fig-FORTH 8086/8088
ASSEMBLY SOURCE LISTING

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fig

RELEASE 1.0

WITH COMPILER SECURITY

AND

VARIABLE LENGTH WORDS

MARCH 1981

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                TITLE   'Fig Forth 8086/88  Ver 1.0'
                PAGEWIDTH 75
                PAGESIZE  66

; ****************************************
; ***                                  ***
; ***    FIG-FORTH for the 8086/88     ***
; ***                                  ***
; ***           Version 1.0            ***
; ***             2/18/81              ***
; ***                                  ***
; ***     Contains interface for       ***
; ***      CP/M-86 (version 1.0)       ***
; ***                                  ***
; ***                                  ***
; ***     Implementation by            ***
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; ***                                  ***
; ****************************************
;
;
;
; NOTE: This version only supports one
;       memory segment of the 8086 (64k bytes).
;
;
; ----------------------------------------------
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; Acknowledgements:
;       John Cassady
;       Kim Harris
;       George Flammer
;       Robt. D. Villwock
```

```
                            EJECT

                      ;-----------------------------------------------
                      ;
                      ;       RELEASE & VERSION NUMBERS
                      ;
ØØØ1                  FIGREL  EQU     1         ; FIG RELEASE #
ØØØØ                  FIGREV  EQU     Ø         ; FIG REVISION #
ØØØØ                  USRVER  EQU     Ø         ; USER VERSION #
                      ;
                      ;       ASCII CHARACTERS USED
                      ;
ØØ2Ø                  ABL     EQU     2ØH       ; SPACE
ØØØD                  ACR     EQU     ØDH       ; CARRIAGE RETURN
ØØ2E                  ADOT    EQU     Ø2EH      ; PERIOD
ØØØ7                  BELL    EQU     Ø7H       ; (^G)
ØØ5F                  BSIN    EQU     5FH       ; INPUT DELETE CHAR
ØØØ8                  BSOUT   EQU     Ø8H       ; OUTPUT BACKSPACE (^H)
ØØ1Ø                  DLE     EQU     1ØH       ; (^P)
ØØØA                  LF      EQU     ØAH       ; LINE FEED
ØØØC                  FF      EQU     ØCH       ; FORM FEED (^L)


                      ;       MEMORY ALLOCATION
                      ;
4ØØØ                  EM      EQU     4ØØØH     ; END OF MEMORY + 1
ØØØ1                  NSCR    EQU     1         ; NO. 1Ø24 BYTE SCREENS
ØØ8Ø                  KBBUF   EQU     128       ; DATA BYTES PER DISK BUF
ØØ4Ø                  US      EQU     4ØH       ; USER VARIABLES SPACE
ØØAØ                  RTS     EQU     ØAØH      ; RETURN STK & TERM BUFF.
                      ;
ØØ84                  CO      EQU     KBBUF+4 ; DISK BUFFER +4 BYTES
ØØØ8                  NBUF    EQU     NSCR*1Ø24/KBBUF ; NO. OF BUFFERS
3BEØ                  BUF1    EQU     EM-CO*NBUF      ; FIRST DISK BUF
3BAØ                  INITRØ  EQU     BUF1-US         ; (RØ)
3BØØ                  INITSØ  EQU     INITRØ-RTS      ; (SØ)
```

```
                                     EJECT

                                ;-----------------------------------------------
                                ;
                                        CSEG
                                        ORG     100H


0100 90                         ORIG    DB      90H      ; 'NOP' INSTRUCTION
0101 E9 92 0E                           JMP     CLD      ; VECTOR TO COLD START
0104 90                                 NOP
0105 E9 79 0E                           JMP     WRM      ; VECTOR TO WARM START
                                ;
0108 01                                 DB      FIGREL   ; FIG RELEASE #
0109 00                                 DB      FIGREV   ; FIG REVISION #
010A 00                                 DB      USRVER   ; USER VERSION #
010B 0E                                 DB      0EH      ; VERSION ATTRIBUTES
010C 00 1A                              DW      TASK-7   ; TOP WORD IN FORTH VOC
010E 5F 00                              DW      BSIN     ; BKSPACE CHARACTER
0110 A0 3B                              DW      INITR0   ; INIT (UP)


                                ; <<<<<< FOLLOWING USED BY "COLD" WORD >>>>>>>
                                ;
                                ; MUST BE IN SAME ORDER AS USER VARIABLES
                                ;
0112 00 3B                              DW      INITS0   ; INIT (S0)
0114 A0 3B                              DW      INITR0   ; INIT (R0)
0116 00 3B                              DW      INITS0   ; INIT (TIB)
0118 20 00                              DW      32               ; INIT (WIDTH)
011A 00 00                              DW      0                ; INIT (WARNING)
011C 0B 1A                              DW      INITDP           ; INIT (FENCE)
011E 0B 1A                              DW      INITDP           ; INIT (DP)
0120 FF 0E                              DW      FORTH+6          ; INIT (VOC-LINK)
                                ;
                                ; <<<<<< END DATA USED BY "COLD" WORD >>>>>


                                ; THE FOLLOWING IS THE CPU'S NAME (PRINTED DURING
                                ; "COLD" START).
                                ;
                                ; THE NAME IS 32 BITS IN BASE 32.
                                ;
0122 05 00 26 B3                        DW      5H,0B326H        ; "8086"


0126 A0 3B                      UP      DW      INITR0   ; USER AREA POINTER
0128 A0 3B                      RPP     DW      INITR0   ; RETURN STACK POINTER
```

```
        EJECT
;------------------------------------------------
;
; FORTH REGISTERS
;
; FORTH 8086    FORTH PRESERVATION RULES
; ----- ----    ------------------------
;
; IP    SI      INTERPRETER POINTER.
;               MUST BE PRESERVED
;               ACROSS FORTH WORDS.
;
; W     DX      WORKING REGISTER.
;               JUMP TO 'DPUSH' WILL
;               PUSH CONTENTS ONTO THE
;               PARAMETER STACK BEFORE
;               EXECUTING 'APUSH'.
;
; SP    SP      PARAMETER STACK POINTER.
;               MUST BE PRESERVED
;               ACROSS FORTH WORDS.
;
; RP    BP      RETURN STACK.
;               MUST BE PRESERVED
;               ACROSS FORTH WORDS.
;
;       AX      GENERAL REGISTER.
;               JUMP TO 'APUSH' WILL PUSH
;               CONTENTS ONTO THE PARAMETER
;               STACK BEFORE EXECUTING 'NEXT'.
;
;       BX      GENERAL PURPOSE REGISTER.
;
;       CX      GENERAL PURPOSE REGISTER.
;
;       DI      GENERAL PURPOSE REGISTER.
;
;       CS      SEGMENT REGISTER.  MUST BE
;               PRESERVED ACROSS FORTH WORDS.
;
;       DS        "      "       "
;
;       SS        "      "       "
;
;       ES      TEMPORARY SEGMENT REGISTER
;               ONLY USED BY A FEW WORDS.
;
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
```

```
        EJECT

;-----------------------------------------------
;
; COMMENT CONVENTIONS:
; -------------------
;
; =      MEANS   "IS EQUAL TO"
; <-     MEANS   ASSIGNMENT
;
; NAME      =    ADDRESS OF NAME
; (NAME)    =    CONTENTS AT NAME
; ((NAME))  =    INDIRECT CONTENTS
;
; CFA   =        ADDRESS OF CODE FIELD
; LFA   =        ADDRESS OF LINK FIELD
; NFA   =        ADDR OF NAME FIELD
; PFA   =        ADDR OF PARAMETER FIELD
;
; S1    =        PARAMETER STACK:  1ST WORD
; S2    =        PARAMETER STACK:  2ND WORD
; R1    =        RETURN STACK:  1ST WORD
; R2    =        RETURN STACK:  2ND WORD
;
; (ABOVE STACK POSITIONS VALID BEFORE
;  AND AFTER EXECUTION OF ANY WORD, NOT
;  DURING.)
;
; LSB   =        LEAST SIGNIFICANT BIT
; MSB   =        MOST SIGNIFICANT BIT
; LB    =        LOW BYTE
; HB    =        HIGH BYTE
; LW    =        LOW WORD
; HW    =        HIGH WORD
```

```
                               EJECT
                       ;
                       ;-----------------------------------------------
                       ;       DEBUG SUPPORT
                       ;
                       ; THIS ROUTINE WILL ALLOW YOU TO STEP THRU FORTH
                       ; PROGRAMS EVERY TIME 'NEXT' IS EXECUTED.
                       ;
                       ; IN ORDER TO USE THE STEP FEATURE, YOU MUST DO
                       ; THE FOLLOWING:
                       ;
                       ;       1. PATCH THE INSTRUCTION IN 'NEXT'
                       ;          WITH A JUMP TO 'TNEXT'.
                       ;
                       ;       2. PATCH YOUR BREAKPOINT ROUTINE AT
                       ;          'BREAK' (USING 'DDT86' IN CP/M).
                       ;
                       ;       3. SET VARIABLES, 'BIP' & 'BIPE' TO THE
                       ;          ADDRESSES YOUR WANT TO STEP THROUGH.
                       ;
                       ;
                       ; THE CONTENTS OF THE TWO VARIABLES 'BIPS' AND
                       ; 'BIPE' ARE INTERPRETED AS FOLLOWS:
                       ;
                       ; BIP   BIPE    DEBUG-CONDITION
                       ; -------------------------------
                       ;
                       ; Ø     X       OFF
                       ; -1    X       TRACE ALL 'NEXT' CALLS.
                       ; ADDR1 Ø       TRACE 'ADDR1' ONLY.
                       ; ADDR1 ADDR2   TRACE 'ADDR1' TO 'ADDR1'.
                       ;
                       ; NOTE:  THE ABOVE ADDRESSES CAN'T POINT
                       ;        TO A 'CODE FIELD ADDRESS'.
                       ;        'X' = DON'T CARE VALUE.
                       ;
                       ; --------------------------------
                       ;
                       ;
Ø12A ØØ ØØ             BIP     DW      Ø       ; BREAKPOINT START ADDR
Ø12C ØØ ØØ             BIPE    DW      Ø       ; BREAKPOINT END ADDR
```

```
                                        EJECT

                                ; ***************
                                ; *   'TNEXT'   *
                                ; ***************
                                ;
                                ; THIS IS 'NEXT' WITH DEBUG SUPPORT...
                                ;
 012E 9C                        TNEXT:  PUSHF                   ; SAVE REGS
 012F 50                                PUSH    AX
 0130 2E A1 2A 01                       MOV     AX,BIP  ; BREAKPOINT START ADDR
 0134 0B C0                             OR      AX,AX   ; ZERO?
 0136 74 1B                             JZ      TNEXT2  ; NO BREAKPOINT
 0138 3D FF FF                          CMP     AX,-1
 013B 74 12                             JZ      TNEXT1  ; STEP ALL POINTS
 013D 3B C6                             CMP     AX,SI   ; IN BREAKPOINT RANGE?
 013F 74 0E                             JZ      TNEXT1  ; STEP THIS LOCATION
 0141 77 10                             JA      TNEXT2  ; NO
 0143 2E A1 2C 01                       MOV     AX,BIPE ; BREAKPOINT END ADDR
 0147 0B C0                             OR      AX,AX   ; ZERO?
 0149 74 08                             JZ      TNEXT2  ; ONLY ONE LOCATION
 014B 3B C6                             CMP     AX,SI   ; IN RANGE STILL?
 014D 72 04                             JB      TNEXT2  ; NO

                                ; PAUSE ON ADDRESS
                                ;
 014F 58                        TNEXT1: POP     AX      ; RESTORE REG
 0150 9D                                POPF

                                ; ADD YOUR BREAKPOINT CALL HERE
                                ;
 0151 EB 02                     BREAK:  JMPS    TNEXT3  ; CONTINUE WITH PROGRAM


                                ; NO BREAKPOINT PAUSE, RESTORE REGISTERS
                                ;
 0153 58                        TNEXT2: POP     AX
 0154 9D                                POPF
 0155 AD                        TNEXT3: LODS    AX      ; AX <- (IP)
 0156 8B D8                             MOV     BX,AX
 0158 EB 05                             JMPS    NEXT1
```

```
                                  EJECT

                        ; *************
                        ; *           *
                        ; *   NEXT    *
                        ; *           *
                        ; *   DPUSH   *
                        ; *           *
                        ; *   APUSH   *
                        ; *           *
                        ; *************
                        ;
                        ;
Ø15A 52                 DPUSH:  PUSH    DX
Ø15B 5Ø                 APUSH:  PUSH    AX
                        ;
                        ; -----------------------------------------
                        ;
                        ; PATCH THE NEXT 3 LOCATIONS
                        ; (USING A DEBUG MONITOR; I.E. DDT86)
                        ; WITH  'JMP TNEXT'  FOR TRACING THROUGH
                        ; HIGH-LEVEL FORTH WORDS.
                        ;
Ø15C AD                 NEXT:   LODS    AX         ; AX<- (IP)
Ø15D 8B D8                      MOV     BX,AX
                        ;
                        ; -----------------------------------------
                        ;
Ø15F 8B D3              NEXT1:  MOV     DX,BX    ; (W) <- (IP)
Ø161 42                         INC     DX       ; (W) <- (W)+1
Ø162 FF 27                      JMP     WORD PTR [BX] ; TO 'CFA'
```

```
                                     EJECT

                            ; ****************************************
                            ; ******   DICTIONARY WORDS START HERE   ******
                            ; ****************************************
                            ;
                            ;
                            ; ***********
                            ; *   LIT   *
                            ; ***********
                            ;
Ø164 83                     DPØ      DB       83H
Ø165 4C 49                           DB       'LI'
Ø167 D4                              DB       'T'+8ØH
Ø168 ØØ ØØ                           DW       Ø          ; START OF DICTIONARY
Ø16A 6C Ø1                  LIT      DW$+2               ; (S1) <- ((IP))
Ø16C AD                              LODS     AX         ; AX <- LITERAL
Ø16D E9 EB FF                        JMP      APUSH      ; TO TOP OF STACK


                            ; ***************
                            ; *   EXECUTE   *
                            ; ***************
                            ;
Ø17Ø 87                              DB       87H
Ø171 45 58 45 43 55 54               DB       'EXECUT'
Ø177 C5                              DB       'E'+8ØH
Ø178 64 Ø1                           DW       LIT-6
Ø17A 7C Ø1                  EXEC     DW       $+2
Ø17C 5B                              POP      BX         ; GET CFA
Ø17D E9 DF FF                        JMP      NEXT1      ; EXECUTE NEXT


                            ; **************
                            ; *   BRANCH   *
                            ; **************
                            ;
Ø18Ø 86                              DB       86H        ; BRANCH
Ø181 42 52 41 4E 43                  DB       'BRANC'
Ø186 C8                              DB       'H'+8ØH
Ø187 7Ø Ø1                           DW       EXEC-ØAH
Ø189 8B Ø1                  BRAN     DW       $+2        ; (IP) <- (IP) + ((IP))
Ø18B Ø3 34                  BRAN1:   ADD      SI,[SI]
Ø18D E9 CC FF                        JMP      NEXT       ; JUMP TO OFFSET


                            ; ***************
                            ; *   ØBRANCH   *
                            ; ***************
                            ;
Ø19Ø 87                              DB       87H
Ø191 3Ø 42 52 41 4E 43               DB       'ØBRANC'
Ø197 C8                              DB       'H'+8ØH
Ø198 8Ø Ø1                           DW       BRAN-9
Ø19A 9C Ø1                  ZBRAN    DW       $+2
Ø19C 58                              POP      AX         ; GET STACK VALUE
Ø19D ØB CØ                           OR       AX,AX      ; ZERO?
Ø19F 74 EA                           JZ       BRAN1      ; YES, BRANCH
```

```
 Ø1A1 46                           INC     SI        ; NO, CONTINUE...
 Ø1A2 46                           INC     SI
 Ø1A3 E9 B6 FF                     JMP     NEXT


                        ; **************
                        ; *   (LOOP)   *
                        ; **************
                        ;
 Ø1A6 86                           DB      86H
 Ø1A7 28 4C 4F 4F 5Ø               DB      '(LOOP'
 Ø1AC A9                           DB      ')'+8ØH
 Ø1AD 9Ø Ø1                        DW      ZBRAN-ØAH
 Ø1AF B1 Ø1             XLOOP      DW      $+2
 Ø1B1 BB Ø1 ØØ                     MOV     BX,1      ; INCREMENT
 Ø1B4 Ø1 5E ØØ          XLOO1:     ADD     [BP],BX ; INDEX=INDEX+INCR
 Ø1B7 8B 46 ØØ                     MOV     AX,[BP] ; GET NEW INDEX
 Ø1BA 2B 46 Ø2                     SUB     AX,2[BP]; COMPARE WITH LIMIT
 Ø1BD 33 C3                        XOR     AX,BX     ; TEST SIGN (BIT-16)
 Ø1BF 78 CA                        JS      BRAN1     ; KEEP LOOPING...

                        ; END OF 'DO' LOOP.
 Ø1C1 83 C5 Ø4                     ADD     BP,4      ; ADJ. RETURN STK
 Ø1C4 46                           INC     SI
 Ø1C5 46                           INC     SI        ; BYPASS BRANCH OFFSET
 Ø1C6 E9 93 FF                     JMP     NEXT      ; CONTINUE...


