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        ttl      "tp I/O65 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 IO65
E800  VDDRAM   equ      $E800        ;Start of 2Kbyte VDU-ram
F000  IO_BEG   equ      $F000        ;Begin of IO65
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  RPDIN    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  HSFL6    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  GRFL6    res  1              ;Graphics 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      SEEK  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 ***

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F00F 4C BBF3	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	IEROU JMP	[IRQVECTOR]	

;*** Main Reset routine ***

F033 DB	RESET	CLD	First clear decimal
F034 7B		SEI	No interrupts
F035 A2 0F		LDX	##0F
F037 BA	1	TXA	Initialize DATRAM
F038 49 0F		EDR	##0F
F03A 9D F0FF		STA	DATRAM,X
F03D CA		DEX	
F03E 10 F7		BPL	1.B
F040 A9 00		LDA	##00
F042 A2 51		LDX	##NDVRS+1&255
F044 9D FFE6	2	STA	IO_VARS-1,X
F047 CA		DEX	Reset variable
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
F051 F0 0A		BEQ	4.F
F053 AA		TAX	Branch if end
F054 B9 ADF1		LDA	VART2,Y
F057 9D 00E7		STA	IO_VARS,X
F05A CB		INY	Set variable to initial value
F05B D0 F1		BNE	3.B
F05D 20 D3F0	4	JSR	KBINIT
F060 20 2CF1		JSR	VDUINIT
F063 20 2CFB		JSR	FORMFEED
			Keyboard init. Crtc init. 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 5B	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 1B6920204B	fcc	,\$1B,'i HaViSoft ',,\$1B,'n\n\r',0	
F097 615669536F			
F09C 667420201B			
FOA1 6E0A0D00			
FOA5 20 99F6	1	JSR	INP
FOAB 29 5F		AND	##01011111
FOAA C9 42		CMR	##B
FOAC D0 F7		BNE	1.B
FOAE 20 BFFD		JSR	BCNTR
FOB1 4C A5F0		JMP	1.B
			Execute bootstrap

*** By X selectable device initialization ***

FOB4 BA	INITS	TXA		
FOB5 F0 1B		BEG	2.F	Not correct input
FOB7 30 0C		BMI	1.F	Branch for input devices
FOB9 C9 09		CMP	#9	
FOBB B0 15		BCS	2.F	Not correct input
FOBD 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 BD B7E7		STA	KEYPNT	
F0D8 BD 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 BD 0CE1		STA	VAPCR	
F0E5 A9 B2		LDA	##B2	Enable interrupts from CA1 only
F0E7 BD 0EE1		STA	VAIER	
F0EA AD 0BE1		LDA	VAACR	
F0ED 09 01		ORA	##00000001	Latch mode port A
F0EF BD 0BE1		STA	VAACR	
F0F2 18	DUMRTS	CLC		
F0F3 60		RTS		

*** Centronics parallel printer initialisation subroutine ***

F0F4 A9 FF	PRINIT	LDA	##FF	
F0F6 BD 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 BD 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 BD 12E1		STA	VBPBDD	Set data direction
F10B A9 00		LDA	##00	
F10D BD 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 1B		CLC		
F11A D0 0F		BNE	3.F	Then handshake received
F11C CA		DEX		Wait and
F11D D0 F5		BNE	2.B	Try again
F11F 8B		DEY		Wait and
F120 D0 F0		BNE	1.B	Try again

;No handshake received, device not present!!!

