



R6500 Microcomputer System APPLICATION NOTE

Printer Control with the R6522 VIA

PURPOSE

The R6522 Versatile Interface Adapter (VIA) is an extremely powerful device for controlling peripheral devices in a 6500-based microcomputer system. The most versatile features of the R6522 are the two 16-bit programmable counter/timers, which can significantly reduce and simplify the real-time programs required to control external equipment.

This application note describes how a dot matrix printer mechanism can be interfaced to a Rockwell AIM 65 Microcomputer, using the on-board, user-dedicated R6522 VIA to control all printer functions. The printer mechanism chosen was the Two-Day Corporation 10600 Series 80-column Impact Dot Matrix Printer. Two models of this printer are available:

1. Model 10600A Synchronous Motor Drive
2. Model 10600B Stepper Motor Drive, Independent Paper Feed

The two print mechanisms are identical except for the drive motor and the method of generating the paper feed function. Model 10600A has a fixed printing rate of one line per second. The paper feed is controlled by a ratchet mechanism which generates a paper feed after each line is printed. Model 10600B is somewhat more versatile, since the stepper motor speed can be controlled. Also, the paper feed is under direct control and is independent of print head motion. The required interface hardware and software for both models of the printer are described in the following text.

INTERFACE HARDWARE

Figure 1 shows the circuitry required for the Model 10600A printer. Note the 3 Amp. fuses to protect the print head from overheating and damage due to driver failure. A DIP read relay is used to switch the AC power to the synchronous motor. The relay also provides electrical isolation from the power line; an optical isolator could also be used to perform this function.

Figures 2a and 2b show the motor control section for the Model 10600B. The stepper motors require four sequenced quadrature square waves to generate the stepping motion. The circuits shown generate the required sequence from a single control pulse input from the AIM 65. The Head Drive circuit requires an extra

divide-by-four counter on the input to achieve proper stepping rates from the R6522 Shift Register output.

Figure 3 shows the printer timing.

INTERFACE SOFTWARE

Figure 4 is an overall flowchart for the printer control program. The T1 Timer in the R6522 is used in the free-run mode to generate the dot timing intervals. The T2 Timer is used in the Model 10600B Printer to control the shift register output (CB2), which also operates in the free-run mode to generate the pulse train that controls the head drive stepper motor. The paper feed stepper motor is driven by a software timing loop controlling the CA2 output in manual control mode.

The operation of the program is very straightforward. Since the head is traveling across the platen at a known speed, the dot data is output to the head drive electronics at a fixed constant rate to provide the desired characters.

The nominal character density specified by the manufacturer is 80 characters per line, using a 4-by-7 dot matrix. In order to utilize the dot matrix tables in the AIM 65 Monitor ROM, it was necessary to modify the character font to use a 5-by-7 matrix. Two character densities have been generated: 60 characters per line, corresponding to the AIM 65 Text Editor buffer length, and 72 characters per line for use with the AIM 65 Assembler. Listings for both driver programs are attached for the Model 10600A printer.

Many other character densities and print fonts are possible. The Model 10600A printer is restricted by its constant head speed, however, since the manufacturer recommends a maximum duty cycle on the head solenoids of approximately 30%. This limits the dot density, since the solenoids must be energized for 0.5 Ms to create a satisfactory dot. In the Model 10600B, the head speed can be reduced, resulting in much denser characters. Further, the paper feed control on the 10600B permits graphic printing, although a graphics software package is not presently available.

Although the software listed here is written for the AIM 65 microcomputer, it is useable in any 6500-based system by simply replacing the specified AIM 65 Monitor subroutines with the coding for these subroutines. The subroutines are listed in the AIM 65 Monitor Program Listing, Rockwell Document No. 29650 N36L.

