Micro-ADE

for the

6502

ASSEMBLER

DISASSEMBLER

EDITOR

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```
0010:
0020:
0030:
0040:
0050:
0060:                  *********************************
0070:                  ***** MICRO-ADE TEXT EDITOR *(C)*
0080:                  *********************************
0090:
0100:
0110: 2000             EDITOR ORG   $2000  77.06.28
0120:
0130:                  PAGE ZERO SYMBOLS
0140:
0150: 2000             BLO    *     $0010  WS POINTER
0160: 2000             BHI    *     $0011
0170: 2000             OBLO   *     $0012  WS POINTER TEMP
0180: 2000             OBHI   *     $0013
0190: 2000             LTH    *     $0014  LENGTH OF INPUT BUFFER
0200: 2000             NLO    *     $0015  LINE NUMBER
0210: 2000             NHI    *     $0016
0220: 2000             CTR    *     $0017  NUMBER OF INPUT PARAMETERS
0230: 2000             LO     *     $0018  INPUT TEMP
0240: 2000             HI     *     $0019
0250: 2000             LOPAR  *     $001A  COMMAND INPUT PARAMETER
0260: 2000             HIPAR  *     $001D
0270: 2000             LABEL  *     $0020  SYMBOL TEMP
0280: 2000             SAVID  *     $0027  TEMP FOR ID
0290: 2000             PCLO   *     $003D  ADDRESS FOR DSMBLR
0300: 2000             PCHI   *     $003E
0310: 2000             SLO    *     $003F  SYMBOL TABLE POINTER
0320: 2000             SHI    *     $0040
0330: 2000             ELO    *     $0041  END OF SYMBOL TABLE
0340: 2000             EHI    *     $0042
0350: 2000             XLO    *     $0055  TABLE TEMP
0360: 2000             XHI    *     $0056
0370: 2000             CNT    *     $0054  SYMBOL TABLE COUNTER
0380: 2000             SALX   *     $0060  SAVE ADDRESS FOR CWRITE
0390: 2000             SAHX   *     $0061
0400: 2000             ID     *     $0062  TAPE ID ID FOR CWRITE & CREAD
0410: 2000             PMODE  *     $0063  PAGING FLAG
0420: 2000             COUNTL *     $0064  PAGING LINE COUNTER
0430: 2000             BUFFER *     $0100  I/O BUFFER
0440:
0450:                  KIM PAGE 17 ADDRESSES FOR CREAD/CWRITE
0460:
0470: 2000             SAL    *     $17F5  START TAPE ADDRESSS
0480: 2000             SAH    *     $17F6
0490: 2000             EAL    *     $17F7  END TAPE ADDRESS
0500: 2000             EAH    *     $17F8
0510: 2000             SAVX   *     $17E9  PACKT TEMPORARY
0520:
0530:
0540:                  EXTERNAL SUBROUTINES
0550:
0560: 2000             PACKT  *     $2E94  PACK SUBROUTINE
```

```
0570: 2000              READ   *      $2E97  CASSETTE READ ROUTINE
0580: 2000              WRITE  *      $2E9A  CASSETTE WRITE ROUTINE
0590: 2000              NOUT   *      $2DC5  PRINT LINE NUMBER
0600: 2000              HEXAX  *      $2DC9  PRINT 2 HEX BYTES
0610: 2000              HEXSP  *      $2DEB  PRINT 2 HEX BYTES + SPACE
0620: 2000              HEXOUT *      $2DCD  OUTPUT 2 HEX CHARS
0630: 2000              BACKSP *      $2DE3  BACKSPACE
0640: 2000              CRLF   *      $2DE7  CARRIAGE RETURN/LF
0650: 2000              OUTSP  *      $2DEE  OUTPUT BLANK
0660: 2000              OUTCH  *      $2DF0  OUTPUT CHAR
0670: 2000              INCH   *      $2E2B  INPUT CHARACTER
0680: 2000              BUFIN  *      $2E3F  FILL INPUT BUFFER
0690: 2000              PRBUF  *      $2E84   PRINT OUTPUT BUFFER
0700: 2000              ASMBLR *      $25F8  ASSEMBLER
0710: 2000              YSNO   *      $2794  MESSY + PROMPT
0720: 2000              MESSY  *      $27A0  PRINT MESSG(Y)
0730: 2000              DADS   *      $27C1  INC SYM SUBROUTINE
0740: 2000              DADX   *      $27C3  INC SYM + X SUB
0750: 2000              DSMBLR *      $2C7A  DISASSEMBLER PROGRAM
0760:
0770:                   ADDRESSES FOR MEMORY ALLOCATION PARAMETERS
0780:
0790: 2000              SYMF   *      $2EA7  END OF SYMBOL TABLE AREA
0800: 2000              SYMBOL *      $2EA6  SYMBOL TABLE
0810: 2000              SOURCM *      $2EA3  SOURCE AREA OUT OF RANGE
0820: 2000              SOURCE *      $2EA4  SOURCE AREA START ADDRESS
0830: 2000              OBJECT *      $2EA8  OBJECT AREA ADDRESS
0840: 2000              SOURCF *      $2EA5  SOURCE END ADDRESS
0850:
0860:
0870: 2000              EOF    *      $40    END OF FILE SYMBOL
0880:
ID=E2

0010:                   COLD START ENTRY FOR MICRO-ADE
0020:
0030: 2000 D8                  CLD           CLEAR DECIMAL
0040: 2001 20 E7 2D            JSR    CRLF
0050:
0060: 2004 A9 FF               LDAIM $FF     RESET
0070: 2006 85 63               STA    PMODE  PAGE MODE
0080:
0090: 2008 A0 63               LDYIM $63     PRINT:"NEW?"
0100: 200A 20 94 27            JSR    YSNO
0110: 200D D0 22               BNE    RESTRT IF "NO"
0120: 200F 20 F4 23            JSR    RESB
0130: 2012 A9 0D               LDAIM $0D     FORMAT
0140: 2014 20 2F 24            JSR    STORE  WORKSPACE
0150: 2017 20 28 24            JSR    STORN  TO
0160: 201A F0 06               BEQ    INCCLR $0D,$00,$00,$40,...
0170: 201C A0 00               LDYIM $00
0180: 201E A9 40        CLEAR  LDAIM EOF
0190: 2020 91 10               STAIY BLO
0200: 2022 20 0D 25     INCCLR JSR    INCBUF
0210: 2025 A5 11               LDA    BHI
0220: 2027 CD A5 2E            CMP    SOURCF
0230: 202A D0 F2               BNE    CLEAR
0240:
```

```
202C A0 69            LDYIM $69     PRINT:
202E 20 A0 27         JSR   MESSY   "CLEAR"
                WARM START ENTRY
2031 20 E7 2D   RESTRT JSR   CRLF
2034 A2 FF            LDXIM $FF     RESET
2036 9A               TXS           STACK
2037 D8               CLD           & MODES
2038 58               CLI
2039 A9 04            LDAIM ERROR         SET UP
203B 8D FE 17         STA   $17FE         IRQ TO
203E A9 24            LDAIM ERROR   /256 ERROR
2040 8D FF 17         STA   $17FF         ROUTINE
2043 A9 0C            LDAIM $0C     TURN ON
2045 8D 03 17         STA   $1703   CASSETTE PIA
2048 8D 02 17         STA   $1702
204B A9 2D            LDAIM '-      PROMPT FOR
204D 20 F0 2D         JSR   OUTCH   COMMAND
2050 20 3F 2E         JSR   BUFIN
                ROUTINE TO DECODE 1 TO 3
                HEXADECIMAL INPUT PARAMETERS
                AND SAVE THEM IN LOPAR,HIPAR
2053 A9 00            LDAIM $00
2055 A2 06            LDXIM $06
2057 95 19      GTCLR STAAX HI      CLEAR
2059 CA               DEX           OLD
205A D0 FB            BNE   GTCLR   PARAMETERS
205C 85 17            STA   CTR
205E BD 00 01   GTA   LDAAX BUFFER
2061 C9 41            CMPIM 'A      SKIP
2063 30 03            BMI   REGETA  OVER
2065 E8               INX           COMMAND
2066 D0 F6            BNE   GTA
2068 CA         REGETA DEX
2069 A9 00      REGET LDAIM $00     RESET
206B 85 18            STA   LO      TEMPS
206D 85 19            STA   HI
206F 8D E9 17         STA   SAVX
2072 E8         NXT   INX
2073 BD 00 01         LDAAX BUFFER  CHECK
2076 C9 0D            CMPIM $0D     FOR
2078 F0 23            BEQ   COMMA   DELIMITERS
207A C9 20            CMPIM '
207C F0 F4            BEQ   NXT
207E C9 2C            CMPIM ',
2080 F0 1B            BEQ   COMMA
2082 20 94 2E         JSR   PACKT   PACK
```

```
2085 D0 15              BNE   ERR     FOUR
2087 A5 18              LDA   LO      DIGITS
2089 A0 04              LDYIM $04     INTO
208B 0A         ROT     ASLA          HI,LO
208C 26 19              ROL   HI
208E 88                 DEY
208F D0 FA              BNE   ROT
2091 0D E9 17           ORA   SAVX
2094 85 18              STA   LO
2096 8C E9 17           STY   SAVX
2099 4C 72 20           JMP   NXT
ID=E3

209C 00         ERR     BRK           *****<9E> COMMAND SYNTAX
209D A4 17      COMMA   LDY   CTR
209F 48                 PHA
20A0 A5 18              LDA   LO      SAVE
20A2 99 1A 00           STAAY LOPAR   LOPAR(Y)
20A5 A5 19              LDA   HI      HIPAR(Y)
20A7 99 1D 00           STAAY HIPAR
20AA 68                 PLA
20AB E6 17              INC   CTR     END
20AD C9 0D              CMPIM $0D     OF
20AF D0 B8              BNE   REGET   INPUT
20B1 C6 17              DEC   CTR
20B3 D0 08              BNE   NOTON   IF ONLY
20B5 A5 1A              LDA   LOPAR   1 INPUT--
20B7 85 1B              STA   LOPAR   +01 BOTH SAME
20B9 A5 1D              LDA   HIPAR    DUPLICATE
20BB 85 1E              STA   HIPAR   +01
20BD AD 00 01   NOTON   LDA   BUFFER
20C0 C9 41              CMPIM 'A
20C2 D0 2C              BNE   NOTA
                ***[ADD]***
20C4 20 96 24           JSR   FNDND   FIND EOF
20C7 20 E6 23           JSR   DECBUF  ADJUST IT
20CA 20 E6 23           JSR   DECBUF
20CD 20 E6 23           JSR   DECBUF
20D0 A9 0D              LDAIM $0D     CHANGE EOF
20D2 A0 00              LDYIM $00     TO CR
20D4 91 10              STAIY BLO
20D6 20 E7 2D           JSR   CRLF
20D9 20 88 24   NXTAD   JSR   PRNN    GET INPUT
20DC 20 28 24           JSR   STORN   SAVE N
20DF 20 76 24           JSR   LINE    AND DATA
20E2 C9 40              CMPIM EOF
20E4 F0 05              BEQ   ENDAD
20E6 20 3F 24           JSR   NADJ    N=N+10
20E9 90 EE              BCC   NXTAD
20EB 20 2F 24   ENDAD   JSR   STORE
```

```
0460: 20EE F0 07              BEQ    RSTRTB
0470:
0480: 20F0 C9 4C      NOTA    CMPIM 'L
0490: 20F2 D0 06              BNE    NOTL
0500:
0510:                 ***[LIST]***
0520:
0530: 20F4 20 67 23   LSFN    JSR    LIST
0540: 20F7 4C 31 20   RSTRTB JMP    RESTRT
0550:
0560: 20FA C9 49      NOTL    CMPIM 'I
0570: 20FC D0 52              BNE    NOTI
0580:
0590:                 ***[INSERT]***
0600:
0610: 20FE 20 4F 24           JSR    FNDLN   FIND LINE N
0620: 2101 F8                 SED
0630: 2102 A5 15              LDA    NLO
0640: 2104 38                 SEC
0650: 2105 E9 10              SBCIM $10     N=N-10
0660: 2107 85 15              STA    NLO
0670: 2109 A5 16              LDA    NHI
0680: 210B E9 00              SBCIM $00
0690: 210D 85 16              STA    NHI
0700:
0710: 210F A9 01      AGN     LDAIM $01
0720: 2111 20 41 24           JSR    NADJA   N=N+1
0730: 2114 A5 15              LDA    NLO
0740: 2116 C5 1A              CMP    LOPAR
0750: 2118 D0 01              BNE    INSRX
0760: 211A 00                 BRK             ****<1C> INSERTION OVFLW
ID=E4

0010: 211B 20 88 24   INSRX   JSR    PRNN    PROMPT & INPUT
0020:
0030: 211E A5 15              LDA    NLO
0040: 2120 48                 PHA
0050: 2121 A5 16              LDA    NHI
0060: 2123 48                 PHA            CREATE
0070: 2124 20 B2 24           JSR    SPACE   SPACE
0080: 2127 68                 PLA            FOR NEW
0090: 2128 85 16              STA    NHI     LINE
0100: 212A 68                 PLA
0110: 212B 85 15              STA    NLO
0120:
0130: 212D 20 28 24           JSR    STORN   STORE
0140: 2130 20 76 24           JSR    LINE    NEW LINE
0150: 2133 C9 40              CMPIM EOF
0160: 2135 D0 D8              BNE    AGN
0170:
0180: 2137 A9 20              LDAIM '
0190: 2139 20 2F 24           JSR    STORE
0200: 213C A9 0D              LDAIM $0D
0210: 213E 20 2F 24           JSR    STORE
0220:
0230: 2141 A5 15              LDA    NLO
0240: 2143 85 1A              STA    LOPAR   DELETE
0250: 2145 85 1B              STA    LOPAR   +01 LAST LINE
```

```
2147 A5 16              LDA   NHI     ENTERED
2149 85 1D              STA   HIPAR
214B 85 1E              STA   HIPAR   +01
214D 4C 71 21           JMP   DELFN

2150 C9 4E     NOTI     CMPIM 'N
2152 D0 19              BNE   NOTN

               ***[NUMBER]***

2154 20 F4 23           JSR   RESB
2157 20 FB 24  NUMB     JSR   LOAD    CHECK
215A 30 18              BMI   ENDN    FOR END
215C C9 40              CMPIM EOF
215E F0 14              BEQ   ENDN
2160 C9 0D              CMPIM $0D
2162 D0 F3              BNE   NUMB    STORE
2164 20 3F 24           JSR   NADJ    N,N+10,...
2167 20 28 24           JSR   STORN
216A 4C 57 21           JMP   NUMB

216D C9 44     NOTN     CMPIM 'D
216F D0 06              BNE   NOTD

               ***[DELETE]***

2171 20 A0 23  DELFN    JSR   DELETE
2174 4C 31 20  ENDN     JMP   RESTRT

2177 C9 43     NOTD     CMPIM 'C
2179 D0 03              BNE   NOTC

               ***[CLEAR]***

217B 4C 00 20           JMP   EDITOR

217E C9 46     NOTC     CMPIM 'F
2180 D0 09              BNE   NOTF

               ***[FIX]***

2182 20 67 23           JSR   LIST
2185 20 A0 23           JSR   DELETE
2188 4C 1B 21           JMP   INSRX

218B C9 57     NOTF     CMPIM 'W
218D D0 0D              BNE   NOTW

               ***[WHERE]***

218F 20 4F 24           JSR   FNDLN   FIND N
2192 A5 11     WOUT     LDA   BHI
2194 A6 10              LDX   BLO     PRINT ADDRESS
2196 20 EB 2D           JSR   HEXSP
2199 4C F4 20           JMP   LSFN    LIST N
ID=E5
```

```
219C C9 53      NOTW   CMPIM 'S
219E D0 5B             BNE   NOTS

                ***[SAVE]***

21A0 20 A6 21          JSR   SAVEX
21A3 4C 31 20          JMP   RESTRT

21A6 A6 17      SAVEX  LDX   CTR        ADDRESS
21A8 E0 02             CPXIM $02        GIVEN?
21AA F0 18             BEQ   SAVA

21AC 20 96 24   SAVEY  JSR   FNDND
21AF A9 00             LDAIM $00             SET UP
21B1 85 1B             STA   LOPAR  +01      PARAMETERS
21B3 AD A4 2E          LDA   SOURCE          FROM
21B6 85 1E             STA   HIPAR  +01      WORKSPACE
21B8 A5 10             LDA   BLO             DEFINITION
21BA 69 06             ADCIM $06
21BC 85 1C             STA   LOPAR  +02
21BE A5 11             LDA   BHI
21C0 69 00             ADCIM $00
21C2 85 1F             STA   HIPAR  +02

21C4 A5 1B      SAVA   LDA   LOPAR  +01
21C6 8D F5 17          STA   SAL         SET UP
21C9 A5 1C             LDA   LOPAR  +02  SAVE
21CB 8D F7 17          STA   EAL         PARAMETERS
21CE A5 1E             LDA   HIPAR  +01
21D0 8D F6 17          STA   SAH
21D3 A5 1F             LDA   HIPAR  +02
21D5 8D F8 17          STA   EAH
21D8 A5 1E             LDA   HIPAR  +01
21DA A6 1B             LDX   LOPAR  +01  PRINT
21DC 20 EB 2D          JSR   HEXSP       ADDRESSES
21DF A5 1F             LDA   HIPAR  +02
21E1 A6 1C             LDX   LOPAR  +02
21E3 20 EB 2D          JSR   HEXSP

21E6 C6 62             DEC   ID
21E8 A5 1A             LDA   LOPAR  SAME ID
21EA F0 02             BEQ   WRITEA AS READ
21EC 85 62             STA   ID

21EE AD F5 17   WRITEA LDA   SAL
21F1 85 60             STA   SALX   CALL CWRITE
21F3 AD F6 17          LDA   SAH
21F6 85 61             STA   SAHX
21F8 4C 9A 2E          JMP   WRITE
ID=E6