F122 AD 10E7		LDA	DEVMDOUT	Get output device select bits
F125 29 BF		AND	##10111111	Disable centronics par. output
F127 BD 10E7		STA	DEVMDOUT	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 BA	1	TXA		
F12F BD 40E1		STA	CRTCAR	Select register
F132 BD 41F1		LDA	CTB,X	Get value from table
F135 BD 41E1		STA	CRTCRF	Put value in register
F138 CA		DEX		Next register
F139 10 F3		BPL	1.B	Ready?
F13B EB		INX		
F13C BE 71E7		STX	COUD	

F13F 18 CLC
F140 60 RTS

;*** CRTIC 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		

;Offsettable 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	DV06VEC	
F16F 8A		fcc	DV06VEC+1	
F170 8B		fcc	DV16VEC	
F171 8C		fcc	DV16VEC+1	
F172 8D		fcc	DV07VEC	
F173 8E		fcc	DV07VEC+1	
F174 8F		fcc	DV17VEC	
F175 90		fcc	DV17VEC+1	
F176 91		fcc	DV08VEC	
F177 92		fcc	DV08VEC+1	
F178 93		fcc	DV18VEC	
F179 94		fcc	DV18VEC+1	
F17A 23		fcc	DMPRAM	
F17B 26		fcc	DMPRAM+3	RTS
F17C 27		fcc	LDALET	
F17D 2A		fcc	LDALET+3	RTS
F17E 2B		fcc	FRMR	
F17F 2E		fcc	FRMR+3	RTS
F180 2F		fcc	FRRE	
F181 32		fcc	FRRE+3	RTS
F182 B5		fcc	IRGVECTOR	
F183 B6		fcc	IRGVECTOR+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	

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

;Datatablel 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 00EB		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

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

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```

F1F7 A9 EF      VOINIT LDA    #WYTEF&255
F1F9 8D 85E7    STA    DVD4VEC
F1FC A9 F7      LDA    #WYTEF>>8
F1FE 8D 86E7    STA    DVD4VEC+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 8D 76E7    1     LDA    WRBEG,X    Copy beginaddress into selfmod. program
F220 9D 2CE7    STA    FRWR+1,X
F223 8D 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

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

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;*** IRQ interrupt routine ***

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```

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    VIAINT
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    VIAINT 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 7BF2    2     JSR    INTFUN    Execute interrupt routine

```

```

;
; Return address for executed interrupt routine
F272 68      INTEX  PLA
F273 AB      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 4B      PHA
F27F BD 50E7 LDA      INTV1,X   Get low byte
F282 4B      PHA
F283 60      RTS          Execute interrupt routine

;Clock update interrupt routine
F284 2C 04E1 INTTIM BIT      VATACL   Reset timer interrupt flag
F287 A9 00   LDA      #$00     Update clock
                               TIME SEC1.20,$14
F289 AE 37E7 LDX      SEC1.20
F28C EB      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
  LDX SECONDS
  INX
F2B0 8E 84E7 STX      SECONDS
F2B3 E0 3C   CPX      #$3C
F2B5 D0 53   BNE      INTND
F2B7 8D 84E7 STA      SECONDS
  TIME MINUTES,$3C
  LDX MINUTES
  INX
F2BE 8E 83E7 STX      MINUTES
F2C1 E0 3C   CPX      #$3C
F2C3 D0 45   BNE      INTND
F2C5 8D 83E7 STA      MINUTES
  TIME HOURS,$18
  LDX HOURS
  INX
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      #200000011 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 EB          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 ***