                        ; ***************
                        ; *   (+LOOP)   *
                        ; ***************
                        ;
 Ø1C9 87                           DB      87H
 Ø1CA 28 2B 4C 4F 4F 5Ø            DB      '(+LOOP'
 Ø1DØ A9                           DB      ')'+8ØH
 Ø1D1 A6 Ø1                        DW      XLOOP-9
 Ø1D3 D5 Ø1             XPLOO      DW      $+2
 Ø1D5 5B                           POP     BX        ; GET LOOP VALUE
 Ø1D6 E9 DB FF                     JMP     XLOO1


                        ;************
                        ;*   (DO)   *
                        ;************
                        ;
 Ø1D9 84                           DB      84H
 Ø1DA 28 44 4F                     DB      '(DO'
 Ø1DD A9                           DB      ')'+8ØH
 Ø1DE C9 Ø1                        DW      XPLOO-ØAH
 Ø1EØ E2 Ø1             XDO        DW      $+2
 Ø1E2 5A                           POP     DX        ; INITIAL INDEX VALUE
 Ø1E3 58                           POP     AX        ; LIMIT VALUE
 Ø1E4 87 EC                        XCHG    BP,SP     ; GET RETURN STACK
 Ø1E6 5Ø                           PUSH    AX
 Ø1E7 52                           PUSH    DX
 Ø1E8 87 EC                        XCHG    BP,SP     ; GET PARAMETER STACK
 Ø1EA E9 6F FF                     JMP     NEXT
```

```
                                          EJECT

                                  ; *********
                                  ; *   I   *
                                  ; *********
                                  ;
 01ED 81                                  DB      81H
 01EE C9                                  DB      'I'+80H
 01EF D9 01                               DW      XDO-7
 01F1 F3 01                       IDO     DW      $+2       ; (S1) <- (R1)
 01F3 8B 46 00                            MOV     AX,[BP] ; GET INDEX VALUE
 01F6 E9 62 FF                            JMP     APUSH     ; TO PARAMETER STACK


                                  ; *************
                                  ; *   DIGIT   *
                                  ; *************
                                  ;
 01F9 85                                  DB      85H
 01FA 44 49 47 49                         DB      'DIGI'
 01FE D4                                  DB      'T'+80H
 01FF ED 01                               DW      IDO-4
 0201 03 02                       DIGIT   DW      $+2
 0203 5A                                  POP     DX        ; NUMBER BASE
 0204 58                                  POP     AX        ; ASCII DIGIT
 0205 2C 30                               SUB     AL,'0'
 0207 72 17                               JB      DIGI2     ; NUMBER ERROR
 0209 3C 09                               CMP     AL,9
 020B 76 06                               JBE     DIGI1     ; NUMBER = 0 THRU 9
 020D 2C 07                               SUB     AL,7
 020F 3C 0A                               CMP     AL,10     ; NUMBER 'A' THRU 'Z' ?
 0211 72 0D                               JB      DIGI2     ; NO
                                  ;
 0213 3A C2                       DIGI1:  CMP     AL,DL     ; COMPARE NUMBER TO BASE
 0215 73 09                               JAE     DIGI2     ; NUMBER ERROR
 0217 2B D2                               SUB     DX,DX     ; ZERO
 0219 8A D0                               MOV     DL,AL     ; NEW BINARY NUMBER
 021B B0 01                               MOV     AL,1      ; TRUE FLAG
 021D E9 3A FF                            JMP     DPUSH     ; ADD TO STACK

                                  ; NUMBER ERROR
                                  ;
 0220 2B C0                       DIGI2:  SUB     AX,AX     ; FALSE FLAG
 0222 E9 36 FF                            JMP     APUSH     ; BYE
```

```
                               EJECT

                       ; **************
                       ; *   (FIND)   *
                       ; **************
                       ;
Ø225 86                        DB      86H
Ø226 28 46 49 4E 44            DB      '(FIND'
Ø22B A9                        DB      ')'+8ØH
Ø22C F9 Ø1                     DW      DIGIT-8
Ø22E 3Ø Ø2             PFIND   DW      $+2
Ø23Ø 8C D8                     MOV     AX,DS
Ø232 8E CØ                     MOV     ES,AX   ; ES = DS
Ø234 5B                        POP     BX      ; NFA
Ø235 59                        POP     CX      ; STRING ADDR
                       ;
                       ; SEARCH LOOP
Ø236 8B F9             PFIN1:  MOV     DI,CX   ; GET ADDR
Ø238 8A Ø7                     MOV     AL,[BX] ; GET WORD LENGTH
Ø23A 8A DØ                     MOV     DL,AL   ; SAVE LENGTH
Ø23C 32 Ø5                     XOR     AL,[DI]
Ø23E 24 3F                     AND     AL,3FH  ; CHECK LENGTHS
Ø24Ø 75 18                     JNZ     PFIN5   ; LENGTHS DIFFER
                       ;
                       ; LENGTH MATCH, CHECK EACH CHARACTER IN NAME
Ø242 43                PFIN2:  INC     BX
Ø243 47                        INC     DI      ; NEXT CHAR OF NAME
Ø244 8A Ø7                     MOV     AL,[BX]
Ø246 32 Ø5                     XOR     AL,[DI] ; COMPARE NAMES
Ø248 Ø2 CØ                     ADD     AL,AL   ; THIS WILL TEST BIT-8
Ø24A 75 ØE                     JNZ     PFIN5   ; NO MATCH
Ø24C 73 F4                     JNB     PFIN2   ; MATCH SO FAR, LOOP

                       ; FOUND END OF NAME (BIT-8 SET); A MATCH
Ø24E 83 C3 Ø5                  ADD     BX,5    ; BX = PFA
Ø251 53                        PUSH    BX      ; (S3) <- PFA
Ø252 B8 Ø1 ØØ                  MOV     AX,1    ; TRUE VALUE
Ø255 2A F6                     SUB     DH,DH   ; CLEAR HIGH LENGTH
Ø257 E9 ØØ FF                  JMP     DPUSH

                       ; NO NAME FIELD MATCH, TRY ANOTHER
                       ;
                       ; GET NEXT LINK FIELD ADDR (LFA)
                       ; (ZERO = FIRST WORD OF DICTIONARY)
                       ;
Ø25A 43                PFIN5:  INC     BX      ; NEXT ADDR
Ø25B 72 Ø7                     JB      PFIN6   ; END OF NAME
Ø25D 8A Ø7                     MOV     AL,[BX] ; GET NEXT CHAR
Ø25F Ø2 CØ                     ADD     AL,AL   ; SET/RESET CARRY
Ø261 E9 F6 FF                  JMP     PFIN5   ; LOOP UNTIL FOUND
                       ;
Ø264 8B 1F             PFIN6:  MOV     BX,[BX] ; GET LINK FIELD ADDR
Ø266 ØB DB                     OR      BX,BX   ; START OF DICT. (Ø)?
Ø268 75 CC                     JNZ     PFIN1   ; NO, LOOK SOME MORE
Ø26A B8 ØØ ØØ                  MOV     AX,Ø    ; FALSE FLAG
Ø26D E9 EB FE                  JMP     APUSH   ; DONE (NO MATCH FOUND)
```

```
                                EJECT

                        ; ***************
                        ; *   ENCLOSE   *
                        ; ***************
                        ;
Ø27Ø 87                         DB      87H
Ø271 45 4E 43 4C 4F 53          DB      'ENCLOS'
Ø277 C5                         DB      'E'+8ØH
Ø278 25 Ø2                      DW      PFIND-9
Ø27A 7C Ø2              ENCL    DW      $+2
Ø27C 58                         POP     AX      ; S1 - TERMINATOR CHAR.
Ø27D 5B                         POP     BX      ; S2 - TEXT ADDR
Ø27E 53                         PUSH    BX      ; ADDR BACK TO STACK
Ø27F B4 ØØ                      MOV     AH,Ø    ; ZERO
Ø281 BA FF FF                   MOV     DX,-1   ; CHAR OFFSET COUNTER
Ø284 4B                         DEC     BX      ; ADDR -1

                        ; SCAN TO FIRST NON-TERMINATOR CHAR
                        ;
Ø285 43                 ENCL1:  INC     BX      ; ADDR +1
Ø286 42                         INC     DX      ; COUNT +1
Ø287 3A Ø7                      CMP     AL,[BX]
Ø289 74 FA                      JZ      ENCL1   ; WAIT FOR NON-TERMINATOR
Ø28B 52                         PUSH    DX      ; OFFSET TO 1ST TEXT CHR
Ø28C 3A 27                      CMP     AH,[BX] ; NULL CHAR?
Ø28E 75 Ø6                      JNZ     ENCL2   ; NO

                        ; FOUND NULL BEFORE FIRST NON-TERMINATOR CHAR.
Ø29Ø 8B C2                      MOV     AX,DX   ; COPY COUNTER
Ø292 42                         INC     DX      ; +1
Ø293 E9 C4 FE                   JMP     DPUSH

                        ; FOUND FIRST TEXT CHAR, COUNT THE CHARACTERS
                        ;
Ø296 43                 ENCL2:  INC     BX      ; ADDR+1
Ø297 42                         INC     DX      ; COUNT +1
Ø298 3A Ø7                      CMP     AL,[BX] ; TERMINATOR CHAR?
Ø29A 74 Ø9                      JZ      ENCL4   ; YES
Ø29C 3A 27                      CMP     AH,[BX] ; NULL CHAR
Ø29E 75 F6                      JNZ     ENCL2   ; NO, LOOP AGAIN

                        ; FOUND NULL AT END OF TEXT
                        ;
Ø2AØ 8B C2              ENCL3:  MOV     AX,DX   ; COUNTERS ARE EQUAL
Ø2A2 E9 B5 FE                   JMP     DPUSH

                        ; FOUND TERINATOR CHARACTER
                        ;
Ø2A5 8B C2              ENCL4:  MOV     AX,DX
Ø2A7 4Ø                         INC     AX      ; COUNT +1
Ø2A8 E9 AF FE                   JMP     DPUSH
```

```
                                     EJECT

                              ;  ***********
                              ;  *   EMIT   *
                              ;  ***********
                              ;
 Ø2AB 84                                 DB      84H
 Ø2AC 45 4D 49                           DB      'EMI'
 Ø2AF D4                                 DB      'T'+8ØH
 Ø2BØ 7Ø Ø2                              DW      ENCL-ØAH
 Ø2B2 2Ø Ø5                     EMIT     DW      DOCOL
 Ø2B4 72 15                              DW      PEMIT
 Ø2B6 A5 Ø5 83 Ø6                        DW      ONE,OUTT
 Ø2BA 95 Ø4 9A Ø3                        DW      PSTOR,SEMIS


                              ;  **********
                              ;  *   KEY   *
                              ;  **********
                              ;
 Ø2BE 83                                 DB      83H
 Ø2BF 4B 45                              DB      'KE'
 Ø2C1 D9                                 DB      'Y'+8ØH
 Ø2C2 AB Ø2                              DW      EMIT-7
 Ø2C4 C6 Ø2                     KEY      DW      $+2
 Ø2C6 E9 94 12                           JMP     PKEY


                              ;  ****************
                              ;  *   ?TERMINAL   *
                              ;  ****************
                              ;
 Ø2C9 89                                 DB      89H
 Ø2CA 3F 54 45 52 4D 49                  DB      '?TERMINA'
      4E 41
 Ø2D2 CC                                 DB      'L'+8ØH
 Ø2D3 BE Ø2                              DW      KEY-6
 Ø2D5 D7 Ø2                     QTERM    DW      $+2
 Ø2D7 E9 75 12                           JMP     PQTER


                              ;  *********
                              ;  *   CR   *
                              ;  *********
                              ;
 Ø2DA 82                                 DB      82H
 Ø2DB 43                                 DB      'C'
 Ø2DC D2                                 DB      'R'+8ØH
 Ø2DD C9 Ø2                              DW      QTERM-ØCH
 Ø2DF E1 Ø2                     CR       DW      $+2
 Ø2E1 E9 97 12                           JMP     PCR
```

```
                                          EJECT

                                 ; *************
                                 ; *   CMOVE   *
                                 ; *************
                                 ;
Ø2E4 85                                   DB       85H
Ø2E5 43 4D 4F 56                          DB       'CMOV'
Ø2E9 C5                                   DB       'E'+8ØH
Ø2EA DA Ø2                                DW       CR-5
Ø2EC EE Ø2                       CMOVE    DW       $+2
Ø2EE FC                                   CLD               ; INC DIRECTION
Ø2EF 8B DE                                MOV      BX,SI    ; SAVE IP
Ø2F1 59                                   POP      CX       ; COUNT
Ø2F2 5F                                   POP      DI       ; DEST.
Ø2F3 5E                                   POP      SI       ; SOURCE
Ø2F4 8C D8                                MOV      AX,DS
Ø2F6 8E CØ                                MOV      ES,AX    ; ES <- DS
Ø2F8 F3 A4                                REP      MOVS     AL,AL    ; THATS THE MOVE
Ø2FA 8B F3                                MOV      SI,BX    ; GET BACK IP
Ø2FC E9 5D FE                             JMP      NEXT


                                 ; **********
                                 ; *   U*   *
                                 ; **********
                                 ;
Ø2FF 82                                   DB       82H
Ø3ØØ 55                                   DB       'U'
Ø3Ø1 AA                                   DB       '*'+8ØH
Ø3Ø2 E4 Ø2                                DW       CMOVE-8
Ø3Ø4 Ø6 Ø3                       USTAR    DW       $+2
Ø3Ø6 58                                   POP      AX
Ø3Ø7 5B                                   POP      BX
Ø3Ø8 F7 E3                                MUL      BX       ; UNSIGNED
Ø3ØA 92                                   XCHG     AX,DX    ; AX NOW = MSW
Ø3ØB E9 4C FE                             JMP      DPUSH    ; STORE DOUBLE WORD



                                 ; **********
                                 ; *   U/   *
                                 ; **********
                                 ;
Ø3ØE 82                                   DB       82H
Ø3ØF 55                                   DB       'U'
Ø31Ø AF                                   DB       '/'+8ØH
Ø311 FF Ø2                                DW       USTAR-5
Ø313 15 Ø3                       USLAS    DW       $+2
Ø315 5B                                   POP      BX       ; DIVISOR
Ø316 5A                                   POP      DX       ; MSW OF DIVIDEND
Ø317 58                                   POP      AX       ; LSW OF DIVIDEND
Ø318 3B D3                                CMP      DX,BX    ; DIVIDE BY ZERO?
Ø31A 73 Ø5                                JNB      DZERO    ; ZERO DIVIDE, NO WAY
Ø31C F7 F3                                DIV      BX       ; 16 BIT DIVIDE
Ø31E E9 39 FE                             JMP      DPUSH    ; STORE QUOT/REM

                                 ; DIVIDE BY ZERO ERROR (SHOW MAX NUMBERS)
```

```
                         ;
 Ø321 B8 FF FF           DZERO:  MOV     AX,-1
 Ø324 8B DØ                      MOV     DX,AX
 Ø326 E9 31 FE                   JMP     DPUSH     ; STORE QUOT/REM


                         ; ***********
                         ; *   AND   *
                         ; ***********
                         ;
 Ø329 83                         DB      83H
 Ø32A 41 4E                      DB      'AN'
 Ø32C C4                         DB      'D'+8ØH
 Ø32D ØE Ø3                      DW      USLAS-5
 Ø32F 31 Ø3              ANDD    DW      $+2       ; (S1) <- (S1) AND (S2)
 Ø331 58                         POP     AX
 Ø332 5B                         POP     BX
 Ø333 23 C3                      AND     AX,BX
 Ø335 E9 23 FE                   JMP     APUSH


                         ; **********
                         ; *   OR   *
                         ; **********
                         ;
 Ø338 82                         DB      82H
 Ø339 4F                         DB      'O'
 Ø33A D2                         DB      'R'+8ØH
 Ø33B 29 Ø3                      DW      ANDD-6
 Ø33D 3F Ø3              ORR     DW      $+2       ; (S1) <- (S1) OR (S2)
 Ø33F 58                         POP     AX
 Ø34Ø 5B                         POP     BX
 Ø341 ØB C3                      OR      AX,BX
 Ø343 E9 15 FE                   JMP     APUSH


                         ; ***********
                         ; *   XOR   *
                         ; ***********
                         ;
 Ø346 83                         DB      83H
 Ø347 58 4F                      DB      'XO'
 Ø349 D2                         DB      'R'+8ØH
 Ø34A 38 Ø3                      DW      ORR-5
 Ø34C 4E Ø3              XORR    DW      $+2       ; (S1) <- (S1) XOR (S2)
 Ø34E 58                         POP     AX
 Ø34F 5B                         POP     BX
 Ø35Ø 33 C3                      XOR     AX,BX
 Ø352 E9 Ø6 FE                   JMP     APUSH
```

```
                                        EJECT
                                ; ***********
                                ; *   SP@    *
                                ; ***********
                                ;
Ø355 83                                 DB      83H
Ø356 53 5Ø                              DB      'SP'
Ø358 CØ                                 DB      '@'+8ØH
Ø359 46 Ø3                              DW      XORR-6
Ø35B 5D Ø3                      SPAT    DW      $+2        ; (S1) <- (SP)
Ø35D 8B C4                              MOV     AX,SP
Ø35F E9 F9 FD                           JMP     APUSH


                                ; ***********
                                ; *   SP!    *
                                ; ***********
                                ;
Ø362 83                                 DB      83H
Ø363 53 5Ø                              DB      'SP'
Ø365 A1                                 DB      '!'+8ØH
Ø366 55 Ø3                              DW      SPAT-6
Ø368 6A Ø3                      SPSTO   DW      $+2
Ø36A 2E 8B 1E 26 Ø1                     MOV     BX,UP     ; USER VAR BASE ADDR
Ø36F 8B 67 Ø6                           MOV     SP,6[BX]; RESET PARAM. STACK PT.
Ø372 E9 E7 FD                           JMP     NEXT


                                ; ***********
                                ; *   RP@    *
                                ; ***********
                                ;
Ø375 83                                 DB      83H
Ø376 52 5Ø                              DB      'RP'
Ø378 CØ                                 DB      '@'+8ØH
Ø379 62 Ø3                              DW      SPSTO-6
Ø37B 7D Ø3                      RPAT    DW      $+2        ; (S1) <- (RP)
Ø37D 8B C5                              MOV     AX,BP      ; RETURN STACK ADDR
Ø37F E9 D9 FD                           JMP     APUSH


                                ; ***********
                                ; *   RP!    *
                                ; ***********
                                ;
Ø382 83                                 DB      83H
Ø383 52 5Ø                              DB      'RP'
Ø385 A1                                 DB      '!'+8ØH
Ø386 75 Ø3                              DW      RPAT-6
Ø388 8A Ø3                      RPSTO   DW      $+2
Ø38A 2E 8B 1E 26 Ø1                     MOV     BX,UP     ; (AX) <- USR VAR. BASE
Ø38F 8B 6F Ø8                           MOV     BP,8[BX]; RESET RETURN STK PT.
Ø392 E9 C7 FD                           JMP     NEXT
```

```
                                       EJECT

                                ; **********
                                ; *   ;S   *
                                ; **********
                                ;
                                ; END OF SCREEN OR RUN-TIME COLON WORD
                                ;
Ø395 82                                DB      82H
Ø396 3B                                DB      ';'
Ø397 D3                                DB      'S'+8ØH
Ø398 82 Ø3                             DW      RPSTO-6
Ø39A 9C Ø3                      SEMIS  DW      $+2
Ø39C 8B 76 ØØ                          MOV     SI,[BP] ; (IP) <- (R1)
Ø39F 45                                INC     BP
Ø3AØ 45                                INC     BP      ; ADJUST STACK
Ø3A1 E9 B8 FD                          JMP     NEXT

                                ; *************
                                ; *   LEAVE   *
                                ; *************
                                ;
Ø3A4 85                                DB      85H
Ø3A5 4C 45 41 56                       DB      'LEAV'
Ø3A9 C5                                DB      'E'+8ØH
Ø3AA 95 Ø3                             DW      SEMIS-5
Ø3AC AE Ø3                      LEAVE  DW      $+2     ; LIMIT <- INDEX
Ø3AE 8B 46 ØØ                          MOV     AX,[BP] ; GET INDEX
Ø3B1 89 46 Ø2                          MOV     2[BP],AX; STORE IT AT LIMIT
Ø3B4 E9 A5 FD                          JMP     NEXT
```