Printer Control with the R6522 VIA

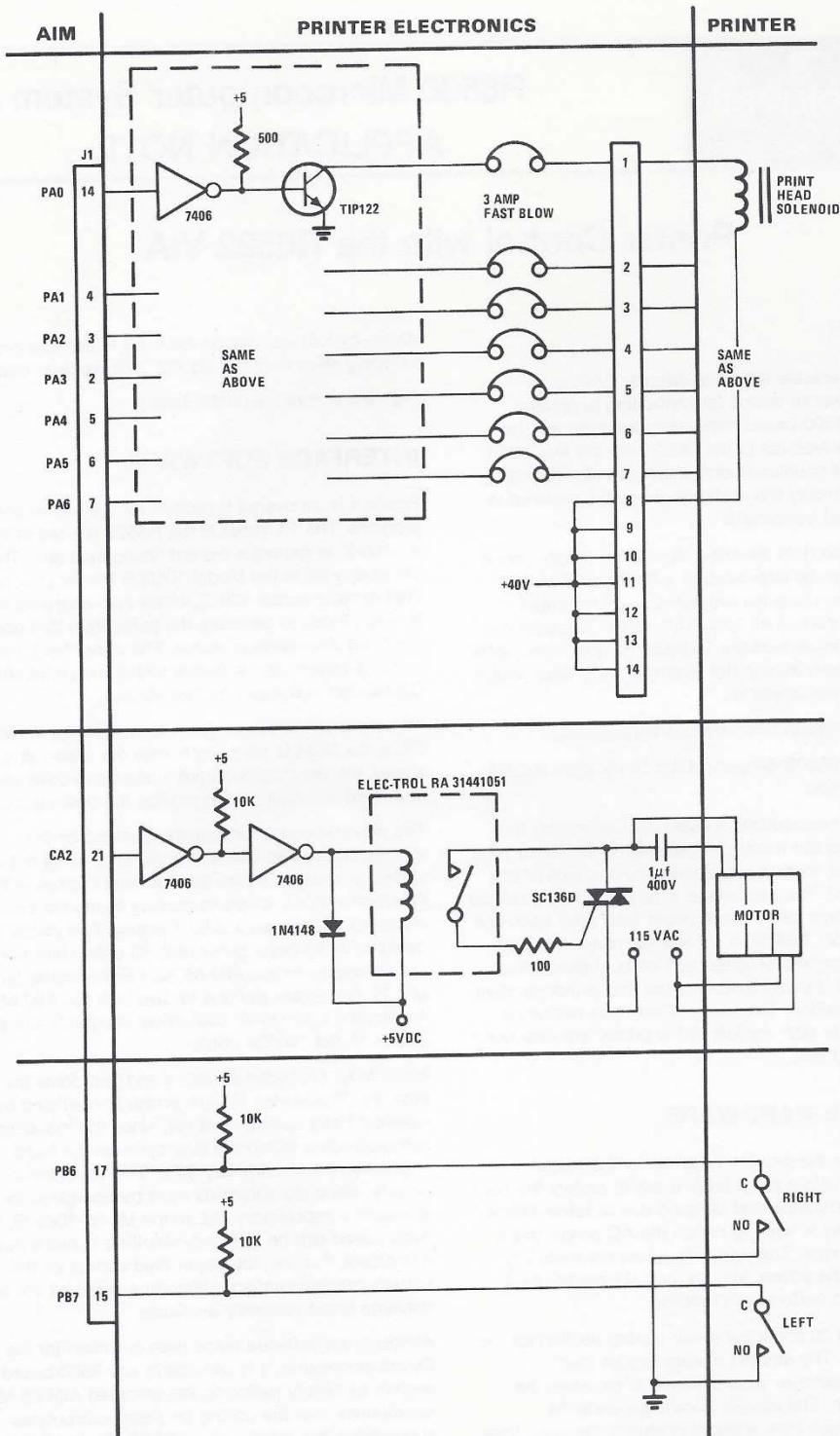


Figure 1. MODEL 10600A PRINTER INTERFACE

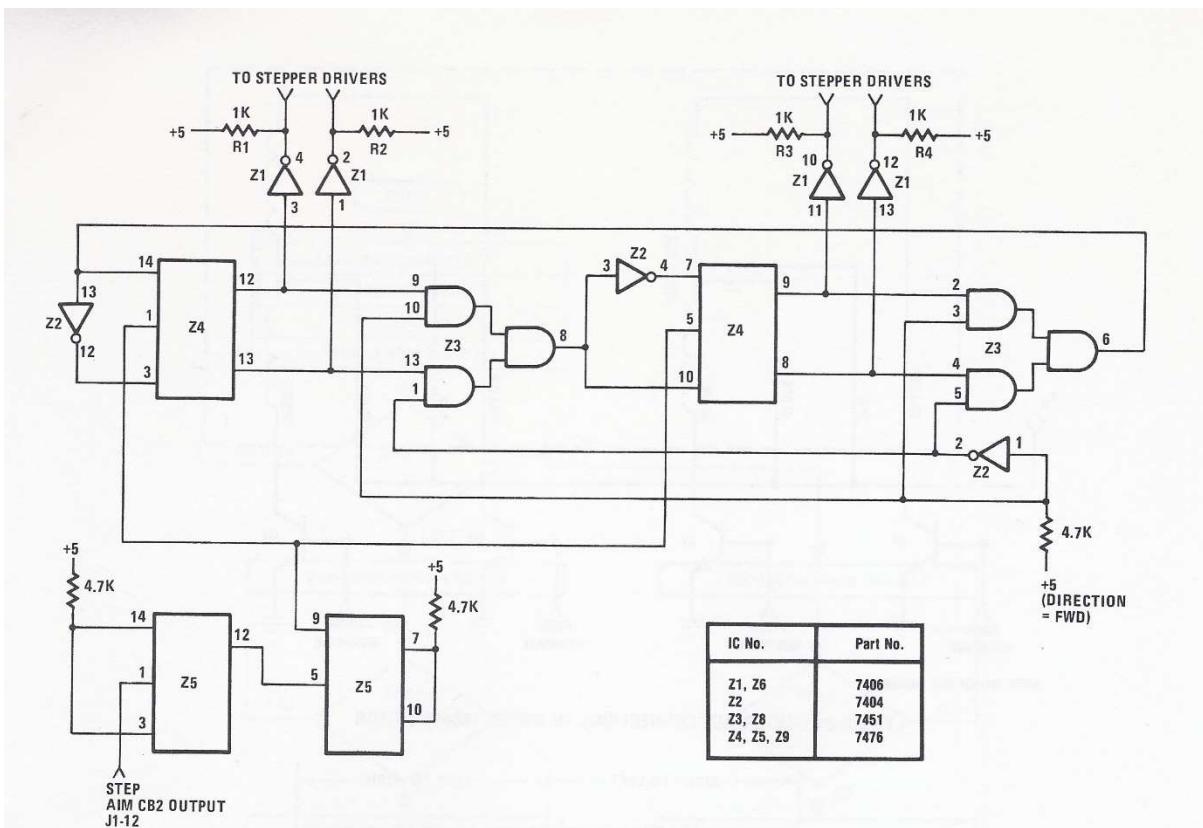


Figure 2a. MODEL 10600B HEAD DRIVE MOTOR INTERFACE

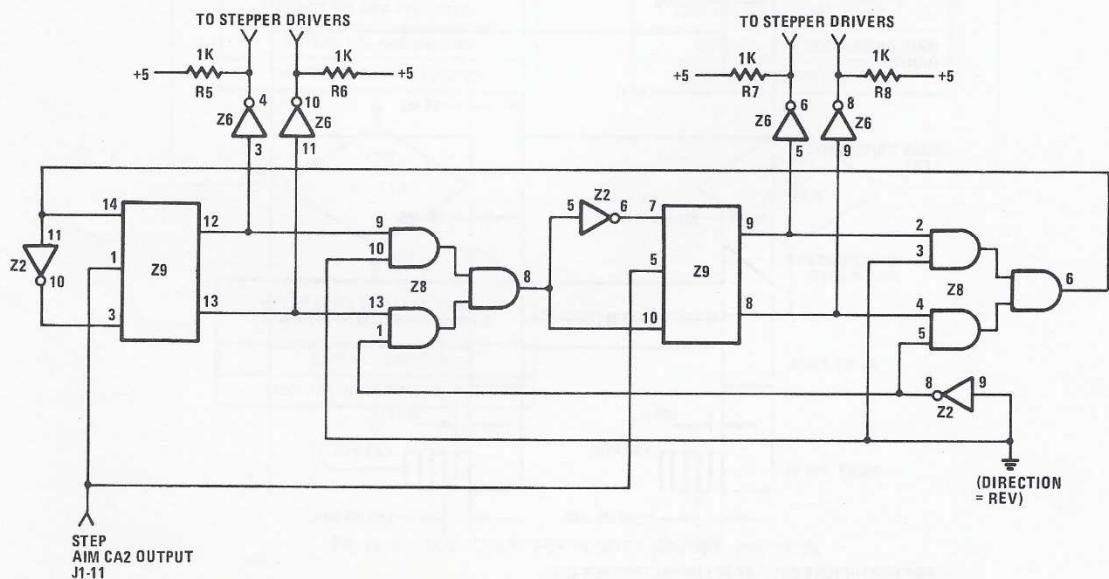
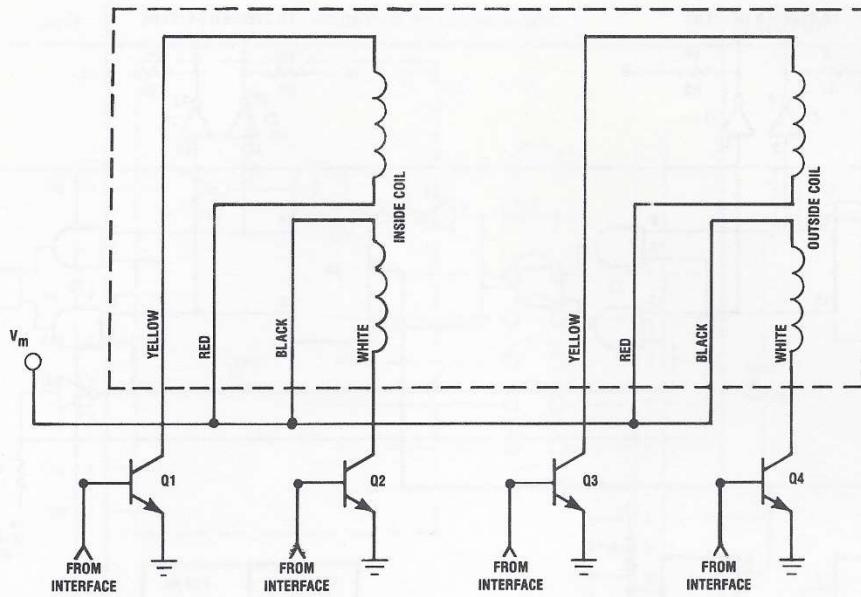
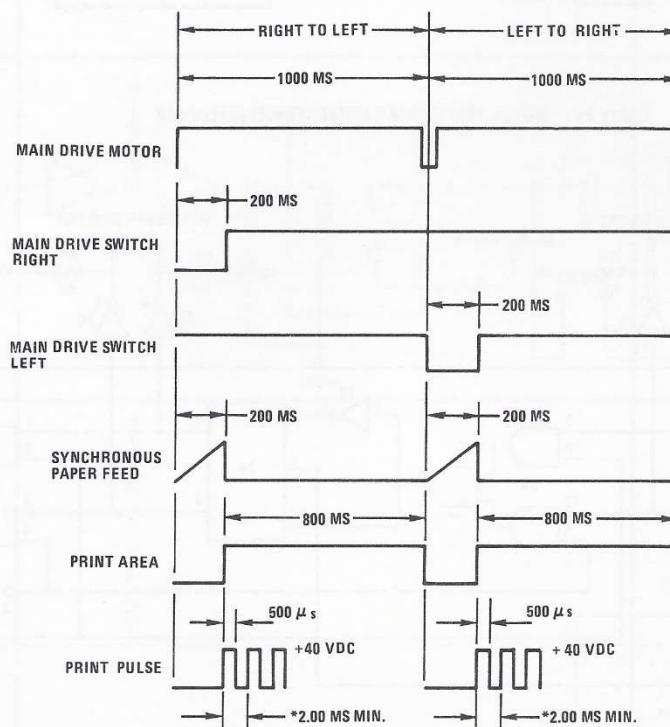


Figure 2b. MODEL 10600B PAPER FEED MOTOR INTERFACE



NOTE: Q1-Q4 ARE 2N6039.