21FB C9 4D      NOTS   CMPIM 'M
21FD F0 03             BEQ   MOVE
21FF 4C A4 22          JMP   NOTM

                ***[MOVE]***

```

```
2202 A5 1A      MOVE    LDA    LOPAR
2204 85 18              STA    LO     FIND
2206 A5 1D              LDA    HIPAR  'TO'
2208 85 19              STA    HI     LINE
220A 20 4F 24           JSR    FNDLN
220D D0 15              BNE    ERRM
220F A5 1B              LDA    LOPAR  +01
2211 85 1A              STA    LOPAR
2213 A5 1E              LDA    HIPAR  +01
2215 85 1D              STA    HIPAR
2217 A5 10      REMOVA  LDA    BLO    SAVE
2219 85 12              STA    OBLO   'TO'
221B A5 11              LDA    BHI    ADDRESS
221D 85 13              STA    OBHI
221F 20 4F 24           JSR    FNDLN  FIND 'FROM' LINE
2222 F0 01              BEQ    OKLN
2224 00         ERRM    BRK           *****<26> ILLEGAL LINE
2225 A5 15      OKLN    LDA    NLO
2227 C5 1A              CMP    LOPAR  CORRECT
2229 D0 28              BNE    NXTL   LINE?
222B A5 16              LDA    NHI
222D C5 1D              CMP    HIPAR
222F D0 22              BNE    NXTL
2231 20 0D 25           JSR    INCBUF LOAD
2234 20 0D 25           JSR    INCBUF BUFFER
2237 20 DE 24           JSR    BUFOUT
223A 8A                 TXA
223B A8                 TAY
223C 88                 DEY
223D A5 12              LDA    OBLO
223F 85 10              STA    BLO    CREATE
2241 A5 13              LDA    OBHI   SPACE
2243 85 11              STA    BHI    FOR
2245 20 B2 24           JSR    SPACE  LINE
2248 A9 00              LDAIM  $00
224A 20 2F 24           JSR    STORE  INSERT
224D 20 2F 24           JSR    STORE  LINE
2250 20 76 24           JSR    LINE
2253 A6 17      NXTL    LDX    CTR
2255 E0 02              CPXIM  $02    SINGLE LINE?
2257 D0 19              BNE    DUN
2259 A9 01              LDAIM  $01
225B 18                 CLC
225C F8                 SED
225D 65 1A              ADC    LOPAR
225F 85 1A              STA    LOPAR  RESET
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```
0650: 2261 A5 1D            LDA   HIPAR  TO
0660: 2263 69 00            ADCIM $00    SEARCH
0670: 2265 85 1D            STA   HIPAR  FOR
0680: 2267 D8               CLD          NEXT
0690: 2268 A5 1C            LDA   LOPAR  +02  LINE
0700: 226A C5 1A            CMP   LOPAR
0710: 226C A5 1F            LDA   HIPAR  +02
0720: 226E E5 1D            SBC   HIPAR
0730: 2270 B0 18            BCS   REMOVE
0740:
0750: 2272 A2 FB     DUN    LDXIM $FB
0760: 2274 B5 20     SHFT   LDAZX HIPAR  +03 SHIFT
0770: 2276 95 1F            STAZX HIPAR  +02 COMMAND
0780: 2278 E8               INX              PARAMETERS
0790: 2279 D0 F9            BNE   SHFT         TO
0800: 227B C6 17            DEC   CTR        DELETE
0810: 227D D0 08            BNE   TWO        OLD BLOCK
0820: 227F A5 1A            LDA   LOPAR
0830: 2281 85 1B            STA   LOPAR  +01
0840: 2283 A5 1D            LDA   HIPAR
0850: 2285 85 1E            STA   HIPAR  +01
0860: 2287 4C 71 21  TWO    JMP   DELFN
0870:
0880: 228A A5 1A     REMOVE LDA   LOPAR
0890: 228C 48               PHA
0900: 228D A5 1D            LDA   HIPAR
0910: 228F 48               PHA          GET
0920: 2290 A5 18            LDA   LO     BACK
0930: 2292 85 1A            STA   LOPAR  'TO'
0940: 2294 A5 19            LDA   HI     LINE
0950: 2296 85 1D            STA   HIPAR
0960: 2298 20 4F 24         JSR   FNDLN
0970: 229B 68               PLA
0980: 229C 85 1D            STA   HIPAR
0990: 229E 68               PLA
1000: 229F 85 1A            STA   LOPAR
1010: 22A1 4C 17 22         JMP   REMOVA START OVER
1020:
ID=E7

0010:
0020: 22A4 C9 58     NOTM   CMPIM 'X
0030: 22A6 D0 10            BNE   NOTX
0040:
0050:                ***[EXECUTE]***
0060:
0070: 22A8 A5 1D            LDA   HIPAR
0080: 22AA 05 1A            ORA   LOPAR
0090: 22AC D0 03            BNE   GETADS
0100: 22AE 4C F8 25         JMP   ASMBLR ASSEMBLE
0110:
0120: 22B1 A5 1D     GETADS LDA   HIPAR
0130: 22B3 85 1B            STA   LOPAR  +01
0140: 22B5 6C 1A 00         JMI   LOPAR  EXECUTE
0150:
0160: 22B8 C9 50     NOTX   CMPIM 'P
0170: 22BA D0 0C            BNE   NOTP
0180:
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0190:                    ***[PAGE MODE]***
0200:
0210: 22BC A5 63                LDA    PMODE
0220: 22BE 49 FF                EORIM  $FF     RESET
0230: 22C0 85 63                STA    PMODE   MODE
0240: 22C2 A9 F0                LDAIM  $F0     AND
0250: 22C4 85 64                STA    COUNTL  COUNTER
0260: 22C6 D0 26                BNE    RSTRTA
0270:
0280: 22C8 C9 47         NOTP   CMPIM  'G
0290: 22CA D0 11                BNE    NOTG
0300:
0310:                    ***[GET FILE]***
0320:
0330: 22CC A5 1A                LDA    LOPAR
0340: 22CE 85 62                STA    ID
0350: 22D0 20 97 2E      GETRD  JSR    READ     CREAD
0360:
0370: 22D3 E6 62                INC    ID
0380: 22D5 A5 1B                LDA    LOPAR   +01 MORE FILES?
0390: 22D7 C5 62                CMP    ID
0400: 22D9 B0 F5                BCS    GETRD
0410: 22DB 90 11                BCC    RSTRTA
0420:
0430: 22DD C9 45         NOTG   CMPIM  'E
0440: 22DF D0 10                BNE    NOTE
0450:
0460:                    ***[END]***
0470:
0480: 22E1 20 96 24             JSR    FNDND
0490: 22E4 A5 11                LDA    BHI     PRINT
0500: 22E6 A6 10                LDX    BLO     ADDRESS
0510: 22E8 20 EB 2D             JSR    HEXSP   & N
0520: 22EB 20 C5 2D             JSR    NOUT
0530: 22EE 4C 31 20      RSTRTA JMP    RESTRT
0540:
0550: 22F1 C9 5A         NOTE   CMPIM  'Z
0560: 22F3 D0 36                BNE    NOTZ
0570:
0580:                    ***[DISASSEMBLER]***
0590:
0600: 22F5 A6 17                LDX    CTR
0610: 22F7 D0 06                BNE    TWIN    (2 PARS)
0620:
0630: 22F9 A5 1A                LDA    LOPAR
0640: 22FB 05 1D                ORA    HIPAR
0650: 22FD F0 08                BEQ    CONT    (0 PARS)
0660:
0670: 22FF A5 1A         TWIN   LDA    LOPAR
0680: 2301 85 3D                STA    PCLO    SET PC
0690: 2303 A5 1D                LDA    HIPAR
0700: 2305 85 3E                STA    PCHI
0710:
0720: 2307 A9 F0         CONT   LDAIM  $F0
0730: 2309 85 18                STA    LO
0740: 230B 20 7A 2C      TWX    JSR    DSMBLR
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```
230E A6 17                  LDX    CTR
2310 D0 0D                  BNE    CHK      END
2312 E6 18                  INC    LO       OF
2314 30 F5                  BMI    TWX      PAGE?
2316 20 2B 2E               JSR    INCH
2319 C9 0D                  CMPIM  $0D
231B D0 EA                  BNE    CONT
231D F0 CF         RSTRTC   BEQ    RSTRTA
231F A5 3D         CHK      LDA    PCLO
2321 C5 1B                  CMP    LOPAR    +01
2323 A5 3E                  LDA    PCHI         END
2325 E5 1E                  SBC    HIPAR    +01 ADDRESS?
2327 90 E2                  BCC    TWX
2329 B0 C3                  BCS    RSTRTA
232B C9 54         NOTZ     CMPIM  'T
232D D0 03                  BNE    NOTT
                   ***[TABLE]***
232F 4C 14 25               JMP    TABLE
2332 C9 52         NOTT     CMPIM  'R
2334 D0 18                  BNE    NOTR
                   ***[REPRODUCE]***
2336 A5 1B                  LDA    LOPAR    +01
2338 85 27                  STA    SAVID
233A A5 1A         RDTWO    LDA    LOPAR
233C 85 62                  STA    ID       ID=LOPAR
233E 20 97 2E               JSR    READ     COPY
2341 20 AC 21               JSR    SAVEY    FILE
2344 E6 1A                  INC    LOPAR
2346 A5 27                  LDA    SAVID    LAST ID?
2348 C5 1A                  CMP    LOPAR
234A B0 EE                  BCS    RDTWO
234C 90 A0                  BCC    RSTRTA
234E C9 42         NOTR     CMPIM  'B
2350 D0 14                  BNE    NOTB
                   ***[BLOCKMOVE]***
2352 A4 1C                  LDY    LOPAR    +02
2354 A6 1B                  LDX    LOPAR    +01 REARRANGE
2356 A5 1D                  LDA    HIPAR        PARAMETERS
2358 86 1D                  STX    HIPAR
235A 85 1B                  STA    LOPAR    +01
235C 88            JLP      DEY
235D B1 1A                  LDAIY  LOPAR    MOVE
235F 91 1D                  STAIY  HIPAR    BLOCK
2361 98                     TYA
2362 D0 F8                  BNE    JLP
```

```
1310: 2364 F0 B7             BEQ   RSTRTC
1320:
1330: 2366 00         NOTB   BRK                *****<68> COMMAND ERROR
1340:
ID=E8

0010:                    ****** ***********
0020:                 ***EDITOR SUBROUTINES***
0030:                    ****** ***********
0040:
0050:
0060:                 LIST 1 OR MORE LINES
0070:                 GIVEN BY LOPAR,HIPAR
0080:
0090: 2367 20 4F 24  LIST   JSR   FNDLN
0100: 236A A5 1D            LDA   HIPAR
0110: 236C 05 1A            ORA   LOPAR  ARGUMENT?
0120: 236E D0 06            BNE   PARAMS
0130:
0140: 2370 A9 99            LDAIM $99
0150: 2372 85 1E            STA   HIPAR  +01 LIST ALL
0160: 2374 85 1B            STA   LOPAR  +01
0170:
0180: 2376 20 FB 24  PARAMS JSR   LOAD
0190: 2379 85 16            STA   NHI    GET N
0200: 237B 20 FB 24         JSR   LOAD
0210: 237E 85 15            STA   NLO
0220:
0230: 2380 A5 1B            LDA   LOPAR  +01
0240: 2382 C5 15            CMP   NLO    ALL DONE?
0250: 2384 A5 1E            LDA   HIPAR  +01
0260: 2386 E5 16            SBC   NHI
0270: 2388 90 15            BCC   RETL
0280:
0290: 238A 20 C5 2D  PRINT  JSR   NOUT   PRINT N
0300: 238D A9 3A            LDAIM ':        :
0310: 238F 20 F0 2D         JSR   OUTCH
0320: 2392 20 EE 2D         JSR   OUTSP  SPACE
0330: 2395 20 DE 24         JSR   BUFOUT FILL BUFFER
0340: 2398 48               PHA
0350: 2399 20 84 2E         JSR   PRBUF  PRINT BUFFER
0360: 239C 68               PLA
0370: 239D 10 D7            BPL   PARAMS
0380: 239F 60        RETL   RTS
0390:
0400:                DELETE ROUTINE
0410:
0420: 23A0 20 4F 24  DELETE JSR   FNDLN  FIND LINE N
0430: 23A3 10 33            BPL   ADL
0440: 23A5 60               RTS
0450:
0460: 23A6 A0 02     DLN    LDYIM $02
0470: 23A8 C8        GETY   INY
0480: 23A9 B1 10            LDAIY BLO    COUNT
0490: 23AB C9 0D            CMPIM $0D    LINE
0500: 23AD F0 05            BEQ   CLOSE  LENGTH
0510: 23AF C9 40            CMPIM EOF
0520: 23B1 D0 F5            BNE   GETY
```

```
0530: 23B3 60              RTS
0540:
0550: 23B4 84 14     CLOSE STY   LTH    SAVE LENGTH
0560: 23B6 A5 10           LDA   BLO    AND
0570: 23B8 85 12           STA   OBLO   START ADDRESS
0580: 23BA A5 11           LDA   BHI
0590: 23BC 85 13           STA   OBHI
0600:
0610: 23BE A4 14     LOOP  LDY   LTH
0620: 23C0 B1 10           LDAIY BLO    CLOSE
0630: 23C2 A0 00           LDYIM $00    LINE
0640: 23C4 91 10           STAIY BLO    TO
0650: 23C6 20 0D 25        JSR   INCBUF EOF
0660: 23C9 AD A5 2E        LDA   SOURCF
0670: 23CC C5 11           CMP   BHI
0680: 23CE D0 EE           BNE   LOOP
0690:
0700: 23D0 A5 12           LDA   OBLO
0710: 23D2 85 10           STA   BLO    RESTORE
0720: 23D4 A5 13           LDA   OBHI   ADDRESS
0730: 23D6 85 11           STA   BHI
0740:
0750: 23D8 A0 02     ADL   LDYIM $02
0760: 23DA A5 1B           LDA   LOPAR  +01
0770: 23DC D1 10           CMPIY BLO
0780: 23DE 88              DEY
0790: 23DF A5 1E           LDA   HIPAR  +01
0800: 23E1 F1 10           SBCIY BLO
0810: 23E3 B0 C1           BCS   DLN
0820: 23E5 60        RETDEL RTS
0830:
0840:
ID=E9

0010:                DECREMENT POINTER
0020:                BLO,BHI
0030:
0040: 23E6 A5 10     DECBUF LDA   BLO
0050: 23E8 38               SEC          16 BIT
0060: 23E9 E9 01            SBCIM $01    SUBTRACT
0070: 23EB 85 10            STA   BLO
0080: 23ED A5 11            LDA   BHI
0090: 23EF E9 00            SBCIM $00
0100: 23F1 85 11            STA   BHI
0110: 23F3 60               RTS
0120:
0130:                RESET POINTER
0140:                TO START OF WORKSPACE
0150:                AND N TO 0000
0160:
0170: 23F4 A9 FF     RESB   LDAIM $FF
0180: 23F6 85 10            STA   BLO
0190: 23F8 AD A3 2E         LDA   SOURCM
0200: 23FB 85 11            STA   BHI
0210: 23FD A9 00            LDAIM $00
0220: 23FF 85 15            STA   NLO
0230: 2401 85 16            STA   NHI
0240: 2403 60               RTS
```

```

                      PRINT ERROR MESSAGE

2404 68               ERROR  PLA              GET LO
2405 68                      PLA              RET ADDRESS
2406 20 0C 24                JSR    ERRPRT
2409 4C 31 20                JMP    RESTRT

240C 48               ERRPRT PHA
240D 20 E7 2D                JSR    CRLF
2410 A0 0A                   LDYIM  $0A       PRINT
2412 A9 2A            STAR   LDAIM  '*        ******<
2414 20 F0 2D                JSR    OUTCH
2417 88                      DEY
2418 10 F8                   BPL    STAR
241A A9 3C                   LDAIM  '<
241C 20 F0 2D                JSR    OUTCH
241F 68                      PLA              ERROR # >
2420 20 CD 2D                JSR    HEXOUT
2423 A9 3E                   LDAIM  '>
2425 4C F0 2D                JMP    OUTCH

                      STORE NLO,NHI

2428 A5 16            STORN  LDA    NHI
242A 20 2F 24                JSR    STORE
242D A5 15                   LDA    NLO

                      STORE ONE BYTE
                      CHECK FOR OVFLOW

242F 20 0D 25         STORE  JSR    INCBUF
2432 AC A5 2E                LDY    SOURCF
2435 C4 11                   CPY    BHI
2437 D0 01                   BNE    OKS
2439 00                      BRK              ****<3B> SOURCE OVFLW

243A A0 00            OKS    LDYIM  $00
243C 91 10                   STAIY  BLO
243E 60                      RTS

                      N=N+10

243F A9 10            NADJ   LDAIM  $10
2441 18               NADJA  CLC
2442 F8                      SED
2443 65 15                   ADC    NLO       16 BIT
2445 85 15                   STA    NLO       ADD
2447 A5 16                   LDA    NHI
2449 69 00                   ADCIM  $00
244B 85 16                   STA    NHI
244D D8                      CLD
244E 60                      RTS

                      FIND LINE # N

```

```
0810: 244F 20 F4 23  FNDLN  JSR    RESB    RESET POINTER
0820:
0830: 2452 20 FB 24  LODE   JSR    LOAD    LOOK
0840: 2455 30 1E            BMI    ENDF    FOR
0850: 2457 C9 0D            CMPIM  $0D     CR
0860: 2459 D0 F7            BNE    LODE
0870:
0880: 245B 20 FB 24         JSR    LOAD
0890: 245E 85 16            STA    NHI     GET N
0900: 2460 20 FB 24         JSR    LOAD
0910: 2463 85 15            STA    NLO
0920: 2465 C5 1A            CMP    LOPAR   COMPARE
0930: 2467 A5 16            LDA    NHI     LOPAR,HIPAR
0940: 2469 E5 1D            SBC    HIPAR
0950: 246B 90 E5            BCC    LODE
0960: 246D 20 E6 23  ENDO   JSR    DECBUF  ADJUST
0970: 2470 20 E6 23         JSR    DECBUF  BLO,BHI
0980: 2473 A9 00            LDAIM  $00
0990: 2475 60        ENDF   RTS
1000:
1010:                STORE BUFFER IN WORKSPACE
1020:
1030: 2476 A2 00     LINE   LDXIM  $00
1040: 2478 BD 00 01  STR    LDAAX  BUFFER
1050: 247B C9 40            CMPIM  EOF
1060: 247D F0 08            BEQ    ENDLN
1070: 247F 20 2F 24         JSR    STORE
1080: 2482 E8               INX
1090: 2483 C9 0D            CMPIM  $0D     END OF LINE
1100: 2485 D0 F1            BNE    STR
1110: 2487 60        ENDLN  RTS
1120:
1130:                PROMPT "N:" AND INPUT TO BUFFER
1140:
1150: 2488 20 C5 2D  PRNN   JSR    NOUT
1160: 248B A9 3A            LDAIM  ':
1170: 248D 20 F0 2D  BUFX   JSR    OUTCH
1180: 2490 20 EE 2D         JSR    OUTSP
1190: 2493 4C 3F 2E         JMP    BUFIN
1200:
ID=EA

0010:
0010:                FIND END OF FILE RECORD
0020:
0030:
0040: 2496 20 F4 23  FNDND  JSR    RESB
0050: 2499 20 FB 24  LD     JSR    LOAD
0060: 249C C9 40            CMPIM  EOF     LOOK
0070: 249E D0 01            BNE    NOTEN   FOR
0080: 24A0 60               RTS            FIRST
0090: 24A1 C9 0D     NOTEN  CMPIM  $0D     EOF
0100: 24A3 D0 F4            BNE    LD      CHARACTER
0110: 24A5 20 FB 24         JSR    LOAD
0120: 24A8 85 16            STA    NHI
0130: 24AA 20 FB 24         JSR    LOAD    GET N
0140: 24AD 85 15            STA    NLO
0150: 24AF 4C 99 24         JMP    LD
```

```


                   CREATE A SPACE
                   Y+3 CHARACTERS LONG
                   FROM BLO,BHI


24B2 C8            SPACE  INY
24B3 C8                   INY                Y=Y+3
24B4 C8                   INY
24B5 84 14                STY    LTH
24B7 A5 10                LDA    BLO
24B9 85 12                STA    OBLO    SAVE
24BB A5 11                LDA    BHI     BLO,BHI
24BD 85 13                STA    OBHI
24BF 20 96 24             JSR    FNDND

24C2 A0 00         SPACIT LDYIM  $00
24C4 B1 10                LDAIY  BLO
24C6 A4 14                LDY    LTH     MOVE BLOCK
24C8 91 10                STAIY  BLO     UP LTH
24CA 20 E6 23             JSR    DECBUF  BYTES
24CD CD A3 2E             CMP    SOURCM
24D0 D0 01                BNE    NOERS
24D2 00                   BRK            ****<D4> MOVING BELOW SOURCE!