```
                                   EJECT

                          ; **********
                          ; *   >R   *
                          ; **********
                          ;
Ø3B7 82                            DB      82H
Ø3B8 3E                            DB      '>'
Ø3B9 D2                            DB      'R'+8ØH
Ø3BA A4 Ø3                         DW      LEAVE-8
Ø3BC BE Ø3                TOR      DW      $+2       ; (R1) <- (S1)
Ø3BE 5B                            POP     BX        ; GET STACK PARAMETER
Ø3BF 4D                            DEC     BP
Ø3CØ 4D                            DEC     BP        ; MOVE RETURN STACK DOWN
Ø3C1 89 5E ØØ                      MOV     [BP],BX ; ADD TO RETURN STACK
Ø3C4 E9 95 FD                      JMP     NEXT


                          ; **********
                          ; *   R>   *
                          ; **********
                          ;
Ø3C7 82                            DB      82H
Ø3C8 52                            DB      'R'
Ø3C9 BE                            DB      '>'+8ØH
Ø3CA B7 Ø3                         DW      TOR-5
Ø3CC CE Ø3                FROMR    DW      $+2       ; (S1) <- (R1)
Ø3CE 8B 46 ØØ                      MOV     AX,[BP] ; GET RETURN STACK VALUE
Ø3D1 45                            INC     BP        ; DELETE FROM STACK
Ø3D2 45                            INC     BP
Ø3D3 E9 85 FD                      JMP     APUSH


                          ; *********
                          ; *   R   *
                          ; *********
                          ;
Ø3D6 81                            DB      81H
Ø3D7 D2                            DB      'R'+8ØH
Ø3D8 C7 Ø3                         DW      FROMR-5
Ø3DA F3 Ø1                RR       DW      IDO+2
```

```
                                      EJECT
                                ; **********
                                ; *   Ø=   *
                                ; **********
                                ;
Ø3DC 82                               DB      82H
Ø3DD 3Ø                               DB      'Ø'
Ø3DE BD                               DB      '='+8ØH
Ø3DF D6 Ø3                            DW      RR-4
Ø3E1 E3 Ø3                      ZEQU  DW      $+2
Ø3E3 58                               POP     AX
Ø3E4 ØB CØ                            OR      AX,AX      ; DO TEST
Ø3E6 B8 Ø1 ØØ                         MOV     AX,1       ; TRUE
Ø3E9 74 Ø1                            JZ      ZEQU1      ; ITS ZERO
Ø3EB 48                               DEC     AX         ; FALSE
Ø3EC E9 6C FD                   ZEQU1: JMP    APUSH


                                ; **********
                                ; *   Ø<   *
                                ; **********
                                ;
Ø3EF 82                               DB      82H
Ø3FØ 3Ø                               DB      'Ø'
Ø3F1 BC                               DB      '<'+8ØH
Ø3F2 DC Ø3                            DW      ZEQU-5
Ø3F4 F6 Ø3                      ZLESS DW      $+2
Ø3F6 58                               POP     AX
Ø3F7 ØB CØ                            OR      AX,AX      ; SET FLAGS
Ø3F9 B8 Ø1 ØØ                         MOV     AX,1       ; TRUE
Ø3FC 78 Ø1                            JS      ZLESS1
Ø3FE 48                               DEC     AX         ; FLASE
Ø3FF E9 59 FD                   ZLESS1: JMP   APUSH


                                ; *********
                                ; *   +   *
                                ; *********
                                ;
Ø4Ø2 81                               DB      81H
Ø4Ø3 AB                               DB      '+'+8ØH
Ø4Ø4 EF Ø3                            DW      ZLESS-5
Ø4Ø6 Ø8 Ø4                      PLUS  DW      $+2        ;(S1) <- (S1) + (S2)
Ø4Ø8 58                               POP     AX
Ø4Ø9 5B                               POP     BX
Ø4ØA Ø3 C3                            ADD     AX,BX
Ø4ØC E9 4C FD                         JMP     APUSH
```

```
                               EJECT
                       ; **********
                       ; *   D+   *
                       ; **********
                       ;
                       ; XLW XHW  YLW YHW --> SLW SHW
                       ; S4  S3   S2  S1      S2  S1
                       ;
Ø40F 82                        DB      82H
Ø410 44                        DB      'D'
Ø411 AB                        DB      '+'+8ØH
Ø412 Ø2 Ø4                     DW      PLUS-4
Ø414 16 Ø4             DPLUS   DW      $+2
Ø416 58                        POP     AX       ; YHW
Ø417 5A                        POP     DX       ; YLW
Ø418 5B                        POP     BX       ; XHW
Ø419 59                        POP     CX       ; XLW
Ø41A Ø3 D1                     ADD     DX,CX    ; SLW
Ø41C 13 C3                     ADC     AX,BX    ; SHW
Ø41E E9 39 FD                  JMP     DPUSH


                       ; *************
                       ; *   MINUS   *
                       ; *************
                       ;
Ø421 85                        DB      85H
Ø422 4D 49 4E 55               DB      'MINU'
Ø426 D3                        DB      'S'+8ØH
Ø427 ØF Ø4                     DW      DPLUS-5
Ø429 2B Ø4             MINUS   DW      $+2
Ø42B 58                        POP     AX
Ø42C F7 D8                     NEG     AX
Ø42E E9 2A FD                  JMP     APUSH


                       ; **************
                       ; *   DMINUS   *
                       ; **************
                       ;
Ø431 86                        DB      86H
Ø432 44 4D 49 4E 55            DB      'DMINU'
Ø437 D3                        DB      'S'+8ØH
Ø438 21 Ø4                     DW      MINUS-8
Ø43A 3C Ø4             DMINU   DW      $+2
Ø43C 5B                        POP     BX
Ø43D 59                        POP     CX
Ø43E 2B CØ                     SUB     AX,AX    ; ZERO
Ø44Ø 8B DØ                     MOV     DX,AX
Ø442 2B D1                     SUB     DX,CX    ; MAKE 2'S COMPLEMENT
Ø444 1B C3                     SBB     AX,BX    ; HIGH WORD
Ø446 E9 11 FD                  JMP     DPUSH
```

```
                                    EJECT

                            ; ************
                            ; *   OVER   *
                            ; ************
                            ;
0449 84                             DB      84H
044A 4F 56 45                       DB      'OVE'
044D D2                             DB      'R'+80H
044E 31 04                          DW      DMINU-9
0450 52 04                  OVER    DW      $+2
0452 5A                             POP     DX
0453 58                             POP     AX
0454 50                             PUSH    AX
0455 E9 02 FD                       JMP     DPUSH


                            ; ************
                            ; *   DROP   *
                            ; ************
                            ;
0458 84                             DB      84H
0459 44 52 4F                       DB      'DRO'
045C D0                             DB      'P'+80H
045D 49 04                          DW      OVER-7
045F 61 04                  DROP    DW      $+2
0461 58                             POP     AX
0462 E9 F7 FC                       JMP     NEXT


                            ; ************
                            ; *   SWAP   *
                            ; ************
                            ;
0465 84                             DB      84H
0466 53 57 41                       DB      'SWA'
0469 D0                             DB      'P'+80H
046A 58 04                          DW      DROP-7
046C 6E 04                  SWAP    DW      $+2
046E 5A                             POP     DX
046F 58                             POP     AX
0470 E9 E7 FC                       JMP     DPUSH


                            ; ***********
                            ; *   DUP   *
                            ; ***********
                            ;
0473 83                             DB      83H
0474 44 55                          DB      'DU'
0476 D0                             DB      'P'+80H
0477 65 04                          DW      SWAP-7
0479 7B 04                  DUP     DW      $+2
047B 58                             POP     AX
047C 50                             PUSH    AX
047D E9 DB FC                       JMP     APUSH
```

```
                       ; ************
                       ; *   2DUP   *
                       ; ************
                       ;
Ø48Ø 84                        DB      84H
Ø481 32 44 55                  DB      '2DU'
Ø484 DØ                        DB      'P'+8ØH
Ø485 73 Ø4                     DW      DUP-6
Ø487 89 Ø4             TDUP    DW      $+2
Ø489 58                        POP     AX
Ø48A 5A                        POP     DX
Ø48B 52                        PUSH    DX
Ø48C 5Ø                        PUSH    AX
Ø48D E9 CA FC                  JMP     DPUSH


                       ; **********
                       ; *   +!   *
                       ; **********
                       ;
Ø49Ø 82                        DB      82H
Ø491 2B                        DB      '+'
Ø492 A1                        DB      '!'+8ØH
Ø493 8Ø Ø4                     DW      TDUP-7
Ø495 97 Ø4             PSTOR   DW      $+2     ; ((S1)) <- ((S1)) + (S2)
Ø497 5B                        POP     BX      ; ADDRESS
Ø498 58                        POP     AX      ; INCREMENT
Ø499 Ø1 Ø7                     ADD     [BX],AX
Ø49B E9 BE FC                  JMP     NEXT


                       ; **************
                       ; *   TOGGLE   *
                       ; **************
                       ;
Ø49E 86                        DB      86H
Ø49F 54 4F 47 47 4C            DB      'TOGGL'
Ø4A4 C5                        DB      'E'+8ØH
Ø4A5 9Ø Ø4                     DW      PSTOR-5
Ø4A7 A9 Ø4             TOGGL   DW      $+2
Ø4A9 58                        POP     AX      ; BIT PATTERN
Ø4AA 5B                        POP     BX      ; ADDR
Ø4AB 3Ø Ø7                     XOR     [BX],AL
Ø4AD E9 AC FC                  JMP     NEXT


                       ; *********
                       ; *   @   *
                       ; *********
                       ;
Ø4BØ 81                        DB      81H
Ø4B1 CØ                        DB      '@'+8ØH
Ø4B2 9E Ø4                     DW      TOGGL-9
Ø4B4 B6 Ø4             AT      DW      $+2     ; (S1) <- ((S1))
Ø4B6 5B                        POP     BX
Ø4B7 8B Ø7                     MOV     AX,[BX]
Ø4B9 E9 9F FC                  JMP     APUSH
```

```
                               ; **********
                               ; *   C@   *
                               ; **********
                               ;
Ø4BC 82                                DB      82H
Ø4BD 43                                DB      'C'
Ø4BE CØ                                DB      '@'+8ØH
Ø4BF BØ Ø4                             DW      AT-4
Ø4C1 C3 Ø4                     CAT     DW      $+2        ; (S1) <- ((S1))LB
Ø4C3 5B                                POP     BX
Ø4C4 8A Ø7                             MOV     AL,[BX]
Ø4C6 2A E4                             SUB     AH,AH
Ø4C8 E9 9Ø FC                          JMP     APUSH


                               ; **********
                               ; *   2@   *
                               ; **********
                               ;
Ø4CB 82                                DB      82H
Ø4CC 32                                DB      '2'
Ø4CD CØ                                DB      '@'+8ØH
Ø4CE BC Ø4                             DW      CAT-5
Ø4DØ D2 Ø4                     TAT     DW      $+2
Ø4D2 5B                                POP     BX         ; ADDR
Ø4D3 8B Ø7                             MOV     AX,[BX]  ; MSW
Ø4D5 8B 57 Ø2                          MOV     DX,2[BX]; LSW
Ø4D8 E9 7F FC                          JMP     DPUSH


                               ; *********
                               ; *   !   *
                               ; *********
                               ;
Ø4DB 81                                DB      81H
Ø4DC A1                                DB      '!'+8ØH
Ø4DD CB Ø4                             DW      TAT-5
Ø4DF E1 Ø4                     STORE   DW      $+2        ; ((S1)) <- (S2)
Ø4E1 5B                                POP     BX         ; ADDR
Ø4E2 58                                POP     AX         ; DATA
Ø4E3 89 Ø7                             MOV     [BX],AX
Ø4E5 E9 74 FC                          JMP     NEXT


                               ; **********
                               ; *   C!   *
                               ; **********
                               ;
Ø4E8 82                                DB      82H
Ø4E9 43                                DB      'C'
Ø4EA A1                                DB      '!'+8ØH
Ø4EB DB Ø4                             DW      STORE-4
Ø4ED EF Ø4                     CSTOR   DW      $+2        ; ((S1))LB <- (S2)LB
Ø4EF 5B                                POP     BX         ; ADDR
Ø4FØ 58                                POP     AX         ; DATA
Ø4F1 88 Ø7                             MOV     [BX],AL
Ø4F3 E9 66 FC                          JMP     NEXT
```

```
                        ; **********
                        ; *   2!   *
                        ; **********
                        ;
Ø4F6 82                          DB      82H
Ø4F7 32                          DB      '2'
Ø4F8 A1                          DB      '!'+8ØH
Ø4F9 E8 Ø4                       DW      CSTOR-5
Ø4FB FD Ø4              TSTOR    DW      $+2
Ø4FD 5B                          POP     BX        ; ADDR
Ø4FE 58                          POP     AX        ; DATA (HW)
Ø4FF 89 Ø7                       MOV     [BX],AX
Ø5Ø1 58                          POP     AX        ; DATA (LW)
Ø5Ø2 89 47 Ø2                    MOV     2[BX],AX
Ø5Ø5 E9 54 FC                    JMP     NEXT
```

```
                               EJECT

                       ; *********
                       ; *   :   *
                       ; *********
                       ;
Ø5Ø8 C1                        DB      ØC1H
Ø5Ø9 BA                        DB      ':'+8ØH
Ø5ØA F6 Ø4                     DW      TSTOR-5
Ø5ØC 2Ø Ø5             COLON   DW      DOCOL
Ø5ØE BD Ø8                     DW      QEXEC
Ø51Ø 78 Ø8                     DW      SCSP
Ø512 B6 Ø6                     DW      CURR
Ø514 B4 Ø4                     DW      AT
Ø516 A8 Ø6                     DW      CONT
Ø518 DF Ø4                     DW      STORE
Ø51A 86 ØD                     DW      CREAT
Ø51C 42 Ø9                     DW      RBRAC
Ø51E 95 Ø9                     DW      PSCOD
Ø52Ø 42                DOCOL:  INC     DX       ; W=W+1
Ø521 4D                        DEC     BP
Ø522 4D                        DEC     BP       ; (RP) <- (RP)-2
Ø523 89 76 ØØ                  MOV     [BP],SI  ; R1 <- (RP)
Ø526 8B F2                     MOV     SI,DX    ; (IP) <- (W)
Ø528 E9 31 FC                  JMP     NEXT


                       ; *********
                       ; *   ;   *
                       ; *********
                       ;
Ø52B C1                        DB      ØC1H
Ø52C BB                        DB      ';'+8ØH
Ø52D Ø8 Ø5                     DW      COLON-4
Ø52F 2Ø Ø5             SEMI    DW      DOCOL
Ø531 E7 Ø8                     DW      QCSP
Ø533 1E Ø9                     DW      COMP
Ø535 9A Ø3                     DW      SEMIS
Ø537 57 Ø9                     DW      SMUDG
Ø539 34 Ø9                     DW      LBRAC
Ø53B 9A Ø3                     DW      SEMIS


                       ; ************
                       ; *   NOOP   *
                       ; ************
                       ;
Ø53D 84                        DB      84H
Ø53E 4E 4F 4F                  DB      'NOO'
Ø541 DØ                        DB      'P'+8ØH
Ø542 2B Ø5                     DW      SEMI-4
Ø544 2Ø Ø5             NOOP    DW      DOCOL
Ø546 9A Ø3                     DW      SEMIS
```

```
                                      EJECT

                              ; ****************
                              ; *   CONSTANT   *
                              ; ****************
                              ;
 0548 88                              DB      88H
 0549 43 4F 4E 53 54 41               DB      'CONSTAN'
      4E
 0550 D4                              DB      'T'+80H
 0551 3D 05                           DW      NOOP-7
 0553 20 05                   CON     DW      DOCOL
 0555 86 0D                           DW      CREAT
 0557 57 09                           DW      SMUDG
 0559 3F 07                           DW      COMMA
 055B 95 09                           DW      PSCOD
 055D 42                      DOCON:  INC     DX        ; PFA
 055E 8B DA                           MOV     BX,DX
 0560 8B 07                           MOV     AX,[BX] ; GET DATA
 0562 E9 F6 FB                        JMP     APUSH

                              ; ****************
                              ; *   VARIABLE   *
                              ; ****************
                              ;
 0565 88                              DB      88H
 0566 56 41 52 49 41 42               DB      'VARIABL'
      4C
 056D C5                              DB      'E'+80H
 056E 48 05                           DW      CON-0BH
 0570 20 05                   VAR     DW      DOCOL
 0572 53 05                           DW      CON
 0574 95 09                           DW      PSCOD
 0576 42                      DOVAR:  INC     DX        ; (DE) <- PFA
 0577 52                              PUSH    DX        ; (S1) <- PFA
 0578 E9 E1 FB                        JMP     NEXT

                              ; ************
                              ; *   USER   *
                              ; ************
                              ;
 057B 84                              DB      84H
 057C 55 53 45                        DB      'USE'
 057F D2                              DB      'R'+80H
 0580 65 05                           DW      VAR-0BH
 0582 20 05                   USER    DW      DOCOL
 0584 53 05                           DW      CON
 0586 95 09                           DW      PSCOD
 0588 42                      DOUSE:  INC     DX        ; PFA
 0589 8B DA                           MOV     BX,DX
 058B 8A 1F                           MOV     BL,[BX]
 058D 2A FF                           SUB     BH,BH
 058F 2E 8B 3E 26 01                  MOV     DI,UP     ; USER VARIABLE ADDR
 0594 8D 01                           LEA     AX,[BX+DI] ; ADDR OF VARIABLE
 0596 E9 C2 FB                        JMP     APUSH
```

```
                                        EJECT

                               ; *********
                               ; *   Ø   *
                               ; *********
                               ;
 Ø599 81                                DB        81H
 Ø59A BØ                                DB        'Ø'+8ØH
 Ø59B 7B Ø5                             DW        USER-7
 Ø59D 5D Ø5                    ZERO     DW        DOCON
 Ø59F ØØ ØØ                             DW        Ø


                               ; *********
                               ; *   1   *
                               ; *********
                               ;
 Ø5A1 81                                DB        81H
 Ø5A2 B1                                DB        '1'+8ØH
 Ø5A3 99 Ø5                             DW        ZERO-4
 Ø5A5 5D Ø5                    ONE      DW        DOCON
 Ø5A7 Ø1 ØØ                             DW        1


                               ; *********
                               ; *   2   *
                               ; *********
                               ;
 Ø5A9 81                                DB        81H
 Ø5AA B2                                DB        '2'+8ØH
 Ø5AB A1 Ø5                             DW        ONE-4
 Ø5AD 5D Ø5                    TWO      DW        DOCON
 Ø5AF Ø2 ØØ                             DW        2


                               ; *********
                               ; *   3   *
                               ; *********
                               ;
 Ø5B1 81                                DB        81H
 Ø5B2 B3                                DB        '3'+8ØH
 Ø5B3 A9 Ø5                             DW        TWO-4
 Ø5B5 5D Ø5                    THREE    DW        DOCON
 Ø5B7 Ø3 ØØ                             DW        3