Figure 2c. INTERFACE CONNECTIONS TO MODEL 10600B MOTOR



* FOR CONTINUOUS DUTY AT 80 CHARACTERS PER LINE
BI-DIRECTIONAL PRINTING

Figure 3. PRINTER TIMING

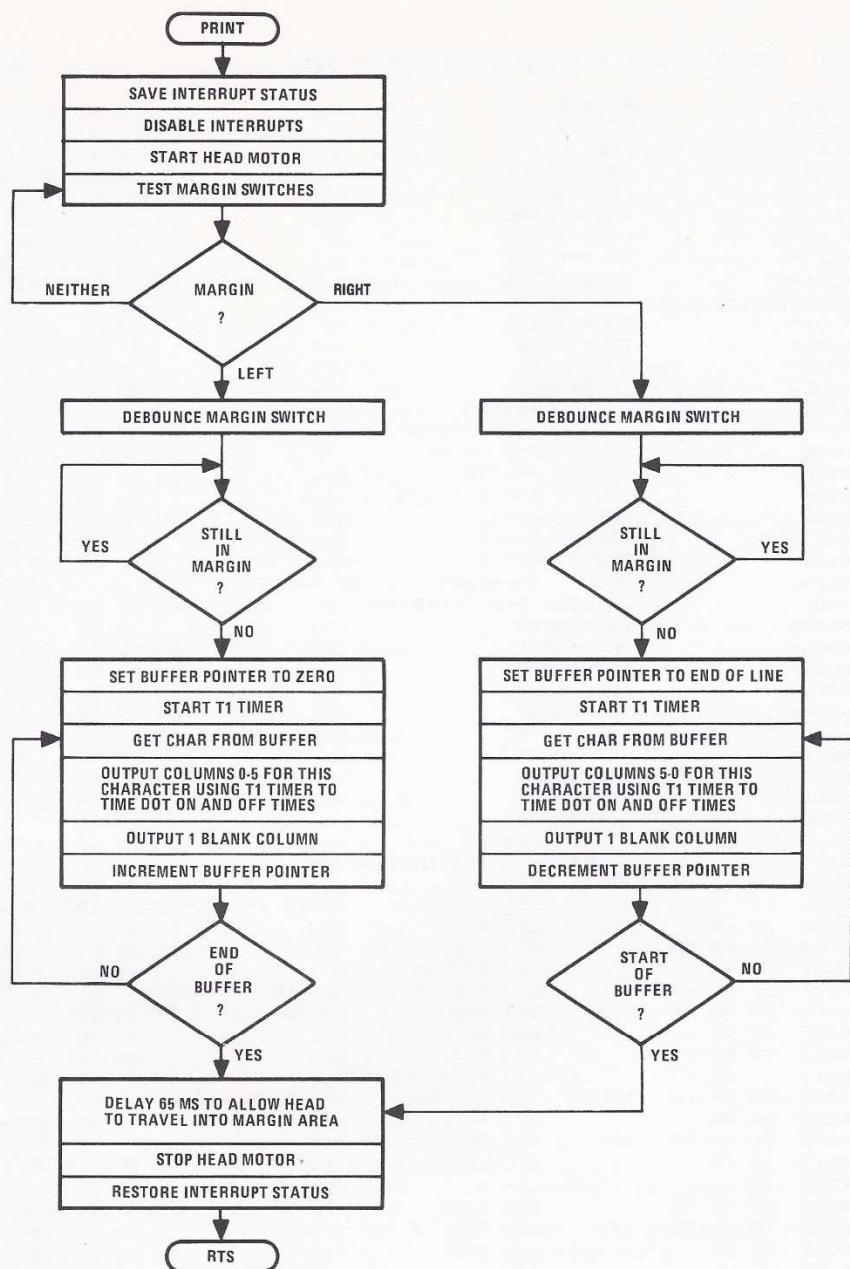


Figure 4. FLOWCHART FOR PRINTER CONTROL PROGRAM

PAGE 0001 MODEL 10600A ASSEMBLER PRINTER DRIVER

```
0002 0032=      PC=$32
0003 003B=      SEMI=$3B
0004 EC18=      DE1=$EC18
0005 EA84=      PACK=$EA84
0006 EB9E=      PHXY=$EB9E
0007 EBAC=      PLXY=$EBAC
0008 F2E1=      COL0=$F2E1
0009 F321=      COL1=$F321
0010 F361=      COL2=$F361
0011 F3A1=      COL3=$F3A1
0012 F3E1=      COL4=$F3E1
0013 A808=      T2L=$A808
0014 000C=      MOTON=$C
0015 000E=      MOTOFF=$E
0016 0000          *=+$100
0017 010A FA 02          WOR DRIVER
0018 010C 4C 00 02          JMP PRINT
0019 010F          *=+$100
0020 0190          SAVA  *====+1
0021 0191          EQFL  *====+1
0022 0192          CRFL  *====+1
0023 0193          PBPTR *====+1
0024 0194          PBUF  *====+2
0025 01DC          ; '6522 REGISTERS'
0026 A000=      DRB=$A000
0027 A001=      DRA=$A001
0028 A002=      DDRB=$A002
0029 A003=      DDRA=$A003
0030 A004=      T1L=$A004
0031 A005=      T1CH=$A005
0032 A007=      T1H=$A007
0033 A008=      ACR=$A008
0034 A00C=      PCR=$A00C
0035 A00D=      IFR=$A00D
0036 01DC          *=+$200
0037 0200          ; 'ENTRY & INITIALIZATION'
0038 0200 08      PRINT PHP      ; SAVE STATUS
0039 0201 78      SEI           ; DIS INT DURING PRINT
0040 0202 A9 D0      LDA #$D0
0041 0204 8D 04 A0      STA T1L
0042 0207 A9 0C      LDA #MOTON
0043 0209 8D 0C A0      STA PCR      ; START MOTOR
0044 020C 20 00 A0      PR1          BIT DRB      ; TEST LIMIT SWITCHES
0045 020F 50 53      BVC RMAR
0046 0211 30 F9      BMI PR1
0047 0213          ; 'LEFT TO RIGHT PRINT'
0048 0213 20 CF 02      LMAR JSR DEBDEL ; DEBOUNCE DELAY
0049 0216 A0 00      LDY #0
0050 0218 20 00 A0      LM1          BIT DRB
0051 0218 10 FB      BPL LM1      ; WAIT TO CLEAR MARGIN
0052 021D A9 01      LDA #1
0053 021F 8D 05 A0      STA T1CH ; START DOT TIMER(200)
0054 0222 B9 94 01      LM2          LDA PBUF, Y ; GET CHAR
0055 0225 29 3F      AND #$3F
0056 0227 AA          TAX
0057 0228 A9 20      LDA #$20
0058 022A 99 94 01      STA PBUF, Y ; REPLACE WITH BLANK
0059 022D BD E1 F2      LDA COL0, X
```

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```
0060 0230 20 A6 02      JSR OUTDOT    ; OUTPUT COL 0
0061 0233 BD 21 F3      LDA COL1, X
0062 0236 20 A6 02      JSR OUTDOT    ; OUTPUT COL 1
0063 0239 BD 61 F3      LDA COL2, X
0064 023C 20 A6 02      JSR OUTDOT    ; ETC---
0065 023F BD A1 F3      LDA COL3, X
0066 0242 20 A6 02      JSR OUTDOT
0067 0245 BD E1 F3      LDA COL4, X
0068 0248 20 A6 02      JSR OUTDOT
0069 024B A9 00          LDA #0        ; ONE DOT SPACE BETWEEN CHARS
0070 024D 20 A6 02      JSR OUTDOT
0071 0250 C8            INY
0072 0251 00 48          CPY #$72      ; END OF LINE?
0073 0253 90 CD          BCC LM2      ; IF NOT, CONTINUE
0074 0255 , 'EXIT ROUTINE'
0075 0255 A9 FF          PRXIT       LDA #$FF
0076 0257 80 08 A8          STA T2L
0077 025A 20 18 EC          JSR DE1
0078 025D A9 0E          LDA #MOTOFF
0079 025F 80 0C A0          STA PCR      ; MOTOR OFF
0080 0262 28            PLP          ; RESTORE STATUS
0081 0263 60            RTS
0082 0264 , 'RIGHT TO LEFT PRINT'
0083 0264 20 CF 02          RMAR       JSR DEBDEL
0084 0267 A0 47          LDY #71      ; START AT RIGHT END OF BUFFER
0085 0269 20 00 A0          RM1        BIT DRB
0086 026C 50 FB          BVC RM1
0087 026E A9 01          LDA #1
0088 0270 80 05 A0          STA T1CH
0089 0273 B9 94 01          RM2        LDA PBUF, Y
0090 0276 29 3F          AND #$3F
0091 0278 AA            TAX
0092 0279 A9 20          LDA #$20
0093 027B 99 94 01          STA PBUF, Y
0094 027E BD E1 F3          LDA COL4, X
0095 0281 20 A6 02          JSR OUTDOT
0096 0284 BD A1 F3          LDA COL3, X
0097 0287 20 A6 02          JSR OUTDOT
0098 028A BD 61 F3          LDA COL2, X
0099 028D 20 A6 02          JSR OUTDOT
0100 0290 BD 21 F3          LDA COL1, X
0101 0293 20 A6 02          JSR OUTDOT
0102 0296 BD E1 F2          LDA COL0, X
0103 0299 20 A6 02          JSR OUTDOT
0104 029C A9 00          LDA #0
0105 029E 20 A6 02          JSR OUTDOT
0106 02A1 88            DEY
0107 02A2 10 CF          BPL RM2
0108 02A4 30 AF          BMI PRXIT
0109 02A6 , 'OUTPUT 1 COL OF DOTS'
0110 02A6 49 FF          OUTDOT EOR #$FF    ; OUTPUT IS INVERTED
0111 02A8 20 0D A0          DD1        BIT IFR
0112 02AB 50 FB          BVC DD1      ; WAIT FOR INTER-DOT TIMEOUT
0113 02AD 8D 01 A0          STA DRA      ; OUTPUT DOTS
0114 02B0 A9 05          LDA #5
0115 02B2 8D 07 A0          STA T1H      ; LOAD INTER-DOT TIME
0116 02B5 A9 86          LDA #$86
0117 02B7 8D 04 A0          STA T1L
```

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```
0118 02BA R9 FF          LDA #$FF
0119 02BC 2C 0D A8    0D2   BIT IFR
0120 02BF 50 FB          BVC 0D2      ;WAIT FOR DOT TIMEOUT
0121 02C1 8D 01 A8          STA DRA
0122 02C4 R9 01          LDA #1
0123 02C6 8D 07 A8          STA T1H      ;SETUP TIMER FOR NEXT DOT
0124 02C9 R9 D0          LDA #$D0
0125 02CB 8D 04 A8          STA T1L
0126 02CE 60              RTS
0127 02CF          ; 'DELAY ROUTINES'
0128 02CF R9 10          DEBDEL LDA #$10      ;DEBOUNCE DELAY
0129 02D1 8D 08 A8          STA T2L
0130 02D4 R9 27          LDA #$27
0131 02D6 4C 18 EC          JMP DE1
0132 02D9          ; 'INITIALIZATION ROUTINE'
0133 02D9 R2 47          DRI   LDX #71
0134 02DB R9 20          LDA #$20
0135 02DD 9D 94 01          DRI1  STA PBUF,X      ;CLEAR BUFFER
0136 02E0 CA              DEX
0137 02E1 10 FA          BPL DRI1
0138 02E3 R9 00          LDA #0
0139 02E5 8D 93 01          STA PBPTR
0140 02E8 8D 92 01          STA CRFL
0141 02EB 8D 91 01          STA EQFL
0142 02EE 8E 01 A0          STX DRA
0143 02F1 8E 03 A0          STX DDRA
0144 02F4 R9 40          LDA #$40
0145 02F6 8D 08 A8          STA ACR      ;T1 FREE RUN
0146 02F9 60              RTS
0147 02FA          ; 'DRIVER ROUTINE'
0148 02FA 90 DD          DRIVER BCC DRI      ;INITIALZATION OR NORMAL ENTRY?
0149 02FC 68              PLA
0150 02FD 20 9E EB          JSR PHXY      ;NORMAL, GET CHAR TO BE PRINTED
0151 0300 8D 90 01          STA SAVA
0152 0303 29 7F          AND #$7F
0153 0305 C9 0D          CMP #$D      ;CR?
0154 0307 D0 0E          BNE DR1
0155 0309 8E 92 01          ASL CRFL      ;YES
0156 030C 90 03          BCC CR1      ;CRFLAG SET?
0157 030E 20 7A 03          JSR PLINE      ;YES, PRINT LINE
0158 0311 38          CR1   SEC
0159 0312 6E 92 01          ROR CRFL      ;SET CR FLAG
0160 0315 D0 36          BNE DRXIT
0161 0317 C9 3D          DR1   CMP #'='      ;EQ?
0162 0319 D0 1A          BNE DR3
0163 031B 8E 92 01          ASL CRFL      ;YES
0164 031E 90 0E          BCC DR2      ;CR FLAG SET?
0165 0320 20 00 02          JSR PRINT      ;YES, PRINT LINE
0166 0323 R9 00          LDA #0
0167 0325 8D 93 01          STA PBPTR      ;ZERO BUFF PTR
0168 0328 38          SEC
0169 0329 6E 91 01          ROR EQFL      ;SET EQ FLAG
0170 032C D0 1F          BNE DRXIT
0171 032E 8E 91 01          DR2   ASL EQFL      ;CRFL NOT SET, TST EQFL
0172 0331 90 35          BCC STUFF      ;PUT EQ IN BUFF IF FIRST
0173 0333 B0 18          BCS DRXIT      ;IF SECOND EQ, IGNORE
0174 0335 C9 3B          DR3   CMP #SEMI      ;SEMICOLON?
0175 0337 D0 1B          BNE DR5
```