24D3 C5 13         NOERS  CMP    OBHI
24D5 D0 EB                BNE    SPACIT
24D7 A5 10                LDA    BLO
24D9 C5 12                CMP    OBLO
24DB D0 E5                BNE    SPACIT
24DD 60                   RTS

                   FILL BUFFER WITH CURRENT LINE

24DE A2 00         BUFOUT LDXIM  $00
24E0 20 FB 24      LDX    JSR    LOAD
24E3 9D 00 01             STAAX  BUFFER
24E6 E8                   INX            LIMIT OF
24E7 E0 40                CPXIM  $40     64 CHARACTERS
24E9 10 08                BPL    OVFLOW

24EB C9 0D                CMPIM  $0D
24ED F0 0B                BEQ    ENDOT   END OF
24EF C9 40                CMPIM  EOF     LINE
24F1 D0 ED                BNE    LDX

24F3 A9 0D         OVFLOW LDAIM  $0D
24F5 9D 00 01             STAAX  BUFFER
24F8 A9 FF                LDAIM  $FF     RET N=1
24FA 60            ENDOT  RTS             IF OVFLOW

                   LOAD A FROM WORKSPACE
                   CHECKING FOR EOF

24FB 20 0D 25      LOAD   JSR    INCBUF
24FE AC A5 2E             LDY    SOURCF
```

```
0720: 2501 C4 11            CPY   BHI
0730: 2503 D0 03            BNE   NOEND
0740: 2505 A9 FF            LDAIM $FF      RET N=1 IF
0750: 2507 60               RTS            EOF REACHED
0760:
0770: 2508 A0 00     NOEND  LDYIM $00
0780: 250A B1 10            LDAIY BLO
0790: 250C 60               RTS
0800:
0810:                INCREMENT BLO,BHI
0820:
0830: 250D E6 10     INCBUF INC   BLO
0840: 250F D0 02            BNE   RETI
0850: 2511 E6 11            INC   BHI
0860: 2513 60        RETI   RTS
ID=EB

0010:
0020:                SYMBOL TABLE ROUTINE
0030:
0040: 2514 A0 4B     TABLE  LDYIM $4B      PRINT
0050: 2516 20 A0 27         JSR   MESSY    "SYMBOL TABLE"
0060: 2519 AD A6 2E         LDA   SYMBOL
0070: 251C A2 00            LDXIM $00
0080: 251E 20 EB 2D         JSR   HEXSP    START &
0090: 2521 A5 42            LDA   EHI      END ADDRESSES
0100: 2523 A6 41            LDX   ELO
0110: 2525 20 C9 2D         JSR   HEXAX
0120:
0130: 2528 A6 1A            LDX   LOPAR
0140: 252A E0 02            CPXIM $02
0150: 252C F0 73            BEQ   LONLY    (T2 COMMAND)
0160:
0170: 252E 30 0A            BMI   SORT
0180:
0190: 2530 A5 1B            LDA   LOPAR    +01
0200: 2532 85 41            STA   ELO      SET ELO,EHI
0210: 2534 A5 1E            LDA   HIPAR    +01
0220: 2536 85 42            STA   EHI
0230: 2538 D0 67            BNE   LONLY
0240:
0250:                BUBBLE SORT ROUTINE
0260:
0270: 253A 20 E6 25  SORT   JSR   SETSY
0280: 253D A6 1A     LOOPT  LDX   LOPAR
0290: 253F D0 11            BNE   LOOPB
0300: 2541 A0 00            LDYIM $00
0310: 2543 B1 55     NEXTY  LDAIY XLO      COMPARE
0320: 2545 D1 3F            CMPIY SLO      FOR
0330: 2547 90 16            BCC   MOVX     ALPHA
0340: 2549 D0 25            BNE   LESS     SORT
0350: 254B C8               INY
0360: 254C C0 04            CPYIM $04
0370: 254E D0 F3            BNE   NEXTY
0380: 2550 F0 1E            BEQ   LESS
0390:
0400: 2552 A0 04     LOOPB  LDYIM $04
0410: 2554 B1 55            LDAIY XLO      COMPARE
```

```
2556 D1 3F              CMPIY SLO     FOR
2558 C8                 INY           ADDRESS
2559 B1 55              LDAIY XLO     SORT
255B F1 3F              SBCIY SLO
255D B0 11              BCS   LESS

255F A0 05     MOVX     LDYIM $05
2561 B1 3F     MOVET    LDAIY SLO
2563 48                 PHA
2564 B1 55              LDAIY XLO     EXCHANGE
2566 91 3F              STAIY SLO     SYMBOLS
2568 68                 PLA
2569 91 55              STAIY XLO
256B 88                 DEY
256C 10 F3              BPL   MOVET
256E E6 54              INC   CNT

2570 20 C1 27  LESS     JSR   DADS    S=S+6
2573 A2 16              LDXIM $16
2575 20 C3 27           JSR   DADX    X=X+6
2578 90 C3              BCC   LOOPT

257A A6 54              LDX   CNT     FINISHED?
257C D0 BC              BNE   SORT

257E A9 00              LDAIM $00
2580 20 E6 25           JSR   SETSY
2583 E6 54     PRNT     INC   CNT     PRINT
2585 30 07              BMI   PRNTX   NEW
2587 20 E7 2D           JSR   CRLF    LINE
258A A9 FC              LDAIM $FC
258C 85 54              STA   CNT

258E 20 A4 25  PRNTX    JSR   PRSYM
2591 A0 04              LDYIM $04     PRINT
2593 B1 3F              LDAIY SLO     SYMBOL
2595 AA                 TAX           AND
2596 C8                 INY           ADDRESS
2597 B1 3F              LDAIY SLO
2599 20 C9 2D           JSR   HEXAX
259C 20 C1 27           JSR   DADS
259F 90 E2              BCC   PRNT

25A1 4C 31 20  LONLY    JMP   RESTRT

               ROUTINE TO PRINT 4 SPACES
               AND SYMBOL   ADDRESS

25A4 A0 04     PRSYM    LDYIM $04
25A6 20 EE 2D  PRX      JSR   OUTSP
25A9 88                 DEY
25AA D0 FA              BNE   PRX

               ROUTINE TO PRINT SYMBOL

25AC A0 00     DPSYM    LDYIM $00
```

```
0980: 25AE B1 3F      LOD    LDAIY SLO
0990: 25B0 99 20 00          STAAY LABEL  UNPACK
1000: 25B3 C8                INY          4 BYTES
1010: 25B4 C0 04             CPYIM $04    INTO 5 BIT
1020: 25B6 D0 F6             BNE   LOD    ASCII
1030: 25B8 A0 06             LDYIM $06    FOR 6 CHAR
1040: 25BA A2 06             LDXIM $06    SYMBOL
1050: 25BC A9 00      A      LDAIM $00
1060: 25BE 06 23      ROTT   ASL   LABEL  +03
1070: 25C0 26 22             ROL   LABEL  +02
1080: 25C2 26 21             ROL   LABEL  +01
1090: 25C4 26 20             ROL   LABEL
1100: 25C6 2A                ROLA
1110: 25C7 29 1F             ANDIM $1F
1120: 25C9 CA                DEX
1130: 25CA D0 F2             BNE   ROTT
1140: 25CC 18                CLC
1150: 25CD 69 40             ADCIM $40
1160: 25CF C9 40             CMPIM $40
1170: 25D1 D0 02             BNE   NOSP   40=SPACE
1180: 25D3 A9 20             LDAIM $20
1190: 25D5 20 F0 2D   NOSP   JSR   OUTCH
1200: 25D8 A2 05             LDXIM $05
1210: 25DA C0 04             CPYIM $04    FILL BLANKS
1220: 25DC D0 02             BNE   X      TO END OF 6
1230: 25DE A2 06             LDXIM $06    CHARACTERS
1240: 25E0 88         X      DEY
1250: 25E1 D0 D9             BNE   A
1260: 25E3 4C EE 2D          JMP   OUTSP
1270:
1280:                 RESET SLO, XLO
1290:
1300: 25E6 A9 00      SETSY  LDAIM $00
1310: 25E8 85 3F             STA   SLO
1320: 25EA 85 54             STA   CNT
1330: 25EC A9 06             LDAIM $06
1340: 25EE 85 55             STA   XLO
1350: 25F0 AD A6 2E          LDA   SYMBOL
1360: 25F3 85 40             STA   SHI
1370: 25F5 85 56             STA   XHI
1380: 25F7 60                RTS
ID=
```

EDITOR

SYMBOL TABLE 3000 346E

A	25BC	ADL	23D8	AGN	210F	ASMBLR	25F8
BACKSP	2DE3	BHI	0011	BLO	0010	BUFFER	0100
BUFIN	2E3F	BUFOUT	24DE	BUFX	248D	CHK	231F
CLEAR	201E	CLOSE	23B4	CNT	0054	COMMA	209D
CONT	2307	COUNTL	0064	CRLF	2DE7	CTR	0017
DADS	27C1	DADX	27C3	DECBUF	23E6	DELETE	23A0
DELFN	2171	DLN	23A6	DPSYM	25AC	DSMBLR	2C7A
DUN	2272	EAH	17F8	EAL	17F7	EDITOR	2000
EHI	0042	ELO	0041	ENDAD	20EB	ENDF	2475
ENDLN	2487	ENDN	2174	ENDO	246D	ENDOT	24FA
EOF	4040	ERRM	2224	ERROR	2404	ERRPRT	240C
ERR	209C	FNDLN	244F	FNDND	2496	GETADS	22B1
GETRD	22D0	GETY	23A8	GTA	205E	GTCLR	2057
HEXAX	2DC9	HEXOUT	2DCD	HEXSP	2DEB	HI	0019
HIPAR	001D	ID	0062	INCBUF	250D	INCCLR	2022
INCH	2E2B	INSRX	211B	JLP	235C	LABEL	0020
LD	2499	LDX	24E0	LESS	2570	LINE	2476
LIST	2367	LO	0018	LOAD	24FB	LODE	2452
LOD	25AE	LONLY	25A1	LOOP	23BE	LOOPB	2552
LOOPT	253D	LOPAR	001A	LSFN	20F4	LTH	0014
MESSY	27A0	MOVE	2202	MOVET	2561	MOVX	255F
NADJ	243F	NADJA	2441	NEXTY	2543	NHI	0016
NLO	0015	NOEND	2508	NOERS	24D3	NOSP	25D5
NOTA	20F0	NOTB	2366	NOTC	217E	NOTD	2177
NOTE	22F1	NOTEN	24A1	NOTF	218B	NOTG	22DD
NOTI	2150	NOTL	20FA	NOTM	22A4	NOTN	216D
NOTON	20BD	NOTP	22C8	NOTR	234E	NOTS	21FB
NOTT	2332	NOTW	219C	NOTX	22B8	NOTZ	232B
NOUT	2DC5	NUMB	2157	NXTAD	20D9	NXTL	2253
NXT	2072	OBHI	0013	OBJECT	2EA8	OBLO	0012
OKLN	2225	OKS	243A	OUTCH	2DF0	OUTSP	2DEE
OVFLOW	24F3	PACKT	2E94	PARAMS	2376	PCHI	003E
PCLO	003D	PMODE	0063	PRBUF	2E84	PRINT	238A
PRNN	2488	PRNT	2583	PRNTX	258E	PRSYM	25A4
PRX	25A6	RDTWO	233A	READ	2E97	REGET	2069
REGETA	2068	REMOVA	2217	REMOVE	228A	RESB	23F4
RESTRT	2031	RETDEL	23E5	RETI	2513	RETL	239F
ROTT	25BE	ROT	208B	RSTRTA	22EE	RSTRTB	20F7
RSTRTC	231D	SAHX	0061	SAH	17F6	SALX	0060
SAL	17F5	SAVA	21C4	SAVEX	21A6	SAVEY	21AC
SAVID	0027	SAVX	17E9	SETSY	25E6	SHFT	2274
SHI	0040	SLO	003F	SORT	253A	SOURCE	2EA4
SOURCF	2EA5	SOURCM	2EA3	SPACE	24B2	SPACIT	24C2
STAR	2412	STORE	242F	STORN	2428	STR	2478
SYMBOL	2EA6	SYMF	2EA7	TABLE	2514	TWIN	22FF
TWO	2287	TWX	230B	WOUT	2192	WRITE	2E9A
WRITEA	21EE	X	25E0	XHI	0056	XLO	0055
YSNO	2794						

```





                  *******************************
                  ***** MICRO-ADE ASSEMBLER *****
                  ***** (C) COPYRIGHT  1977 *****
                  ***** MICRO-WARE  LIMITED *****
                  ***** 27 FIRSTBROOKE  RD. *****
                  ***** TORONTO,    CANADA  *****
                  *******************************



25F8              ASMBLR ORG   $25F8  77.06.28

                  PAGE ZERO SYMBOLS

25F8              BLO     *     $0010  WS POINTER
25F8              BHI     *     $0011
25F8              NLO     *     $0015  CURRENT LINE NUMBER
25F8              NHI     *     $0016
25F8              LOPAR   *     $001A  COMMAND INPUT PARAMETERS
25F8              HIPAR   *     $001D
25F8              LABEL   *     $0020  LABEL INPUT
25F8              OPIN    *     $0026  INSTRUCTION INPUT
25F8              AD      *     $0029  ADDRESS MODE INPUT
25F8              ARGIN   *     $002B  ARGUMENT INPUT
25F8              YCOM    *     $0031  COMMENT POINTER
25F8              PLAB    *     $0032  PACKED LABEL
25F8              POP     *     $0036  PACKED INSTRUCTION
25F8              TMP     *     $003C  TEMPORARY DATA
25F8              PCLO    *     $003D  ASSEMBLY ADDRESS
25F8              PCHI    *     $003E
25F8              SLO     *     $003F  SYMBOL TABLE POINTER
25F8              SHI     *     $0040
25F8              ELO     *     $0041  END OF SYMBOL TABLE
25F8              EHI     *     $0042
25F8              SXL     *     $0043  TEMP SYMBOL TABLE POINTER
25F8              SXH     *     $0044
25F8              ADM     *     $0045  ADDRESS MODE
25F8              LENGTH  *     $0046  INSTRUCTION LENGTH
25F8              OP      *     $0047  OP-CODE (OBJECT BYTE 1)
25F8              PCALO   *     $004A  OBJECT OUTPUT POINTER
25F8              PCAHI   *     $004B
25F8              PASS    *     $004C  PASS FLAG
25F8              PRFLAG  *     $004D  PRINT FLAG
25F8              SAVE    *     $0051  SAVE FLAG
25F8              PAGE    *     $0055  PAGE NUMBER
25F8              PGN     *     $0056  LINE IN PAGE
25F8              TITLE   *     $0057  TITLE
25F8              SAVID   *     $005D  ID TEMPORARY
25F8              SALX    *     $0060  START ADDRESS FOR CWRITE
25F8              SAHX    *     $0061
25F8              ID      *     $0062  ID FOR CWRITE
```

```
0570: 25F8              BUFFER *      $0100  I/O BUFFER
0580:
0590: 25F8              INDX   *      $0027
0600: 25F8              SPCNT  *      $0028  SPACE COUNT FOR DSMBLR
0610: 25F8              XCLO   *      $0029  SYMBOL TABLE PTR FOR DSMBLR
0620: 25F8              XCHI   *      $002A
0630: 25F8              X      *      $002B  TEMPORARY DATA
0640:
0650:
0660:                   PAGE 17 DATA FOR KIM CREAD/CWRITE
0670:
0680: 25F8              SAL    *      $17F5  START ADDRESS
0690: 25F8              SAH    *      $17F6
0700: 25F8              EAL    *      $17F7  END ADDRESS
0710: 25F8              EAH    *      $17F8
0720:
0730:                   EXTERNAL SUBROUTINES
0740:
0750: 25F8              PACKT  *      $2E94  PACK ASCII TO HEX
0760: 25F8              LOAD   *      $24FB  LOAD FROM WS
0770: 25F8              OUT    *      $24DE  BUFFER OUT 1 LINE
0780: 25F8              READ   *      $2E97  CASSETTE READ
0790: 25F8              WRITE  *      $2E9A  CASSETTE WRITE
0800: 25F8              INCH   *      $2E2B  INPUT CHARACTER
0810: 25F8              HEXSP  *      $2DEB  OUTPUT 2 BYTES + SPACE
0820: 25F8              ERRPRT *      $240C  PRINT ERROR
0830: 25F8              OUTK   *      $2DF0  OUTPUT 1 CHARACTER
0840: 25F8              HEXOUT *      $2DCD  OUTPUT 1 HEX BYTE
0850: 25F8              BUFIN  *      $2E41  BUFFER IN
0860: 25F8              RESTRT *      $2E31  EDITOR ENTRY
0870: 25F8              RESB   *      $23F4  RESET BLO,BHI
0880: 25F8              INCBUF *      $250D  INC BLO,BHI
0890: 25F8              NOUT   *      $2DC5  OUTPUT N
0900: 25F8              DPSYM  *      $25AC  PRINT SYMBOL
0910: 25F8              ZUTSP  *      $2DEC  OUTPUT SPACE
0920: 25F8              HEXAX  *      $2DC9  OUTPUT 2 HEX BYTES
0930: 25F8              SETSY  *      $25E6  SET SLO
0940: 25F8              ZRLF   *      $2DE7  CRLF
0950:
0960:                   WORKSPACE PARAMETER DEFINITIONS
0970:
0980: 25F8              SOURCE *      $2EA4  SOURCE DEFINITION
0990: 25F8              SYMBOL *      $2EA6  SYMBOL TABLE DEFINITION
1000: 25F8              ENDSYM *      $2EA7  SYMBOL TABLE END
1010: 25F8              OBJECT *      $2EA8  OBJECT DEFINITION
1020: 25F8              BINARY *      OBJECT
ID=A2

0010:                   ASSEMBLER NORMAL ENTRY
0020:
0030: 25F8 A0 00        MAIN   LDYIM $00     RESET
0040: 25FA 84 41               STY   ELO     SYMBOL
0050: 25FC AD A6 2E            LDA   SYMBOL  TABLE
0060: 25FF 85 42               STA   EHI
0070:
0080:                   ENTRY WITHOUT SYMBOL TABLE RESET
0090:
0100: 2601 20 A0 27     OLDST  JSR   MESSY   PRINT "PASS 1"
```