                               ; **********
                               ; *   BL   *
                               ; **********
                               ;
 Ø5B9 82                                DB        82H
 Ø5BA 42                                DB        'B'
 Ø5BB CC                                DB        'L'+8ØH
 Ø5BC B1 Ø5                             DW        THREE-4
 Ø5BE 5D Ø5                    BLS      DW        DOCON
 Ø5CØ 2Ø ØØ                             DW        2ØH
```

```
                        ; ***********
                        ; *   C/L   *
                        ; ***********
                        ;
Ø5C2 83                          DB       83H       ; CHARACTERS/LINE
Ø5C3 43 2F                       DB       'C/'
Ø5C5 CC                          DB       'L'+8ØH
Ø5C6 B9 Ø5                       DW       BLS-5
Ø5C8 5D Ø5              CSLL     DW       DOCON
Ø5CA 4Ø ØØ                       DW       64

                        ; *************
                        ; *   FIRST   *
                        ; *************
                        ;
Ø5CC 85                          DB       85H
Ø5CD 46 49 52 53                 DB       'FIRS'
Ø5D1 D4                          DB       'T'+8ØH
Ø5D2 C2 Ø5                       DW       CSLL-6
Ø5D4 5D Ø5              FIRST    DW       DOCON
Ø5D6 EØ 3B                       DW       BUF1

                        ; *************
                        ; *   LIMIT   *
                        ; *************
                        ;
Ø5D8 85                          DB       85H
Ø5D9 4C 49 4D 49                 DB       'LIMI'
Ø5DD D4                          DB       'T'+8ØH
Ø5DE CC Ø5                       DW       FIRST-8
Ø5EØ 5D Ø5              LIMIT    DW       DOCON
Ø5E2 ØØ 4Ø                       DW       EM

                        ; *************
                        ; *   B/BUF   *
                        ; *************
                        ;
Ø5E4 85                          DB       85H       ; BYTES/BUFFER
Ø5E5 42 2F 42 55                 DB       'B/BU'
Ø5E9 C6                          DB       'F'+8ØH
Ø5EA D8 Ø5                       DW       LIMIT-8
Ø5EC 5D Ø5              BBUF     DW       DOCON
Ø5EE 8Ø ØØ                       DW       KBBUF

                        ; *************
                        ; *   B/SCR   *
                        ; *************
                        ;
Ø5FØ 85                          DB       85H       ; BUFFERS/SCREEN
Ø5F1 42 2F 53 43                 DB       'B/SC'
Ø5F5 D2                          DB       'R'+8ØH
Ø5F6 E4 Ø5                       DW       BBUF-8
Ø5F8 5D Ø5              BSCR     DW       DOCON
Ø5FA Ø8 ØØ                       DW       4ØØH/KBBUF
```

```
                                ; ***************
                                ; *   +ORIGIN   *
                                ; ***************
                                ;
 Ø5FC 87                                DB      87H
 Ø5FD 2B 4F 52 49 47 49                 DB      '+ORIGI'
 Ø6Ø3 CE                                DB      'N'+8ØH
 Ø6Ø4 FØ Ø5                             DW      BSCR-8
 Ø6Ø6 2Ø Ø5                     PORIG   DW      DOCOL
 Ø6Ø8 6A Ø1                             DW      LIT
 Ø6ØA ØØ Ø1                             DW      ORIG
 Ø6ØC Ø6 Ø4                             DW      PLUS
 Ø6ØE 9A Ø3                             DW      SEMIS
```

```
                                EJECT
                       ; ========== USER VARIABLES ==========
                       ;
                       ; **********
                       ; *   SØ   *
                       ; **********
                       ;
Ø61Ø 82                         DB      82H
Ø611 53                         DB      'S'
Ø612 BØ                         DB      'Ø'+8ØH
Ø613 FC Ø5                      DW      PORIG-ØAH
Ø615 88 Ø5             SZERO    DW      DOUSE
Ø617 Ø6 ØØ                      DW      6

                       ; **********
                       ; *   RØ   *
                       ; **********
                       ;
Ø619 82                         DB      82H
Ø61A 52                         DB      'R'
Ø61B BØ                         DB      'Ø'+8ØH
Ø61C 1Ø Ø6                      DW      SZERO-5
Ø61E 88 Ø5             RZERO    DW      DOUSE
Ø62Ø Ø8 ØØ                      DW      8

                       ; ***********
                       ; *   TIB   *
                       ; ***********
                       ;
Ø622 83                         DB      83H
Ø623 54 49                      DB      'TI'
Ø625 C2                         DB      'B'+8ØH
Ø626 19 Ø6                      DW      RZERO-5
Ø628 88 Ø5             TIB      DW      DOUSE
Ø62A ØA ØØ                      DW      ØAH

                       ; *************
                       ; *   WIDTH   *
                       ; *************
                       ;
Ø62C 85                         DB      85H
Ø62D 57 49 44 54                DB      'WIDT'
Ø631 C8                         DB      'H'+8ØH
Ø632 22 Ø6                      DW      TIB-6
Ø634 88 Ø5             WIDTH    DW      DOUSE
Ø636 ØC ØØ                      DW      ØCH

                       ; ***************
                       ; *   WARNING   *
                       ; ***************
                       ;
Ø638 87                         DB      87H
Ø639 57 41 52 4E 49 4E          DB      'WARNIN'
```

```
Ø63F C7                          DB      'G'+8ØH
Ø64Ø 2C Ø6                       DW      WIDTH-8
Ø642 88 Ø5              WARN     DW      DOUSE
Ø644 ØE ØØ                       DW      ØEH


                        ; *************
                        ; *   FENCE   *
                        ; *************
                        ;
Ø646 85                          DB      85H
Ø647 46 45 4E 43                 DB      'FENC'
Ø64B C5                          DB      'E'+8ØH
Ø64C 38 Ø6                       DW      WARN-ØAH
Ø64E 88 Ø5              FENCE    DW      DOUSE
Ø65Ø 1Ø ØØ                       DW      1ØH


                        ; **********
                        ; *   DP   *
                        ; **********
                        ;
Ø652 82                          DB      82H
Ø653 44                          DB      'D'
Ø654 DØ                          DB      'P'+8ØH
Ø655 46 Ø6                       DW      FENCE-8
Ø657 88 Ø5              DP       DW      DOUSE
Ø659 12 ØØ                       DW      12H


                        ; ****************
                        ; *   VOC-LINK   *
                        ; ****************
                        ;
Ø65B 88                          DB      88H
Ø65C 56 4F 43 2D 4C 49           DB      'VOC-LIN'
     4E
Ø663 CB                          DB      'K'+8ØH
Ø664 52 Ø6                       DW      DP-5
Ø666 88 Ø5              VOCL     DW      DOUSE
Ø668 14 ØØ                       DW      14H


                        ; ***********
                        ; *   BLK   *
                        ; ***********
                        ;
Ø66A 83                          DB      83H
Ø66B 42 4C                       DB      'BL'
Ø66D CB                          DB      'K'+8ØH
Ø66E 5B Ø6                       DW      VOCL-ØBH
Ø67Ø 88 Ø5              BLK      DW      DOUSE
Ø672 16 ØØ                       DW      16H
```

```
                               EJECT
                       ; **********
                       ; *   IN   *
                       ; **********
                       ;
Ø674 82                        DB      82H
Ø675 49                        DB      'I'
Ø676 CE                        DB      'N'+8ØH
Ø677 6A Ø6                     DW      BLK-6
Ø679 88 Ø5             INN     DW      DOUSE
Ø67B 18 ØØ                     DW      18H


                       ; ***********
                       ; *   OUT   *
                       ; ***********
                       ;
Ø67D 83                        DB      83H
Ø67E 4F 55                     DB      'OU'
Ø68Ø D4                        DB      'T'+8ØH
Ø681 74 Ø6                     DW      INN-5
Ø683 88 Ø5             OUTT    DW      DOUSE
Ø685 1A ØØ                     DW      1AH


                       ; ***********
                       ; *   SCR   *
                       ; ***********
                       ;
Ø687 83                        DB      83H
Ø688 53 43                     DB      'SC'
Ø68A D2                        DB      'R'+8ØH
Ø68B 7D Ø6                     DW      OUTT-6
Ø68D 88 Ø5             SCR     DW      DOUSE
Ø68F 1C ØØ                     DW      1CH


                       ; **************
                       ; *   OFFSET   *
                       ; **************
                       ;
Ø691 86                        DB      86H
Ø692 4F 46 46 53 45            DB      'OFFSE'
Ø697 D4                        DB      'T'+8ØH
Ø698 87 Ø6                     DW      SCR-6
Ø69A 88 Ø5             OFSET   DW      DOUSE
Ø69C 1E ØØ                     DW      1EH


                       ; ***************
                       ; *   CONTEXT   *
                       ; ***************
                       ;
Ø69E 87                        DB      87H
Ø69F 43 4F 4E 54 45 58         DB      'CONTEX'
Ø6A5 D4                        DB      'T'+8ØH
Ø6A6 91 Ø6                     DW      OFSET-9
```

```
  Ø6A8 88 Ø5              CONT    DW      DOUSE
  Ø6AA 2Ø ØØ                      DW      2ØH


                          ; ***************
                          ; *   CURRENT   *
                          ; ***************
                          ;
  Ø6AC 87                         DB      87H
  Ø6AD 43 55 52 52 45 4E          DB      'CURREN'
  Ø6B3 D4                         DB      'T'+8ØH
  Ø6B4 9E Ø6                      DW      CONT-ØAH
  Ø6B6 88 Ø5              CURR    DW      DOUSE
  Ø6B8 22 ØØ                      DW      22H


                          ; *************
                          ; *   STATE   *
                          ; *************
                          ;
  Ø6BA 85                         DB      85H
  Ø6BB 53 54 41 54                DB      'STAT'
  Ø6BF C5                         DB      'E'+8ØH
  Ø6CØ AC Ø6                      DW      CURR-ØAH
  Ø6C2 88 Ø5              STATE   DW      DOUSE
  Ø6C4 24 ØØ                      DW      24H


                          ; ************
                          ; *   BASE   *
                          ; ************
                          ;
  Ø6C6 84                         DB      84H
  Ø6C7 42 41 53                   DB      'BAS'
  Ø6CA C5                         DB      'E'+8ØH
  Ø6CB BA Ø6                      DW      STATE-8
  Ø6CD 88 Ø5              BASE    DW      DOUSE
  Ø6CF 26 ØØ                      DW      26H


                          ; ***********
                          ; *   DPL   *
                          ; ***********
                          ;
  Ø6D1 83                         DB      83H
  Ø6D2 44 5Ø                      DB      'DP'
  Ø6D4 CC                         DB      'L'+8ØH
  Ø6D5 C6 Ø6                      DW      BASE-7
  Ø6D7 88 Ø5              DPL     DW      DOUSE
  Ø6D9 28 ØØ                      DW      28H


                          ; ***********
                          ; *   FLD   *
                          ; ***********
                          ;
  Ø6DB 83                         DB      83H
  Ø6DC 46 4C                      DB      'FL'
```

```
 Ø6DE C4                        DB      'D'+8ØH
 Ø6DF D1 Ø6                     DW      DPL-6
 Ø6E1 88 Ø5             FLD     DW      DOUSE
 Ø6E3 2A ØØ                     DW      2AH

                        ; ***********
                        ; *   CSP   *
                        ; ***********
                        ;
 Ø6E5 83                        DB      83H
 Ø6E6 43 53                     DB      'CS'
 Ø6E8 DØ                        DB      'P'+8ØH
 Ø6E9 DB Ø6                     DW      FLD-6
 Ø6EB 88 Ø5             CSPP    DW      DOUSE
 Ø6ED 2C ØØ                     DW      2CH

                        ; **********
                        ; *   R#   *
                        ; **********
                        ;
 Ø6EF 82                        DB      82H
 Ø6FØ 52                        DB      'R'
 Ø6F1 A3                        DB      '#'+8ØH
 Ø6F2 E5 Ø6                     DW      CSPP-6
 Ø6F4 88 Ø5             RNUM    DW      DOUSE
 Ø6F6 2E ØØ                     DW      2EH

                        ; ***********
                        ; *   HLD   *
                        ; ***********
                        ;
 Ø6F8 83                        DB      83H
 Ø6F9 48 4C                     DB      'HL'
 Ø6FB C4                        DB      'D'+8ØH
 Ø6FC EF Ø6                     DW      RNUM-5
 Ø6FE 88 Ø5             HLD     DW      DOUSE
 Ø7ØØ 3Ø ØØ                     DW      3ØH

                        ; ========== END OF USER VARIABLES =========
                                            EJECT

                                  ; **********
                                  ; *   1+   *
                                  ; **********
                                  ;
Ø7Ø2 82                                     DB      82H
Ø7Ø3 31                                     DB      '1'
Ø7Ø4 AB                                     DB      '+'+8ØH
Ø7Ø5 F8 Ø6                                  DW      HLD-6
Ø7Ø7 2Ø Ø5                        ONEP      DW      DOCOL
Ø7Ø9 A5 Ø5                                  DW      ONE
Ø7ØB Ø6 Ø4                                  DW      PLUS
Ø7ØD 9A Ø3                                  DW      SEMIS


                                  ; **********
                                  ; *   2+   *
                                  ; **********
                                  ;
Ø7ØF 82                                     DB      82H
Ø71Ø 32                                     DB      '2'
Ø711 AB                                     DB      '+'+8ØH
Ø712 Ø2 Ø7                                  DW      ONEP-5
Ø714 2Ø Ø5                        TWOP      DW      DOCOL
Ø716 AD Ø5                                  DW      TWO
Ø718 Ø6 Ø4                                  DW      PLUS
Ø71A 9A Ø3                                  DW      SEMIS


                                  ; ************
                                  ; *   HERE   *
                                  ; ************
                                  ;
Ø71C 84                                     DB      84H
Ø71D 48 45 52                               DB      'HER'
Ø72Ø C5                                     DB      'E'+8ØH
Ø721 ØF Ø7                                  DW      TWOP-5
Ø723 2Ø Ø5                        HERE      DW      DOCOL
Ø725 57 Ø6                                  DW      DP
Ø727 B4 Ø4                                  DW      AT
Ø729 9A Ø3                                  DW      SEMIS


                                  ; *************
                                  ; *   ALLOT   *
                                  ; *************
                                  ;
Ø72B 85                                     DB      85H
Ø72C 41 4C 4C 4F                            DB      'ALLO'
Ø73Ø D4                                     DB      'T'+8ØH
Ø731 1C Ø7                                  DW      HERE-7
Ø733 2Ø Ø5                        ALLOT     DW      DOCOL
Ø735 57 Ø6                                  DW      DP
Ø737 95 Ø4                                  DW      PSTOR
Ø739 9A Ø3                                  DW      SEMIS
```

```
                            ; *********
                            ; *   ,   *
                            ; *********
                            ;
073B 81                           DB      81H
073C AC                           DB      ','+80H
073D 2B 07                        DW      ALLOT-8
073F 20 05                  COMMA DW      DOCOL
0741 23 07                        DW      HERE
0743 DF 04                        DW      STORE
0745 AD 05                        DW      TWO
0747 33 07                        DW      ALLOT
0749 9A 03                        DW      SEMIS


                            ; **********
                            ; *   C,   *
                            ; **********
                            ;
074B 82                           DB      82H
074C 43                           DB      'C'
074D AC                           DB      ','+80H
074E 3B 07                        DW      COMMA-4
0750 20 05                  CCOMM DW      DOCOL
0752 23 07                        DW      HERE
0754 ED 04                        DW      CSTOR
0756 A5 05                        DW      ONE
0758 33 07                        DW      ALLOT
075A 9A 03                        DW      SEMIS


                            ; *********
                            ; *   -   *
                            ; *********
                            ;
075C 81                           DB      81H
075D AD                           DB      '-'+80H
075E 4B 07                        DW      CCOMM-5
0760 62 07                  SUBB  DW      $+2
0762 5A                           POP     DX        ; S1
0763 58                           POP     AX        ; S1
0764 2B C2                        SUB     AX,DX     ; AX = S1 - S1
0766 E9 F2 F9                     JMP     APUSH
```

```
                                EJECT

                        ; *********
                        ; *   =   *
                        ; *********
                        ;
0769 81                         DB      81H
076A BD                         DB      '='+80H
076B 5C 07                      DW      SUBB-4
076D 20 05              EQUAL   DW      DOCOL
076F 60 07                      DW      SUBB
0771 E1 03                      DW      ZEQU
0773 9A 03                      DW      SEMIS


                        ; *********
                        ; *   <   *
                        ; *********
                        ;
0775 81                         DB      81H
0776 BC                         DB      '<'+80H ; X  <  Y
0777 69 07                      DW      EQUAL-4 ; S2    S1
0779 7B 07              LESS    DW      $+2
077B 5A                         POP     DX      ; S1
077C 58                         POP     AX      ; S2
077D 8B DA                      MOV     BX,DX
077F 33 D8                      XOR     BX,AX   ; TEST FOR EQUAL SIGNS
0781 78 02                      JS      LES1    ; SIGNS NOT THE SAME
0783 2B C2                      SUB     AX,DX
0785 0B C0              LES1:   OR      AX,AX   ; TEST SIGN BIT
0787 B8 00 00                   MOV     AX,0    ; ASSUME FALSE CONDITION
078A 79 01                      JNS     LES2    ; NOT LESS THEN
078C 40                         INC     AX      ; TRUE (1)
078D E9 CB F9           LES2:   JMP     APUSH


                        ; **********
                        ; *   U<   *
                        ; **********
                        ;
0790 82                         DB      82H
0791 55                         DB      'U'
0792 BC                         DB      '<'+80H
0793 75 07                      DW      LESS-4
0795 20 05 87 04        ULESS   DW      DOCOL,TDUP
0799 4C 03 F4 03                DW      XORR,ZLESS
079D 9A 01                      DW      ZBRAN
079F 0C 00                      DW      OFFSET ULES1-$ ; IF
07A1 5F 04 F4 03                DW      DROP,ZLESS
07A5 E1 03                      DW      ZEQU
07A7 89 01                      DW      BRAN
07A9 06 00                      DW      OFFSET ULES2-$
07AB 60 07 F4 03        ULES1   DW      SUBB,ZLESS        ; ELSE
07AF 9A 03              ULES2   DW      SEMIS             ; ENDIF
```

```
                              EJECT

                      ; *********
                      ; *   >   *
                      ; *********
                      ;
Ø7B1 81                       DB      81H
Ø7B2 BE                       DB      '>'+8ØH
Ø7B3 9Ø Ø7                    DW      ULESS-5
Ø7B5 2Ø Ø5            GREAT   DW      DOCOL
Ø7B7 6C Ø4                    DW      SWAP
Ø7B9 79 Ø7                    DW      LESS
Ø7BB 9A Ø3                    DW      SEMIS