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0176	0339	0E 92 01	ASL CRFL	; YES
0177	033C	AE 93 01	LDX PBPTR	
0178	033F	E0 0C	CPX #12	; START OF LINE?
0179	0341	F0 25	BEQ STUFF	
0180	0343	A2 1E	DR4	LDX #30
0181	0345	EC 93 01	CPX PBPTR	; NO
0182	0348	90 03	BCC DRXIT	; COL 30 YET?
0183	034A	8E 93 01	STX PBPTR	; NO, TAB TO COL 30
0184	034D	20 AC EB	DRXIT	JSR PLXY
0185	0350	AD 90 01	LDA SAVA	
0186	0353	60	RTS	
0187	0354	0E 92 01	DR5	ASL CRFL
0188	0357	90 0F	BCC STUFF	; NOT CR, EQ OR SEMI
0189	0359	A2 0C	LDX #12	; IF CRFL NOT SET, STUFF IT
0190	035B	EC 93 01	CPX PBPTR	; CRFL IS SET
0191	035E	90 05	BCC DR6	; BEYOND COL 12?
0192	0360	8E 93 01	STX PBPTR	; NO, TAB TO COL 12
0193	0363	B0 03	BCS STUFF	; AND STUFF IT
0194	0365	20 7A 03	DR6	JSR PLINE
0195	0368	AD 90 01	STUFF	LDA SAVA
0196	036B	AE 93 01	LDX PBPTR	; GET CHAR
0197	036E	E0 48	CPX #72	; GET BUFF PTR
0198	0370	B0 DB	BCS DRXIT	; BUFF FULL?
0199	0372	9D 94 01	STA PBUF, X	; NO, PUT CHAR IN BUFF
0200	0375	EE 93 01	INC PBPTR	; INCR BUFF PTR
0201	0378	D0 D3	BNE DRXIT	
0202	037A	20 00 02	PLINE	JSR PRINT
0203	037D	A2 00	LDX #0	
0204	037F	A5 33	LDA PC+1	; PC UPPER
0205	0381	20 8F 03	JSR CONVT	
0206	0384	A5 32	LDA PC	; PC LOWER
0207	0386	20 8F 03	JSR CONVT	
0208	0389	A2 0C	LDX #12	
0209	038B	8E 93 01	STX PBPTR	; SET COL PTR TO 12
0210	038E	60	RTS	
0211	038F			; 'CONVERT HEX TO ASCII & STUFF'
0212	038F	48	CONVT	PHA
0213	0390	4A		LSR A
0214	0391	4A		LSR A
0215	0392	4A		LSR A
0216	0393	4A		LSR A
0217	0394	20 9A 03		JSR CONV
0218	0397	68		PLA
0219	0398	29 0F		AND #\$F
0220	039A	18	CONV	CLC
0221	039B	69 30		ADC #\$30
0222	039D	C9 3A		CMP #\$3A
0223	039F	90 02		BCC CONV1
0224	03A1	69 06		ADC #6
0225	03A3	9D 94 01	CONV1	STA PBUF, X
0226	03A6	E8		INX
0227	03A7	60		RTS
0228	03A8			END

ERRORS=0000 <0000>

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SYMBOL TABLE

ACR	A00B	COL0	F2E1	COL1	F321	COL2	F361
COL3	F3H1	COL4	F3E1	CONV	039H	CONV1	03H3
CONVT	038F	CR1	0311	CRFL	0192	DDRA	A003
DRB6	A002	DE1	EC18	DEBDEL	02CF	DRI	0317
DR2	032E	DR3	0335	DR4	0343	DR5	0354
DR6	0365	DRH	A001	DRB	H00d	DRI	0209
DRI1	020D	DRIVER	02FA	DRXIT	034D	EQFL	0191
IFR	A00D	LM1	0218	LM2	0222	LMAR	0213
MOTOFF	000E	MOTON	000C	001	02AB	002	02BC
OUTDOT	02H6	PACK	ER84	PBPTR	0193	PBUF	0194
PC	0032	PCR	A00C	PHXY	EB9E	PLINE	037H
PLXY	EBAC	PR1	020C	PRINT	0200	PRXIT	0255
RM1	0269	RM2	0273	RMR	0264	SAVA	0190
SEM1	003B	STUFF	0368	T1CH	H005	T1H	A007
T1L	A004	T2L	A808				

END OF ASSEMBLY

PAGE 0001 MODEL 10600B ASSEMBLER PRINTER DRIVER

```
0002 0032=      PC=$32
0003 003B=      SEMI=$3B
0004 EC18=      DE1=$EC18
0005 ER84=      PACK=$ER84
0006 EB9E=      PHXY=$EB9E
0007 EBAC=      PLXY=$EBAC
0008 F2E1=      COL0=$F2E1
0009 F321=      COL1=$F321
0010 F361=      COL2=$F361
0011 F3H1=      COL3=$F3H1
0012 F3E1=      COL4=$F3E1
0013 R808=      T2L=$A808
0014 R482=      DRB2=$A482
0015 0050=      MOTON=$50
0016 0040=      MOTOFF=$40
0017 0000      *=+$10H
0018 010H 1C 03      WOR DRIVER      ;VECTOR FOR USER I/O
0019 010C 4C 00 02      JMP PRINT      ;PRINTS CURRENT PBUF CONTENTS
0020 010F 4C EC 03      JMP FORMF      ;ADVANCES TO TOP OF PAGE
0021 0112 4C 74 02      JMP FEED      ;GENERATES CONTINUOUS PAPER FEED
0022 0115      *=+$190
0023 0190      SAVA  *====+1      ;SAVE AREA FOR A REG
0024 0191      EQFL  *====+1      ;EQUAL CHAR FLAG
0025 0192      CRFL  *====+1      ;CARRIAGE RETURN FLAG
0026 0193      PBPTR *====+1      ;PRINT BUFFER POINTER
0027 0194      LINCTR *====+1
0028 0195      PBUF   *====+72      ;PRINT BUFFER
0029 01DD      ; 6522 REGISTERS
0030 R000=      DRB=$A000
0031 R001=      DRH=$A001
0032 R002=      DDRB=$A002
0033 R003=      DDRA=$A003
0034 R004=      T1L=$A004
0035 R005=      T1CH=$A005
0036 R007=      T1H=$A007
0037 R008=      UT2L=$A008
0038 R00A=      USR=$A00A
0039 R00B=      ACR=$A00B
0040 R00C=      PCR=$A00C
0041 R00D=      IFR=$A00D
0042 01DD      *=+$200
0043 0200      ; ENTRY & INITIALIZATION
0044 0200 08      PRINT PHP      ;SAVE STATUS
0045 0201 78      SEI      ;DIS INT DURING PRINT
0046 0202 A9 FF      LDA #FF
0047 0204 8D 04 A0      STA T1L
0048 0207 A9 50      LDA #MOTON
0049 0209 8D 0B A0      STA ACR      ;START MOTOR
0050 020C A9 0F      LDA #FF
0051 020E 8D 0A A0      STA USR      ;LOAD SHIFT REGISTER
0052 0211 20 00 A0      PR1      BIT DRB      ;TEST LIMIT SWITCHES
0053 0214 10 6C      BPL RMAR
0054 0216 70 F9      BVS PR1
0055 0218      ; LEFT TO RIGHT PRINT
0056 0218 20 EB 02      LMAR JSR DEBDEL      ;DEBOUNCE DELAY
0057 0218 A0 00      LDY #0
0058 021D 20 00 A0      LM1      BIT DRB
0059 0220 50 FB      BVC LM1      ;WAIT TO CLEAR MARGIN
```