```
0110: 2604 A9 FF              LDAIM  $FF     SET PASS = 1
0120: 2606 85 4C              STAZ   PASS
0130:
0140:                  ENTRY FOR CONTINUATION AT "ID:"
0150:
0160: 2608 A0 5E       IDAS   LDYIM  $5E
0170: 260A 20 A0 27    GETID  JSR    MESSY   PRINT "ID:"
0180: 260D E6 1C              INC    LOPAR   +02
0190: 260F A5 1F              LDA    HIPAR   +02 AUTO
0200: 2611 C5 1C              CMP    LOPAR   +02 ID
0210:
0220: 2613 90 0D              BCC    GETIT
0230: 2615 A5 1C              LDA    LOPAR   +02
0240: 2617 85 62              STA    ID
0250: 2619 20 CD 2D           JSR    HEXOUT  PRINT ID
0260: 261C 20 87 27           JSR    CRLF
0270: 261F 4C 53 26           JMP    NOERID
0280:
0290: 2622 20 41 2E    GETIT  JSR    BUFIN
0300: 2625 AD 00 01           LDA    BUFFER  INPUT
0310: 2628 C9 0D              CMPIM  $0D     ID
0320: 262A D0 03              BNE    NENDID
0330: 262C 4C E2 26           JMP    ENDID
0340:
0350: 262F AE 01 01    NENDID LDX    BUFFER  +01
0360: 2632 20 FD 2A           JSR    PACKX       PACK ID
0370: 2635 D0 18              BNE    ERID
0380: 2637 85 1C              STA    LOPAR   +02
0390: 2639 85 62              STA    ID
0400: 263B AD 02 01           LDA    BUFFER  +02
0410: 263E C9 2C              CMPIM  ',      MORE THAN 1?
0420: 2640 D0 11              BNE    NOERID
0430: 2642 AD 03 01           LDA    BUFFER  +03
0440: 2645 AE 04 01           LDX    BUFFER  +04
0450: 2648 20 FD 2A           JSR    PACKX      PACK ID 2
0460: 264B 85 1F              STA    HIPAR   +02
0470: 264D F0 04              BEQ    NOERID
0480:
0490: 264F A0 67       ERID   LDYIM  $67     PRINT "?"
0500: 2651 D0 B7              BNE    GETID
0510:
0520: 2653 A5 62       NOERID LDA    ID
0530: 2655 F0 03              BEQ    OKRD
0540: 2657 20 97 2E           JSR    READ    READ FILE
0550:
0560: 265A 20 F4 23    OKRD   JSR    RESB     RESET BLO
0570: 265D 20 0D 25           JSR    INCBUF
0580: 2660 A9 FF              LDAIM  $FF
0590: 2662 85 4A              STA    PCALO   OBJECT OUTPUT
0600: 2664 AD A8 2E           LDA    OBJECT  RESET
0610: 2667 38                 SEC
0620: 2668 E9 01              SBCIM  $01
0630: 266A 85 4B              STAZ   PCAHI
0640:
0650:                  ENTRY TO CONTINUE FROM BREAK
0660:
```

```
2668 A2 FF      ERRTRY LDXIM $FF     RESET
266E 58                CLI           STACK &
266F 9A                TXS            IRQ
2670 A9 A4             LDAIM ERROR
2672 8D FE 17          STA   $17FE
2675 A9 28             LDAIM ERROR   /256
2677 8D FF 17          STA   $17FF

267A 20 FB 24          JSR   LOAD    GET N OF LINE
267D 85 16             STA   NHI
267F 20 FB 24          JSR   LOAD
2682 85 15             STA   NLO
2684 20 DE 24          JSR   OUT     PUT LINE IN BUFFER

2687 30 26             BMI   ASMBLD
2689 20 D9 27          JSR   INTRP   INTERPRET INPUT SYNTAX

268C 20 D4 28          JSR   DECODE  DECODE OP
268F 85 47             STA   OP
2691 20 56 29          JSR   ADJLTH

2694 20 20 27          JSR   SPECOP  CHECK FOR PSEUDO-OP

2697 A6 4C             LDX   PASS
2699 D0 0B             BNE   ONEX
269B 20 8B 29          JSR   GETARG  INTERPRET ARGUMENT

269E 20 CC 2A          JSR   RELAD   CALCULATE RELATIVE BRANCHES

26A1 20 F9 29          JSR   PRINT   PRINT LINE
26A4 F0 03             BEQ   DNX

26A6 20 59 28   ONEX   JSR   ADDSYM  ADD SYMBOL TO TABLE

26A9 20 7B 29   DNX    JSR   PCADJ   ADJUST PC
26AC 4C 6C 26          JMP   ERRTRY  LOOP TO NEXT LINE


26AF A6 4C      ASMBLD LDX   PASS    PASS 2 =0
26B1 D0 2C             BNE   IDXS

26B3 A6 51             LDXZ  SAVE
26B5 D0 28             BNE   IDXS
26B7 E6 5D             INC   SAVID   SAVE
26B9 A5 5D             LDA   SAVID   OBJECT
26BB 85 62             STA   ID      CODE
26BD 8E F5 17          STX   SAL
26C0 AD A8 2E          LDA   OBJECT
26C3 8D F6 17          STA   SAH
26C6 A5 4A             LDA   PCALO
26C8 69 01             ADCIM $01
26CA 8D F7 17          STA   EAL
26CD A5 4B             LDA   PCAHI
26CF 69 00             ADCIM $00
26D1 8D F8 17          STA   EAH
26D4 20 9A 2E          JSR   WRITE
```

```
1230: 26D7 A5 3D            LDA    PCLO    RESET
1240: 26D9 85 60            STA    SALX    OBJECT
1250: 26DB A5 3E            LDA    PCHI    PARAMETERS
1260: 26DD 85 61            STA    SAHX
1270:
1280: 26DF 4C 08 26  IDXS   JMP    IDAS    GET NEXT TAPE
1290:
1300: 26E2 A5 4C     ENDID  LDAZ   PASS
1310: 26E4 F0 37            BEQ    ENDB
ID=A3
0010:
0020:                ENTRY FOR PASS 2 ASSEMBLY ONLY
0030:
0040: 26E6 A9 00     PASSTW LDAIM $00     PASS = 2 (00)
0050: 26E8 85 4C            STAZ   PASS
0060:
0070: 26EA A9 00            LDAIM $00     RESET
0080: 26EC 85 55            STAZ   PAGE    PAGE
0090: 26EE 85 56            STAZ   PGN
0100:
0110: 26F0 A0 08            LDYIM $08     PRINT "PRINT?"
0120: 26F2 20 94 27         JSR    YSNO
0130: 26F5 D0 02            BNE    NOPRT   SET PRINT FLAG
0140: 26F7 A9 00            LDAIM $00
0150: 26F9 85 4D     NOPRT  STAZ   PRFLAG
0160:
0170: 26FB A0 18     ERISD  LDYIM $18     PRINT "SAVE ID:"
0180: 26FD 20 A0 27         JSR    MESSY
0190: 2700 20 41 2E         JSR    BUFIN   INPUT ID
0200: 2703 AD 00 01         LDA    BUFFER
0210: 2706 C9 0D            CMPIM $0D
0220: 2708 F0 0E            BEQ    NSVE
0230: 270A AE 01 01         LDX    BUFFER +01
0240: 270D 20 FD 2A         JSR    PACKX     PACK ID
0250: 2710 D0 E9            BNE    ERISD
0260: 2712 85 5D            STA    SAVID
0270: 2714 C6 5D            DEC    SAVID
0280: 2716 A9 00            LDAIM $00     SET SAVE FLAG
0290: 2718 85 51     NSVE   STAZ   SAVE
0300: 271A 4C 08 26         JMP    IDAS    ASSEMBLE
0310:
0320: 271D 4C 31 2E  ENDB   JMP    RESTRT RETURN TO EDITOR
ID=A4
0010:                   ********* ***********
0020:                ***ASSEMBLER SUBROUTINES***
0030:                   ********* ***********
0040:
0050:                PSEUDO OPERATION DECODE
0060:
0070:
0080: 2720 A5 47     SPECOP LDAZ   OP
0090: 2722 C9 0C            CMPIM $0C     'ORG'
0100: 2724 D0 1D            BNE    NTPC
0110:
0120: 2726 A2 05            LDXIM $05     SET UP
0130: 2728 B5 20     MVTIT  LDAAX LABEL   TITLE
0140: 272A 95 57            STAAX TITLE
0150: 272C CA               DEX
```

```
0160: 272D 10 F9             BPL   MVTIT
0170:
0180: 272F 20 8B 29          JSR   GETARG DECODE ARGUMENT
0190:
0200: 2732 A5 49             LDA   OP     +02 SET UP
0210: 2734 85 61             STAZ  SAHX       PC
0220: 2736 85 3E             STAZ  PCHI       AND SAVE
0230: 2738 A5 48             LDA   OP     +01 FOR ASSEMBLY
0240: 273A 85 60             STAZ  SALX
0250: 273C 85 3D             STAZ  PCLO
0260:
0270: 273E A9 FF      LTHX   LDAIM $FF    LENGTH = 0
0280: 2740 85 46             STAZ  LENGTH
0290: 2742 60                RTS
0300:
0310: 2743 C9 80      NTPC   CMPIM $80    COMMENT LINE
0320: 2745 F0 F7             BEQ   LTHX
0330:
0340: 2747 C9 FA             CMPIM $FA    * OPERATION
0350: 2749 F0 F3             BEQ   LTHX
0360:
0370:                 ROUTINE TO OPTIMIZE ZERO-PAGE OPS
0380:
0390: 274B C9 4C             CMPIM $4C    SKIP SOME
0400: 274D F0 30             BEQ   RTO    SPECIAL
0410: 274F C9 6C             CMPIM $6C    OPS
0420: 2751 F0 2C             BEQ   RTO
0430:
0440: 2753 29 0C             ANDIM $0C    OPTIMIZABLE CODES?
0450: 2755 C9 0C             CMPIM $0C
0460: 2757 D0 26             BNE   RTO
0470:
0480: 2759 A5 2B             LDA   ARGIN  CHECK FOR $XXXX ARGS
0490: 275B C9 24             CMPIM $24
0500: 275D D0 0A             BNE   NOTDOL
0510:
0520: 275F A5 2C             LDA   ARGIN  +01
0530: 2761 05 2D             ORA   ARGIN  +02
0540: 2763 C9 30             CMPIM $30
0550: 2765 F0 10             BEQ   REDUCE
0560: 2767 D0 16             BNE   RTO
0570:
0580: 2769 A9 38      NOTDOL LDAIM $38    LOOK UP
0590: 276B 85 43             STAZ  SXL    SYMBOLIC ARGUMENT
0600: 276D 20 37 28          JSR   FNDSBL
0610: 2770 D0 0D             BNE   RTO
0620:
0630: 2772 C8                INY
0640: 2773 B1 3F             LDAIY SLO    ZERO-PAGE?
0650: 2775 D0 08             BNE   RTO
0660:
0670: 2777 A5 47      REDUCE LDAZ  OP
0680: 2779 29 F7             ANDIM $F7    OPTIMIZE
0690: 277B 85 47             STAZ  OP
0700: 277D C6 46             DECZ  LENGTH
0710: 277F 60         RTO    RTS
```

```
0720:
0730:                      ROUTINE TO PRINT HEX BYTE
0740:
0750: 2780 A6 4D       HEXR   LDXZ  PRFLAG CHECK PRINT FLAG
0760: 2782 D0 FB              BNE   RTO
0770: 2784 4C CD 2D    HEXX   JMP   HEXOUT
0780:
0790:                      PRINT ROUTINES WITH PRINT FLAG
0800:
0810: 2787 A9 0D       CRLF   LDAIM $0D    CR AND LF
0820: 2789 D0 02              BNE   OUTCH
0830:
0840: 278B A9 20       OUTSP  LDAIM $20    SPACE
0850:
0860: 278D A6 4D       OUTCH  LDXZ  PRFLAG CHECK FLAG
0870: 278F D0 EE              BNE   RTO
0880:
0890: 2791 4C F0 2D    OUTX   JMP   OUTK
0900:
0910:                      PRINT MESSG(Y) AND CHECK FOR "YES" RESPONSE
0920:
0930: 2794 20 A0 27    YSNO   JSR   MESSY
0940: 2797 20 41 2E           JSR   BUFIN
0950: 279A AD 00 01           LDA   BUFFER
0960: 279D C9 59              CMPIM 'Y
0970: 279F 60                 RTS
0980:
0990:                      PRINT MESSG(Y)
1000:
1010: 27A0 B9 0A 2C    MESSY  LDAAY MESSG
1020: 27A3 C8                 INY
1030: 27A4 C9 40              CMPIM $40
1040: 27A6 F0 05              BEQ   ENDM   DO NOT USE
1050: 27A8 20 91 27           JSR   OUTX   PRINT FLAG
1060: 27AB D0 F3              BNE   MESSY
1070: 27AD 60          ENDM   RTS
ID=A5
0010:                      GET ONE WORD FROM BUFFER
0020:
0030: 27AE B9 00 01    GET    LDAAY BUFFER
0040: 27B1 C9 0D              CMPIM $0D    END?
0050: 27B3 D0 03              BNE   ST
0060: 27B5 88                 DEY
0070: 27B6 A9 20              LDAIM '      FILL BLANKS
0080: 27B8 95 20       ST     STAZX LABEL
0090: 27BA E8                 INX
0100: 27BB C8                 INY          COPY TO
0110: 27BC C9 20              CMPIM '      DELIMITER
0120: 27BE D0 EE              BNE   GET    (SPACE)
0130: 27C0 60                 RTS
0140:
0150:                      16 BIT ADD
0160:
0170: 27C1 A2 00       DADS   LDXIM $00    SLO
0180: 27C3 A9 06       DADX   LDAIM $06    +6
0190: 27C5 18          DADA   CLC          OR A
0200: 27C6 75 3F              ADCZX SLO
```

```
0210: 27C8 95 3F           STAZX SLO
0220: 27CA B5 40           LDAZX SHI
0230: 27CC 69 00           ADCIM $00
0240: 27CE 95 40           STAZX SHI
0250: 27D0 B5 3F           LDAZX SLO
0260: 27D2 C5 41           CMP   ELO
0270: 27D4 B5 40           LDAZX SHI
0280: 27D6 E5 42           SBC   EHI
0290: 27D8 60              RTS
0300:
0310:              INTERPRET INPUT SYNTAX
0320:
0330: 27D9 A2 1C   INTRP   LDXIM $1C
0340: 27DB A9 20           LDAIM '         CLEAR INPUT
0350: 27DD 95 20   LOOPC   STAZX LABEL     TEMPORARIES
0360: 27DF CA              DEX
0370: 27E0 10 FB           BPL   LOOPC
0380:
0390: 27E2 A0 00           LDYIM $00
0400: 27E4 E8              INX             GET LABEL
0410: 27E5 20 AE 27        JSR   GET
0420:
0430: 27E8 A2 06           LDXIM $06
0440: 27EA 20 AE 27        JSR   GET       GET OP/AD
0450: 27ED E0 0A           CPXIM $0A
0460: 27EF D0 02           BNE   NOT8
0470: 27F1 95 20           STAZX LABEL
0480:
0490: 27F3 A2 0B   NOT8    LDXIM $0B
0500: 27F5 20 AE 27        JSR   GET       GET ARGUMENT
0510: 27F8 84 31           STYZ  YCOM      COMMENT POINTER
0520:
0530: 27FA A0 00           LDYIM $00
0540: 27FC A2 00           LDXIM $00
0550: 27FE 20 1A 28        JSR   PACKYX PACK LABEL
0560: 2801 A0 03           LDYIM $03
0570: 2803 A2 02           LDXIM $02
0580: 2805 20 1A 28        JSR   PACKYX
0590: 2808 A0 06           LDYIM $06
0600: 280A A2 04           LDXIM $04
0610: 280C 20 1A 28        JSR   PACKYX PACK OP
0620: 280F A0 0B           LDYIM $0B
0630: 2811 A2 06           LDXIM $06
0640: 2813 20 1A 28        JSR   PACKYX PACK ARG
0650: 2816 A0 0E           LDYIM $0E
0660: 2818 A2 08           LDXIM $08
0670:
0680:              ROUTINE TO PACK 3 CHARS IN 2 BYTES
0690:
0700: 281A B9 20 00 PACKYX LDAAY LABEL   IN(Y,Y+1,Y+2)
0710: 281D 95 32           STAZX PLAB    OUT(X,X+1)
0720: 281F B9 22 00        LDAAY LABEL   +02
0730: 2822 29 1F           ANDIM $1F
0740: 2824 85 3C           STAZ  TMP
0750: 2826 B9 21 00        LDAAY LABEL   +01
0760: 2829 0A              ASLA
```

```
0770: 282A 0A             ASLA          OAAAAABB
0780: 282B 0A             ASLA          BBBCCCCC
0790: 282C 0A             ASLA
0800: 282D 36 32          ROLZX PLAB
0810: 282F 2A             ROLA
0820: 2830 36 32          ROLZX PLAB
0830: 2832 05 3C          ORAZ  TMP
0840: 2834 95 33          STAZX PLAB    +01
0850: 2836 60             RTS
ID=A6

0010:
0020:              LOOK UP SYMBOL IN TABLE
0030:
0040: 2837 A9 FA   FNDSBL LDAIM $FA
0050: 2839 85 3F          STAZ  SLO     RESET
0060: 283B AD A6 2E       LDA   SYMBOL SLO,SHI
0070: 283E 38             SEC
0080: 283F E9 01          SBCIM $01
0090: 2841 85 40          STAZ  SHI
0100:
0110: 2843 A0 00   EACH   LDYIM $00
0120: 2845 B1 3F   CHECK  LDAIY SLO     LOOK FOR
0130: 2847 D1 43          CMPIY SXL     MATCH
0140: 2849 D0 06          BNE   NOMTCH
0150: 284B C8             INY
0160: 284C C0 04          CPYIM $04
0170: 284E D0 F5          BNE   CHECK
0180: 2850 60             RTS           SYMBOL FOUND
0190:
0200: 2851 20 C1 27 NOMTCH JSR  DADS
0210: 2854 90 ED          BCC   EACH
0220: 2856 A9 FF          LDAIM $FF
0230: 2858 60             RTS           SYMBOL NOT FOUND
0240:
0250:              ADD SYMBOL TO TABLE
0260:
0270: 2859 A5 20   ADDSYM LDA   LABEL
0280: 285B C9 20          CMPIM '       SKIP
0290: 285D D0 01          BNE   NOTBL   BLANK
0300: 285F 60             RTS
0310:
0320: 2860 A9 32   NOTBL  LDAIM $32
0330: 2862 85 43          STAZ  SXL
0340: 2864 A9 00          LDAIM $00     CHECK
0350: 2866 85 44          STAZ  SXH     FOR
0360: 2868 20 37 28       JSR   FNDSBL DUPLICATE
0370: 286B D0 01          BNE   OK
0380: 286D 00             BRK           ****<6F> DUPLICATE SYMBOL
0390:
0400: 286E A0 00   OK     LDYIM $00
0410: 2870 B1 43   LODA   LDAIY SXL
0420: 2872 91 41          STAIY ELO     ADD TO
0430: 2874 C8             INY           TABLE
0440: 2875 C0 04          CPYIM $04
0450: 2877 D0 F7          BNE   LODA
0460:
0470: 2879 A6 47          LDX   OP
```