F32B 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
F338 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 error message
F35C 070A0D4952  fcc          7, '\n\rIRQ ignored\n\r',0
F361 512069676E

```

F366 6F7265640A
 F368 0D00
 F36D 4C 72F2

JMP INTEX

;It was an NMI!!!!

F370 A2 00 UNNMI LDX #000 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 AB TAY
 F3E8 68 PLA
 F3E9 AA TAX
 F3EA 68 PLA
 F3EB 28 PLP
 F3EC 60 RTS

;*** Set linenummer 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
F408	AD 3EE7	LDA	LNHR	Get highbyte linenumbr
F40E	AE 3DE7	LDX	LNRL	Get lowbyte linenumbr
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	LNHR	
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 C0FF		JSR	ADPNTX	Setup a self-modifying 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	CLSPRT	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 B5F4		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 C0FF  JSR    ADPNTX      Setup a selfmodifying program
F4AF A9 83   LDA    ##83
F4B1 8D 01E7  STA    STATTOG
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    STATTOG
F4C3 A9 02   LDA    ##02
F4C5 20 CBF4  JSR    PRSTAT
F4CB 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    STATTOG
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
F4FB 00
F4F9 AD 10E7  LDA    DEVMODOUT   What are the active devices?
F4FC AB      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 AB      TAY          Keep rest of devices in Y
F50C 20 3FF5  JSR    PRONOFF     Print 'on' (C=1), 'off' (C=0)
F50F EB      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
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 85F5    JSR    PRDAT       Print the date
F571 20 12F6    JSR    ST2UD       Print rest of the line
F574 20 A2F3    JSR    UNSELS
F577 4C B3FD    JMP    SFIENDD     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     Wait for vertical blank
F586 20 02FB    JSR    VERBLANK
F589 20 9DF7    JSR    PRTEXT
F58C 14071900    fcc    20,7,25,0    Set pointer to Time position
F590 AD 82E7    LDA    HOURS
F593 20 BEFF    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
F5A5 20 ABF5    JSR    PRTIMA     Print the seconds
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     Print text
F5B8 20 9DF7    JSR    PRTEXT
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	CLKLUP	LDA	STATTOG	Get kind of statusline
F5E2 C9 B2		CMF	##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 1B		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 0B		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	SFIENDD	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 EB		INX		Because first column is 1
F625 8A		TXA		
F626 20 BEFF		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 EB		INX		Because first row is 1
F639 8A		TXA		
F63A 20 BEFF		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 AB	SAVEREGS	PHA		First save the accu
F65D BA		TXA		Save X in the accu
F65E AE 00E7		LDX	SAVSTACKP	Get the software stackpointer
F661 9D 9DE7		STA	XSAVSTACK,X	Save X on xstack
F664 68		PLA		Get old accu
F665 9D 95E7		STA	ASAVSTACK,X	Save A on accustack

```

F668 98 TYA Get Y in accu
F669 9D ASE7 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 0A TAX Get the stackpointer
F684 BC ASE7 LDY YSAVESTACK,X Restore Y
F687 8D 95E7 LDA ASAVESTACK,X Get A and
F68A 4B PHA save it
F68B 8D 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 3B 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 4B 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
F6B4 B0 06 BCS 1.F Get evt. as.
F6B6 20 91F6 JSR XTODEV Branch if no special device selected
F6B9 8D 11E7 STA DEVMODINP Convert X to devicebit in accu
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 1B INPA CLC
F6C7 0A INPB ASL A If C=1 then device is active
F6C8 E8 INX
F6C9 90 FC BCC INPB Look for active device
F6CB 20 4EF7 JSR FLNTAB 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 4B 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 08    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 B1      2      CPY      #81
F713 B0 14    BCS      3.F          Branch if position not correct
F715 68      PLA
F716 98      TYA
F717 AA      TAX
F718 A0 19    LDY      #25          X position
F71A 20 83F9 JSR      PNTCUR      Y position
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      RESDDEV     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      LABEL+#01,X Get highbyte
F754 48      PHA          Push on stack
F755 BD 5DF7 LDA      LABEL,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    DV01-$01   Output devices
F75F 8BF8   fdb    DV02-$01
F761 4BF9   fdb    DV03-$01
F763 EBF7   fdb    DV04-$01
F765 45FB   fdb    DV05-$01
F767 79FB   fdb    DV06-$01
F769 7FF8   fdb    DV07-$01
F76B 85FB   fdb    DV08-$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      Branch if local st.line selected
F7A0 30 0B      BMI    3.F
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 returnaddress
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 32FB 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          Put character in dataregister
F808 8D 11E1   STA    VBPAD
F80B 60      RTS