PAGE 0002 MODEL 10600B ASSEMBLER PRINTER DRIVER

```
0060 0222 A9 01      LDA #1
0061 0224 8D 05 A0    STA T1CH      ; START DOT TIMER(200)
0062 0227 B9 95 01    LM2     LDA PBUF,Y   ; GET CHAR
0063 022A 29 3F      AND #$3F
0064 022C AA          TAX
0065 022D A9 20      LDA #$20
0066 022F 99 95 01    STA PBUF,Y   ; REPLACE WITH BLANK
0067 0232 BD E1 F2    LDA COL2,X
0068 0235 20 C4 02    JSR OUTDOT   ; OUTPUT COL 0
0069 0238 BD 21 F3    LDA COL1,X
0070 023B 20 C4 02    JSR OUTDOT   ; OUTPUT COL 1
0071 023E BD 61 F3    LDA COL2,X
0072 0241 20 C4 02    JSR OUTDOT   ; ETC---
0073 0244 BD A1 F3    LDA COL3,X
0074 0247 20 C4 02    JSR OUTDOT
0075 024A BD E1 F3    LDA COL4,X
0076 024D 20 C4 02    JSR OUTDOT
0077 0250 A9 00      LDA #0      ; ONE DOT SPACE BETWEEN CHARS
0078 0252 20 C4 02    JSR OUTDOT
0079 0255 C8          INY
0080 0256 C8 48      CPY #72
0081 0258 90 CD      BCC LM2    ; IF NOT, CONTINUE
0082 025A            ; 'EXIT ROUTINE'
0083 025A 20 CA 03    PRXIT  JSR LINEF
0084 025D A9 40      LDA #MOTOFF
0085 025F 8D 0B A0    STA ACR
0086 0262 CE 94 01    DEC LINCTR
0087 0265 D0 0B      BNE PRX2    ; END OF PAGE?
0088 0267 8D 94 01    STA LINCTR
0089 026A A0 08      LDY #8    ; YES, RESET TO 64
0090 026C 20 CA 03    PRX1   JSR LINEF
0091 026F 88          DEY
0092 0270 D0 FA      BNE PRX1
0093 0272 28          PRX2   PLP
0094 0273 60          RTS    ; PRINT COMPLETE
0095 0274            ; 'MANUAL LINE FEED'
0096 0274 20 F5 02    FEED   JSR DRI   ; F3 KEY INITIATES
0097 0277 20 CA 03    FEED1  JSR LINEF
0098 027A RD 82 R4    LDA DRB2    ; GENERATE LINE FEED
0099 027D 49 FF      EOR #$FF
0100 027F D0 F6      BNE FEED1
0101 0281 60          RTS    ; GET KB RETURNS
0102 0282            ; 'RIGHT TO LEFT PRINT'
0103 0282 20 EB 02    RMAR   JSR DEBDEL
0104 0285 A0 47      LDY #71    ; START AT RIGHT END OF BUFFER
0105 0287 2C 00 A0    RM1    BIT DRB
0106 028A 10 FB      BPL RM1
0107 028C A9 01      LDA #1
0108 028E 8D 05 A0    STA T1CH
0109 0291 B9 95 01    RM2    LDA PBUF,Y
0110 0294 29 3F      AND #$3F
0111 0296 AA          TAX
0112 0297 A9 20      LDA #$20
0113 0299 99 95 01    STA PBUF,Y
0114 029C BD E1 F3    LDA COL4,X
0115 029F 20 C4 02    JSR OUTDOT
0116 02A2 BD A1 F3    LDA COL3,X
0117 02A5 20 C4 02    JSR OUTDOT
```

PAGE 0003 MODEL 10600B ASSEMBLER PRINTER DRIVER

```
0118 02A8 BD 61 F3      LDA COL2,X
0119 02AB 20 C4 02      JSR OUTDOT
0120 02AE BD 21 F3      LDA COL1,X
0121 02B1 20 C4 02      JSR OUTDOT
0122 02B4 BD E1 F2      LDA COL0,X
0123 02B7 20 C4 02      JSR OUTDOT
0124 02BA R9 00          LDA #0
0125 02BC 20 C4 02      JSR OUTDOT
0126 02BF 88            DEY
0127 02C0 10 CF          BPL RM2
0128 02C2 30 96          BMI PRXIT
0129 02C4                ; 'OUTPUT 1 COL OF DOTS'
0130 02C4 49 FF          OUTDOT EOR #$FF      ; OUTPUT IS INVERTED
0131 02C6 2C 0D A0        DD1 BIT IFR
0132 02C9 50 FB          BVC DD1      ; WAIT FOR INTER-DOT TIMEOUT
0133 02CB 8D 01 A0        STA DRA      ; OUTPUT DOTS
0134 02CE A9 05          LDA #5
0135 02D0 8D 07 A0        STA T1H      ; LOAD INTER-DOT TIME
0136 02D3 A9 57          LDA #$57
0137 02D5 8D 04 A0        STA T1L
0138 02D8 A9 FF          LDA #$FF
0139 02DA 2C 0D A0        DD2 BIT IFR
0140 02DD 50 FB          BVC DD2      ; WAIT FOR DOT TIMEOUT
0141 02DF 8D 01 A0        STA DRA      ; DOTS OFF
0142 02E2 8D 04 A0        STA T1L
0143 02E5 R9 01          LDA #1
0144 02E7 8D 07 A0        STA T1H      ; SETUP TIMER FOR NEXT DOT
0145 02EA 60            RTS
0146 02EB                ; 'DELAY ROUTINES'
0147 02EB A9 10          DEBDEL LDA #$10      ; DEBOUNCE DELAY
0148 02ED 8D 08 A8
0149 02F0 A9 27          STA T2L
0150 02F2 4C 18 EC        LDA #$27
0151 02F5                ; 'INITIALIZATION ROUTINE'
0152 02F5 A2 47          DRI LDX #71
0153 02F7 R9 20          LDA #$20
0154 02F9 9D 95 01        DRI1 STA PBUF,X      ; CLEAR BUFFER
0155 02FC CA
0156 02FD 10 FA          DEX
0157 02FF A9 00          BPL DRI1
0158 0301 8D 93 01        LDA #0
0159 0304 8D 92 01        STA CRFL
0160 0307 8D 91 01        STA EQFL
0161 030A 8E 01 A0        STX DRA      ; FLOAT PORT A DRIVERS
0162 030D 8E 03 A0        STX DDRA     ; PORT A = OUTPUTS
0163 0310 A9 40          LDA #$40
0164 0312 8D 08 A0        STA ACR      ; T1 FREE RUN
0165 0315 8D 08 A0        STA UT2L     ; SETUP SHIFT REG TIMER
0166 0318 8D 94 01        STA LINCTR   ; INITIALIZE LINE CTR TO 64
0167 031B 60            RTS
0168 031C                ; 'DRIVER ROUTINE'
0169 031C 90 D7          DRIVER BCC DRI      ; INITIALIZATION OR NORMAL ENTRY?
0170 031E 68            PLA
0171 031F 20 9E EB        JSR PHXY      ; NORMAL, GET CHAR TO BE PRINTED
0172 0322 8D 90 01        STA SAVA
0173 0325 29 7F          AND #$7F
0174 0327 C9 00          CMP #$0
0175 0329 D0 0E          BNE DR1      ; CR?
```

PAGE 0004 MODEL 10600B ASSEMBLER PRINTER DRIVER

0176	032B	0E 92 01	ASL CRFL	; YES
0177	032E	90 03	BCC CR1	; CRFLAG SET?
0178	0330	20 9C 03	JSR PLINE	; YES, PRINT LINE
0179	0333	38	CR1 SEC	
0180	0334	6E 92 01	ROR CRFL	; SET CR FLAG
0181	0337	D0 36	BNE DRXIT	
0182	0339	C9 3D	DR1 CMP #1=	; EQ?
0183	033B	D0 1A	BNE DR3	
0184	033D	0E 92 01	RSL CRFL	; YES
0185	0340	90 0E	BCC DR2	; CR FLAG SET?
0186	0342	20 00 02	JSR PRINT	; YES, PRINT LINE
0187	0345	A9 00	LDA #0	
0188	0347	8D 93 01	STR PBPTR	; ZERO BUFF PTR
0189	0348	38	SEC	
0190	034B	6E 91 01	ROR EQFL	; SET EQ FLAG
0191	034E	D0 1F	BNE DRXIT	
0192	0350	0E 91 01	DR2 RSL EQFL	; CRFL NOT SET, TST EQFL
0193	0353	90 25	BCC STUFF	; PUT EQ IN BUFF IF FIRST
0194	0355	B0 18	BCS DRXIT	; IF SECOND EQ, IGNORE
0195	0357	C9 3B	DR3 CMP #SEMI	; SEMICOLON?
0196	0359	D0 18	BNE DKS	
0197	035B	0E 92 01	RSL CRFL	; YES
0198	035E	AE 93 01	LDX PBPTR	
0199	0361	E0 0C	CPX #12	; START OF LINE?
0200	0363	F0 25	BEQ STUFF	
0201	0365	A2 1E	DR4 LDX #30	; NO
0202	0367	EC 93 01	CPX PBPTR	; COL 30 YET?
0203	036A	90 03	BCC DRXIT	
0204	036C	8E 93 01	STX PBPTR	; NO, TAB TO COL 30
0205	036F	20 AC EB	DRXIT JSR PLXY	
0206	0372	AD 90 01	LDA SAVA	
0207	0375	60	RTS	
0208	0376	0E 92 01	DR5 RSL CRFL	; NOT CR, EQ OR SEMI
0209	0379	90 0F	BCC STUFF	; IF CRFL NOT SET, STUFF IT
0210	037B	A2 0C	LDX #12	; CRFL IS SET
0211	037D	EC 93 01	CPX PBPTR	; BEYOND COL 12?
0212	0380	90 05	BCC DR6	
0213	0382	8E 93 01	STX PBPTR	; NO, TAB TO COL 12
0214	0385	B0 03	BCS STUFF	; AND STUFF IT
0215	0387	20 9C 03	DR6 JSR PLINE	; PRINT LINE
0216	0388	AD 90 01	STUFF LDA SAVA	; GET CHAR
0217	038D	AE 93 01	LDX PBPTR	; GET BUFF PTR
0218	0390	E0 48	CPX #72	; BUFF FULL?
0219	0392	B0 DB	BCS DRXIT	
0220	0394	9D 95 01	STA PBUF,X	; NO, PUT CHAR IN BUFF
0221	0397	EE 93 01	INC PBPTR	; INCR BUFF PTR
0222	0398	D0 D3	BNE DRXIT	
0223	039C	20 00 02	PLINE JSR PRINT	
0224	039F	A2 00	LDX #0	
0225	03A1	A5 33	LDA PC+1	; PC UPPER
0226	03A3	20 B1 03	JSR CONVT	
0227	03A6	A5 32	LDA PC	; PC LOWER
0228	03A8	20 B1 03	JSR CONVT	
0229	03AB	A2 0C	LDX #12	
0230	03AD	0E 93 01	STX PBPTR	; SET COL PTR TO 12
0231	03B0	60	RTS	
0232	03B1			; 'CONVERT HEX TO ASCII & STUFF'
0233	03B1	48	CONVT PHA	