```
0480: 287B E0 FA              CPXIM $FA     * OPERATION
0490: 287D D0 0E              BNE   ORDAD
0500: 287F 20 8B 29           JSR   GETARG
0510: 2882 A5 48              LDA   OP      +01 USE
0520: 2884 A0 04              LDYIM $04         ARGUMENT
0530: 2886 91 41              STAIY ELO
0540: 2888 A5 49              LDA   OP      +02
0550: 288A C8                 INY
0560: 288B D0 07              BNE   ADTABL
0570:
0580: 288D A5 3D       ORDAD  LDA   PCLO
0590: 288F 91 41              STAIY ELO     USE
0600: 2891 C8                 INY           PC
0610: 2892 A5 3E              LDAZ  PCHI
0620: 2894 91 41       ADTABL STAIY ELO
0630: 2896 A2 02              LDXIM $02     ADJUST
0640: 2898 20 C3 27           JSR   DADX    ELO,EHI
0650: 289B A5 42              LDA   EHI
0660: 289D CD A7 2E           CMP   ENDSYM
0670: 28A0 D0 01              BNE   RETA
0680: 28A2 00                 BRK           ****<A4> TABLE OVERFLOW
0690:
0700: 28A3 60          RETA   RTS
0710:
0720:                  ERROR ROUTINE
0730:
0740: 28A4 68          ERROR  PLA
0750: 28A5 68                 PLA
0760: 28A6 20 0C 24           JSR   ERRPRT PRINT "***<#>"
0770: 28A9 20 C5 2D           JSR   NOUT    PRINT LINE #
0780: 28AC A9 00              LDAIM $00
0790: 28AE 85 47              STA   OP      CLEAR OBJ CODE
0800: 28B0 85 48              STA   OP      +01
0810: 28B2 85 49              STA   OP      +02
0820: 28B4 A9 02              LDAIM $02
0830: 28B6 85 46              STA   LENGTH 3 BYTE OP
0840: 28B8 A5 4D              LDA   PRFLAG
0850: 28BA 48                 PHA
0860: 28BB A9 00              LDAIM $00     PRINT
0870: 28BD 85 4D              STA   PRFLAG LINE
0880: 28BF A6 4C              LDX   PASS
0890: 28C1 D0 05              BNE   PASONE
0900: 28C3 20 F9 29           JSR   PRINT
0910: 28C6 F0 03              BEQ   PASTWO
0920: 28C8 20 83 2A    PASONE JSR   PRBUF
0930: 28CB 68          PASTWO PLA
0940: 28CC 85 4D              STA   PRFLAG
0950: 28CE 20 7B 29           JSR   PCADJ
0960: 28D1 4C 6C 26           JMP   ERRTRY CONTINUE ASSEMBLY
ID=A7

0010:
0020:                  DECODE OP-CODE/ADDRESS MODE
0030:
0040: 28D4 A2 09       DECODE LDXIM $09
0050: 28D6 A5 29       NEXT   LDA   AD      LOOK-UP
0060: 28D8 DD 9B 2B           CMPAX TABLL   ADDRESS MODE
0070: 28DB F0 04              BEQ   LEFT
```

```
28DD CA          NEXTX  DEX
28DE 10 F6              BPL   NEXT
28E0 00                 BRK          ***<E2> ADDRESS MODE NOT FOUND

28E1 A5 2A       LEFT   LDA   AD     +01
28E3 DD A5 2B           CMPAX TABLR
28E6 D0 F5              BNE   NEXTX
28E8 86 45              STXZ  ADM    ADM=INDEX TO TABLL,R

28EA E0 00              CPXIM $00
28EC D0 04              BNE   NOTIM
28EE A0 37              LDYIM $37    IM LIMIT
28F0 D0 02              BNE   YIN

28F2 A0 3F       NOTIM  LDYIM $3F
28F4 A5 36       YIN    LDAZ  POP    GET INSTRUCTION
28F6 D9 07 2B           CMPAY MNL    CODE FROM
28F9 D0 07              BNE   NEXTY  MNR,MNL
28FB A5 37              LDA   POP    +01
28FD D9 47 2B           CMPAY MNR
2900 F0 04              BEQ   HERE
2902 88          NEXTY  DEY
2903 10 EF              BPL   YIN
2905 00                 BRK          ***<07> UNREC. INSTRUCTION

2906 98          HERE   TYA
2907 C9 35              CMPIM $35    CHECK FOR
2909 D0 04              BNE   ORDIN  ERRORS
290B E0 06              CPXIM $06
290D F0 13              BEQ   VERIF  (LDXAY)

290F C9 3D       ORDIN  CMPIM $3D
2911 D0 04              BNE   ORDB
2913 E0 07              CPXIM $07
2915 F0 0B              BEQ   VERIF  (STYAX)

2917 DD AF 2B    ORDB   CMPAX LOM
291A 90 05              BCC   ERR    CHECK RANGE
291C DD B9 2B           CMPAX HIM    ALLOWED
291F 90 01              BCC   VERIF
2921 00          ERR    BRK          ****<23> ILLEGAL ADDRESS MODE

2922 C0 30       VERIF  CPYIM $30
2924 10 05              BPL   TTWO
2926 BD 87 2B           LDAAX FMTA
2929 D0 03              BNE   XX     DECODE
292B BD 91 2B    TTWO   LDAAX FMTB   OP LENGTH
292E 85 3C       XX     STAZ  TMP
2930 29 07              ANDIM $07
2932 85 46              STAZ  LENGTH

2934 98                 TYA
2935 A2 03              LDXIM $03
2937 26 3C       ROT    ROLZ  TMP
2939 2A                 ROLA         ENCODE
293A CA                 DEX          OP CODE
```

```
0640: 293B D0 FA          BNE   ROT    INTO
0650: 293D 90 0F          BCC   OUTA   ACC
0660: 293F 26 3C          ROLZ  TMP
0670: 2941 2A             ROLA
0680: 2942 B0 02          BCS   SETB
0690: 2944 10 0B          BPL   OUTB
0700: 2946 26 3C   SETB   ROLZ  TMP
0710: 2948 2A             ROLA
0720: 2949 90 02          BCC   OKC
0730: 294B 29 FD          ANDIM $FD
0740: 294D 60      OKC    RTS
0750: 294E 29 F8   OUTA   ANDIM $F8
0760: 2950 60             RTS
0770: 2951 29 70   OUTB   ANDIM $70
0780: 2953 09 8A          ORAIM $8A
0790: 2955 60             RTS
0800:
0810:              ROUTINE TO FIX ODD LENGTHS
0820:
0830: 2956 A6 46   ADJLTH LDXZ  LENGTH
0840: 2958 E0 03          CPXIM $03    (6 IS DUMMY LENGTH)
0850: 295A 30 1E          BMI   NOT6
0860: 295C A5 47          LDAZ  OP
0870: 295E C9 20          CMPIM $20    JSR
0880: 2960 F0 14          BEQ   ABS
0890: 2962 29 1F          ANDIM $1F
0900: 2964 C9 10          CMPIM $10
0910: 2966 D0 04          BNE   NTREL  RELATIVE OP
0920: 2968 A2 01          LDXIM $01
0930: 296A D0 0C          BNE   STORE
0940: 296C 29 0F   NTREL  ANDIM $0F
0950: 296E C9 0B          CMPIM $0B    >XB
0960: 2970 10 04          BPL   ABS
0970: 2972 A2 00          LDXIM $00
0980: 2974 F0 02          BEQ   STORE
0990: 2976 A2 02   ABS    LDXIM $02
1000: 2978 86 46   STORE  STXZ  LENGTH
1010: 297A 60      NOT6   RTS
1020:
1030:              ADJUST PC
1040:
1050: 297B A5 46   PCADJ  LDAZ  LENGTH
1060: 297D 30 0B          BMI   RETPC
1070: 297F 38             SEC
1080: 2980 65 3D          ADCZ  PCLO   PC=PC+LENGTH+1
1090: 2982 85 3D          STAZ  PCLO
1100: 2984 A5 3E          LDAZ  PCHI
1110: 2986 69 00          ADCIM $00
1120: 2988 85 3E          STAZ  PCHI
1130: 298A 60      RETPC  RTS
ID=A8

0010:              GET HEX VALUE FOR ARGUMENT
0020:
0030: 298B A5 2B   GETARG LDA   ARGIN
0040: 298D C9 20          CMPIM '
0050: 298F F0 F9          BEQ   RETPC  NO ARG
0060: 2991 C9 24          CMPIM '$'
```

```
2993 F0 4D              BEQ    GHEX    HEX ARG
2995 C9 27              CMPIM  '''
2997 F0 43              BEQ    ASCI    ASCII ARG
2999 A9 38              LDAIM  $38
299B 85 43              STAZ   SXL     SYMBOLIC
299D A9 00              LDAIM  $00     ARG
299F 85 44              STAZ   SXH
29A1 20 37 28           JSR    FNDSBL  LOOK-UP
29A4 F0 01              BEQ    OKS
29A6 00                 BRK            ****<A8> UNDEFINED SYMBOL

29A7 B1 3F     OKS      LDAIY  SLO
29A9 85 48              STA    OP      +01
29AB C8                 INY                 SYMBOL
29AC B1 3F              LDAIY  SLO          VALUE
29AE 85 49              STA    OP      +02

29B0 A4 31              LDY    YCOM
29B2 B9 00 01           LDAAY  BUFFER
29B5 C9 2F              CMPIM  '/      ARITHMETIC
29B7 F0 3B              BEQ    ONE     ADJUSTMENTS
29B9 C9 2B              CMPIM  '+
29BB F0 06              BEQ    POFF
29BD C9 2D              CMPIM  '-
29BF D0 C9              BNE    RETPC
29C1 C6 49              DEC    OP      +02
29C3 29 02     POFF     ANDIM  $02
29C5 48                 PHA
29C6 C8                 INY
29C7 B9 00 01           LDAAY  BUFFER  GET OFFSET
29CA C8                 INY
29CB BE 00 01           LDXAY  BUFFER
29CE 20 FD 2A           JSR    PACKX
29D1 28                 PLP
29D2 F0 03              BEQ    PLUSO
29D4 49 FF              EORIM  $FF
29D6 38                 SEC
29D7 A2 09     PLUSO    LDXIM  $09          16 BIT
29D9 4C C6 27           JMP    DADA    +01 CALCULATION
29DC A5 2C     ASCI     LDA    ARGIN   +01 ASCII DATA
29DE 85 49              STA    OP      +02
29E0 D0 12              BNE    ONE

29E2 A5 2C     GHEX     LDA    ARGIN   +01 HEX DATA
29E4 A6 2D              LDX    ARGIN   +02
29E6 20 FD 2A           JSR    PACKX
29E9 85 49              STA    OP      +02
29EB A5 2E              LDA    ARGIN   +03
29ED A6 2F              LDX    ARGIN   +04
29EF 20 FD 2A           JSR    PACKX
29F2 F0 02              BEQ    TWO
29F4 A5 49     ONE      LDA    OP      +02
29F6 85 48     TWO      STA    OP      +01
29F8 60                 RTS

               ROUTINE TO PRINT LISTING
```

```
0630:
0640: 29F9 E6 56      PRINT  INCZ  PGN
0650: 29FB 30 3C             BMI   OKPAG
0660: 29FD A9 0C             LDAIM $0C    NEW
0670: 29FF 20 8D 27          JSR   OUTCH  PAGE
0680: 2A02 20 87 27          JSR   CRLF
0690:
0700: 2A05 A0 00             LDYIM $00
0710: 2A07 B9 57 00   TIT    LDAAY TITLE
0720: 2A0A 20 8D 27          JSR   OUTCH  TITLE
0730: 2A0D C8                INY
0740: 2A0E C0 06             CPYIM $06
0750: 2A10 D0 F5             BNE   TIT
0760:
0770: 2A12 A0 23             LDYIM $23
0780: 2A14 B9 0A 2C   MESSPR LDAAY MESSG  HEADER
0790: 2A17 C9 40             CMPIM $40
0800: 2A19 F0 06             BEQ   DUNMES
0810: 2A1B 20 8D 27          JSR   OUTCH
0820: 2A1E C8                INY
0830: 2A1F D0 F3             BNE   MESSPR
0840:
0850: 2A21 A5 55      DUNMES LDA   PAGE
0860: 2A23 F8                SED          PAGE
0870: 2A24 18                CLC          NUMBER
0880: 2A25 69 01             ADCIM $01
0890: 2A27 85 55             STA   PAGE
0900: 2A29 D8                CLD
0910: 2A2A 20 80 27          JSR   HEXR
0920: 2A2D A0 03             LDYIM $03
0930: 2A2F 20 87 27   CR     JSR   CRLF   SKIP
0940: 2A32 88                DEY          4 LINES
0950: 2A33 D0 FA             BNE   CR
0960: 2A35 A9 C8             LDAIM $C8
0970: 2A37 85 56             STAZ  PGN
0980:
0990: 2A39 20 87 27   OKPAG  JSR   CRLF
1000: 2A3C A5 16             LDAZ  NHI
1010: 2A3E 20 80 27          JSR   HEXR   PRINT
1020: 2A41 A5 15             LDAZ  NLO    LINE
1030: 2A43 20 80 27          JSR   HEXR   NUMBER
1040: 2A46 A9 3A             LDAIM ':
1050: 2A48 20 8D 27          JSR   OUTCH
1060: 2A4B 20 8B 27          JSR   OUTSP
1070:
1080: 2A4E A5 26             LDA   OPIN
1090: 2A50 C9 20             CMPIM '
1100: 2A52 D0 0A             BNE   NOCOMN
ID=A9

0010: 2A54 A0 0E             LDYIM $0E
0020: 2A56 20 8B 27   OUTS   JSR   OUTSP  COMMENT
0030: 2A59 88                DEY          LINE
0040: 2A5A 10 FA             BPL   OUTS
0050: 2A5C 30 43             BMI   COMNT
0060:
0070: 2A5E A5 3E      NOCOMN LDA   PCHT
0080: 2A60 20 80 27          JSR   HEXR   PC
```

```
2A63 A5 3D               LDAZ   PCLO
2A65 20 80 27            JSR    HEXR
2A68 20 8B 27            JSR    OUTSP
2A6B A5 47               LDA    OP
2A6D A6 46               LDXZ   LENGTH OBJECT
2A6F 20 B1 2A  OVRR      JSR    OUTSTR CODE
2A72 A5 48               LDA    OP     +01
2A74 A6 46               LDXZ   LENGTH
2A76 CA                  DEX
2A77 20 B1 2A            JSR    OUTSTR
2A7A A5 49               LDA    OP     +02
2A7C A6 46               LDXZ   LENGTH
2A7E CA                  DEX
2A7F CA                  DEX
2A80 20 B1 2A            JSR    OUTSTR
2A83 20 8B 27  PRBUF     JSR    OUTSP
2A86 A0 00               LDYIM  $00
2A88 C0 06     OUTP      CPYIM  $06
2A8A F0 04               BEQ    SPCE
2A8C C0 0B               CPYIM  $0B
2A8E D0 03               BNE    NOSP
2A90 20 8B 27  SPCE      JSR    OUTSP  FORMAT
2A93 B9 20 00  NOSP      LDAAY  LABEL  LABEL, OP
2A96 20 8D 27            JSR    OUTCH  & ARG
2A99 C8                  INY
2A9A C0 11               CPYIM  $11
2A9C D0 EA               BNE    OUTP
2A9E 20 8B 27            JSR    OUTSP
2AA1 A4 31     COMNT     LDYZ   YCOM   COMMENT
2AA3 B9 00 01  LDY       LDAAY  BUFFER
2AA6 C9 0D               CMPIM  $0D
2AA8 F0 06               BEQ    RETX
2AAA 20 8D 27            JSR    OUTCH
2AAD C8                  INY
2AAE D0 F3               BNE    LDY
2AB0 60        RETX      RTS
               ROUTINE TO PRINT OBJECT CODE OR SPACE
2AB1 30 10     OUTSTR    BMI    DONE
2AB3 A0 00               LDYIM  $00
2AB5 E6 4A               INCZ   PCALO
2AB7 D0 02               BNE    XOT
2AB9 E6 4B               INCZ   PCAHI
2ABB 91 4A     XOT       STAIY  PCALO
2ABD 20 80 27            JSR    HEXR
2AC0 4C 8B 27            JMP    OUTSP
2AC3 20 8B 27  DONE      JSR    OUTSP
2AC6 20 8B 27            JSR    OUTSP
2AC9 4C 8B 27            JMP    OUTSP
               RELATIVE BRANCH CALCULATOR
```

```
0650: 2ACC A5 47      RELAD  LDA   OP
0660: 2ACE C9 DA             CMPIM $DA
0670: 2AD0 F0 26             BEQ   EQU      = PSEUDO-OP
0680: 2AD2 29 1F             ANDIM $1F
0690: 2AD4 C9 10             CMPIM $10      REL OP
0700: 2AD6 D0 1F             BNE   RETREL
0710:
0720: 2AD8 A5 48             LDA   OP       +01
0730: 2ADA 38                SEC
0740: 2ADB E9 02             SBCIM $02      CALCULATE
0750: 2ADD 48                PHA            OFFSET
0760: 2ADE A5 49             LDA   OP       +02
0770: 2AE0 E9 00             SBCIM $00
0780: 2AE2 85 49             STAZ  OP       +02
0790: 2AE4 68                PLA
0800: 2AE5 38                SEC
0810: 2AE6 E5 3D             SBCZ  PCLO
0820: 2AE8 85 48             STA   OP       +01
0830: 2AEA A5 49             LDA   OP       +02
0840: 2AEC E5 3E             SBCZ  PCHI
0850: 2AEE A5 48             LDA   OP       +01
0860: 2AF0 B0 03             BCS   PLUS
0870: 2AF2 30 03             BMI   RETREL
0880:
0890: 2AF4 00         EREL   BRK            ***<F6> RANGE ERROR
0900:
0910: 2AF5 30 FD      PLUS   BMI   EREL
0920: 2AF7 60         RETREL RTS
0930: 2AF8 A5 49      EQU    LDA   OP       +02 = PSEUDO-OP
0940: 2AFA 85 47             STA   OP
0950: 2AFC 60                RTS
0960:
0970:                 PACK ASCII TO HEX
0980:
0990: 2AFD 20 94 2E   PACKX  JSR   PACKT    INPUT IN A & X
1000: 2B00 D0 04             BNE   ERP
1010: 2B02 8A                TXA
1020: 2B03 20 94 2E          JSR   PACKT
1030: 2B06 60         ERP    RTS
ID=AA
                      TABLE DATA FOR ASSEMBLER
0020:
0030:                 LEFT HALF MNEMONIC
0040:
0050: 2B07 0A         MNL    =     $0A      BRK
0060: 2B08 41                =     $41      PHP
0070: 2B09 0A                =     $0A      BPL
0080: 2B0A 0D                =     $0D      CLC
0090: 2B0B 2A                =     $2A      JSR
0100: 2B0C 41                =     $41      PLP
0110: 2B0D 09                =     $09      BMI
0120: 2B0E 4C                =     $4C      SEC
0130: 2B0F 4A                =     $4A      RTI
0140: 2B10 41                =     $41      PHA
0150: 2B11 0A                =     $0A      BVC
0160: 2B12 0D                =     $0D      CLI
0170: 2B13 4A                =     $4A      RTS
```

