX           Get X pointer
FAD5 E0 50              CPX     #80             Was it the last position
FAD7 D0 12              BNE     UITCRV          If not then normal next position
FAD9 A2 00              LDX     #$00            Else goto first position on next line
FADB 8E 04E7            STX     CURPX           Store 00 in pointer
FADE EE 05E7            INC     CURPY           Increase then also Y position
FAE1 AC 05E7            LDY     CURPY           Check if it was the last line
FAE4 C0 18              CPY     #24             Only 24 lines on 1 screen
FAE6 D0 03              BNE     UITCRV          Normal next position now
FAE8 4C 37FA            JMP     SCROLL          It was the last line so scroll!!!

                ;*** Calculate new DUMP and set cursor ***

FAEB EE 24E7    UITCRV  INC     DUMPL           Increase DUMP address
FAEE D0 0F              BNE     UITCRVA         If zero then also highbyte
FAF0 EE 25E7            INC     DUMPH           Increase highbyte
FAF3 AD 25E7            LDA     DUMPH           Get highbyte
FAF6 C9 F0              CMP     #VDURAM+$0800>>8 Watch out for maximum
FAF8 D0 05              BNE     UITCRVA         Jump if not over maximum
FAFA A9 E8              LDA     #VDURAM>>8      Reset DUMPH
FAFC 8D 25E7            STA     DUMPH           Put value in register
FAFF 4C C2F9    UITCRVA JMP     DLHCLH          Set cursor and ready

                ;*** Wait for a vertical blank, only for 6545 ***

FB02            VERBLANK
FB02 2C 46E7            BIT     CHKCRT          $00 for 6845
```

```
FB05 F0 0E            BEQ     1.F
FB07 AD 40E1          LDA     CRTCAR          Get statusregister
FB0A 29 20            AND     #$20            Check only vertical blank bit
FB0C D0 F4            BNE     VERBLANK        Wait until it is zero
FB0E AD 40E1  VRBLK   LDA     CRTCAR          Get statusregister
FB11 29 20            AND     #$20            Check vert. blank bit again
FB13 F0 F9            BEQ     VRBLK           Wait until it is set
FB15 60       1       RTS                     Now you have the whole vert. blank time

              ;*** Set flag to 6545 crt controller ***

FB16 A9 FF    SET65   LDA     #$FF
FB18 8D 46E7          STA     CHKCRT
FB1B 60               RTS

              ;*** Set no cursor ***

FB1C A9 20    CURSUIT LDA     #$20            Value for no cursor
FB1E D0 03            BNE     CURSZET         Continue elsewhere

              ;*** Restore old cursor mode ***

FB20 AD 71E7  CURSOUD LDA     COUD            Get old cursor mode

              ;*** Send cursor mode to CRT ***

FB23 A2 0A    CURSZET LDX     #$0A            Get number of register
FB25 8E 40E1          STX     CRTCAR          Select CUR START register
FB28 8D 41E1          STA     CRTCRF          Place value in register
FB2B 60               RTS

              ;*** Clear screen subroutine ***

FB2C A9 20    FORMFEED LDA    #'              Get space character
FB2E A2 00             LDX    #$00            Reset counter
FB30 9D 00E8  FFBACK  STA     VDURAM,X        Place spaces direct in videoram
FB33 9D 00E9          STA     VDURAM+$0100,X
FB36 9D 00EA          STA     VDURAM+$0200,X
FB39 9D 00EB          STA     VDURAM+$0300,X
FB3C 9D 00EC          STA     VDURAM+$0400,X
FB3F 9D 00ED          STA     VDURAM+$0500,X
FB42 9D 00EE          STA     VDURAM+$0600,X
FB45 9D 00EF          STA     VDURAM+$0700,X
FB48 CA               DEX                     Decrease counter for next 256 bytes
FB49 D0 E5            BNE     FFBACK          Ready?
FB4B 20 49F6          JSR     STATOUD         Restore statusline, it was destroyed

              ;*** Cursor to home position ***

FB4E A9 00    CURSHOME LDA    #$00            Reset X,Y cursor pointer
FB50 8D 04E7          STA     CURPX
FB53 8D 05E7          STA     CURPY
FB56 4C BFF9          JMP     CNVCLH          Calculate DUMP and place cursor

              ;*** Print a character only on the screen ***
              ;*** Test for direct cursor addressing    ***
              ;*** Place cursor on X,Y position         ***