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```
0234 03B2 4R          LSR R
0235 03B3 4R          LSR H
0236 03B4 4R          LSR R
0237 03B5 4R          LSR R
0238 03B6 20 BC 03    JSR CONV
0239 03B9 68          PLA
0240 03BA 29 0F        AND #$F
0241 03BC 18          CONV  CLC
0242 03BD 69 38        ADC #$30
0243 03BF C9 3A        CMP #$3A
0244 03C1 90 02        BCC CONV1
0245 03C3 69 06        RDC #6
0246 03C5 9D 95 01    CONV1 STA PBUF,X
0247 03C8 E8          INX
0248 03C9 60          RTS
0249 03CA              ; 'LINE FEED SUBROUTINE'
0250 03CA A2 16        LINEF LDX #22      ; 22 STEPS GIVES 72 LINES/PAGE
0251 03CC A9 00        LDA #0
0252 03CE 8D 04 R0    STA T1L
0253 03D1 A9 13        LDA #$13
0254 03D3 8D 05 R0    STA T1CH     ; T1 IS STEP TIME
0255 03D6 A9 0C        LF   LDA #$C
0256 03D8 8D 0C R0    STA PCR      ; TOGGLE CR2
0257 03DB A9 0E        LDA #$E
0258 03DD 8D 0C R0    STA PCR
0259 03E0 2C 0D R0    LF1  BIT IFR
0260 03E3 50 FB        BVC LF1      ; WAIT FOR T1 TIMEOUT
0261 03E5 AD 04 R0    LDA T1L      ; CLEAR IFR FLAG
0262 03E8 C9          DEX
0263 03E9 D0 EB        BNE LF      ; 22 STEPS
0264 03EB 60          RTS
0265 03EC              ; 'FORM FEED ROUTINE'
0266 03EC AD 94 01    FORMF LDA LINCTR
0267 03EF 18          CLC
0268 03F0 69 08        ADC #8      ; SETUP LINE FEED COUNT TO TOP OF F
0269 03F2 88          TAY      ; Y IS LINEFEED CTR
0270 03F3 20 CR 03    FF1  JSR LINEF     ; GEN. LF
0271 03F6 88          DEY
0272 03F7 D0 FA        BNE FF1      ; TO TOP OF PG
0273 03F9 A9 40        LDA #$40
0274 03FB 8D 94 01    STA LINCTR     ; RESET LINE CTR TO 64
0275 03FE 60          RTS
0276 03FF              END
```

ERRORS=0000 <0000>

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SYMBOL TABLE

ACR	A00B	COL0	F2E1	COL1	F321	COL2	F361
COL2	F3A1	COL4	F3E1	CONV	03BC	CONV1	03C5
CONVT	03B1	CR1	0333	CRFL	0192	DDR4	A003
DRB	A002	DE1	EC18	DEBDEL	02EB	DR1	0339
DR2	0350	DR3	0357	DR4	0365	DR5	0376
DR6	0387	DRA	A001	DRB	A000	DRB2	A482
DRI	B2F5	DR11	02F9	DRIVER	031C	DRXIT	036F
EQFL	0191	FEED	0274	FEED1	0277	FF1	03F3
FORMF	03EC	IFR	A08D	LF	03D6	LF1	03E0
LINCTR	0194	LINEF	03CA	LM1	021D	LM2	0227
LMAR	B218	MOTOFF	0040	MOTON	0050	0D1	0206
OD2	02DA	OUTDOT	02C4	PACK	ER84	PBPTR	0193
PBUF	0195	PC	0032	PCR	A00C	PHXY	EB9E
PLINE	039C	PLXY	EBAC	PR1	0211	PRINT	0200
PRX1	026C	PRX2	0272	PRXIT	025A	RM1	0287
RM2	0291	RMAR	0282	SAVA	0190	SEMI	003B
STUFF	038A	T1CH	A005	T1H	A007	T1L	A004
T2L	A808	USR	A00A	UT2L	A008		
END OF ASSEMBLY							

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```

0002 EC18=          DE1=$EC18
0003 F2E1=          COL0=$F2E1
0004 F321=          COL1=$F321
0005 F361=          COL2=$F361
0006 F3H1=          COL3=$F3H1
0007 F3E1=          COL4=$F3E1
0008 A808=          T2L=$A808
0009 000C=          MOTON=$C
0010 000E=          MOTOFF=$E
0011 0000          **=$10H
0012 010A EB 02      WOR DRIVER
0013 010C 4C 00 02    JMP PRINT      ; F1 KEY DOES MANUAL LINE FEED
0014 010F 4C 00 02    JMP PRINT
0015 0112 4C 00 02    JMP PRINT
0016 0115          **=0
0017 0000          PBUF  ****+60
0018 0030          PBFR  ****+1
0019 003D          : 16522 REGISTERS
0020 A000=          DRB=$A000
0021 H001=          DRH=$A001
0022 A002=          DDRB=$A002
0023 H003=          DDRA=$A003
0024 H004=          T1L=$A004
0025 H005=          T1CH=$A005
0026 H007=          T1H=$A007
0027 A00B=          HCR=$H00B
0028 A00C=          PCR=$A00C
0029 A00D=          IFR=$A00D
0030 003D          **=$200
0031 0200 08          PRINT PHP      ; SAVE STATUS
0032 0201 78          SEI           ; DISABLE INTERRUPTS
0033 0202 A9 FF          LDA #FF
0034 0204 8D 01 A0      STA DRA      ; FLOAT PORT A DRIVERS
0035 0207 8D 03 A0      STA DDRA     ; PORT A = OUTPUTS
0036 020A A9 40          LDA #$40
0037 020C 8D 0B A0      STA HCR      ; T1 FREE RUN
0038 020F A9 00          LDA #0
0039 0211 8D 04 A0      STA T1L
0040 0214 A9 0C          LDA #MOTON
0041 0216 8D 0C A0      STA PCR      ; START MOTOR
0042 0219 2C 00 A0      PR1          BIT DRB      ; TEST MARGIN SWITCHES
0043 021C 50 56          BVC RMAR     ; BIT 6 = RIGHT MARGIN
0044 021E 30 F9          BMI PR1      ; BIT 7 IS LEFT
0045 0220          : LEFT TO RIGHT PRINT
0046 0220 20 D8 02      LMAR          JSR DEDEL     ; DEBOUNCE MARGIN SSWITCH
0047 0223 A0 00          LDY #0
0048 0225 20 00 A0      LM1          BIT DRB
0049 0228 10 FB          BPL LM1      ; WAIT TO CLEAR MARGIN
0050 022A 20 E1 02      JSR ALDEL     ; ALIGNMENT DELAY
0051 022D A9 02          LDA #2
0052 022F 8D 05 A0      STA T1CH     ; LOAD DOT TIME IN T1
0053 0232 B9 00 00      LM2          LDA PBUF,Y   ; GET CHAR TO BBE PRINTED
0054 0235 29 3F          AND #$3F      ; STRIP UPPER BITS
0055 0237 AA            TAX          ; USE AS INDEX TO DOT TABLES
0056 0238 A9 20          LDA #$20
0057 023A 99 00 00      STA PBUF,Y   ; REPLACE CHAR WITH BLANK IN BUFFE
0058 023D BD E1 F2      LDA COL0,X
0059 0240 20 B9 02      JSR OUTDOT    ; OUTPUT COL 0