                      ; ***********
                      ; *   ROT   *
                      ; ***********
                      ;
Ø7BD 83                       DB      83H
Ø7BE 52 4F                    DB      'RO'
Ø7CØ D4                       DB      'T'+8ØH
Ø7C1 B1 Ø7                    DW      GREAT-4
Ø7C3 C5 Ø7            ROT     DW      $+2
Ø7C5 5A                       POP     DX      ; S1
Ø7C6 5B                       POP     BX      ; S2
Ø7C7 58                       POP     AX      ; S3
Ø7C8 53                       PUSH    BX
Ø7C9 E9 8E F9                 JMP     DPUSH


                      ; *************
                      ; *   SPACE   *
                      ; *************
                      ;
Ø7CC 85                       DB      85H
Ø7CD 53 5Ø 41 43              DB      'SPAC'
Ø7D1 C5                       DB      'E'+8ØH
Ø7D2 BD Ø7                    DW      ROT-6
Ø7D4 2Ø Ø5            SPACE   DW      DOCOL
Ø7D6 BE Ø5                    DW      BLS
Ø7D8 B2 Ø2                    DW      EMIT
Ø7DA 9A Ø3                    DW      SEMIS


                      ; ************
                      ; *   -DUP   *
                      ; ************
                      ;
Ø7DC 84                       DB      84H
Ø7DD 2D 44 55                 DB      '-DU'
Ø7EØ DØ                       DB      'P'+8ØH
Ø7E1 CC Ø7                    DW      SPACE-8
Ø7E3 2Ø Ø5            DDUP    DW      DOCOL
Ø7E5 79 Ø4                    DW      DUP
Ø7E7 9A Ø1                    DW      ZBRAN   ; IF
Ø7E9 Ø4 ØØ                    DW      OFFSET DDUP1-$
Ø7EB 79 Ø4                    DW      DUP     ; ENDIF
```

```
Ø7ED 9A Ø3               DDUP1   DW       SEMIS

                         ; ***************
                         ; *   TRAVERSE   *
                         ; ***************
                         ;
Ø7EF 88                          DB       88H
Ø7FØ 54 52 41 56 45 52           DB       'TRAVERS'
     53
Ø7F7 C5                          DB       'E'+8ØH
Ø7F8 DC Ø7                       DW       DDUP-7
Ø7FA 2Ø Ø5               TRAV    DW       DOCOL
Ø7FC 6C Ø4                       DW       SWAP
Ø7FE 5Ø Ø4               TRAV1   DW       OVER      ; BEGIN
Ø8ØØ Ø6 Ø4                       DW       PLUS
Ø8Ø2 6A Ø1 7F ØØ                 DW       LIT,7FH
Ø8Ø6 5Ø Ø4                       DW       OVER
Ø8Ø8 C1 Ø4                       DW       CAT
Ø8ØA 79 Ø7                       DW       LESS
Ø8ØC 9A Ø1                       DW       ZBRAN     ; UNTIL
Ø8ØE FØ FF                       DW       OFFSET TRAV1-$
Ø81Ø 6C Ø4                       DW       SWAP
Ø812 5F Ø4                       DW       DROP
Ø814 9A Ø3                       DW       SEMIS

                         ; *************
                         ; *   LATEST   *
                         ; *************
                         ;
Ø816 86                          DB       86H
Ø817 4C 41 54 45 53              DB       'LATES'
Ø81C D4                          DB       'T'+8ØH
Ø81D EF Ø7                       DW       TRAV-ØBH
Ø81F 2Ø Ø5               LATES   DW       DOCOL
Ø821 B6 Ø6                       DW       CURR
Ø823 B4 Ø4                       DW       AT
Ø825 B4 Ø4                       DW       AT
Ø827 9A Ø3                       DW       SEMIS

                         ; **********
                         ; *   LFA   *
                         ; **********
                         ;
Ø829 83                          DB       83H
Ø82A 4C 46                       DB       'LF'
Ø82C C1                          DB       'A'+8ØH
Ø82D 16 Ø8                       DW       LATES-9
Ø82F 2Ø Ø5               LFA     DW       DOCOL
Ø831 6A Ø1 Ø4 ØØ                 DW       LIT,4
Ø835 6Ø Ø7                       DW       SUBB
Ø837 9A Ø3                       DW       SEMIS
```

```
                                  EJECT

                         ; ***********
                         ; *   CFA   *
                         ; ***********
                         ;
0839 83                           DB       83H
083A 43 46                        DB       'CF'
083C C1                           DB       'A'+80H
083D 29 08                        DW       LFA-6
083F 20 05               CFA      DW       DOCOL
0841 AD 05                        DW       TWO
0843 60 07                        DW       SUBB
0845 9A 03                        DW       SEMIS


                         ; ***********
                         ; *   NFA   *
                         ; ***********
                         ;
0847 83                           DB       83H
0848 4E 46                        DB       'NF'
084A C1                           DB       'A'+80H
084B 39 08                        DW       CFA-6
084D 20 05               NFA      DW       DOCOL
084F 6A 01 05 00                  DW       LIT,5
0853 60 07                        DW       SUBB
0855 6A 01 FF FF                  DW       LIT,-1
0859 FA 07                        DW       TRAV
085B 9A 03                        DW       SEMIS


                         ; ***********
                         ; *   PFA   *
                         ; ***********
                         ;
085D 83                           DB       83H
085E 50 46                        DB       'PF'
0860 C1                           DB       'A'+80H
0861 47 08                        DW       NFA-6
0863 20 05               PFA      DW       DOCOL
0865 A5 05                        DW       ONE
0867 FA 07                        DW       TRAV
0869 6A 01 05 00                  DW       LIT,5
086D 06 04                        DW       PLUS
086F 9A 03                        DW       SEMIS
```

```
                                         EJECT

                                ; ************
                                ; *   !CSP   *
                                ; ************
                                ;
Ø871 84                                  DB       84H
Ø872 21 43 53                            DB       '!CS'
Ø875 DØ                                  DB       'P'+8ØH
Ø876 5D Ø8                               DW       PFA-6
Ø878 2Ø Ø5                      SCSP     DW       DOCOL
Ø87A 5B Ø3                               DW       SPAT
Ø87C EB Ø6                               DW       CSPP
Ø87E DF Ø4                               DW       STORE
Ø88Ø 9A Ø3                               DW       SEMIS


                                ; **************
                                ; *   ?ERROR   *
                                ; **************
                                ;
Ø882 86                                  DB       86H
Ø883 3F 45 52 52 4F                      DB       '?ERRO'
Ø888 D2                                  DB       'R'+8ØH
Ø889 71 Ø8                               DW       SCSP-7
Ø88B 2Ø Ø5                      QERR     DW       DOCOL
Ø88D 6C Ø4                               DW       SWAP
Ø88F 9A Ø1                               DW       ZBRAN    ; IF
Ø891 Ø8 ØØ                               DW       OFFSET QERR1-$
Ø893 1A ØD                               DW       ERROR
Ø895 89 Ø1                               DW       BRAN     ; ELSE
Ø897 Ø4 ØØ                               DW       OFFSET QERR2-$
Ø899 5F Ø4                      QERR1    DW       DROP     ; ENDIF
Ø89B 9A Ø3                      QERR2    DW       SEMIS


                                ; *************
                                ; *   ?COMP   *
                                ; *************
                                ;
Ø89D 85                                  DB       85H
Ø89E 3F 43 4F 4D                         DB       '?COM'
Ø8A2 DØ                                  DB       'P'+8ØH
Ø8A3 82 Ø8                               DW       QERR-9
Ø8A5 2Ø Ø5                      QCOMP    DW       DOCOL
Ø8A7 C2 Ø6                               DW       STATE
Ø8A9 B4 Ø4                               DW       AT
Ø8AB E1 Ø3                               DW       ZEQU
Ø8AD 6A Ø1 11 ØØ                         DW       LIT,11H
Ø8B1 8B Ø8                               DW       QERR
Ø8B3 9A Ø3                               DW       SEMIS
```

```
                                       EJECT

                              ; *************
                              ; *   ?EXEC   *
                              ; *************
                              ;
08B5 85                                DB      85H
08B6 3F 45 58 45                       DB      '?EXE'
08BA C3                                DB      'C'+80H
08BB 9D 08                             DW      QCOMP-8
08BD 20 05                    QEXEC    DW      DOCOL
08BF C2 06                             DW      STATE
08C1 B4 04                             DW      AT
08C3 6A 01 12 00                       DW      LIT,12H
08C7 8B 08                             DW      QERR
08C9 9A 03                             DW      SEMIS


                              ; **************
                              ; *   ?PAIRS   *
                              ; **************
                              ;
08CB 86                                DB      86H
08CC 3F 50 41 49 52                    DB      '?PAIR'
08D1 D3                                DB      'S'+80H
08D2 B5 08                             DW      QEXEC-8
08D4 20 05                    QPAIR    DW      DOCOL
08D6 60 07                             DW      SUBB
08D8 6A 01 13 00                       DW      LIT,13H
08DC 8B 08                             DW      QERR
08DE 9A 03                             DW      SEMIS


                              ; ************
                              ; *   ?CSP   *
                              ; ************
                              ;
08E0 84                                DB      84H
08E1 3F 43 53                          DB      '?CS'
08E4 D0                                DB      'P'+80H
08E5 CB 08                             DW      QPAIR-9
08E7 20 05                    QCSP     DW      DOCOL
08E9 5B 03                             DW      SPAT
08EB EB 06                             DW      CSPP
08ED B4 04                             DW      AT
08EF 60 07                             DW      SUBB
08F1 6A 01 14 00                       DW      LIT,14H
08F5 8B 08                             DW      QERR
08F7 9A 03                             DW      SEMIS


                              ; ****************
                              ; *   ?LOADING   *
                              ; ****************
                              ;
08F9 88                                DB      88H
08FA 3F 4C 4F 41 44 49                 DB      '?LOADIN'
     4E
```

```
0901 C7                          DB     'G'+80H
0902 E0 08                       DW     QCSP-7
0904 20 05                QLOAD  DW     DOCOL
0906 70 06                       DW     BLK
0908 B4 04                       DW     AT
090A E1 03                       DW     ZEQU
090C 6A 01 16 00                 DW     LIT,16H
0910 8B 08                       DW     QERR
0912 9A 03                       DW     SEMIS
```

```
                                         EJECT

                              ; ***************
                              ; *   COMPILE   *
                              ; ***************
                              ;
 Ø914 87                              DB       87H
 Ø915 43 4F 4D 50 49 4C               DB       'COMPIL'
 Ø91B C5                              DB       'E'+8ØH
 Ø91C F9 Ø8                           DW       QLOAD-ØBH
 Ø91E 2Ø Ø5                   COMP    DW       DOCOL
 Ø92Ø A5 Ø8                           DW       QCOMP
 Ø922 CC Ø3                           DW       FROMR
 Ø924 79 Ø4                           DW       DUP
 Ø926 14 Ø7                           DW       TWOP
 Ø928 BC Ø3                           DW       TOR
 Ø92A B4 Ø4                           DW       AT
 Ø92C 3F Ø7                           DW       COMMA
 Ø92E 9A Ø3                           DW       SEMIS


                              ; *********
                              ; *   [   *
                              ; *********
                              ;
 Ø93Ø C1                              DB       ØC1H
 Ø931 DB                              DB       '['+8ØH
 Ø932 14 Ø9                           DW       COMP-ØAH
 Ø934 2Ø Ø5                   LBRAC   DW       DOCOL
 Ø936 9D Ø5                           DW       ZERO
 Ø938 C2 Ø6                           DW       STATE
 Ø93A DF Ø4                           DW       STORE
 Ø93C 9A Ø3                           DW       SEMIS


                              ; *********
                              ; *   ]   *
                              ; *********
                              ;
 Ø93E 81                              DB       81H
 Ø93F DD                              DB       ']'+8ØH
 Ø94Ø 3Ø Ø9                           DW       LBRAC-4
 Ø942 2Ø Ø5                   RBRAC   DW       DOCOL
 Ø944 6A Ø1 CØ ØØ                     DW       LIT,ØCØH
 Ø948 C2 Ø6 DF Ø4                     DW       STATE,STORE
 Ø94C 9A Ø3                           DW       SEMIS
```

```
                                           EJECT

                                  ; **************
                                  ; *   SMUDGE   *
                                  ; **************
                                  ;
094E 86                                    DB      86H
094F 53 4D 55 44 47                        DB      'SMUDG'
0954 C5                                    DB      'E'+80H
0955 3E 09                                 DW      RBRAC-4
0957 20 05                        SMUDG    DW      DOCOL
0959 1F 08                                 DW      LATES
095B 6A 01 20 00                           DW      LIT,20H
095F A7 04                                 DW      TOGGL
0961 9A 03                                 DW      SEMIS


                                  ; ***********
                                  ; *   HEX   *
                                  ; ***********
                                  ;
0963 83                                    DB      83H
0964 48 45                                 DB      'HE'
0966 D8                                    DB      'X'+80H
0967 4E 09                                 DW      SMUDG-9
0969 20 05                        HEX      DW      DOCOL
096B 6A 01 10 00                           DW      LIT,16
096F CD 06                                 DW      BASE
0971 DF 04                                 DW      STORE
0973 9A 03                                 DW      SEMIS


                                  ; ***************
                                  ; *   DECIMAL   *
                                  ; ***************
                                  ;
0975 87                                    DB      87H
0976 44 45 43 49 4D 41                     DB      'DECIMA'
097C CC                                    DB      'L'+80H
097D 63 09                                 DW      HEX-6
097F 20 05                        DECA     DW      DOCOL
0981 6A 01 0A 00                           DW      LIT,10
0985 CD 06                                 DW      BASE
0987 DF 04                                 DW      STORE
0989 9A 03                                 DW      SEMIS
```

```
                                    EJECT

                         ; ***************
                         ; *   (;CODE)   *
                         ; ***************
                         ;
Ø98B 87                                 DB      87H
Ø98C 28 3B 43 4F 44 45                  DB      '(;CODE'
Ø992 A9                                 DB      ')'+8ØH
Ø993 75 Ø9                              DW      DECA-ØAH
Ø995 2Ø Ø5               PSCOD          DW      DOCOL
Ø997 CC Ø3                              DW      FROMR
Ø999 1F Ø8                              DW      LATES
Ø99B 63 Ø8                              DW      PFA
Ø99D 3F Ø8                              DW      CFA
Ø99F DF Ø4                              DW      STORE
Ø9A1 9A Ø3                              DW      SEMIS


                         ; *************
                         ; *   ;CODE   *
                         ; *************
                         ;
Ø9A3 C5                                 DB      ØC5H
Ø9A4 3B 43 4F 44                        DB      ';COD'
Ø9A8 C5                                 DB      'E'+8ØH
Ø9A9 8B Ø9                              DW      PSCOD-ØAH
Ø9AB 2Ø Ø5               SEMIC          DW      DOCOL
Ø9AD E7 Ø8                              DW      QCSP
Ø9AF 1E Ø9                              DW      COMP
Ø9B1 95 Ø9                              DW      PSCOD
Ø9B3 34 Ø9                              DW      LBRAC
Ø9B5 44 Ø5               SEMI1          DW      NOOP      ; ( ASSEMBLER )
Ø9B7 9A Ø3                              DW      SEMIS


                         ; ***************
                         ; *   <BUILDS   *
                         ; ***************
                         ;
Ø9B9 87                                 DB      87H
Ø9BA 3C 42 55 49 4C 44                  DB      '<BUILD'
Ø9CØ D3                                 DB      'S'+8ØH
Ø9C1 A3 Ø9                              DW      SEMIC-8
Ø9C3 2Ø Ø5               BUILD          DW      DOCOL
Ø9C5 9D Ø5                              DW      ZERO
Ø9C7 53 Ø5                              DW      CON
Ø9C9 9A Ø3                              DW      SEMIS


                         ; *************
                         ; *   DOES>   *
                         ; *************
                         ;
Ø9CB 85                                 DB      85H
Ø9CC 44 4F 45 53                        DB      'DOES'
Ø9DØ BE                                 DB      '>'+8ØH
Ø9D1 B9 Ø9                              DW      BUILD-ØAH
```

```
Ø9D3 2Ø Ø5              DOES     DW       DOCOL
Ø9D5 CC Ø3                       DW       FROMR
Ø9D7 1F Ø8                       DW       LATES
Ø9D9 63 Ø8                       DW       PFA
Ø9DB DF Ø4                       DW       STORE
Ø9DD 95 Ø9                       DW       PSCOD
Ø9DF 87 EC              DODOE:   XCHG     BP,SP     ; GET RETURN STACK
Ø9E1 56                          PUSH     SI        ; (RP) <- (IP)
Ø9E2 87 EC                       XCHG     BP,SP
Ø9E4 42                          INC      DX        ; PFA
Ø9E5 8B DA                       MOV      BX,DX
Ø9E7 8B 37                       MOV      SI,[BX] ; NEW CFA
Ø9E9 42                          INC      DX
Ø9EA 42                          INC      DX
Ø9EB 52                          PUSH     DX        ; PFA
Ø9EC E9 6D F7                    JMP      NEXT


                        ; *************
                        ; *   COUNT   *
                        ; *************
                        ;
Ø9EF 85                          DB       85H
Ø9FØ 43 4F 55 4E                 DB       'COUN'
Ø9F4 D4                          DB       'T'+8ØH
Ø9F5 CB Ø9                       DW       DOES-8
Ø9F7 2Ø Ø5              COUNT    DW       DOCOL
Ø9F9 79 Ø4                       DW       DUP
Ø9FB Ø7 Ø7                       DW       ONEP
Ø9FD 6C Ø4                       DW       SWAP
Ø9FF C1 Ø4                       DW       CAT
ØAØ1 9A Ø3                       DW       SEMIS


                        ; ************
                        ; *   TYPE   *
                        ; ************
                        ;
ØAØ3 84                          DB       84H
ØAØ4 54 59 5Ø                    DB       'TYP'
ØAØ7 C5                          DB       'E'+8ØH
ØAØ8 EF Ø9                       DW       COUNT-8
ØAØA 2Ø Ø5              TYPES    DW       DOCOL
ØAØC E3 Ø7                       DW       DDUP
ØAØE 9A Ø1                       DW       ZBRAN    ; IF
ØA1Ø 18 ØØ                       DW       OFFSET TYPE1-$
ØA12 5Ø Ø4                       DW       OVER
ØA14 Ø6 Ø4                       DW       PLUS
ØA16 6C Ø4                       DW       SWAP
ØA18 EØ Ø1                       DW       XDO       ; DO
ØA1A F1 Ø1              TYPE2    DW       IDO
ØA1C C1 Ø4                       DW       CAT
ØA1E B2 Ø2                       DW       EMIT
ØA2Ø AF Ø1                       DW       XLOOP    ; LOOP
ØA22 F8 FF                       DW       OFFSET TYPE2-$
ØA24 89 Ø1                       DW       BRAN     ; ELSE
ØA26 Ø4 ØØ                       DW       OFFSET TYPE3-$
```