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

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

;No handshake received

F814 20 28FB   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
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
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 28FB   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     FREED1  JMP      [DVO6VEC]   Output device 6
F87D 6C 8BE7     FREE11  JMP      [DVI6VEC]   Input device 6
F880 6C 8DE7     FREE02  JMP      [DVO7VEC]   Output device 7
F883 6C 8FE7     FREE12  JMP      [DVI7VEC]   Input device 7
F886 6C 91E7     FREE03  JMP      [DVO8VEC]   Output device 8
F889 6C 93E7     FREE13  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     WACKTACK LDA        VAIFR      Wait for acknowledge
F89E 29 10          AND     #10          Check only CB1 flag
F8A0 F0 F9          BEQ     WACKTACK     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          1.F
F8B4 A2 00          LDX     #00          It was a function key
F8B6 BE 19E7     STX     FUNENA       Reset the flag
F8B9 20 FDFC     JSR     FLINTDENSEN   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?
F8CB 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     CURSOLD   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

```

```

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    Turn off screen
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
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        Set flag off
F93C 8E 38E7    STX      TOUTF
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    RSD1   BIT      HSFLG    Stop for handshake?
F954 30 FB      BMI      RSD1      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 EB        INX
F963 AC 0BE7    LDY      YPSOLD    the POSIT call
F966 CB        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>>B Maximum
F989 09 08      ORA     #0B      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	BEG	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 BCF9	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		CMR	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>DUMPH 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 AB		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 DUMPH highbyte
FA13 29 07        AND   #07           Strip for crtc
FA15 4B           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 4B           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 4B           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 BE 04E7      STX   CURPX
FA7C BC 05E7      STY   CURPY

```

;Copy calculated values in CRT registers

FA7F A0 00	LDY	#0	
FAB1 A2 0C	LDX	#\$0C	Number of START HI register
FAB3 20 02FB	JSR	VERBLANK	Wait for vertical blank if CRT=6545
FAB6 8E 40E1	STX	CRTCAR	Select START HI register
FAB9 68	PLA		Get value
FABA 8D 41E1	STA	CRTCRF	First set START HI
FABD E8	INX		Number of next register
FABE 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	
FACB 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	#\$DURAM+\$0800>>8	Watch out for maximum
FAF8 D0 05		BNE	UITCRVA	Jump if not over maximum
FAFA A9 EB		LDA	#\$DURAM>>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    CURSOLD LDA      COLD      Get old cursor mode

```

*** Send cursor mode to CRT ***

```

FB23 A2 0A      CURSZET LDX      #0A      Get number of register
FB25 BE 40E1    STA      CRTCAR      Select CUR START register
FB28 BD 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 00EB    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      PRVDUI
FB61 4C 78F6    JMP      RESTOREGS

```

```

FB64 AA        PRVDUI  TAX          Save character in X
FB65 AD 06E7    LDA      CURP        Check direct cursor addressing 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      X0KE
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      X0KE     STA      SCLRPX  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      SCLRPX  Get X pointer
FB9A 8D 04E7      STA      CURPX   Set X pointer
FB9D 20 BFF9      JSR      CNVCLH  Calculate DUMP and place cursor
FBA0 4C BEF8      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?
FBA8 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      #000   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  Branch always
FBD1 F0 E3       BEQ      PRTKRG

FBD3 2C 1CE7     PRTKRA BIT      GRFLG  Grafics enabled?
FBD6 F0 02       BEQ      PRTKRH   Branch if disabled
FBD8 29 1F       AND      #1F      Make characters <$32
FBD8 0D 43E7     PRTKRH ORA      INVERS  Eventually invers video
FBD0 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
FBE8 09 C0       ORA      #11000000 PCR 7 and 6 :=1
FBE8 8D 1CE1     STA      VBPCR   CB2 low
FBE1 09 E0       ORA      #11100000 PCR 7,6,5 :=1
FBE3 8D 1CE1     STA      VBPCR   CB2 High
FBE6 60           RTS

FBE7 C9 08       1          CMP      #08
FBE9 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?
FC0B D0 06		BNE	BCKSPCB	Branch if allowed
FC0A 20 EBF9		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 ***

FC4B 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 linenumbr
FC54 C0 FF		CPY	#\$FF	Not to low number?
FC56 D0 09		BNE	VTUIT	No
FC5B 20 EBF9		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 4B		PHA		
FC7A A5 01		LDA	PTA+1	
FC7C 4B		PHA		