```

PAGE 0002 MODEL 10600A TEXT EDITOR PRINTER DRIVER

```
0060 0243 BD 21 F3      LDA COL1,X
0061 0246 20 B9 02      JSR OUTDOT    ;OUTPUT COL 1
0062 0249 BD 61 F3      LDA COL2,X
0063 024C 20 B9 02      JSR OUTDOT    ;ETC----
0064 024F BD A1 F3      LDA COL3,X
0065 0252 20 B9 02      JSR OUTDOT
0066 0255 BD E1 F3      LDA COL4,X
0067 0258 20 B9 02      JSR OUTDOT
0068 025B A9 00          LDA #0
0069 025D 20 B9 02      JSR OUTDOT    ;ONE BLANK COL SEPARATES CHARS
0070 0260 C8              INY          ;INCR BUFF PTR
0071 0261 C0 3C          CPY #60      ;60 CHARS/LINE
0072 0263 90 CD          BCC LM2     ;END OF LINE?
0073 0265                ;'EXIT ROUTINE'
0074 0265 A9 FF          PRXIT      LDA #$FF    ;END OF LINE
0075 0267 8D 08 A8          STA T2L
0076 0268 20 18 EC          JSR DE1     ;DELAY FOR CARRIAGE TO REACH END 0
0077 026D A9 0E          LDA #MOTOFF
0078 026F 8D 0C A0          STA PCR     ;STOP MOTOR
0079 0272 28              PLP         ;RESTORE STATUS
0080 0273 60              RTS         ;DONE WITH LINE
0081 0274                ;'RIGHT TO LEFT PRINT'
0082 0274 20 D8 02          RMHR       JSR DEBDEL   ;SEE LEFT TO RIGHT PRINT COMMENTS
0083 0277 A0 3B              LDY #59
0084 0279 20 00 A0          RM1        BIT DRB
0085 027C 50 FB              BVC RM1
0086 027E 20 E1 02          JSR ALDEL
0087 0281 A9 02              LDA #2
0088 0283 8D 05 A0          STA T1CH
0089 0286 B9 00 00          RM2        LDA PBUF,Y
0090 0289 29 3F              AND #$3F
0091 028B A9 20              TAX
0092 028C A9 20              LDA #$20
0093 028E 99 00 00          STA PBUF,Y
0094 0291 BD E1 F3          LDA COL4,X
0095 0294 20 B9 02          JSR OUTDOT
0096 0297 BD A1 F3          LDA COL3,X
0097 029A 20 B9 02          JSR OUTDOT
0098 029D BD 61 F3          LDA COL2,X
0099 02A0 20 B9 02          JSR OUTDOT
0100 02A3 BD 21 F3          LDA COL1,X
0101 02A6 20 B9 02          JSR OUTDOT
0102 02A9 BD E1 F2          LDA COL0,X
0103 02AC 20 B9 02          JSR OUTDOT
0104 02AF A9 00              LDA #0
0105 02B1 20 B9 02          JSR OUTDOT
0106 02B4 88              DEY
0107 02B5 10 CF              BPL RM2
0108 02B7 30 AC              BMI PRXIT
0109 02B9                ;'OUTPUT 1 COL OF DOTS'
0110 02B9 49 FF          OUTDOT EOR #$FF    ;OUTPUT IS INVERTED
0111 02B9 2C 0D A0          DD1        BIT IFR
0112 02BE 50 FB              BVC DD1     ;WAIT FOR INTER-DOT TIMEOUT
0113 02C0 8D 01 A0          STA DRA     ;OUTPUT DOTS
0114 02C3 A9 06              LDA #6
0115 02C5 8D 07 A0          STA T1H     ;LOAD INTER-DOT TIME
0116 02C8 A9 FF              LDA #$FF
0117 02CA 2C 0D A0          DD2        BIT IFR
```

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```

0118 02CD S0 FB      BVC 0D2      ;WAIT FOR DOT TIMEOUT
0119 02CF S0 01 A0    STA DRA      ;DOTS OFF
0120 02D2 R9 02      LDR #2
0121 02D4 S0 07 A0    STA T1H      ;LOAD TIME FOR NEXT DOT
0122 02D7 60          RTS
0123 02D8            ;`DELAY ROUTINES'
0124 02D8 R9 10      DEBDEL LDA #$10  ;DEBOUNCE DELAY
0125 02D9 S0 08 A8    STA T2L
0126 02DD R9 27      LDA #$27  ;2710 HEX = 10 MS
0127 02DF D0 07      BNE LDE1
0128 02E1 R9 00      ALDEL LDA #0  ;ALIGNMENT DELAY
0129 02E3 S0 08 A8    STA T2L
0130 02E6 R9 94      LDA #$94
0131 02E8 4C 18 EC   LDE1 JMP DE1
0132 02EB            ;`DRIVER ROUTINE'
0133 02EB 90 14      DRIVER BCC DRI  ;INITIALIZATION OR NORMAL ENTRY?
0134 02ED 60          PLA          ;NORMAL, GET CHAR TO BE PRINTED
0135 02EE C9 0D      CMP #$0
0136 02F0 F8 07      BEQ DR1      ;CARRIAGE RETURN?
0137 02F2 A6 3C      LDX PBPTR  ;NO, GET BUFF PTR
0138 02F4 95 00      STA PBUF,X  ;PUT CHAR IN PRINT BUFFER
0139 02F6 E6 3C      INC PBPTR  ;INCR BUFF PTR
0140 02F8 60          RTS
0141 02F9 20 00 02    DR1 JSR PRINT  ;PRINT LINE
0142 02FC R9 00      DR1A LDA #0
0143 02FE 85 3C      STA PBPTR  ;RESET BUFF PTR
0144 0300 60          RTS
0145 0301 A2 3B      DRI LDX #59
0146 0303 R9 20      LDA #$20
0147 0305 95 00      DR3 STA PBUF,X  ;CLEAR PRINT BUFFER TO BLANKS
0148 0307 C9          DEX
0149 0308 10 FB      BPL DR3
0150 030A 30 F0      BMI DR1A
0151 030C            END

```

ERRORS=0000 <00000>

PAGE 0004 MODEL 10600A TEXT EDITOR PRINTER DRIVER

SYMBOL TABLE

ACR	A00B	ALDEL	02E1	COL0	F2E1	COL1	F321
COL2	F361	COL3	F3A1	COL4	F3E1	DDRA	A003
DDR2	A002	DE1	EC18	DEBDEL	02D8	DR1	02F9
DR1A	02FC	DR3	0305	DRA	A001	DRB	A000
DRI	0301	DRIVER	02EB	IFR	A00D	LDE1	02E8
LM1	0225	LM2	0232	LMAR	0220	MOTOFF	000E
MOTON	000C	OD1	02BB	OD2	02CA	OUTDOT	02B9
PBPTR	003C	PBUF	0000	PCR	A00C	PR1	0219
PRINT	0200	PRXIT	0265	RM1	0279	RM2	0286
RMAR	0274	T1CH	A005	T1H	A007	T1L	A004
T2L	A008						
		END OF ASSEMBLY					

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```
0002 EC18= DE1=$EC18
0003 F2E1= COL0=$F2E1
0004 F321= COL1=$F321
0005 F361= COL2=$F361
0006 F3A1= COL3=$F3A1
0007 F3E1= COL4=$F3E1
0008 A808= T2L=$A808
0009 0050= MOTON=$50
0010 0040= MOTOFF=$40
0011 A482= DRB2=$A482
0012 0000= **=$10H
0013 010A 00 03 WDR DRIVER
0014 010C 4C 2F 03 JMP FEED , F1 KEY DOES CONTINUOUS LINE FEED
0015 010F 4C 00 02 JMP PRINT , PRINTS CURRENT PBUF CONTENT
0016 0112 4C 00 02 JMP PRINT
0017 0115 *=0
0018 0000 PBUF *=++60
0019 003C PBPTR *=++1
0020 003D , '6522 REGISTERS'
0021 A000= DRB=$A000
0022 A001= DRH=$A001
0023 A002= DDRB=$A002
0024 A003= DDRA=$A003
0025 A004= T1L=$A004
0026 A005= T1CH=$A005
0027 A007= T1H=$A007
0028 A008= UT2L=$A008
0029 A00R= USR=$A00R
0030 A00B= ACR=$A00B
0031 A00C= PCR=$A00C
0032 A00D= IFR=$A00D
0033 003D *=3200
0034 0200 08 PRINT PHP , SAVE STATUS
0035 0201 78 SEI , DISABLE INTERRUPTS
0036 0202 A9 00 LDA #0
0037 0204 8D 04 A0 STA T1L
0038 0207 A9 50 LDA #MOTON
0039 0209 8D 08 A0 STA ACR , START MOTOR
0040 020C A9 0F LDA #$F
0041 020E 8D 08 A0 STA USR , LOAD SHIFT REG FOR SQUARE WAVE OU
0042 0211 2C 00 A0 PR1 BIT DRB , TEST MARGIN SWITCHES
0043 0214 10 73 BPL RMAR , BIT 7 = RIGHT MARGIN
0044 0216 70 F9 BVS PR1 , BIT 6 IS LEFT
0045 0218 , 'LEFT TO RIGHT PRINT'
0046 0218 20 ED 02 LMAR JSR DEBDEL , DEBOUNCE MARGIN SWITCH
0047 021B A0 00 LDY #0
0048 021D 20 00 A0 LM1 BIT DRB
0049 0220 50 FB BVC LM1 , WAIT TO CLEAR MARGIN
0050 0222 20 F6 02 JSR ALDEL , ALIGNMENT DELAY
0051 0225 A9 02 LDA #2
0052 0227 8D 05 A0 STA T1CH , LOAD DOT TIME IN T1
0053 022A B9 00 00 LM2 LDA PBUF,Y , GET CHAR TO BBE PRINTED
0054 022D 29 3F AND #$3F , STRIP UPPER BITS
0055 022F AA TAX , USE AS INDEX TO DOT TABLES
0056 0230 A9 28 LDA #$28
0057 0232 99 00 00 STA PBUF,Y , REPLACE CHAR WITH BLANK IN BUFFE
0058 0235 8D E1 F2 LDA COL0,X
0059 0238 20 CE 02 JSR OUTDOT , OUTPUT COL 0
```