FB59 48       PRVDU   PHA
FB5A 20 5CF6          JSR     SAVEREGS
FB5D 68               PLA
FB5E 20 64FB          JSR     PRVDU1
FB61 4C 78F6          JMP     RESTOREGS

FB64 AA       PRVDU1  TAX                     Save character in X
FB65 AD 06E7          LDA     CURP            Check direct cursor adressing flag
FB68 F0 39            BEQ     PRINTKAR        Normal character
FB6A C9 FF            CMP     #$FF            If CURP=FF then error took place
FB6C F0 20            BEQ     UITPOINT        To error exit
FB6E 2C 06E7          BIT     CURP            Test for pointers
FB71 30 02            BMI     XPOINTER        It was a X pointer
FB73 70 13            BVS     YPOINTER        It was a Y pointer

FB75 CA       XPOINTER DEX                    Value minus 1
FB76 8A                TXA
FB77 C9 50             CMP    #80             Max X pointer is 80
FB79 30 06             BMI    XOKE
FB7B A9 FF             LDA    #$FF            Error X was to large
```

```
FB7D 8D 06E7          STA    CURP          Set error flag
FB80 60               RTS                  X-error exit

FB81 8D 07E7  XOKE    STA    SCURPX        Save X pointer
FB84 4E 06E7          LSR    CURP          Set flag to Y pointer
FB87 60               RTS                  Get next pointer

FB88 CA       YPOINTER DEX                 Value minus 1
FB89 8A               TXA
FB8A C9 19            CMP    #25           Max Y pointer is 25
FB8C 30 06            BMI    YOKE

              ;Normal and error exit

FB8E A9 00    UITPOINT LDA   #0            Error Y was to large
FB90 8D 06E7          STA    CURP          Reset curp
FB93 60               RTS                  Y-error exit

              ;Both pointers correct

FB94 8D 05E7  YOKE    STA    CURPY         Set Y pointer
FB97 AD 07E7          LDA    SCURPX        Get X pointer
FB9A 8D 04E7          STA    CURPX         Set X pointer
FB9D 20 BFF9          JSR    CNVCLH        Calculate DUMP and place cursor
FBA0 4C 8EFB          JMP    UITPOINT      Reset curp

              ;*** Compute the character and print it ***

FBA3 8A       PRINTKAR TXA                 Restore character in A
FBA4 C9 20            CMP    #$20          Check for control characters
FBA6 90 3B            BCC    CONTROL       Branch if control
FBA8 2C 41E7          BIT    ESCFLG        Is the escape flag set?
FBAB 10 26            BPL    PRTKRA        Branch if not set
FBAD C9 69            CMP    #'i           Invers video?
FBAF D0 0B            BNE    PRTKRB        Branch if not invers
FBB1 A9 80            LDA    #$80          Get value
FBB3 8D 43E7  PRTKD   STA    INVERS        Set invers
FBB6 A9 00    PRTKRG  LDA    #$00          Reset escape flag
FBB8 8D 41E7          STA    ESCFLG
FBBB 60               RTS

FBBC C9 6E    PRTKRB  CMP    #'n           Check for reset invers video
FBBE D0 04            BNE    PRTKRE        Branch if not
FBC0 A9 00            LDA    #0            Reset invers video
FBC2 F0 EF            BEQ    PRTKD         Branch always

FBC4 C9 46    PRTKRE  CMP    #'F           Check for set grafics
FBC6 F0 06            BEQ    PRTKRI        Branch if yes
FBC8 C9 47            CMP    #'G           Reset grafics
FBCA D0 EA            BNE    PRTKRG        Branch if not
FBCC A9 00            LDA    #0            Reset grafics
FBCE 8D 1CE7  PRTKRI  STA    GRFLG
FBD1 F0 E3            BEQ    PRTKRG        Branch always

FBD3 2C 1CE7  PRTKRA  BIT    GRFLG         Grafics enabled?
FBD6 F0 02            BEQ    PRTKRH        Branch if disabled
FBD8 29 1F            AND    #$1F          Make characters <$32
FBDA 0D 43E7  PRTKRH  ORA    INVERS        Eventually invers video
FBDD 20 23E7          JSR    DMPRAM
FBE0 4C CFFA          JMP    CURVER        Place cursor on next position