```
0180: 2B14 41                 =      $41     PLA
0190: 2B15 0A                 =      $0A     BVS
0200: 2B16 4C                 =      $4C     SEI
0210: 2B17 80                 =      $80
0220: 2B18 10                 =      $10     DEY
0230: 2B19 08                 =      $08     BCC
0240: 2B1A 53                 =      $53     TYA
0250: 2B1B 30                 =      $30     LDY
0260: 2B1C 50                 =      $50     TAY
0270: 2B1D 08                 =      $08     BCC
0280: 2B1E 0D                 =      $0D     CLV
0290: 2B1F 0E                 =      $0E     CPY
0300: 2B20 25                 =      $25     INY
0310: 2B21 09                 =      $09     BNE
0320: 2B22 0D                 =      $0D     CLD
0330: 2B23 0E                 =      $0E     CPX
0340: 2B24 25                 =      $25     INX
0350: 2B25 08                 =      $08     BEQ
0360: 2B26 4C                 =      $4C     SED
0370: 2B27 53                 =      $53     TXA
0380: 2B28 53                 =      $53     TXS
0390: 2B29 50                 =      $50     TAX
0400: 2B2A 52                 =      $52     TSX
0410: 2B2B 10                 =      $10     DEX
0420: 2B2C F4                 =      $F4     *
0430: 2B2D 39                 =      $39     NOP
0440: 2B2E A8                 =      $A8     =
0450: 2B2F 3E                 =      $3E     ORA
0460: 2B30 05                 =      $05     AND
0470: 2B31 15                 =      $15     EOR
0480: 2B32 04                 =      $04     ADC
0490: 2B33 4E                 =      $4E     STA
0500: 2B34 30                 =      $30     LDA
0510: 2B35 0D                 =      $0D     CMP
0520: 2B36 4C                 =      $4C     SBC
0530: 2B37 06                 =      $06     ASL
0540: 2B38 49                 =      $49     ROL
0550: 2B39 32                 =      $32     LSR
0560: 2B3A 49                 =      $49     ROR
0570: 2B3B 4E                 =      $4E     STX
0580: 2B3C 30                 =      $30     LDX
0590: 2B3D 10                 =      $10     DEC
0600: 2B3E 25                 =      $25     INC
0610: 2B3F 3E                 =      $3E     ORG
0620: 2B40 09                 =      $09     BIT
0630: 2B41 29                 =      $29     JMP
0640: 2B42 29                 =      $29     JMI
0650: 2B43 4E                 =      $4E     STY
0660: 2B44 30                 =      $30     LDY
0670: 2B45 0E                 =      $0E     CPY
0680: 2B46 0E                 =      $0E     CPX
0690:
0700:               RIGHT HALF MNEMONIC
0710:
0720: 2B47 4B       MNR       =      $4B     BRK
0730: 2B48 10                 =      $10     PHP
```

```
0740: 2B49 0C           =      $0C     BPL
0750: 2B4A 83           =      $83     CLC
0760: 2B4B 72           =      $72     JSR
0770: 2B4C 90           =      $90     PLP
0780: 2B4D A9           =      $A9     BMI
0790: 2B4E A3           =      $A3     SEC
0800: 2B4F 89           =      $89     RTI
0810: 2B50 01           =      $01     PHA
0820: 2B51 C3           =      $C3     BVC
0830: 2B52 89           =      $89     CLI
0840: 2B53 93           =      $93     RTS
0850: 2B54 81           =      $81     PLA
0860: 2B55 D3           =      $D3     BVS
0870: 2B56 A9           =      $A9     SEI
0880: 2B57 00           =      $00
0890: 2B58 B9           =      $B9     DEY
0900: 2B59 63           =      $63     BCC
0910: 2B5A 21           =      $21     TYA
0920: 2B5B 99           =      $99     LDY
0930: 2B5C 39           =      $39     TAY
0940: 2B5D 73           =      $73     BCS
0950: 2B5E 96           =      $96     CLV
0960: 2B5F 19           =      $19     CPY
0970: 2B60 D9           =      $D9     INY
0980: 2B61 C5           =      $C5     BNE
0990: 2B62 84           =      $84     CLD
1000: 2B63 18           =      $18     CPX
1010: 2B64 D8           =      $D8     INX
1020: 2B65 B1           =      $B1     BEQ
1030: 2B66 A4           =      $A4     SED
1040: 2B67 01           =      $01     TXA
1050: 2B68 13           =      $13     TXS
1060: 2B69 38           =      $38     TAX
1070: 2B6A 78           =      $78     TSX
1080: 2B6B B8           =      $B8     DEX
1090: 2B6C 00           =      $00     =
1100: 2B6D F0           =      $F0     NOP
1110: 2B6E 00           =      $00     *
1120: 2B6F 41           =      $41     ORA
1130: 2B70 C4           =      $C4     AND
1140: 2B71 F2           =      $F2     EOR
1150: 2B72 83           =      $83     ADC
1160: 2B73 81           =      $81     STA
1170: 2B74 81           =      $81     LDA
1180: 2B75 B0           =      $B0     CMP
1190: 2B76 43           =      $43     SBC
1200: 2B77 6C           =      $6C     ASL
1210: 2B78 EC           =      $EC     ROL
1220: 2B79 72           =      $72     LSR
1230: 2B7A F2           =      $F2     ROR
1240: 2B7B 98           =      $98     STX
1250: 2B7C 98           =      $98     LDX
1260: 2B7D A3           =      $A3     DEC
1270: 2B7E C3           =      $C3     INC
1280: 2B7F 47           =      $47     ORG
1290: 2B80 34           =      $34     BIT
```

```
 2B81 B0                    =     $B0     JMP
 2B82 A9                    =     $A9     JMI
 2B83 99                    =     $99     STY
 2B84 99                    =     $99     LDY
 2B85 19                    =     $19     CPY
 2B86 18                    =     $18     RTS
ID=AB


                  MODE FORMATS

 2B87 49          FMTA      =     $49
 2B88 29                    =     $29
 2B89 48                    =     $48
 2B8A 6E                    =     $6E
 2B8B 89                    =     $89
 2B8C A9                    =     $A9
 2B8D CA                    =     $CA
 2B8E EA                    =     $EA
 2B8F A9                    =     $A9
 2B90 09                    =     $09

                  FORMAT B

 2B91 11          FMTB      =     $11
 2B92 31                    =     $31
 2B93 50                    =     $50
 2B94 76                    =     $76
 2B95 91                    =     $91
 2B96 B1                    =     $B1
 2B97 F2                    =     $F2
 2B98 F2                    =     $F2
 2B99 B1                    =     $B1
 2B9A 11                    =     $11

                  LEFT ADDRESS MODE

 2B9B 49          TABLL     =     $49     IM
 2B9C 5A                    =     $5A     Z
 2B9D 41                    =     $41     A
 2B9E 20                    =     $20
 2B9F 49                    =     $49     IY
 2BA0 5A                    =     $5A     ZX
 2BA1 41                    =     $41     AY
 2BA2 41                    =     $41     AX
 2BA3 5A                    =     $5A     ZY
 2BA4 49                    =     $49     IX

                  RIGHT ADDRESS MODE

 2BA5 4D          TABLR     =     $4D
 2BA6 20                    =     $20
 2BA7 20                    =     $20
 2BA8 20                    =     $20
 2BA9 59                    =     $59
 2BAA 58                    =     $58
 2BAB 59                    =     $59
 2BAC 58                    =     $58
```

```
0510: 2BAD 59               =      $59
0520: 2BAE 58               =      $58
0530:
0540:               LOW RANGE
0550:
0560: 2BAF 14       LOM     =      $14
0570: 2BB0 28               =      $28
0580: 2BB1 30               =      $30
0590: 2BB2 00               =      $00
0600: 2BB3 28               =      $28
0610: 2BB4 28               =      $28
0620: 2BB5 28               =      $28
0630: 2BB6 28               =      $28
0640: 2BB7 34               =      $34
0650: 2BB8 28               =      $28
0660:
0670:               HI RANGE
0680:
0690: 2BB9 36       HIM     =      $36
0700: 2BBA 40               =      $40
0710: 2BBB 34               =      $34
0720: 2BBC 40               =      $40
0730: 2BBD 30               =      $30
0740: 2BBE 3E               =      $3E
0750: 2BBF 30               =      $30
0760: 2BC0 39               =      $39
0770: 2BC1 36               =      $36
0780: 2BC2 30               =      $30
0790:
0800:               DSMBLR SPECIAL TABLE
0810:
0820: 2BC3 38       TABL    =      $38
0830: 2BC4 30               =      $30
0840: 2BC5 28               =      $28
0850:
0860:               DSMBLR MODE TABLE
0870:
0880: 2BC6 40       MODE    =      $40
0890: 2BC7 02               =      $02
0900: 2BC8 43               =      $43
0910: 2BC9 04               =      $04
0920: 2BCA 40               =      $40
0930: 2BCB 06               =      $06
0940: 2BCC 40               =      $40
0950: 2BCD 08               =      $08
0960: 2BCE 40               =      $40
0970: 2BCF 22               =      $22
0980: 2BD0 43               =      $43
0990: 2BD1 44               =      $44
1000: 2BD2 40               =      $40
1010: 2BD3 06               =      $06
1020: 2BD4 40               =      $40
1030: 2BD5 08               =      $08
1040: 2BD6 40               =      $40
1050: 2BD7 02               =      $02
1060: 2BD8 43               =      $43
```

```
1070: 2BD9 44              =      $44
1080: 2BDA 40              =      $40
1090: 2BDB 06              =      $06
1100: 2BDC 40              =      $40
1110: 2BDD 08              =      $08
1120: 2BDE 40              =      $40
1130: 2BDF 02              =      $02
1140: 2BE0 43              =      $43
1150: 2BE1 44              =      $44
1160: 2BE2 40              =      $40
1170: 2BE3 06              =      $06
1180: 2BE4 40              =      $40
1190: 2BE5 08              =      $08
1200: 2BE6 00              =      $00
1210: 2BE7 22              =      $22
1220: 2BE8 44              =      $44
1230: 2BE9 44              =      $44
1240: 2BEA 40              =      $40
1250: 2BEB 69              =      $69
1260: 2BEC 44              =      $44
1270: 2BED 00              =      $00
1280: 2BEE 11              =      $11
1290: 2BEF 22              =      $22
1300: 2BF0 44              =      $44
1310: 2BF1 44              =      $44
1320: 2BF2 40              =      $40
1330: 2BF3 69              =      $69
1340: 2BF4 44              =      $44
1350: 2BF5 87              =      $87
1360: 2BF6 10              =      $10
1370: 2BF7 22              =      $22
1380: 2BF8 44              =      $44
1390: 2BF9 44              =      $44
1400: 2BFA 40              =      $40
1410: 2BFB 06              =      $06
1420: 2BFC 40              =      $40
1430: 2BFD 08              =      $08
1440: 2BFE 10              =      $10
1450: 2BFF 22              =      $22
1460: 2C00 44              =      $44
1470: 2C01 44              =      $44
1480: 2C02 40              =      $40
1490: 2C03 06              =      $06
1500: 2C04 40              =      $40
1510: 2C05 08              =      $08
1520: 2C06 A2              =      $A2
1530: 2C07 14              =      $14
1540: 2C08 56              =      $56
1550: 2C09 78              =      $78
ID=AC

0010:
0020:               MESSAGES
0030:
0040: 2C0A 0D       MESSG  =      $0D
0050: 2C0B 50              =      'P
0060: 2C0C 41              =      'A
0070: 2C0D 53              =      'S
```

```
0080: 2C0E 53          =     'S
0090: 2C0F 20          =     '
0100: 2C10 31          =     '1
0110: 2C11 40          =     $40
0120: 2C12 0D          =     $0D
0130: 2C13 50          =     'P
0140: 2C14 41          =     'A
0150: 2C15 53          =     'S
0160: 2C16 53          =     'S
0170: 2C17 20          =     '
0180: 2C18 32          =     '2
0190: 2C19 0D          =     $0D
0200: 2C1A 50          =     'P
0210: 2C1B 52          =     'R
0220: 2C1C 49          =     'I
0230: 2C1D 4E          =     'N
0240: 2C1E 54          =     'T
0250: 2C1F 3F          =     '?
0260: 2C20 20          =     '
0270: 2C21 40          =     $40
0280: 2C22 0D          =     $0D
0290: 2C23 53          =     'S
0300: 2C24 41          =     'A
0310: 2C25 56          =     'V
0320: 2C26 45          =     'E
0330: 2C27 20          =     '
0340: 2C28 49          =     'I
0350: 2C29 44          =     'D
0360: 2C2A 3D          =     '=
0370: 2C2B 20          =     '
0380: 2C2C 40          =     $40
0390: 2C2D 20          =     '
0400: 2C2E 20          =     '
0410: 2C2F 20          =     '
0420: 2C30 20          =     '
0430: 2C31 4D          =     'M
0440: 2C32 49          =     'I
0450: 2C33 43          =     'C
0460: 2C34 52          =     'R
0470: 2C35 4F          =     'O
0480: 2C36 2D          =     '-
0490: 2C37 57          =     'W
0500: 2C38 41          =     'A
0510: 2C39 52          =     'R
0520: 2C3A 45          =     'E
0530: 2C3B 20          =     '
0540: 2C3C 41          =     'A
0550: 2C3D 53          =     'S
0560: 2C3E 53          =     'S
0570: 2C3F 45          =     'E
0580: 2C40 4D          =     'M
0590: 2C41 42          =     'B
0600: 2C42 4C          =     'L
0610: 2C43 45          =     'E
0620: 2C44 52          =     'R
0630: 2C45 20          =     '
```

```
0640: 2C46 36                    =      '6
0650: 2C47 35                    =      '5
0660: 2C48 58                    =      'X
0670: 2C49 58                    =      'X
0680: 2C4A 2D                    =      '-
0690: 2C4B 31                    =      '1
0700: 2C4C 2E                    =      '.
0710: 2C4D 30                    =      '0
0720: 2C4E 20                    =      ' 
0730: 2C4F 50                    =      'P
0740: 2C50 41                    =      'A
0750: 2C51 47                    =      'G
0760: 2C52 45                    =      'E
0770: 2C53 20                    =      ' 
0780: 2C54 40                    =      $40
0790: 2C55 0D                    =      $0D
0800: 2C56 20                    =      ' 
0810: 2C57 20                    =      ' 
0820: 2C58 20                    =      ' 
0830: 2C59 20                    =      ' 
0840: 2C5A 53                    =      'S
0850: 2C5B 59                    =      'Y
0860: 2C5C 4D                    =      'M
0870: 2C5D 42                    =      'B
0880: 2C5E 4F                    =      'O
0890: 2C5F 4C                    =      'L
0900: 2C60 20                    =      ' 
0910: 2C61 54                    =      'T
0920: 2C62 41                    =      'A
0930: 2C63 42                    =      'B
0940: 2C64 4C                    =      'L
0950: 2C65 45                    =      'E
0960: 2C66 20                    =      ' 
0970: 2C67 40                    =      $40
0980: 2C68 0D                    =      $0D
0990: 2C69 49                    =      'I
1000: 2C6A 44                    =      'D
1010: 2C6B 3D                    =      '=
1020: 2C6C 40                    =      $40
1030: 2C6D 0D                    =      $0D
1040: 2C6E 4E                    =      'N
1050: 2C6F 45                    =      'E
1060: 2C70 57                    =      'W
1070: 2C71 3F                    =      '?
1080: 2C72 40                    =      $40
1090: 2C73 0D                    =      $0D
1100: 2C74 43                    =      'C
1110: 2C75 4C                    =      'L
1120: 2C76 45                    =      'E
1130: 2C77 41                    =      'A
1140: 2C78 52                    =      'R
1150: 2C79 40                    =      $40
ID=AD

0010:
0020:
0030:
0040:
```

```
                              ******************************
                              ****MICRO-ADE DISASSEMBLER*(C)*
                              ******************************
2C7A 20 E7 2D                JSR    ZRLF    CRLF
2C7D A5 3E                   LDA    PCHI
2C7F A6 3D                   LDX    PCLO    PRINT PC
2C81 20 C9 2D                JSR    HEXAX
2C84 A2 00                   LDXIM  $00
2C86 A1 3D                   LDAIX  PCLO    GET OP
2C88 A8                      TAY
2C89 4A                      LSRA
2C8A 90 03                   BCC    EVEN
2C8C 4A                      LSRA
2C8D B0 17                   BCS    ERRZ
2C8F C9 22                   CMPIM  $22     HASH
2C91 F0 13                   BEQ    ERRZ    MODE
2C93 29 07                   ANDIM  $07     TABLE
2C95 09 80                   ORAIM  $80     INDEX
2C97 4A              EVEN    LSRA
2C98 AA                      TAX
2C99 BD C6 2B                LDAAX  MODE
2C9C B0 04                   BCS    RIGHT
2C9E 4A                      LSRA
2C9F 4A                      LSRA
2CA0 4A                      LSRA
2CA1 4A                      LSRA           DECODE
2CA2 29 0F           RIGHT   ANDIM  $0F     ADDRESS
2CA4 D0 04                   BNE    GETFMT  MODE INDEX
2CA6 A9 04           ERRZ    LDAIM  $04
2CA8 A0 80                   LDYIM  $80     (ERROR)
2CAA AA              GETFMT  TAX
2CAB 85 27                   STA    INDX
2CAD 84 47                   STY    OP
2CAF CA                      DEX
2CB0 20 2B 29                JSR    TTWO    OBTAIN
2CB3 20 56 29                JSR    ADJLTH  LENGTH
2CB6 98                      TYA
2CB7 29 8F                   ANDIM  $8F
2CB9 AA                      TAX
2CBA 98                      TYA
2CBB A0 00                   LDYIM  $00
2CBD 84 2B                   STY    X       FORMAT
2CBF 4A                      LSRA           MNEMONIC
2CC0 26 2B                   ROL    X       TABLE
2CC2 4A                      LSRA           INDEX
2CC3 26 2B                   ROL    X
2CC5 4A                      LSRA
2CC6 26 2B                   ROL    X
2CC8 F0 11                   BEQ    ZUT
```

```
2CCA 4A                LSRA
2CCB A0 20             LDYIM $20
2CCD E0 8A             CPXIM $8A
2CCF F0 08             BEQ   Y
2CD1 4A                LSRA
2CD2 46 2B             LSR   X
2CD4 A6 2B             LDX   X
2CD6 BC C3 2B          LDYAX TABL
2CD9 29 07      Y      ANDIM $07