PAGE 0002 MODEL 10600B TEXT EDITOR PRINTER DRIVER

0060	023B	BD 21 F3	LDA COL1, X	
0061	023E	20 CE 02	JSR OUTDOT	; OUTPUT COL 1
0062	0241	BD 61 F3	LDA COL2, X	
0063	0244	20 CE 02	JSR OUTDOT	; ETC----
0064	0247	BD A1 F3	LDA COL3, X	
0065	024A	20 CE 02	JSR OUTDOT	
0066	024D	BD E1 F3	LDA COL4, X	
0067	0250	20 CE 02	JSR OUTDOT	
0068	0253	H9 00	LDA #0	
0069	0255	20 CE 02	JSR OUTDOT	; ONE BLANK COL SEPARATES CHARS
0070	0258	C8	INY	; INCR BUFF PTR
0071	0259	C0 3C	CPY #60	; 60 CHARS/LINE
0072	025B	90 CD	BCC LM2	; END OF LINE?
0073	025D		; /*EXIT ROUTINE*/	
0074	025D	20 67 02	PRXIT JSR LNEF GENERATE LINE FEED	
0075	0260	A9 40	LDA #MOTOFF	
0076	0262	8D 0B A0	STA HCR	; STOP MOTOR
0077	0265	28	PLP	; RESTORE STATUS
0078	0266	60	RTS	; DONE WITH LINE
0079	0267		; /*LINE FEED ROUTINE*/	
0080	0267	A2 18	LINEF LDX #24	; STEP COUNT FOR LINE FEED STEPPER
0081	0269	A9 00	LDA #0	
0082	026B	8D 04 A0	STA T1L	
0083	026E	A9 13	LDA #\$13	; STEP TIME = 1300 HEX
0084	0270	8D 05 A0	STA T1CH	
0085	0273	A9 0C	LF LDA #\$C	
0086	0275	8D 0C A0	STA PCR	; TOGGLE CR2
0087	0278	A9 0E	LDA #\$E	
0088	027A	8D 0C A0	STA PCR	
0089	027D	2C 0D A0	LF1 BIT IFR	
0090	0280	50 FB	BVC LF1	; WAIT FOR T1 TIMEOUT
0091	0282	RD 04 A0	LDR T1L	; CLEAR IFR FLAG
0092	0285	CA	DEX	; DECR STEP CNTR
0093	0286	D0 EB	BNE LF	; CONTINUE FOR 24 STEPS
0094	0288	60	RTS	
0095	0289		; /*RIGHT TO LEFT PRINT*/	
0096	0289	20 ED 02	RMR JSR DEBDEL	; SEE LEFT TO RIGHT PRINT COMMENTS
0097	028C	A0 3B	LDY #39	
0098	028E	2C 00 A0	RM1 BIT DRB	
0099	0291	10 FB	BPL RM1	
0100	0293	20 F6 02	JSR ALDEL	
0101	0296	A9 02	LDA #2	
0102	0298	8D 05 A0	STA T1CH	
0103	029B	B9 00 00	RM2 LDA PBUF, Y	
0104	029E	29 3F	AND #\$3F	
0105	02A0	AA	TAX	
0106	02A1	A9 20	LDA #\$20	
0107	02A3	99 00 00	STH PBUF, Y	
0108	02A6	BD E1 F3	LDA COL4, X	
0109	02A9	20 CE 02	JSR OUTDOT	
0110	02AC	BD A1 F3	LDA COL3, X	
0111	02AF	20 CE 02	JSR OUTDOT	
0112	02B2	BD 61 F3	LDA COL2, X	
0113	02B5	20 CE 02	JSR OUTDOT	
0114	02B8	BD 21 F3	LDA COL1, X	
0115	02BB	20 CE 02	JSR OUTDOT	
0116	02BE	BD E1 F2	LDA COL0, X	
0117	02C1	20 CE 02	JSR OUTDOT	

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0118 02C4 A9 00      LDA #0
0119 02C6 20 CE 02    JSR OUTDOT
0120 02C9 88          DEY
0121 02CA 10 CF      BPL RM2
0122 02CC 30 8F      BMI PRXIT
0123 02CE            ; /*OUTPUT 1 COL OF DOTS*/
0124 02CE 49 FF      OUTDOT EOR #$FF      ; OUTPUT IS INVERTED
0125 02D0 20 00 R0    001 BIT 1FR
0126 02D3 50 FB      BVC 001      ; WAIT FOR INTER-DOT TIMEOUT
0127 02D5 80 01 R0    STA DRA      ; OUTPUT DOTS
0128 02D8 A9 06      LDA #6
0129 02DA 80 07 R0    STA T1H      ; LOAD INTER-DOT TIME
0130 02DD A9 FF      LDA #$FF
0131 02DF 20 00 R0    002 BIT 1FR
0132 02E2 50 FB      BVC 002      ; WAIT FOR DOT TIMEOUT
0133 02E4 80 01 R0    STA DRA      ; DOTS OFF
0134 02E7 A9 02      LDA #2
0135 02E9 80 07 R0    STA T1H      ; LOAD TIME FOR NEXT DOT
0136 02EC 60          RTS
0137 02ED            ; /*DELAY ROUTINES*/
0138 02ED A9 10      DEBDEL LDA #$10      ; DEBOUNCE DELAY
0139 02EF 80 08 R8    STA T2L
0140 02F2 A9 27      LDH #$27      ; 2710 HEX = 10 MS
0141 02F4 D0 07      BNE LDE1
0142 02F6 A9 00      ALDEL LDA #0      ; ALIGNMENT DELAY
0143 02F8 80 08 R8    STA T2L
0144 02FB A9 94      LDA #$94
0145 02FD 4C 18 EC    LDE1 JMP DE1
0146 0300            ; /*DRIVER ROUTINE*/
0147 0300 90 14      DRIVER BCC DRI      ; INITIALIZATION OR NORMAL ENTRY?
0148 0302 68          PLA      ; NORMAL, GET CHAR TO BE PRINTED
0149 0303 C9 0D      CMP #$D
0150 0305 F0 07      BEQ DR1      ; CARRIAGE RETURN?
0151 0307 A6 3C      LDX PBPTR
0152 0309 95 00      STR PBUF,X      ; PUT CHAR IN PRINT BUFFER
0153 030B E6 3C      INC PBPTR      ; INCR BUFF PTR
0154 030D 60          RTS
0155 030E 20 00 02    DR1  JSR PRINT      ; PRINT LINE
0156 0311 A9 00      DR1A LDA #0
0157 0313 85 3C      STA PBPTR      ; RESET BUFF PTR
0158 0315 60          RTS
0159 0316 A2 3B      DRI  LDX #59
0160 0318 A9 20      DRI  LDA #$20
0161 031A 95 00      DR3  STA PBUF,X      ; CLEAR PRINT BUFFER TO BLANKS
0162 031C CA          DEX
0163 031D 10 FB      BPL DR3
0164 031F 8E 01 R0    STX DRA      ; FLOAT DRIVERS
0165 0322 8E 03 R0    STX DDRA      ; PORT A IS OUTPUTS
0166 0325 A9 40      LDA #$40
0167 0327 80 0B R0    STA HCR      ; T1 FREE RUN
0168 032A 8D 08 R0    STA UT2L      ; SETUP SHIFT REG TIMER
0169 032D D0 E2      BNE DR1A
0170 032F            ; /*MANUAL LINE FEED*/
0171 032F 20 16 03    FEED  JSR DRI      ; F1 KEY INITIATES
0172 0332 20 67 02    FEED1 JSR LINEF      ; GENERATE LINE FEED
0173 0335 AD 82 R4    LDA DRB2      ; GET KB RETURNS
0174 0338 49 FF      EOR #$FF
0175 033A D0 F6      BNE FEED1      ; CONTINUE IF F1 KEY STILL DOWN
0176 033C 60          RTS
0177 033D            END

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ERRORS=0000 <00000>

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SYMBOL TABLE

ACR	A00B	ALDEL	02F6	COL0	F2E1	COL1	F321
COL2	F361	COL3	F3A1	COL4	F3E1	DDRA	A003
DDR8	A002	DE1	EC18	DEBDEL	02ED	DR1	030E
DR1A	0311	DR3	031A	DRA	A001	DRB	A000
DRB2	A482	DRI	0316	DRIVER	0300	FEED	032F
FEED1	0332	IFR	A000	LDE1	02FD	LF	0273
LF1	027D	LINEF	0267	LM1	021D	LM2	022A
LMAR	0218	MOTOFF	0040	MOTON	0050	001	02D0
OD2	02DF	OUTDOT	02CE	PBPTR	003C	PBUF	0000
PCR	A00C	PR1	0211	PRINT	0200	PRXIT	025D
RM1	028E	RM2	0298	RMAR	0289	T1CH	A005
T1H	A007	T1L	A004	T2L	A808	USR	A00A
UT2L	A008						

END OF ASSEMBLY