```
 ØA28 5F Ø4                TYPE1   DW      DROP     ; ENDIF
 ØA2A 9A Ø3                TYPE3   DW      SEMIS


                           ; *****************
                           ; *   -TRAILING   *
                           ; *****************
                           ;
 ØA2C 89                           DB      89H
 ØA2D 2D 54 52 41 49 4C            DB      '-TRAILIN'
      49 4E
 ØA35 C7                           DB      'G'+8ØH
 ØA36 Ø3 ØA                        DW      TYPES-7
 ØA38 2Ø Ø5                DTRAI   DW      DOCOL
 ØA3A 79 Ø4                        DW      DUP
 ØA3C 9D Ø5                        DW      ZERO
 ØA3E EØ Ø1                        DW      XDO      ; DO
 ØA4Ø 5Ø Ø4                DTRA1   DW      OVER
 ØA42 5Ø Ø4                        DW      OVER
 ØA44 Ø6 Ø4                        DW      PLUS
 ØA46 A5 Ø5                        DW      ONE
 ØA48 6Ø Ø7                        DW      SUBB
 ØA4A C1 Ø4                        DW      CAT
 ØA4C BE Ø5                        DW      BLS
 ØA4E 6Ø Ø7                        DW      SUBB
 ØA5Ø 9A Ø1                        DW      ZBRAN    ; IF
 ØA52 Ø8 ØØ                        DW      OFFSET DTRA2-$
 ØA54 AC Ø3                        DW      LEAVE
 ØA56 89 Ø1                        DW      BRAN     ; ELSE
 ØA58 Ø6 ØØ                        DW      OFFSET DTRA3-$
 ØA5A A5 Ø5                DTRA2   DW      ONE
 ØA5C 6Ø Ø7                        DW      SUBB     ; ENDIF
 ØA5E AF Ø1                DTRA3   DW      XLOOP    ; LOOP
 ØA6Ø EØ FF                        DW      OFFSET DTRA1-$
 ØA62 9A Ø3                        DW      SEMIS
```

```
                                           EJECT
                                   ; ************
                                   ; *   (.")   *
                                   ; ************
                                   ;
ØA64 84                                    DB      84H
ØA65 28 2E 22                              DB      '(."'
ØA68 A9                                    DB      ')'+8ØH
ØA69 2C ØA                                 DW      DTRAI-ØCH
ØA6B 2Ø Ø5                         PDOTQ   DW      DOCOL
ØA6D DA Ø3                                 DW      RR
ØA6F F7 Ø9                                 DW      COUNT
ØA71 79 Ø4                                 DW      DUP
ØA73 Ø7 Ø7                                 DW      ONEP
ØA75 CC Ø3                                 DW      FROMR
ØA77 Ø6 Ø4                                 DW      PLUS
ØA79 BC Ø3                                 DW      TOR
ØA7B ØA ØA                                 DW      TYPES
ØA7D 9A Ø3                                 DW      SEMIS


                                   ; **********
                                   ; *   ."   *
                                   ; **********
                                   ;
ØA7F C2                                    DB      ØC2H
ØA8Ø 2E                                    DB      '.'
ØA81 A2                                    DB      '"'+8ØH
ØA82 64 ØA                                 DW      PDOTQ-7
ØA84 2Ø Ø5                         DOTQ    DW      DOCOL
ØA86 6A Ø1 22 ØØ                           DW      LIT,22H
ØA8A C2 Ø6                                 DW      STATE
ØA8C B4 Ø4                                 DW      AT
ØA8E 9A Ø1                                 DW      ZBRAN    ; IF
ØA9Ø 14 ØØ                                 DW      OFFSET DOTQ1-$
ØA92 1E Ø9                                 DW      COMP
ØA94 6B ØA                                 DW      PDOTQ
ØA96 EC ØB                                 DW      WORDS
ØA98 23 Ø7                                 DW      HERE
ØA9A C1 Ø4                                 DW      CAT
ØA9C Ø7 Ø7                                 DW      ONEP
ØA9E 33 Ø7                                 DW      ALLOT
ØAAØ 89 Ø1                                 DW      BRAN     ; ELSE
ØAA2 ØA ØØ                                 DW      OFFSET DOTQ2-$
ØAA4 EC ØB                         DOTQ1   DW      WORDS
ØAA6 23 Ø7                                 DW      HERE
ØAA8 F7 Ø9                                 DW      COUNT
ØAAA ØA ØA                                 DW      TYPES    ; ENDIF
ØAAC 9A Ø3                         DOTQ2   DW      SEMIS
```

```
                                         EJECT

                              ; **************
                              ; *   EXPECT   *
                              ; **************
                              ;
ØAAE 86                                  DB      86H
ØAAF 45 58 5Ø 45 43                      DB      'EXPEC'
ØAB4 D4                                  DB      'T'+8ØH
ØAB5 7F ØA                               DW      DOTQ-5
ØAB7 2Ø Ø5                    EXPEC      DW      DOCOL
ØAB9 5Ø Ø4                               DW      OVER
ØABB Ø6 Ø4                               DW      PLUS
ØABD 5Ø Ø4                               DW      OVER
ØABF EØ Ø1                               DW      XDO       ; DO
ØAC1 C4 Ø2                    EXPE1      DW      KEY
ØAC3 79 Ø4                               DW      DUP
ØAC5 6A Ø1 ØE ØØ                         DW      LIT,ØEH
ØAC9 Ø6 Ø6                               DW      PORIG
ØACB B4 Ø4                               DW      AT
ØACD 6D Ø7                               DW      EQUAL
ØACF 9A Ø1                               DW      ZBRAN     ; IF
ØAD1 2A ØØ                               DW      OFFSET EXPE2-$
ØAD3 5F Ø4                               DW      DROP
ØAD5 79 Ø4                               DW      DUP
ØAD7 F1 Ø1                               DW      IDO
ØAD9 6D Ø7                               DW      EQUAL
ØADB 79 Ø4                               DW      DUP
ØADD CC Ø3                               DW      FROMR
ØADF AD Ø5                               DW      TWO
ØAE1 6Ø Ø7                               DW      SUBB
ØAE3 Ø6 Ø4                               DW      PLUS
ØAE5 BC Ø3                               DW      TOR
ØAE7 9A Ø1                               DW      ZBRAN     ; IF
ØAE9 ØA ØØ                               DW      OFFSET EXPE6-$
ØAEB 6A Ø1                               DW      LIT
ØAED Ø7 ØØ                               DW      BELL
ØAEF 89 Ø1                               DW      BRAN      ; ELSE
ØAF1 Ø6 ØØ                               DW      OFFSET EXPE7-$
ØAF3 6A Ø1                    EXPE6      DW      LIT
ØAF5 Ø8 ØØ                               DW      BSOUT     ; ENDIF
ØAF7 89 Ø1                    EXPE7      DW      BRAN      ; ELSE
ØAF9 28 ØØ                               DW      OFFSET EXPE3-$
ØAFB 79 Ø4                    EXPE2      DW      DUP
ØAFD 6A Ø1 ØD ØØ                         DW      LIT,ØDH
ØBØ1 6D Ø7                               DW      EQUAL
ØBØ3 9A Ø1                               DW      ZBRAN     ; IF
ØBØ5 ØE ØØ                               DW      OFFSET EXPE4-$
ØBØ7 AC Ø3                               DW      LEAVE
ØBØ9 5F Ø4                               DW      DROP
ØBØB BE Ø5                               DW      BLS
ØBØD 9D Ø5                               DW      ZERO
ØBØF 89 Ø1                               DW      BRAN      ; ELSE
ØB11 Ø4 ØØ                               DW      OFFSET EXPE5-$
ØB13 79 Ø4                    EXPE4      DW      DUP       ; ENDIF
ØB15 F1 Ø1                    EXPE5      DW      IDO
ØB17 ED Ø4                               DW      CSTOR
ØB19 9D Ø5                               DW      ZERO
```

```
ØB1B F1 Ø1                         DW      IDO
ØB1D Ø7 Ø7                         DW      ONEP
ØB1F DF Ø4                         DW      STORE    ; ENDIF
ØB21 B2 Ø2                 EXPE3   DW      EMIT
ØB23 AF Ø1                         DW      XLOOP    ; LOOP
ØB25 9C FF                         DW      OFFSET EXPE1-$
ØB27 5F Ø4                         DW      DROP
ØB29 9A Ø3                         DW      SEMIS

                           ;  *************
                           ;  *   QUERY   *
                           ;  *************
                           ;
ØB2B 85                            DB      85H
ØB2C 51 55 45 52                   DB      'QUER'
ØB3Ø D9                            DB      'Y'+8ØH
ØB31 AE ØA                         DW      EXPEC-9
ØB33 2Ø Ø5                 QUERY   DW      DOCOL
ØB35 28 Ø6                         DW      TIB
ØB37 B4 Ø4                         DW      AT
ØB39 6A Ø1 5Ø ØØ                   DW      LIT,5ØH
ØB3D B7 ØA                         DW      EXPEC
ØB3F 9D Ø5                         DW      ZERO
ØB41 79 Ø6                         DW      INN
ØB43 DF Ø4                         DW      STORE
ØB45 9A Ø3                         DW      SEMIS
```

```
                                       EJECT

                                ; ****************
                                ; *    0 (NULL)   *
                                ; ****************
                                ;
0B47 C1                                DB      0C1H     ; A BINARY ZERO
0B48 80                                DB      80H
0B49 2B 0B                             DW      QUERY-8
0B4B 20 05                      NULL   DW      DOCOL
0B4D 70 06                             DW      BLK
0B4F B4 04                             DW      AT
0B51 9A 01                             DW      ZBRAN    ; IF
0B53 2A 00                             DW      OFFSET NULL1-$
0B55 A5 05                             DW      ONE
0B57 70 06                             DW      BLK
0B59 95 04                             DW      PSTOR
0B5B 9D 05                             DW      ZERO
0B5D 79 06                             DW      INN
0B5F DF 04                             DW      STORE
0B61 70 06                             DW      BLK
0B63 B4 04                             DW      AT
0B65 F8 05                             DW      BSCR
0B67 A5 05                             DW      ONE
0B69 60 07                             DW      SUBB
0B6B 2F 03                             DW      ANDD
0B6D E1 03                             DW      ZEQU
0B6F 9A 01                             DW      ZBRAN    ; IF
0B71 08 00                             DW      OFFSET NULL2-$
0B73 BD 08                             DW      QEXEC
0B75 CC 03                             DW      FROMR
0B77 5F 04                             DW      DROP     ; ENDIF
0B79 89 01                      NULL2  DW      BRAN     ; ELSE
0B7B 06 00                             DW      OFFSET NULL3-$
0B7D CC 03                      NULL1  DW      FROMR
0B7F 5F 04                             DW      DROP     ; ENDIF
0B81 9A 03                      NULL3  DW      SEMIS


                                ; ************
                                ; *   FILL   *
                                ; ************
                                ;
0B83 84                                DB      84H
0B84 46 49 4C                          DB      'FIL'
0B87 CC                                DB      'L'+80H
0B88 47 0B                             DW      NULL-4
0B8A 8C 0B                      FILL   DW      $+2
0B8C 58                                POP     AX       ; FILL CHAR
0B8D 59                                POP     CX       ; FILL COUNT
0B8E 5F                                POP     DI       ; BEGIN ADR
0B8F 8C DB                             MOV     BX,DS
0B91 8E C3                             MOV     ES,BX    ; ES <- DS
0B93 FC                                CLD              ; INC DIRECTION
0B94 F3 AA                             REP     STOS     AL       ; STORE BYTE
0B96 E9 C3 F5                          JMP     NEXT
```

```
                                   ; *************
                                   ; *   ERASE   *
                                   ; *************
                                   ;
ØB99 85                                    DB      85H
ØB9A 45 52 41 53                           DB      'ERAS'
ØB9E C5                                    DB      'E'+8ØH
ØB9F 83 ØB                                 DW      FILL-7
ØBA1 2Ø Ø5                         ERASEE  DW      DOCOL
ØBA3 9D Ø5                                 DW      ZERO
ØBA5 8A ØB                                 DW      FILL
ØBA7 9A Ø3                                 DW      SEMIS


                                   ; **************
                                   ; *   BLANKS   *
                                   ; **************
                                   ;
ØBA9 86                                    DB      86H
ØBAA 42 4C 41 4E 4B                        DB      'BLANK'
ØBAF D3                                    DB      'S'+8ØH
ØBBØ 99 ØB                                 DW      ERASEE-8
ØBB2 2Ø Ø5                         BLANK   DW      DOCOL
ØBB4 BE Ø5                                 DW      BLS
ØBB6 8A ØB                                 DW      FILL
ØBB8 9A Ø3                                 DW      SEMIS


                                   ; ************
                                   ; *   HOLD   *
                                   ; ************
                                   ;
ØBBA 84                                    DB      84H
ØBBB 48 4F 4C                              DB      'HOL'
ØBBE C4                                    DB      'D'+8ØH
ØBBF A9 ØB                                 DW      BLANK-9
ØBC1 2Ø Ø5                         HOLD    DW      DOCOL
ØBC3 6A Ø1 FF FF                           DW      LIT,-1
ØBC7 FE Ø6                                 DW      HLD
ØBC9 95 Ø4                                 DW      PSTOR
ØBCB FE Ø6                                 DW      HLD
ØBCD B4 Ø4                                 DW      AT
ØBCF ED Ø4                                 DW      CSTOR
ØBD1 9A Ø3                                 DW      SEMIS


                                   ; ***********
                                   ; *   PAD   *
                                   ; ***********
                                   ;
ØBD3 83                                    DB      83H
ØBD4 5Ø 41                                 DB      'PA'
ØBD6 C4                                    DB      'D'+8ØH
ØBD7 BA ØB                                 DW      HOLD-7
ØBD9 2Ø Ø5                         PAD     DW      DOCOL
ØBDB 23 Ø7                                 DW      HERE
ØBDD 6A Ø1 44 ØØ                           DW      LIT,44H
```

```
 0BE1 06 04                           DW      PLUS
 0BE3 9A 03                           DW      SEMIS


                              ; ************
                              ; *   WORD   *
                              ; ************
                              ;
 0BE5 84                              DB      84H
 0BE6 57 4F 52                        DB      'WOR'
 0BE9 C4                              DB      'D'+80H
 0BEA D3 0B                           DW      PAD-6
 0BEC 20 05                   WORDS   DW      DOCOL
 0BEE 70 06                           DW      BLK
 0BF0 B4 04                           DW      AT
 0BF2 9A 01                           DW      ZBRAN    ; IF
 0BF4 0C 00                           DW      OFFSET WORD1-$
 0BF6 70 06                           DW      BLK
 0BF8 B4 04                           DW      AT
 0BFA 3F 13                           DW      BLOCK
 0BFC 89 01                           DW      BRAN     ; ELSE
 0BFE 06 00                           DW      OFFSET WORD2-$
 0C00 28 06                   WORD1   DW      TIB
 0C02 B4 04                           DW      AT       ; ENDIF
 0C04 79 06                   WORD2   DW      INN
 0C06 B4 04                           DW      AT
 0C08 06 04                           DW      PLUS
 0C0A 6C 04                           DW      SWAP
 0C0C 7A 02                           DW      ENCL
 0C0E 23 07                           DW      HERE
 0C10 6A 01 22 00                     DW      LIT,22H
 0C14 B2 0B                           DW      BLANK
 0C16 79 06                           DW      INN
 0C18 95 04                           DW      PSTOR
 0C1A 50 04                           DW      OVER
 0C1C 60 07                           DW      SUBB
 0C1E BC 03                           DW      TOR
 0C20 DA 03                           DW      RR
 0C22 23 07                           DW      HERE
 0C24 ED 04                           DW      CSTOR
 0C26 06 04                           DW      PLUS
 0C28 23 07                           DW      HERE
 0C2A 07 07                           DW      ONEP
 0C2C CC 03                           DW      FROMR
 0C2E EC 02                           DW      CMOVE
 0C30 9A 03                           DW      SEMIS
```

```
                                   EJECT

                              ; ***************
                              ; *    (NUMBER)   *
                              ; ***************
                              ;
ØC32 88                                DB      88H
ØC33 28 4E 55 4D 42 45                 DB      '(NUMBER'
     52
ØC3A A9                                DB      ')'+8ØH
ØC3B E5 ØB                             DW      WORDS-7
ØC3D 2Ø Ø5                    PNUMB    DW      DOCOL
ØC3F Ø7 Ø7                    PNUM1    DW      ONEP      ; BEGIN
ØC41 79 Ø4                             DW      DUP
ØC43 BC Ø3                             DW      TOR
ØC45 C1 Ø4                             DW      CAT
ØC47 CD Ø6                             DW      BASE
ØC49 B4 Ø4                             DW      AT
ØC4B Ø1 Ø2                             DW      DIGIT
ØC4D 9A Ø1                             DW      ZBRAN     ; WHILE
ØC4F 2C ØØ                             DW      OFFSET PNUM2-$
ØC51 6C Ø4                             DW      SWAP
ØC53 CD Ø6                             DW      BASE
ØC55 B4 Ø4                             DW      AT
ØC57 Ø4 Ø3                             DW      USTAR
ØC59 5F Ø4                             DW      DROP
ØC5B C3 Ø7                             DW      ROT
ØC5D CD Ø6                             DW      BASE
ØC5F B4 Ø4                             DW      AT
ØC61 Ø4 Ø3                             DW      USTAR
ØC63 14 Ø4                             DW      DPLUS
ØC65 D7 Ø6                             DW      DPL
ØC67 B4 Ø4                             DW      AT
ØC69 Ø7 Ø7                             DW      ONEP
ØC6B 9A Ø1                             DW      ZBRAN     ; IF
ØC6D Ø8 ØØ                             DW      OFFSET PNUM3-$
ØC6F A5 Ø5                             DW      ONE
ØC71 D7 Ø6                             DW      DPL
ØC73 95 Ø4                             DW      PSTOR     ; ENDIF
ØC75 CC Ø3                    PNUM3    DW      FROMR
ØC77 89 Ø1                             DW      BRAN      ; REPEAT
ØC79 C6 FF                             DW      OFFSET PNUM1-$
ØC7B CC Ø3                    PNUM2    DW      FROMR
ØC7D 9A Ø3                             DW      SEMIS
```