2CDB 84 2B      ZUT    STY   X
2CDD 05 2B             ORA   X
2CDF 85 2B             STA   X
2CE1 A0 00             LDYIM $00
2CE3 20 EC 2D          JSR   ZUTSP

2CE6 B1 3D      LOOP   LDAIY PCLO
2CE8 20 CD 2D          JSR   HEXOUT PRINT OP-CODE
2CEB A2 01             LDXIM $01    AND ARG
2CED 20 7A 2D   LPX    JSR   OUTSPX
2CF0 C4 46             CPY   LENGTH
2CF2 C8                INY
2CF3 90 F1             BCC   LOOP

2CF5 A2 03             LDXIM $03
2CF7 C0 04             CPYIM $04
2CF9 90 F2             BCC   LPX
2CFB A6 3D             LDX   PCLO   PRINT LABEL
2CFD A4 3E             LDY   PCHI
2CFF A9 06             LDAIM $06
2D01 85 28             STA   SPCNT
2D03 20 88 2D          JSR   PSYMXY
ID=AE

2D06 A4 2B             LDY   X
2D08 B9 07 2B          LDAAY MNL
2D0B 85 2B             STA   X
2D0D 4A                LSRA         PRINT
2D0E 4A                LSRA         MNEMONIC
2D0F 20 81 2D          JSR   ZUTP
2D12 B9 47 2B          LDAAY MNR
2D15 2A                ROLA
2D16 26 2B             ROL   X
2D18 2A                ROLA
2D19 26 2B             ROL   X
2D1B 2A                ROLA
2D1C 26 2B             ROL   X
2D1E A5 2B             LDA   X
2D20 20 81 2D          JSR   ZUTP
2D23 B9 47 2B          LDAAY MNR
2D26 20 81 2D          JSR   ZUTP

2D29 A6 27             LDX   INDX
2D2B BD 9A 2B          LDAAX TABLL  -01 PRINT
2D2E 20 F0 2D          JSR   OUTK       ADDRESS
2D31 BD A4 2B          LDAAX TABLR  -01 MODE
2D34 20 F0 2D          JSR   OUTK
2D37 20 EC 2D          JSR   ZUTSP
```

```
2D3A A6 46              LDX    LENGTH
2D3C CA                 DEX
2D3D 30 37              BMI    NONE
2D3F D0 25              BNE    TWZ

2D41 A0 01              LDYIM  $01
2D43 A5 47              LDA    OP
2D45 29 1F              ANDIM  $1F
2D47 C9 10              CMPIM  $10
2D49 D0 15              BNE    ZTREL

2D4B B1 3D              LDAIY  PCLO
2D4D 48                 PHA
2D4E 38                 SEC
2D4F 69 01              ADCIM  $01     CALCULATE
2D51 65 3D              ADC    PCLO    RELATIVE
2D53 AA                 TAX            ADDRESS
2D54 A5 3E              LDA    PCHI
2D56 69 00              ADCIM  $00
2D58 A8                 TAY
2D59 68                 PLA
2D5A 10 13              BPL    ZNE
2D5C 88                 DEY
2D5D 4C 6F 2D           JMP    ZNE

2D60 B1 3D     ZTREL    LDAIY  PCLO
2D62 AA                 TAX
2D63 88                 DEY
2D64 F0 09              BEQ    ZNE

2D66 A0 01     TWZ      LDYIM  $01
2D68 B1 3D              LDAIY  PCLO
2D6A AA                 TAX
2D6B C8                 INY
2D6C B1 3D              LDAIY  PCLO
2D6E A8                 TAY

2D6F A9 00     ZNE      LDAIM  $00     PRINT
2D71 85 28              STA    SPCNT   ARGUMENT
2D73 20 88 2D           JSR    PSYMXY
2D76 20 7B 29  NONE     JSR    PCADJ
2D79 60                 RTS

               ROUTINE TO PRINT X SPACES

2D7A 20 EC 2D  OUTSPX   JSR    ZUTSP
2D7D CA                 DEX
2D7E D0 FA              BNE    OUTSPX
2D80 60                 RTS

               PRINT 5 BIT ASCII

2D81 29 1F     ZUTP     ANDIM  $1F
2D83 09 40              ORAIM  $40
2D85 4C F0 2D           JMP    OUTK
```

```
0810:
0820:                    PRINT SYMBOL OF $XY
0830:
0840: 2D88 86 29         PSYMXY STX   XCLO
0850: 2D8A 84 2A                STY   XCHI
0860: 2D8C 20 E6 25             JSR   SETSY
0870:
0880: 2D8F A0 04         SRCH   LDYIM $04
0890: 2D91 B1 3F                LDAIY SLO
0900: 2D93 C5 29                CMP   XCLO
0910: 2D95 D0 0A                BNE   INC    SEARCH
0920: 2D97 C8                   INY          TABLE
0930: 2D98 B1 3F                LDAIY SLO
0940: 2D9A C5 2A                CMP   XCHI
0950: 2D9C D0 03                BNE   INC
0960: 2D9E 4C AC 25             JMP   DPSYM  PRINT ROUTINE
0970:
0980: 2DA1 20 C1 27      INC    JSR   DADS
0990: 2DA4 90 E9                BCC   SRCH
1000:
1010: 2DA6 A4 28                LDY   SPCNT
1020: 2DA8 D0 0F                BNE   BLNK
1030: 2DAA A9 24                LDAIM '$     NO SYMBOL
1040: 2DAC 20 F0 2D             JSR   OUTK   IN TABLE, USE $XY
1050: 2DAF A5 2A                LDA   XCHI
1060: 2DB1 A6 29                LDX   XCLO
1070: 2DB3 20 C9 2D             JSR   HEXAX
1080: 2DB6 20 EC 2D             JSR   ZUTSP
1090:
1100: 2DB9 20 EC 2D      BLNK   JSR   ZUTSP
1110: 2DBC 88                   DEY          FILL
1120: 2DBD 10 FA                BPL   BLNK   BLANKS
1130: 2DBF 60                   RTS
ID=
```

SYMBOL TABLE 3000 352E

ABS	2976	AD	0029	ADDSYM	2859	ADJLTH	2956
ADM	0045	ADTABL	2894	ARGIN	002B	ASCI	29DC
ASMBLD	26AF	ASMBLR	25F8	BHI	0011	BINARY	2EA8
BLNK	2DB9	BLO	0010	BUFFER	0100	BUFIN	2E41
CHECK	2845	COMNT	2AA1	CR	2A2F	CRLF	2787
DADA	27C5	DADS	27C1	DADX	27C3	DECODE	28D4
DNX	26A9	DONE	2AC3	DPSYM	25AC	DUNMES	2A21
EACH	2843	EAH	17F8	EAL	17F7	EHI	0042
ELO	0041	ENDB	271D	ENDID	26E2	ENDM	27AD
ENDSYM	2EA7	EQU	2AF8	EREL	2AF4	ERID	264F
ERISD	26FB	ERP	2B06	ERROR	28A4	ERRPRT	240C
ERRTRY	266C	ERRZ	2CA6	ERR	2921	EVEN	2C97
FMTA	2B87	FMTB	2B91	FNDSBL	2837	GETARG	298B
GETFMT	2CAA	GETID	260A	GETIT	2622	GET	27AE
GHEX	29E2	HERE	2906	HEXAX	2DC9	HEXOUT	2DCD
HEXR	2780	HEXSP	2DEB	HEXX	2784	HIM	2BB9
HIPAR	001D	ID	0062	IDAS	2608	IDXS	26DF
INCBUF	250D	INCH	2E2B	INC	2DA1	INDX	0027
INTRP	27D9	LABEL	0020	LDY	2AA3	LEFT	28E1
LENGTH	0046	LOAD	24FB	LODA	2870	LOM	2BAF
LOOP	2CE6	LOOPC	27DD	LOPAR	001A	LPX	2CED
LTHX	273E	MAIN	25F8	MESSG	2C0A	MESSPR	2A14
MESSY	27A0	MNL	2B07	MNR	2B47	MODE	2BC6
MVTIT	2728	NENDID	262F	NEXT	28D6	NEXTX	28DD
NEXTY	2902	NHI	0016	NLO	0015	NOCOMN	2A5E
NOERID	2653	NOMTCH	2851	NONE	2D76	NOPRT	26F9
NOSP	2A93	NOTBL	2860	NOTDOL	2769	NOTIM	28F2
NOTV	297A	NOTX	27F3	NOUT	2DC5	NSVE	2718
NTPC	2743	NTREL	296C	OBJECT	2EA8	OK	286E
OKC	294D	OKPAG	2A39	OKRD	265A	OKS	29A7
OLDST	2601	ONEX	26A6	ONE	29F4	OP	0047
OPIN	0026	ORDAD	288D	ORDB	2917	ORDIN	290F
OUTA	294E	OUTB	2951	OUTCH	278D	OUTK	2DF0
OUTP	2A88	OUTS	2A56	OUTSP	278B	OUTSPX	2D7A
OUTSTR	2AB1	OUTX	2791	OUT	24DE	OVRR	2A6F
PACKT	2E94	PACKX	2AFD	PACKYX	281A	PAGE	0055
PASONE	28C8	PASS	004C	PASSTW	26E6	PASTWO	28CB
PCADJ	297B	PCAHI	004B	PCALO	004A	PCHI	003E
PCLO	003D	PGN	0056	PLAB	0032	PLUS	2AF5
PLUSO	29D7	POFF	29C3	POP	0036	PRBUF	2A83
PRFLAG	004D	PRINT	29F9	PSYMXY	2D88	READ	2E97
REDUCE	2777	RELAD	2ACC	RESB	23F4	RESTRT	2E31
RETA	28A3	RETPC	298A	RETREL	2AF7	RETX	2AB0
RIGHT	2CA2	ROT	2937	RTO	277F	SAHX	0061
SAH	17F6	SALX	0060	SAL	17F5	SAVE	0051
SAVID	005D	SETB	2946	SETSY	25E6	SHI	0040
SLO	003F	SOURCE	2EA4	SPCE	2A90	SPCNT	0028
SPECOP	2720	SRCH	2D8F	ST	27B8	STORE	2978
SXH	0044	SXL	0043	SYMBOL	2EA6	TABL	2BC3
TABLL	2B9B	TABLR	2BA5	TITLE	0057	TIT	2A07
TMP	003C	TTWO	292B	TWO	29F6	TWZ	2D66
VERIF	2922	WRITE	2E9A	X	002B	XCHI	002A
XCLO	0029	XOT	2ABB	XX	292E	Y	2CD9
YCOM	0031	YIN	28F4	YSNO	2794	ZNE	2D6F
ZRLF	2DE7	ZTREL	2D60	ZUTP	2D91	ZUTSP	2DEC
ZUT	2CDB						

```
                   ************************************
                   ***** INPUT AND OUTPUT ROUTINES *****
                   ***** FOR THE  MICRO-ADE SYSTEM *****
                   ************************************
2DC5               IO      ORG    $2DC5  77.06.24
2DC5               BLO     *      $0010  POINTER TO WORKSPACE
2DC5               N       *      $0015  LINE NUMBER
2DC5               SALX    *      $0060  FILE EXECUTION ADDRESS
2DC5               SAHX    *      $0061
2DC5               ID      *      $0062  FILE ID
2DC5               PMODE   *      $0063  PAGE MODE FLAG
2DC5               COUNTL  *      $0064  LINE COUNT
2DC5               GANG    *      $00F0  CWRITE PULSER
2DC5               TIC     *      $00F1  CWRITE TIMER
2DC5               COUNT   *      $00F2  CWRITE COUNTER
2DC5               TMP     *      $00F3  TEMPORARY STORAGE
2DC5               YTMP    *      $00F4     "         "
2DC5               XTMP    *      $00F5     "         "
2DC5               TRIB    *      $00FE  CYCLE COUNTER
2DC5               BUFFER  *      $0100  INPUT/OUTPUT BUFFER
2DC5               RESTRT  *      $2031  EDITOR WARM ENTRY ADDRESS
                   KIM ROM AND PIA ADDRESSES
2DC5               SBD     *      $1742  PIA LOCATION
2DC5               CHKL    *      $17E7  CHECKSUM
2DC5               CHKH    *      $17E8
2DC5               VEB     *      $17EC  VOLATILE EXECUTION BLOCK
2DC5               SAL     *      $17F5  TAPE START ADDRESS
2DC5               SAH     *      $17F6
2DC5               EAL     *      $17F7  TAPE END ADDRESS
2DC5               EAH     *      $17F8
2DC5               INTVEB  *      $1932  INIT VEB SUBROUTINE
2DC5               CHKT    *      $194C  CHECK SUM SUBROUTINE
2DC5               INCVEB  *      $19EA  INCREMENT VEB SUB
2DC5               RDBYT   *      $19F3  READ BYTE SUBROUTINE
2DC5               RDCHT   *      $1A24  READ CHAR SUBROUTINE
2DC5               RDBIT   *      $1A41  READ BIT SUBROUTINE
2DC5               INIT    *      $1E8C  RESET ALL PIAS
```

```


                  ******** INPUT AND OUTPUT ROUTINES ********

                  SUBROUTINE TO PRINT THE CURRENT LINE NUMBER

2DC5 A5 16        NOUT   LDA    N       +01 GET HI N
2DC7 A6 15               LDX    N           GET LO N...PRINT THEM

                  SUB TO PRINT 2 HEX BYTES
                  FIRST BYTE IS IN A
                  SECOND BYTE IS IN X

2DC9 20 CD 2D     HEXAX  JSR    HEXOUT  PRINT ACCUMULATOR
2DCC 8A                  TXA            GET BYTE IN X ... PRINT IT

                  SUBROUTINE TO PRINT 1 HEX BYTE
                  INPUT IS IN ACCUMULATOR

2DCD 48           HEXOUT PHA            SAVE INPUT
2DCE 4A                  LSRA           GET
2DCF 4A                  LSRA           UPPER
2DD0 4A                  LSRA           NYBBLE
2DD1 4A                  LSRA
2DD2 20 D8 2D            JSR    HEX     PRINT UPPER NYBBLE
2DD5 68                  PLA            GET INPUT BACK
2DD6 29 0F               ANDIM  $0F     GET LOWER NYBBLE

                  SUBROUTINE TO PRINT 1 HEX CHARACTER
                  INPUT CHAR IS IN ACCUMULATOR

2DD8 C9 0A        HEX    CMPIM  $0A     LETTER OR NUMBER?
2DDA 18                  CLC            CALCULATE ASCII
2DDB 30 02               BMI    HEXA    IF IT IS A NUMBER!
2DDD 69 07               ADCIM  $07     ADD 7 TO LETTER
2DDF 69 30        HEXA   ADCIM  $30     AND 30 TO BOTH
2DE1 D0 0D               BNE    OUTCH   THEN PRINT IT

                  SUBROUTINE TO PRINT A BACKSPACE
                  IF YOUR TERMINAL CAN'T-CHANGE THE 5F TO
                  ANOTHER CHARACTER TO INDICATE DELETES

2DE3 A9 5F        BACKSP LDAIM  $5F     BACKSPACE CHARACTER
2DE5 D0 09               BNE    OUTCH   PRINT IT

                  SUBROUTINE TO PRINT CARRIAGE RETURN
                  AND LINE FEED

2DE7 A9 0D        CRLF   LDAIM  $0D     GET CR CHARACTER
2DE9 D0 05               BNE    OUTCH   AND PRINT IT
ID=02


                  SUBROUTINE TO PRINT  2 HEX BYTES
                  FOLLOWED IMMEDIATEDLY BY A SPACE

2DEB 20 C9 2D     HEXSP  JSR    HEXAX   PRINT 2 HEX BYTES

```

```
                       SUBROUTINE TO PRINT A SPACE

      2DEE A9 20       OUTSP  LDAIM '        LOAD SPACE IN A

                       SUBROUTINE TO PRINT AN ASCII CHARACTER
                       INPUT CHARACTER IS IN THE ACCUMULATOR

      2DF0 84 F4       OUTCH  STY   YTMP   HIDE Y
      2DF2 86 F5              STX   XTMP   AND X
      2DF4 C9 0D              CMPIM $0D    IS THIS A CARRIAGE RETURN?
      2DF6 D0 1E              BNE   NOCR   SKIP LF IF NOT

      2DF8 A6 63              LDX   PMODE  CHECK PAGE MODE FLAG
      2DFA D0 13              BNE   NOPG   SKIP IF NOT ON
      2DFC E6 64              INC   COUNTL ADD 1 TO LINES PRINTED
      2DFE D0 0F              BNE   NOPG   SKIP IF NOT END OF SCREEN

      2E00 20 2B 2E           JSR   INCH   PAUSE UNTIL INPUT OF ANY KEY
      2E03 C9 1B              CMPIM $1B    WAS ESCAPE KEY ENTERED?
      2E05 D0 04              BNE   ON     IF NOT CONTINUE IN PAGE MODE
      2E07 A9 FF              LDAIM $FF    TURN OFF PAGE MODE
      2E09 85 63              STA   PMODE

      2E0B A2 F0       ON     LDXIM $F0    RESET LINE COUNTER
      2E0D 86 64              STX   COUNTL TO -16

      2E0F A9 0A       NOPG   LDAIM $0A    PRINT A LINE FEED
      2E11 20 16 2E           JSR   NOCR   (REMOVE IF YOUR TERMINAL HAS AUTO L

      2E14 A9 0D              LDAIM $0D    THIS WAS A CR, REMEMBER
      2E16 20 A0 2E    NOCR   JSR   OUTPUT SO PRINT IT

                       ROUTINE TO TEST FOR BREAK DURING I/O

      2E19 2C 40 17    BRKTST BIT   $1740  TEST INPUT PORT OF PIA
      2E1C 10 05              BPL   BREAK  IF BIT 7=0

      2E1E A6 F5              LDX   XTMP   SEEK HIDDEN X
      2E20 A4 F4              LDY   YTMP   AND HIDDEN Y
      2E22 60                 RTS          AND ITS ALL OVER

      2E23 2C 40 17    BREAK  BIT   $1740  WAIT UNTIL KEY
      2E26 10 FB              BPL   BREAK  IS RELEASED
      2E28 4C 31 20           JMP   RESTRT THEN GO TO EDITOR

                       ROUTINE TO INPUT AN ASCII CHARACTER
                       RETURNS IT IN ACCUMULATOR

      2E2B 86 F5       INCH   STX   XTMP   HIDE X
      2E2D 84 F4              STY   YTMP   AND Y
      2E2F 20 9D 2E           JSR   INPUT  CALL USER INPUT ROUTINE
      2E32 29 7F              ANDIM $7F    STRIP PARITY BIT
      2E34 C9 0D              CMPIM $0D    WAS INPUT A RETURN
      2E36 D0 07              BNE   NOCRIN IF NOT ITS OK

      2E38 A9 0A              LDAIM $0A    PRINT A LF WITH CR INPUT
```

```
2E3A 20 A0 2E          JSR   OUTPUT SKIP THIS IF AUTO LF ON TERMINAL
2E3D A9 0D             LDAIM $0D    REPLACE CR AGAIN FOR RTS
2E3F D0 D8      NOCRIN BNE   BRKTST RETURN VIA BREAK TEST

ID=03


                SUBROUTINE TO FILL BUFFER FROM
                KEYBOARD INPUT

2E41 A0 00      BUFIN  LDYIM $00    RESET BUFFER COUNTER
2E43 20 2B 2E   INB    JSR   INCH   GET CHARACTER INPUT
2E46 C9 7F             CMPIM $7F    WAS IT A DELETE?
2E48 D0 07             BNE   ONIN   IF NOT, CARRY ON

2E4A 20 E3 2D          JSR   BACKSP PRINT A BACKSPACE
2E4D 88                DEY          BACK UP IN BUFFER
2E4E 10 F3             BPL   INB    AND GET IT RIGHT THIS TIME
2E50 00                BRK          ERROR--BACKED UP TOO FAR!