              ;*** Compute the control characters ***

FBE3 C9 07    CONTROL CMP    #$07
FBE5 D0 10            BNE    1.F

              ;*** Ring the bell ***

FBE7 AD 1CE1  PIEPER  LDA    VBPCR
FBEA 29 DF            AND    #%11011111    PCR 5 :=0
FBEC 09 C0            ORA    #%11000000    PCR 7 and 6 :=1
FBEE 8D 1CE1          STA    VBPCR         CB2 low
FBF1 09 E0            ORA    #%11100000    PCR 7,6,5 :=1
FBF3 8D 1CE1          STA    VBPCR         CB2 High
FBF6 60               RTS

FBF7 C9 08    1       CMP    #$08
FBF9 D0 20            BNE    2.F
```

```
                ;*** Cursor 1 column back

FBFB CE 04E7    BCKSPCA DEC     CURPX           Decrease X pointer
FBFE AE 04E7            LDX     CURPX
FC01 E0 FF              CPX     #$FF            One line up?
FC03 D0 13              BNE     BCKSPCC         Branch if not begin of line
FC05 AC 05E7            LDY     CURPY           Is it allowed another line up?
FC08 D0 06              BNE     BCKSPCB         Branch if allowed
FC0A 20 E8F9            JSR     SCRLDWN         Otherwise scroll down
FC0D 4C 13FC            JMP     BCKSPCD         Continue elsewhere
FC10 CE 05E7    BCKSPCB DEC     CURPY           One line up
FC13 A2 4F      BCKSPCD LDX     #79             Get pointer to last column
FC15 8E 04E7            STX     CURPX           Place cursor in last column
FC18 4C BFF9    BCKSPCC JMP     CNVCLH          Calculate DUMP, place cursor

FC1B C9 09      2       CMP     #$09
FC1D D0 0B              BNE     3.F

                ;*** Normal tab ***

FC1F 20 CFFA    TAB     JSR     CURVER          One place to the right
FC22 AD 04E7            LDA     CURPX           Check position
FC25 29 07              AND     #$07            Tabs are on every 8th position
FC27 D0 F6              BNE     TAB             Ready?
FC29 60                 RTS

FC2A C9 0A      3       CMP     #$0A
FC2C D0 16              BNE     4.F

                ;*** Linefeed ***

FC2E AE 04E7    LINEFEED LDX    CURPX           Get current X position
FC31 8E 07E7             STX    SCURPX          Save it
FC34 EE 05E7             INC    CURPY           To next line
FC37 AC 05E7             LDY    CURPY           Get next line number
FC3A C0 18               CPY    #24             Not to high number?
FC3C D0 23               BNE    VTUIT           No
FC3E 20 37FA             JSR    SCROLL          Scroll now
FC41 4C 5BFC             JMP    VTTA            Continue elsewhere

FC44 C9 0B      4       CMP     #$0B
FC46 D0 1C              BNE     5.F

                ;*** One line up ***

FC48 AE 04E7    VERTTAB LDX     CURPX           Get current X position
FC4B 8E 07E7            STX     SCURPX          Save it
FC4E CE 05E7            DEC     CURPY           To previous line
FC51 AC 05E7            LDY     CURPY           Get that linenumber
FC54 C0 FF              CPY     #$FF            Not to low number?
FC56 D0 09              BNE     VTUIT           No
FC58 20 E8F9            JSR     SCRLDWN         So scroll down now
FC5B AE 07E7    VTTA    LDX     SCURPX          Get save X pointer
FC5E 8E 04E7    VTTB    STX     CURPX           Restore X
FC61 4C BFF9    VTUIT   JMP     CNVCLH          Calculate DUMP and place cursor

FC64 C9 0C      5       CMP     #$0C
FC66 D0 03              BNE     6.F
FC68 4C 2CFB            JMP     FORMFEED        Clear screen

FC6B C9 0D      6       CMP     #$0D
FC6D D0 04              BNE     7.F

                ;*** Carriage return ***

FC6F A2 00      CARRET  LDX     #$00            X position is 0
FC71 F0 EB              BEQ     VTTB            Branch always

FC73 C9 19      7       CMP     #$19
FC75 D0 4F              BNE     8.F

                ;*** Erase to end of screen ***

FC77 A5 00      EEOS    LDA     PTA
FC79 48                 PHA
FC7A A5 01              LDA     PTA+1
FC7C 48                 PHA
```