```
                                        EJECT
                             ; **************
                             ; *   NUMBER   *
                             ; **************
                             ;
ØC7F 86                               DB      86H
ØC8Ø 4E 55 4D 42 45                   DB      'NUMBE'
ØC85 D2                               DB      'R'+8ØH
ØC86 32 ØC                            DW      PNUMB-ØBH
ØC88 2Ø Ø5                   NUMB     DW      DOCOL
ØC8A 9D Ø5                            DW      ZERO
ØC8C 9D Ø5                            DW      ZERO
ØC8E C3 Ø7                            DW      ROT
ØC9Ø 79 Ø4                            DW      DUP
ØC92 Ø7 Ø7                            DW      ONEP
ØC94 C1 Ø4                            DW      CAT
ØC96 6A Ø1 2D ØØ                      DW      LIT,2DH
ØC9A 6D Ø7                            DW      EQUAL
ØC9C 79 Ø4                            DW      DUP
ØC9E BC Ø3                            DW      TOR
ØCAØ Ø6 Ø4                            DW      PLUS
ØCA2 6A Ø1 FF FF                      DW      LIT,-1
ØCA6 D7 Ø6                   NUMB1    DW      DPL       ; BEGIN
ØCA8 DF Ø4                            DW      STORE
ØCAA 3D ØC                            DW      PNUMB
ØCAC 79 Ø4                            DW      DUP
ØCAE C1 Ø4                            DW      CAT
ØCBØ BE Ø5                            DW      BLS
ØCB2 6Ø Ø7                            DW      SUBB
ØCB4 9A Ø1                            DW      ZBRAN     ; WHILE
ØCB6 16 ØØ                            DW      OFFSET NUMB2-$
ØCB8 79 Ø4                            DW      DUP
ØCBA C1 Ø4                            DW      CAT
ØCBC 6A Ø1 2E ØØ                      DW      LIT,2EH
ØCCØ 6Ø Ø7                            DW      SUBB
ØCC2 9D Ø5                            DW      ZERO
ØCC4 8B Ø8                            DW      QERR
ØCC6 9D Ø5                            DW      ZERO
ØCC8 89 Ø1                            DW      BRAN      ; REPEAT
ØCCA DC FF                            DW      OFFSET NUMB1-$
ØCCC 5F Ø4                   NUMB2    DW      DROP
ØCCE CC Ø3                            DW      FROMR
ØCDØ 9A Ø1                            DW      ZBRAN     ; IF
ØCD2 Ø4 ØØ                            DW      OFFSET NUMB3-$
ØCD4 3A Ø4                            DW      DMINU     ; ENDIF
ØCD6 9A Ø3                   NUMB3    DW      SEMIS
```

```
                                        EJECT

                                ; *************
                                ; *   -FIND   *
                                ; *************
                                ;
0CD8 85                                 DB      85H
0CD9 2D 46 49 4E                        DB      '-FIN'
0CDD C4                                 DB      'D'+80H
0CDE 7F 0C                              DW      NUMB-9
0CE0 20 05                      DFIND   DW      DOCOL
0CE2 BE 05                              DW      BLS
0CE4 EC 0B                              DW      WORDS
0CE6 23 07                              DW      HERE
0CE8 A8 06                              DW      CONT
0CEA B4 04                              DW      AT
0CEC B4 04                              DW      AT
0CEE 2E 02                              DW      PFIND
0CF0 79 04                              DW      DUP
0CF2 E1 03                              DW      ZEQU
0CF4 9A 01                              DW      ZBRAN    ; IF
0CF6 0A 00                              DW      OFFSET DFIN1-$
0CF8 5F 04                              DW      DROP
0CFA 23 07                              DW      HERE
0CFC 1F 08                              DW      LATES
0CFE 2E 02                              DW      PFIND    ; ENDIF
0D00 9A 03                      DFIN1   DW      SEMIS


                                ; ***************
                                ; *   (ABORT)   *
                                ; ***************
                                ;
0D02 87                                 DB      87H
0D03 28 41 42 4F 52 54                  DB      '(ABORT'
0D09 A9                                 DB      ')'+80H
0D0A D8 0C                              DW      DFIND-8
0D0C 20 05                      PABOR   DW      DOCOL
0D0E 5F 0F                              DW      ABORT
0D10 9A 03                              DW      SEMIS


                                ; *************
                                ; *   ERROR   *
                                ; *************
                                ;
0D12 85                                 DB      85H
0D13 45 52 52 4F                        DB      'ERRO'
0D17 D2                                 DB      'R'+80H
0D18 02 0D                              DW      PABOR-0AH
0D1A 20 05                      ERROR   DW      DOCOL
0D1C 42 06                              DW      WARN
0D1E B4 04                              DW      AT
0D20 F4 03                              DW      ZLESS
0D22 9A 01                              DW      ZBRAN    ; IF
0D24 04 00                              DW      OFFSET ERRO1-$
0D26 0C 0D                              DW      PABOR    ; ENDIF
0D28 23 07                      ERRO1   DW      HERE
```

```
ØD2A F7 Ø9                     DW      COUNT
ØD2C ØA ØA                     DW      TYPES
ØD2E 6B ØA                     DW      PDOTQ
ØD3Ø Ø2                        DB      2
ØD31 3F 2Ø                     DB      '? '
ØD33 7F 11                     DW      MESS
ØD35 68 Ø3                     DW      SPSTO
                       ;       CHANGE FROM FIG MODEL
                       ;       DW      INN,AT,BLK,AT
ØD37 7Ø Ø6 B4 Ø4               DW      BLK,AT
ØD3B E3 Ø7                     DW      DDUP
ØD3D 9A Ø1                     DW      ZBRAN           ; IF
ØD3F Ø8 ØØ                     DW      OFFSET ERRO2-$
ØD41 79 Ø6 B4 Ø4               DW      INN,AT
ØD45 6C Ø4                     DW      SWAP            ; ENDIF
ØD47 32 ØF             ERRO2   DW      QUIT


                       ; ***********
                       ; *   ID.   *
                       ; ***********
                       ;
ØD49 83                        DB      83H
ØD4A 49 44                     DB      'ID'
ØD4C AE                        DB      '.'+8ØH
ØD4D 12 ØD                     DW      ERROR-8
ØD4F 2Ø Ø5             IDDOT   DW      DOCOL
ØD51 D9 ØB                     DW      PAD
ØD53 6A Ø1 2Ø ØØ               DW      LIT,2ØH
ØD57 6A Ø1 5F ØØ               DW      LIT,5FH
ØD5B 8A ØB                     DW      FILL
ØD5D 79 Ø4                     DW      DUP
ØD5F 63 Ø8                     DW      PFA
ØD61 2F Ø8                     DW      LFA
ØD63 5Ø Ø4                     DW      OVER
ØD65 6Ø Ø7                     DW      SUBB
ØD67 D9 ØB                     DW      PAD
ØD69 6C Ø4                     DW      SWAP
ØD6B EC Ø2                     DW      CMOVE
ØD6D D9 ØB                     DW      PAD
ØD6F F7 Ø9                     DW      COUNT
ØD71 6A Ø1 1F ØØ               DW      LIT,1FH
ØD75 2F Ø3                     DW      ANDD
ØD77 ØA ØA                     DW      TYPES
ØD79 D4 Ø7                     DW      SPACE
ØD7B 9A Ø3                     DW      SEMIS
```

```
                                        EJECT

                              ; **************
                              ; *   CREATE   *
                              ; **************
                              ;
ØD7D 86                                 DB      86H
ØD7E 43 52 45 41 54                     DB      'CREAT'
ØD83 C5                                 DB      'E'+8ØH
ØD84 49 ØD                              DW      IDDOT-6
ØD86 2Ø Ø5                    CREAT     DW      DOCOL
ØD88 EØ ØC                              DW      DFIND
ØD8A 9A Ø1                              DW      ZBRAN    ; IF
ØD8C 1Ø ØØ                              DW      OFFSET CREA1-$
ØD8E 5F Ø4                              DW      DROP
ØD9Ø 4D Ø8                              DW      NFA
ØD92 4F ØD                              DW      IDDOT
ØD94 6A Ø1 Ø4 ØØ                        DW      LIT,4
ØD98 7F 11                              DW      MESS
ØD9A D4 Ø7                              DW      SPACE    ; ENDIF
ØD9C 23 Ø7                    CREA1     DW      HERE
ØD9E 79 Ø4                              DW      DUP
ØDAØ C1 Ø4                              DW      CAT
ØDA2 34 Ø6                              DW      WIDTH
ØDA4 B4 Ø4                              DW      AT
ØDA6 58 1Ø                              DW      MIN
ØDA8 Ø7 Ø7                              DW      ONEP
ØDAA 33 Ø7                              DW      ALLOT
ØDAC 79 Ø4                              DW      DUP
ØDAE 6A Ø1 AØ ØØ                        DW      LIT,ØAØH
ØDB2 A7 Ø4                              DW      TOGGL
ØDB4 23 Ø7                              DW      HERE
ØDB6 A5 Ø5                              DW      ONE
ØDB8 6Ø Ø7                              DW      SUBB
ØDBA 6A Ø1 8Ø ØØ                        DW      LIT,8ØH
ØDBE A7 Ø4                              DW      TOGGL
ØDCØ 1F Ø8                              DW      LATES
ØDC2 3F Ø7                              DW      COMMA
ØDC4 B6 Ø6                              DW      CURR
ØDC6 B4 Ø4                              DW      AT
ØDC8 DF Ø4                              DW      STORE
ØDCA 23 Ø7                              DW      HERE
ØDCC 14 Ø7                              DW      TWOP
ØDCE 3F Ø7                              DW      COMMA
ØDDØ 9A Ø3                              DW      SEMIS
```

```
                                             EJECT

                                    ; *****************
                                    ; *    [COMPILE]    *
                                    ; *****************
                                    ;
ØDD2 C9                                      DB      ØC9H
ØDD3 5B 43 4F 4D 5Ø 49                       DB      '[COMPILE'
     4C 45
ØDDB DD                                      DB      ']'+8ØH
ØDDC 7D ØD                                   DW      CREAT-9
ØDDE 2Ø Ø5                          BCOMP    DW      DOCOL
ØDEØ EØ ØC                                   DW      DFIND
ØDE2 E1 Ø3                                   DW      ZEQU
ØDE4 9D Ø5                                   DW      ZERO
ØDE6 8B Ø8                                   DW      QERR
ØDE8 5F Ø4                                   DW      DROP
ØDEA 3F Ø8                                   DW      CFA
ØDEC 3F Ø7                                   DW      COMMA
ØDEE 9A Ø3                                   DW      SEMIS


                                    ; ***************
                                    ; *    LITERAL    *
                                    ; ***************
                                    ;
ØDFØ C7                                      DB      ØC7H
ØDF1 4C 49 54 45 52 41                       DB      'LITERA'
ØDF7 CC                                      DB      'L'+8ØH
ØDF8 D2 ØD                                   DW      BCOMP-ØCH
ØDFA 2Ø Ø5                          LITER    DW      DOCOL
ØDFC C2 Ø6                                   DW      STATE
ØDFE B4 Ø4                                   DW      AT
ØEØØ 9A Ø1                                   DW      ZBRAN    ; IF
ØEØ2 Ø8 ØØ                                   DW      OFFSET LITE1-$
ØEØ4 1E Ø9                                   DW      COMP
ØEØ6 6A Ø1                                   DW      LIT
ØEØ8 3F Ø7                                   DW      COMMA    ; ENDIF
ØEØA 9A Ø3                          LITE1    DW      SEMIS
```

```
                                        EJECT

                                ; ****************
                                ; *   DLITERAL   *
                                ; ****************
                                ;
ØEØC C8                                 DB      ØC8H
ØEØD 44 4C 49 54 45 52                  DB      'DLITERA'
     41
ØE14 CC                                 DB      'L'+8ØH
ØE15 FØ ØD                              DW      LITER-ØAH
ØE17 2Ø Ø5                      DLITE   DW      DOCOL
ØE19 C2 Ø6                              DW      STATE
ØE1B B4 Ø4                              DW      AT
ØE1D 9A Ø1                              DW      ZBRAN   ; IF
ØE1F Ø8 ØØ                              DW      OFFSET DLIT1-$
ØE21 6C Ø4                              DW      SWAP
ØE23 FA ØD                              DW      LITER
ØE25 FA ØD                              DW      LITER   ; ENDIF
ØE27 9A Ø3                      DLIT1   DW      SEMIS

                                ; **************
                                ; *   ?STACK   *
                                ; **************
                                ;
ØE29 86                                 DB      86H
ØE2A 3F 53 54 41 43                     DB      '?STAC'
ØE2F CB                                 DB      'K'+8ØH
ØE3Ø ØC ØE                              DW      DLITE-ØBH
ØE32 2Ø Ø5                      QSTAC   DW      DOCOL
ØE34 5B Ø3                              DW      SPAT
ØE36 15 Ø6                              DW      SZERO
ØE38 B4 Ø4                              DW      AT
ØE3A 6C Ø4                              DW      SWAP
ØE3C 95 Ø7                              DW      ULESS
ØE3E A5 Ø5                              DW      ONE
ØE4Ø 8B Ø8                              DW      QERR
ØE42 5B Ø3                              DW      SPAT
ØE44 23 Ø7                              DW      HERE
ØE46 6A Ø1 8Ø ØØ                        DW      LIT,8ØH
ØE4A Ø6 Ø4                              DW      PLUS
ØE4C 95 Ø7                              DW      ULESS
ØE4E 6A Ø1 Ø7 ØØ                        DW      LIT,7
ØE52 8B Ø8                              DW      QERR
ØE54 9A Ø3                              DW      SEMIS
```

```
                                      EJECT

                              ; ****************
                              ; *   INTERPRET   *
                              ; ****************
                              ;
0E56 89                               DB      89H
0E57 49 4E 54 45 52 50                DB      'INTERPRE'
     52 45
0E5F D4                               DB      'T'+80H
0E60 29 0E                            DW      QSTAC-9
0E62 20 05                    INTER   DW      DOCOL
0E64 E0 0C                    INTE1   DW      DFIND   ; BEGIN
0E66 9A 01                            DW      ZBRAN   ; IF
0E68 1E 00                            DW      OFFSET INTE2-$
0E6A C2 06                            DW      STATE
0E6C B4 04                            DW      AT
0E6E 79 07                            DW      LESS
0E70 9A 01                            DW      ZBRAN   ; IF
0E72 0A 00                            DW      OFFSET INTE3-$
0E74 3F 08                            DW      CFA
0E76 3F 07                            DW      COMMA
0E78 89 01                            DW      BRAN    ; ELSE
0E7A 06 00                            DW      OFFSET INTE4-$
0E7C 3F 08                    INTE3   DW      CFA
0E7E 7A 01                            DW      EXEC    ; ENDIF
0E80 32 0E                    INTE4   DW      QSTAC
0E82 89 01                            DW      BRAN    ; ELSE
0E84 1C 00                            DW      OFFSET INTE5-$
0E86 23 07                    INTE2   DW      HERE
0E88 88 0C                            DW      NUMB
0E8A D7 06                            DW      DPL
0E8C B4 04                            DW      AT
0E8E 07 07                            DW      ONEP
0E90 9A 01                            DW      ZBRAN   ; IF
0E92 08 00                            DW      OFFSET INTE6-$
0E94 17 0E                            DW      DLITE
0E96 89 01                            DW      BRAN    ; ELSE
0E98 06 00                            DW      OFFSET INTE7-$
0E9A 5F 04                    INTE6   DW      DROP
0E9C FA 0D                            DW      LITER   ; ENDIF
0E9E 32 0E                    INTE7   DW      QSTAC   ; ENDIF
0EA0 89 01                    INTE5   DW      BRAN    ; AGAIN
0EA2 C2 FF                            DW      OFFSET INTE1-$
```

```
                                            EJECT

                                    ; *****************
                                    ; *   IMMEDIATE   *
                                    ; *****************
                                    ;
ØEA4 89                                     DB      89H
ØEA5 49 4D 4D 45 44 49                      DB      'IMMEDIAT'
     41 54
ØEAD C5                                     DB      'E'+8ØH
ØEAE 56 ØE                                  DW      INTER-ØCH
ØEBØ 2Ø Ø5                          IMMED   DW      DOCOL
ØEB2 1F Ø8                                  DW      LATES
ØEB4 6A Ø1 4Ø ØØ                            DW      LIT,4ØH
ØEB8 A7 Ø4                                  DW      TOGGL
ØEBA 9A Ø3                                  DW      SEMIS


                                    ; ******************
                                    ; *   VOCABULARY   *
                                    ; ******************
                                    ;
ØEBC 8A                                     DB      8AH
ØEBD 56 4F 43 41 42 55                      DB      'VOCABULAR'
     4C 41 52
ØEC6 D9                                     DB      'Y'+8ØH
ØEC7 A4 ØE                                  DW      IMMED-ØCH
ØEC9 2Ø Ø5                          VOCAB   DW      DOCOL
ØECB C3 Ø9                                  DW      BUILD
ØECD 6A Ø1                                  DW      LIT
ØECF 81 AØ                                  DW      ØAØ81H
ØED1 3F Ø7                                  DW      COMMA
ØED3 B6 Ø6                                  DW      CURR
ØED5 B4 Ø4                                  DW      AT
ØED7 3F Ø8                                  DW      CFA
ØED9 3F Ø7                                  DW      COMMA
ØEDB 23 Ø7                                  DW      HERE
ØEDD 66 Ø6                                  DW      VOCL
ØEDF B4 Ø4                                  DW      AT
ØEE1 3F Ø7                                  DW      COMMA
ØEE3 66 Ø6                                  DW      VOCL
ØEE5 DF Ø4                                  DW      STORE
ØEE7 D3 Ø9                                  DW      DOES
ØEE9 14 Ø7                          DOVOC   DW      TWOP
ØEEB A8 Ø6                                  DW      CONT
ØEED DF Ø4                                  DW      STORE
ØEEF 9A Ø3                                  DW      SEMIS
```

```
                                            EJECT

                                  ; *************
                                  ; *   FORTH   *
                                  ; *************
                                  ;
                                  ; THE 'TASK-7' IS A COLD START VALUE
                                  ; ONLY.  ITS CHANGED EACH TIME A
                                  ; DEFINITION IS APPENED TO THE 'FORTH'
                                  ; VOCABULARY.
                                  ;
ØEF1 C5                                   DB      ØC5H
ØEF2 46 4F 52 54                          DB      'FORT'
ØEF6 C8                                   DB      'H'+8ØH
ØEF7 BC ØE                                DW      VOCAB-ØDH
ØEF9 DF Ø9                        FORTH   DW      DODOE
ØEFB E9 ØE                                DW      DOVOC
ØEFD 81 AØ                                DW      ØAØ81H
ØEFF ØØ 1A                                DW      TASK-7  ; COLD START VALUE ONLY
ØFØ1 ØØ ØØ                                DW      Ø       ; END OF VOCABULARY LIST


                                  ; ******************
                                  ; *   DEFINITIONS   *
                                  ; ******************
                                  ;
ØFØ3 8B                                   DB      8BH
ØFØ4 44 45 46 49 4E 49                    DB      'DEFINITION'
     54 49 4F 4E
ØFØE D3                                   DB      'S'+8ØH
ØFØF F1 ØE                                DW      FORTH-8
ØF11 2Ø Ø5                        DEFIN   DW      DOCOL
ØF13 A8 Ø6                                DW      CONT
ØF15 B4 Ø4                                DW      AT
ØF17 B6 Ø6                                DW      CURR
ØF19 DF Ø4                                DW      STORE
ØF1B 9A Ø3                                DW      SEMIS