2E51 C9 5C      ONIN   CMPIM $5C    (BACKSLASH) WILL
2E53 D0 06             BNE   OKB    DELETE WHOLE LINE
2E55 20 E7 2D          JSR   CRLF   PRINT RETURN AND LF
2E58 4C 41 2E          JMP   BUFIN  AND START OVER

2E5B C9 05      OKB    CMPIM $05    WAS IT A CTL-E?
2E5D F0 11             BEQ   OVR    YES--GO TO OVR FUNCTION
2E5F 99 00 01          STAAY BUFFER JUST AN ORDINARY CHARACTER TO   'E

2E62 C9 0D             CMPIM $0D    WAS THIS THE END?
2E64 F0 09             BEQ   ENDBU  YES, SO GET OUT OF HERE
2E66 C8                INY          INCREMENT POINTER
2E67 C0 3A             CPYIM $3A    ALLOW ONLY 58 CHARS +6 PROMPT=64
2E69 30 D8             BMI   INB    STILL SOME ROOM FOR MORE
2E6B A9 0D             LDAIM $0D    FORCE CR TO END LINE
2E6D D0 EC             BNE   OKB    PRINT IT AND PUT IN BUFFER
2E6F 60         ENDBU  RTS          ALL DONE

2E70 20 E3 2D   OVR    JSR   BACKSP CANCEL THE CTL CHAR (THIS MAY NOT
                                      NECESSARY ON SOME TERMINALS)

2E73 B9 00 01   OVX    LDAAY BUFFER GET CHARACTER IN BUFFER
2E76 C9 0D             CMPIM $0D    IS IT THE END?
2E78 F0 C9             BEQ   INB    IF SO--GO GET NEW ADDITION
2E7A 20 F0 2D          JSR   OUTCH  SHOW HIM WHAT IT IS
2E7D C8                INY          ON TO NEXT CHARACTER
2E7E C0 3A             CPYIM $3A    BUT DON'T GET CARRIED AWAY! BUFFER
2E80 D0 F1             BNE   OVX    KEEP GOING                    LIMIT
2E82 F0 BF             BEQ   INB    LET HIM FIX IT UP

                SUBROUTINE TO PRINT THE BUFFER

2E84 A0 00      PRBUF  LDYIM $00    RESET THE POINTER
2E86 B9 00 01   PRNTB  LDAAY BUFFER GET A CHARACTER
2E89 48                PHA          HIDE IT TEMPORARILY
2E8A 20 F0 2D          JSR   OUTCH  PRINT IT
2E8D 68                PLA          SEEK IT BACK
2E8E C8                INY          POINT TO NEXT CHARACTER
2E8F C9 0D             CMPIM $0D    WAS THAT THE END OF THE BUFFER?
```

```
2E91 D0 F3           BNE   PRNTB  NO, THERE MUST BE MORE
2E93 60              RTS          YES, SO RETURN

                        **** ********* *********
                  ***** USER SPECIFIED ADDRESSES *****
                        **** ********* *********


2E94 4C 00 1A  PACKT  JMP   $1A00  A KIM SUBROUTINE TO PACK ASCII INT

2E97 4C AF 2E  READ   JMP   CREAD  THE CASSETTE READ SUBROUTINE

2E9A 4C 35 2F  WRITE  JMP   CWRITE THE CASSETTE WRITE SUBROUTINE

2E9D 4C 5A 1E  INPUT  JMP   $1E5A  THE KEYBOARD INPUT ROUTINE

2EA0 4C A0 1E  OUTPUT JMP   $1EA0  THE PRINTER OUTPUT ROUTINE

               DEFINITION OF SOURCE LOCATION

2EA3 35        SOURCM =     $35    SOURCE - 1
2EA4 36        SOURCE =     $36    SOURCE AREA OV MEMORY STARTS HERE
2EA5 40        SOURCF =     $40    AND ENDS JUST BELOW HERE

               DEFINITION OF SYMBOL TABLE LOCATION

2EA6 30        SYMBOL =     $30    SYMBOL TABLE STARTS HERE
2EA7 36        SYMF   =     $36    AND JUST BELOW HERE

               DEFINITION OF OBJECT LOCATION

2EA8 02        OBJECT =     $02    THE OBJECT WILL BE ASSEMBLED TO HE

ID=04

               ************************************************
               ***** KIM CASSETTE READ AND WRITE ROUTINES *****
               ************************************************

               CASSETTE READ ERROR (INCORRECT ID)

2EA9 20 CD 2D  ERID   JSR   HEXOUT PRINT THE WRONG ID,
2EAC 20 EE 2D         JSR   OUTSP  SPACE AND THEN START OVER

               ***** CASSETTE READ SUBROUTINE *****

               VERY SIMILAR TO THE READ ROUTINE
               IN THE KIM ROM.
               THE LED DISPLAY OF INCOMING DATA ADAPTED
               FROM VUTAPE, A PROGRAM BY JIM BUTTERFIELD
               FROM THE KIM-1 USER NOTES.


2EAF AD 02 17  CREAD  LDA   $1702  TURN ON CASSETTE #1 BY
2EB2 29 FB            ANDIM $FB    CHANGING BIT 2 TO
2EB4 8D 02 17         STA   $1702  ZERO IN PIA PORT B
```

```
0240: 2EB7 A9 7F           LDAIM $7F    TURN ON THE KIM LED DISPLAY
0250: 2EB9 8D 41 17        STA   $1741  BY SETTING THE DD REG
0260:
0270: 2EBC D8              CLD          JUST TO MAKE SURE
0280:
0290: 2EBD A9 8D           LDAIM $8D    SET UP VEB
0300: 2EBF 8D EC 17        STA   VEB    TO SAVE DATA
0310: 2EC2 20 32 19        JSR   INTVEB (IN KIM ROM)
0320:
0330: 2EC5 A9 13           LDAIM $13    TURN ON INPUT PORT FROM CASSETTE HA
0340: 2EC7 8D 42 17        STA   SBD
0350:
0360: 2ECA 20 41 1A  SYNC  JSR   RDBIT  START READING A BIT AT A TIME
0370:
0380: 2ECD 46 F3           LSRZ  TMP    SHIFT IT INTO TMP
0390: 2ECF 05 F3           ORAZ  TMP
0400: 2ED1 85 F3           STAZ  TMP    AND SAVE IT
0410: 2ED3 8D 40 17        STA   $1740  PLACE IT ON THE LED
0420:
0430: 2ED6 C9 16     TST   CMPIM $16    IS IT A SYNC CHARACTER?
0440: 2ED8 D0 F0           BNE   SYNC   IF NOT, KEEP TRYING
0441:
0450: 2EDA 20 24 1A        JSR   RDCHT  IN SYNC, READ A CHARACTER
0460: 2EDD 8D 40 17        STA   $1740  DISPLAY IT ON LED
0470: 2EE0 C9 2A           CMPIM $2A    IS IT THE START OF DATA?
0480: 2EE2 D0 F2           BNE   TST    IF NOT, LOOP AGAIN
0481:
0490: 2EE4 20 F3 19        JSR   RDBYT  READ THE TAPE ID
0500: 2EE7 C5 62           CMP   ID     IS THIS THE RIGHT TAPE?
0510: 2EE9 D0 BE           BNE   ERID   PRINT IT IF WRONG
0511:
0520: 2EEB 20 F3 19        JSR   RDBYT  READ THE START ADDRESS
0530: 2EEE 20 4C 19        JSR   CHKT   INCLUDE IT IN CHECKSUM
0540: 2EF1 8D ED 17        STA   VEB    +01 AND SAVE IT IN VEB
0550: 2EF4 20 F3 19        JSR   RDBYT  READ THE HI PART OF ADDRESS
0560: 2EF7 20 4C 19        JSR   CHKT   INCLUDE IN SUM
0570: 2EFA 8D EE 17        STA   VEB    +02 SET IT UP IN VEB
0571:
0572:
0580: 2EFD A2 02     LOADIT LDXIM $02   START TO LOAD DATA AS
0590: 2EFF 20 24 1A  READIT JSR  RDCHT  ASCII CHARACTERS
0600: 2F02 C9 2F           CMPIM '/     END OF DATA SYMBOL
0610: 2F04 F0 14           BEQ   ENDRD  SO WIND IT UP
0611:
0620: 2F06 20 94 2E        JSR   PACKT  PACK THE ASCII INTO HEX
0630: 2F09 D0 BF           BNE   SYNC   ERROR IN CHARACTER READ NOT = HEX
0640: 2F0B CA              DEX          COUNT TO TWO
0650: 2F0C D0 F1           BNE   READIT READ SECOND HALF
0651:
0660: 2F0E 20 4C 19        JSR   CHKT   ADD TO CHECKSUM
0670: 2F11 20 EC 17        JSR   VEB    STORE VIA VEB
0680: 2F14 20 EA 19        JSR   INCVEB INCREMENT STORE ADDRESS
0690: 2F17 4C FD 2E        JMP   LOADIT AND READ NEXT BYTE
0691:
0700: 2F1A 20 F3 19  ENDRD JSR   RDBYT  READ CHECKSUM FROM TAPE
0710: 2F1D CD E7 17        CMP   CHKL   COMPARE TO CALCULATED
```

```
0720: 2F20 D0 A8              BNE   SYNC   AND START OVER IF WRONG
0730: 2F22 20 F3 19           JSR   RDBYT  GET SECOND HALF OF SUM
0740: 2F25 CD E8 17           CMP   CHKH   AND DO THE SAME
0750: 2F28 D0 A0              BNE   SYNC   WITH IT
0751:
0760: 2F2A AD 02 17  OKRD     LDA   $1702  TURN OFF CASSETTE
0770: 2F2D 09 04              ORAIM $04    BY SETTING BIT 2
0780: 2F2F 8D 02 17           STA   $1702  OF THE PORT
0790: 2F32 4C 8C 1E           JMP   INIT   RETURN VIA INIT (RESET ALL PORTS)
0791:
ID=05

0010:                ***** KIM CASSETTE WRITE SUBROUTINE *****
0020:
0030:                ADAPTED FROM SUPERTAPE BY JIM BUTTERFIELD
0040:                AS PUBLISHED IN KIM-1 USER NOTES (V I,N 2)
0050:
0060:
0070: 2F35 AD 02 17  CWRITE LDA   $1702  TURN ON CASSETTE #2
0080: 2F38 29 F7            ANDIM $F7    BY SETTING BIT 3 = 0
0090: 2F3A 8D 02 17         STA   $1702  IN PIA PORT B
0100:
0110: 2F3D A9 AD            LDAIM $AD    SET UP
0120: 2F3F 8D EC 17         STA   VEB    VEB FOR SAVE
0130: 2F42 20 32 19         JSR   INTVEB
0140:
0150: 2F45 A9 27            LDAIM $27    SET FLAG
0160: 2F47 85 F0            STAZ  GANG   FOR SBD LATER
0170:
0180: 2F49 A9 BF            LDAIM $BF    TURN ON
0190: 2F4B 8D 43 17         STA   $1743  OUTPUT TO CASSETTE
0200:
0210: 2F4E A2 F0            LDXIM $F0    SEND 240 SYNC PULSES (OPTIMUM # DEP
0220:                                     ON RECORDER START/STOP TIME)
0230: 2F50 A9 16            LDAIM $16    SYNC CHARACTER
0240: 2F52 20 A3 2F         JSR   HIC    OUTPUT X TIMES
0250:
0260: 2F55 A9 2A            LDAIM $2A    SEND START OF DATA CHAR
0270: 2F57 20 C6 2F         JSR   OUTCHT
0280:
0290: 2F5A A5 62            LDA   ID     GET ID
0300: 2F5C 20 B2 2F         JSR   OUTBT  AND SEND AS A BYTE
0310:
0320: 2F5F A5 60            LDAZ  SALX   SEND EXECUTION ADDRESS
0330: 2F61 20 AF 2F         JSR   OUTBTC WITH CHECKSUM CALCULATION
0340: 2F64 A5 61            LDAZ  SAHX   HI PART TOO
0350: 2F66 20 AF 2F         JSR   OUTBTC
0360:
0370: 2F69 20 EC 17  DUMPTA JSR   VEB    GET A BYTE OF MEMORY
0380: 2F6C 20 AF 2F         JSR   OUTBTC SEND AND CHECKSUM IT
0390: 2F6F 20 EA 19         JSR   INCVEB POINT TO NEXT BYTE
0400: 2F72 AD ED 17         LDA   VEB    +01 CHECK FOR END
0410: 2F75 CD F7 17         CMP   EAL    AGAINST EAL
0420: 2F78 AD EE 17         LDA   VEB    +02 AND
0430: 2F7B ED F8 17         SBC   EAH    EAH
0440: 2F7E 90 E9            BCC   DUMPTA AGAIN IF NOT END
0450:
0460: 2F80 A9 2F            LDAIM $2F    SEND END OF DATA CHAR
```

```
2F82 20 C6 2F          JSR    OUTCHT AS CHAR

2F85 AD E7 17          LDA    CHKL   SEND
2F88 20 B2 2F          JSR    OUTBT  CHECKSUM
2F8B AD E8 17          LDA    CHKH   LO AND
2F8E 20 B2 2F          JSR    OUTBT  HI
2F91 A2 02             LDXIM  $02    AND SEND 2
2F93 A9 04             LDAIM  $04    EOT CHARS
2F95 20 A3 2F          JSR    HIC

2F98 AD 02 17          LDA    $1702  TURN OFF CASSETTE
2F9B 09 08             ORAIM  $08    BY SETTING BIT 3
2F9D 8D 02 17          STA    $1702  OF THE CONTROL PORT
2FA0 4C 8C 1E          JMP    INIT   RESET ALL PORTS

                SUBROUTINE TO SEND X CHARACTERS TO TAPE

2FA3 86 F1      HIC    STXZ   TIC    SAVE THE COUNT
2FA5 48         HICA   PHA           AND THE CHARACTER
2FA6 20 C6 2F          JSR    OUTCHT SEND THE CHAR
2FA9 68                PLA           AND GET IT BACK
2FAA C6 F1             DECZ   TIC    TO SEND AGAIN
2FAC D0 F7             BNE    HICA   UNTIL COUNT = 0
2FAE 60                RTS

                SUB TO SEND CHARACTER WITH CHECKSUM CALCULATION

2FAF 20 4C 19   OUTBTC JSR    CHKT   ADD CHAR TO SUM

                SUB TO SEND BYTE AS TWO ASCII CHARS

2FB2 48         OUTBT  PHA           SAVE BYTE
2FB3 4A                LSRA          GET
2FB4 4A                LSRA          UPPER
2FB5 4A                LSRA          NYBBLE
2FB6 4A                LSRA
2FB7 20 BB 2F          JSR    HEXT   AND SEND IT
2FBA 68                PLA           RETURN BYTE

                SUBROUTINE TO SEND ONE HEX CHAR AS ASCII

2FBB 29 0F      HEXT   ANDIM  $0F    CLEAN UP DATA
2FBD C9 0A             CMPIM  $0A    CHANGE TO ASCII
2FBF 18                CLC           BY ADDING
2FC0 30 02             BMI    HEXAT
2FC2 69 07             ADCIM  $07    37 TO A...F
2FC4 69 30      HEXAT  ADCIM  $30    AND 30 TO 0...9
ID=06


                SUBROUTINE TO SEND ONE 8 BIT BYTE

2FC6 A0 08      OUTCHT LDYIM  $08    EIGHT BIT COUNT
2FC8 84 F2             STYZ   COUNT
2FCA A0 02      TRY    LDYIM  $02    START AT
2FCC 84 FE             STYZ   TRIB   3600 HERTZ
2FCE BE FC 2F   ZON    LDXAY  NPUL   NUMBER OF HALF CYCLES
2FD1 48                PHA           SAVE THE CHAR
```

```
0100:
0110: 2FD2 2C 47 17  ZONA   BIT    $1747  WAIT FOR END OF CYCLE
0120: 2FD5 10 FB            BPL    ZONA   IN TIGHT LOOP
0130:
0140: 2FD7 B9 FD 2F         LDAAY  TIMG   SET UP TIMER
0150: 2FDA 8D 44 17         STA    $1744  FOR THIS PULSE
0160:
0170: 2FDD A5 F0            LDAZ   GANG   CHANGE STATE
0180: 2FDF 49 80            EORIM  $80    OF OUTPUT
0190: 2FE1 8D 42 17         STA    $1742  PORT
0200:
0210: 2FE4 85 F0            STAZ   GANG   AND SAVE STATE
0220: 2FE6 CA               DEX           DONE ALL CYCLES?
0230: 2FE7 D0 E9            BNE    ZONA   NO-THEN SEND ANOTHER
0240:
0250: 2FE9 68               PLA           RETRIEVE BYTE
0260: 2FEA C6 FE            DECZ   TRIB   ONE MORE GONE
0270: 2FEC F0 05            BEQ    SETZ   THE LAST ONE, TOO
0280: 2FEE 30 07            BMI    ROUT   EVEN THE LAST ONE WENT
0290:
0300: 2FF0 4A               LSRA          ANOTHER BIT TO THE CARRY
0310: 2FF1 90 DB            BCC    ZON    IF IT IS NOT SET
0320: 2FF3 A0 00     SETZ   LDYIM  $00    SWITCH TO 2400 HZ
0330: 2FF5 F0 D7            BEQ    ZON    ALWAYS
0340:
0350: 2FF7 C6 F2     ROUT   DECZ   COUNT  ONE BIT SENT
0360: 2FF9 D0 CF            BNE    TRY    BUT MORE TO GO
0370: 2FFB 60               RTS           ALL OVER, GO HOME
0380:
0390:                TIMING TABLE
0400:
0410: 2FFC 02        NPUL   =      $02    TWO PULSES
0420: 2FFD C3        TIMG   =      $C3    THE RIGHT TIME
0430: 2FFE 03               =      $03    3 PULSES
0440: 2FFF 7E               =      $7E    AND ENOUGH TIME
0450:
0460:                IF YOUR RECORDER CANNOT HANDLE THIS SPEED,
0470:                YOU CAN SLOW DOWN BY CHANGING NPUL AND NPUL+02
0480:                TO ONE OF THE FOLLOWING:      03       04
0490:                                              06       09
0500:                (THIS IS THE KIM ROM SPEED)   0C       12
ID=
```