                                  ; *********
                                  ; *   (   *
                                  ; *********
                                  ;
ØF1D C1                                   DB      ØC1H
ØF1E A8                                   DB      '('+8ØH
ØF1F Ø3 ØF                                DW      DEFIN-ØEH
ØF21 2Ø Ø5                        PAREN   DW      DOCOL
ØF23 6A Ø1 29 ØØ                          DW      LIT,')'
ØF27 EC ØB                                DW      WORDS
ØF29 9A Ø3                                DW      SEMIS
```

```
                              EJECT

                      ; ************
                      ; *   QUIT   *
                      ; ************
                      ;
ØF2B 84                       DB      84H
ØF2C 51 55 49                 DB      'QUI'
ØF2F D4                       DB      'T'+8ØH
ØF3Ø 1D ØF                    DW      PAREN-4
ØF32 2Ø Ø5            QUIT    DW      DOCOL
ØF34 9D Ø5                    DW      ZERO
ØF36 7Ø Ø6                    DW      BLK
ØF38 DF Ø4                    DW      STORE
ØF3A 34 Ø9                    DW      LBRAC
ØF3C 88 Ø3            QUIT1   DW      RPSTO   ; BEGIN
ØF3E DF Ø2                    DW      CR
ØF4Ø 33 ØB                    DW      QUERY
ØF42 62 ØE                    DW      INTER
ØF44 C2 Ø6                    DW      STATE
ØF46 B4 Ø4                    DW      AT
ØF48 E1 Ø3                    DW      ZEQU
ØF4A 9A Ø1                    DW      ZBRAN   ; IF
ØF4C Ø7 ØØ                    DW      OFFSET QUIT2-$
ØF4E 6B ØA                    DW      PDOTQ
ØF5Ø Ø2                       DB      2
ØF51 4F 4B                    DB      'OK'    ; ENDIF
ØF53 89 Ø1            QUIT2   DW      BRAN    ; AGAIN
ØF55 E7 FF                    DW      OFFSET QUIT1-$


                      ; *************
                      ; *   ABORT   *
                      ; *************
                      ;
ØF57 85                       DB      85H
ØF58 41 42 4F 52              DB      'ABOR'
ØF5C D4                       DB      'T'+8ØH
ØF5D 2B ØF                    DW      QUIT-7
ØF5F 2Ø Ø5            ABORT   DW      DOCOL
ØF61 68 Ø3                    DW      SPSTO
ØF63 7F Ø9                    DW      DECA
ØF65 32 ØE                    DW      QSTAC
ØF67 DF Ø2                    DW      CR
ØF69 A7 19                    DW      DOTCPU
ØF6B 6B ØA                    DW      PDOTQ
ØF6D ØD                       DB      ØDH
ØF6E 46 69 67 2D 46 6F        DB      'Fig-Forth '
     72 74 68 2Ø
ØF78 31 2E 3Ø                 DB      FIGREL+3ØH,ADOT,FIGREV+3ØH
ØF7B F9 ØE                    DW      FORTH
ØF7D 11 ØF                    DW      DEFIN
ØF7F 32 ØF                    DW      QUIT
```

```
                                EJECT

                       ; WARM START VECTOR COMES HERE
                       ;
ØF81 BE 87 ØF          WRM:    MOV     SI,OFFSET WRM1
ØF84 E9 D5 F1                  JMP     NEXT
                       ;
ØF87 9Ø ØF             WRM1    DW      WARM


                       ; ************
                       ; *   WARM   *
                       ; ************
                       ;
ØF89 84                        DB      84H     ; WARM
ØF8A 57 41 52                  DB      'WAR'
ØF8D CD                        DB      'M'+8ØH
ØF8E 57 ØF                     DW      ABORT-8
ØF9Ø 2Ø Ø5             WARM    DW      DOCOL
ØF92 AE 12                     DW      MTBUF
ØF94 5F ØF                     DW      ABORT


                       ; COLD START VECTOR COMES HERE
                       ;
ØF96 BE AF ØF          CLD:    MOV     SI,OFFSET CLD1  ; (IP) <-
ØF99 8C C8                     MOV     AX,CS
ØF9B 8E D8                     MOV     DS,AX           ; SET DATA SEG
ØF9D 2E 8B 26 12 Ø1            MOV     SP,WORD PTR ORIG+12H ; PARAM. STK
ØFA2 8E DØ                     MOV     SS,AX           ; SET STACK SEG
ØFA4 8E CØ                     MOV     ES,AX           ; SET EXTRA SEG
ØFA6 FC                        CLD                     ; DIR = INC
ØFA7 2E 8B 2E 28 Ø1            MOV     BP, RPP         ; RETURN STACK
ØFAC E9 AD F1                  JMP     NEXT
                       ;
ØFAF B8 ØF             CLD1    DW      COLD


                       ; ************
                       ; *   COLD   *
                       ; ************
                       ;
ØFB1 84                        DB      84H
ØFB2 43 4F 4C                  DB      'COL'
ØFB5 C4                        DB      'D'+8ØH
ØFB6 89 ØF                     DW      WARM-7
ØFB8 2Ø Ø5             COLD    DW      DOCOL
ØFBA AE 12                     DW      MTBUF
ØFBC 9D Ø5 43 12               DW      ZERO,DENSTY
ØFCØ DF Ø4                     DW      STORE
ØFC2 D4 Ø5                     DW      FIRST
ØFC4 1Ø 12 DF Ø4               DW      USE,STORE
ØFC8 D4 Ø5                     DW      FIRST
ØFCA 1B 12 DF Ø4               DW      PREV,STORE
ØFCE C2 12                     DW      DRZER
ØFDØ 6A Ø1 ØØ ØØ               DW      LIT,Ø
ØFD4 6A Ø1 97 15               DW      LIT,EPRINT
ØFD8 DF Ø4                     DW      STORE
```

```
 ØFDA 6A Ø1                          DW      LIT
 ØFDC 12 Ø1                          DW      ORIG+12H
 ØFDE 6A Ø1 26 Ø1                    DW      LIT,UP
 ØFE2 B4 Ø4                          DW      AT
 ØFE4 6A Ø1 Ø6 ØØ                    DW      LIT,6
 ØFE8 Ø6 Ø4                          DW      PLUS
 ØFEA 6A Ø1 1Ø ØØ                    DW      LIT,1ØH
 ØFEE EC Ø2                          DW      CMOVE
 ØFFØ 6A Ø1 ØC Ø1                    DW      LIT,ORIG+ØCH
 ØFF4 B4 Ø4                          DW      AT
 ØFF6 6A Ø1 FF ØE                    DW      LIT,FORTH+6
 ØFFA DF Ø4                          DW      STORE
 ØFFC 5F ØF                          DW      ABORT
```

```
                                  EJECT

                           ; ************
                           ; *   S->D   *
                           ; ************
                           ;
ØFFE 84                           DB      84H
ØFFF 53 2D 3E                     DB      'S->'
1ØØ2 C4                           DB      'D'+8ØH
1ØØ3 B1 ØF                        DW      COLD-7
1ØØ5 Ø7 1Ø                 STOD   DW      $+2
1ØØ7 5A                           POP     DX                  ; S1
1ØØ8 2B CØ                        SUB     AX,AX               ; AX = Ø
1ØØA ØB D2                        OR      DX,DX               ; SET FLAGS
1ØØC 79 Ø1                        JNS     STOD1               ; POSITIVE NUMBER
1ØØE 48                           DEC     AX                  ; NEGITIVE NUMBER
1ØØF E9 48 F1              STOD1: JMP     DPUSH


                           ; **********
                           ; *   +-   *
                           ; **********
                           ;
1Ø12 82                           DB      82H
1Ø13 2B                           DB      '+'
1Ø14 AD                           DB      '-'+8ØH
1Ø15 FE ØF                        DW      STOD-7
1Ø17 2Ø Ø5                 PM     DW      DOCOL
1Ø19 F4 Ø3                        DW      ZLESS
1Ø1B 9A Ø1                        DW      ZBRAN    ; IF
1Ø1D Ø4 ØØ                        DW      OFFSET PM1-$
1Ø1F 29 Ø4                        DW      MINUS    ; ENDIF
1Ø21 9A Ø3                 PM1    DW      SEMIS


                           ; ***********
                           ; *   D+-   *
                           ; ***********
                           ;
1Ø23 83                           DB      83H
1Ø24 44 2B                        DB      'D+'
1Ø26 AD                           DB      '-'+8ØH
1Ø27 12 1Ø                        DW      PM-5
1Ø29 2Ø Ø5                 DPM    DW      DOCOL
1Ø2B F4 Ø3                        DW      ZLESS
1Ø2D 9A Ø1                        DW      ZBRAN    ; IF
1Ø2F Ø4 ØØ                        DW      OFFSET DPM1-$
1Ø31 3A Ø4                        DW      DMINU    ; ENDIF
1Ø33 9A Ø3                 DPM1   DW      SEMIS


                           ; ***********
                           ; *   ABS   *
                           ; ***********
                           ;
1Ø35 83                           DB      83H
1Ø36 41 42                        DB      'AB'
1Ø38 D3                           DB      'S'+8ØH
```

```
  1Ø39 23 1Ø                             DW      DPM-6
  1Ø3B 2Ø Ø5                     ABS     DW      DOCOL
  1Ø3D 79 Ø4                             DW      DUP
  1Ø3F 17 1Ø                             DW      PM
  1Ø41 9A Ø3                             DW      SEMIS

                                 ; ************
                                 ; *   DABS   *
                                 ; ************
                                 ;
  1Ø43 84                                DB      84H
  1Ø44 44 41 42                          DB      'DAB'
  1Ø47 D3                                DB      'S'+8ØH
  1Ø48 35 1Ø                             DW      ABS-6
  1Ø4A 2Ø Ø5                     DABS    DW      DOCOL
  1Ø4C 79 Ø4                             DW      DUP
  1Ø4E 29 1Ø                             DW      DPM
  1Ø5Ø 9A Ø3                             DW      SEMIS

                                 ; ***********
                                 ; *   MIN   *
                                 ; ***********
                                 ;
  1Ø52 83                                DB      83H
  1Ø53 4D 49                             DB      'MI'
  1Ø55 CE                                DB      'N'+8ØH
  1Ø56 43 1Ø                             DW      DABS-7
  1Ø58 2Ø Ø5 87 Ø4               MIN     DW      DOCOL,TDUP
  1Ø5C B5 Ø7                             DW      GREAT
  1Ø5E 9A Ø1                             DW      ZBRAN    ; IF
  1Ø6Ø Ø4 ØØ                             DW      OFFSET MIN1-$
  1Ø62 6C Ø4                             DW      SWAP      ; ENDIF
  1Ø64 5F Ø4                     MIN1    DW      DROP
  1Ø66 9A Ø3                             DW      SEMIS

                                 ; ***********
                                 ; *   MAX   *
                                 ; ***********
                                 ;
  1Ø68 83                                DB      83H
  1Ø69 4D 41                             DB      'MA'
  1Ø6B D8                                DB      'X'+8ØH
  1Ø6C 52 1Ø                             DW      MIN-6
  1Ø6E 2Ø Ø5 87 Ø4               MAX     DW      DOCOL,TDUP
  1Ø72 79 Ø7                             DW      LESS
  1Ø74 9A Ø1                             DW      ZBRAN    ; IF
  1Ø76 Ø4 ØØ                             DW      OFFSET MAX1-$
  1Ø78 6C Ø4                             DW      SWAP      ; ENDIF
  1Ø7A 5F Ø4                     MAX1    DW      DROP
  1Ø7C 9A Ø3                             DW      SEMIS
```

```
                                          EJECT

                                 ; **********
                                 ; *   M*   *
                                 ; **********
                                 ;
 107E 82                                  DB      82H
 107F 4D                                  DB      'M'
 1080 AA                                  DB      '*'+80H
 1081 68 10                               DW      MAX-6
 1083 20 05 87 04                MSTAR    DW      DOCOL,TDUP
 1087 4C 03                               DW      XORR
 1089 BC 03                               DW      TOR
 108B 3B 10                               DW      ABS
 108D 6C 04                               DW      SWAP
 108F 3B 10                               DW      ABS
 1091 04 03                               DW      USTAR
 1093 CC 03                               DW      FROMR
 1095 29 10                               DW      DPM
 1097 9A 03                               DW      SEMIS


                                 ; **********
                                 ; *   M/   *
                                 ; **********
                                 ;
 1099 82                                  DB      82H
 109A 4D                                  DB      'M'
 109B AF                                  DB      '/'+80H
 109C 7E 10                               DW      MSTAR-5
 109E 20 05                      MSLAS    DW      DOCOL
 10A0 50 04                               DW      OVER
 10A2 BC 03                               DW      TOR
 10A4 BC 03                               DW      TOR
 10A6 4A 10                               DW      DABS
 10A8 DA 03                               DW      RR
 10AA 3B 10                               DW      ABS
 10AC 13 03                               DW      USLAS
 10AE CC 03                               DW      FROMR
 10B0 DA 03                               DW      RR
 10B2 4C 03                               DW      XORR
 10B4 17 10                               DW      PM
 10B6 6C 04                               DW      SWAP
 10B8 CC 03                               DW      FROMR
 10BA 17 10                               DW      PM
 10BC 6C 04                               DW      SWAP
 10BE 9A 03                               DW      SEMIS


                                 ; *********
                                 ; *   *   *
                                 ; *********
                                 ;
 10C0 81                                  DB      81H
 10C1 AA                                  DB      '*'+80H
 10C2 99 10                               DW      MSLAS-5
 10C4 20 05                      STAR     DW      DOCOL
 10C6 83 10                               DW      MSTAR
```

```
10C8 5F 04                     DW      DROP
10CA 9A 03                     DW      SEMIS


                       ; ************
                       ; *   /MOD   *
                       ; ************
                       ;
10CC 84                        DB      84H
10CD 2F 4D 4F                  DB      '/MO'
10D0 C4                        DB      'D'+80H
10D1 C0 10                     DW      STAR-4
10D3 20 05             SLMOD   DW      DOCOL
10D5 BC 03                     DW      TOR
10D7 05 10                     DW      STOD
10D9 CC 03                     DW      FROMR
10DB 9E 10                     DW      MSLAS
10DD 9A 03                     DW      SEMIS


                       ; *********
                       ; *   /   *
                       ; *********
                       ;
10DF 81                        DB      81H
10E0 AF                        DB      '/'+80H
10E1 CC 10                     DW      SLMOD-7
10E3 20 05             SLASH   DW      DOCOL
10E5 D3 10                     DW      SLMOD
10E7 6C 04                     DW      SWAP
10E9 5F 04                     DW      DROP
10EB 9A 03                     DW      SEMIS


                       ; ***********
                       ; *   MOD   *
                       ; ***********
                       ;
10ED 83                        DB      83H
10EE 4D 4F                     DB      'MO'
10F0 C4                        DB      'D'+80H
10F1 DF 10                     DW      SLASH-4
10F3 20 05             MODD    DW      DOCOL
10F5 D3 10                     DW      SLMOD
10F7 5F 04                     DW      DROP
10F9 9A 03                     DW      SEMIS


                       ; *************
                       ; *   */MOD   *
                       ; *************
                       ;
10FB 85                        DB      85H
10FC 2A 2F 4D 4F               DB      '*/MO'
1100 C4                        DB      'D'+80H
1101 ED 10                     DW      MODD-6
1103 20 05             SSMOD   DW      DOCOL
1105 BC 03                     DW      TOR
```

```
 11Ø7 83 1Ø                       DW      MSTAR
 11Ø9 CC Ø3                       DW      FROMR
 11ØB 9E 1Ø                       DW      MSLAS
 11ØD 9A Ø3                       DW      SEMIS


                          ; **********
                          ; *   */   *
                          ; **********
                          ;
 11ØF 82                          DB      82H
 111Ø 2A                          DB      '*'
 1111 AF                          DB      '/'+8ØH
 1112 FB 1Ø                       DW      SSMOD-8
 1114 2Ø Ø5               SSLA    DW      DOCOL
 1116 Ø3 11                       DW      SSMOD
 1118 6C Ø4                       DW      SWAP
 111A 5F Ø4                       DW      DROP
 111C 9A Ø3                       DW      SEMIS


                          ; *************
                          ; *   M/MOD   *
                          ; *************
                          ;
 111E 85                          DB      85H
 111F 4D 2F 4D 4F                 DB      'M/MO'
 1123 C4                          DB      'D'+8ØH
 1124 ØF 11                       DW      SSLA-5
 1126 2Ø Ø5               MSMOD   DW      DOCOL
 1128 BC Ø3                       DW      TOR
 112A 9D Ø5                       DW      ZERO
 112C DA Ø3                       DW      RR
 112E 13 Ø3                       DW      USLAS
 113Ø CC Ø3                       DW      FROMR
 1132 6C Ø4                       DW      SWAP
 1134 BC Ø3                       DW      TOR
 1136 13 Ø3                       DW      USLAS
 1138 CC Ø3                       DW      FROMR
 113A 9A Ø3                       DW      SEMIS
```

```
                                        EJECT

                              ; *************
                              ; *   (LINE)    *
                              ; *************
                              ;
 113C 86                              DB       86H
 113D 28 4C 49 4E 45                  DB       '(LINE'
 1142 A9                              DB       ')'+80H
 1143 1E 11                           DW       MSMOD-8
 1145 20 05                   PLINE   DW       DOCOL
 1147 BC 03                           DW       TOR
 1149 6A 01 40 00                     DW       LIT,64
 114D EC 05                           DW       BBUF
 114F 03 11                           DW       SSMOD
 1151 CC 03                           DW       FROMR
 1153 F8 05                           DW       BSCR
 1155 C4 10                           DW       STAR
 1157 06 04                           DW       PLUS
 1159 3F 13                           DW       BLOCK
 115B 06 04                           DW       PLUS
 115D 6A 01 40 00                     DW       LIT,64
 1161 9A 03                           DW       SEMIS


                              ; ************
                              ; *   .LINE   *
                              ; ************
                              ;
 1163 85                              DB       85H
 1164 2E 4C 49 4E                     DB       '.LIN'
 1168 C5                              DB       'E'+80H
 1169 3C 11                           DW       PLINE-9
 116B 20 05                   DLINE   DW       DOCOL
 116D 45 11                           DW       PLINE
 116F 38 0A                           DW       DTRAI
 1171 0A 0A                           DW       TYPES
 1173 9A 03                           DW       SEMIS



                              ; **************
                              ; *   MESSAGE   *
                              ; **************
                              ;
 1175 87                              DB       87H
 1176 4D 45 53 53 41 47               DB       'MESSAG'
 117C C5                              DB       'E'+80H
 117D 63 11                           DW       DLINE-8
 117F 20 05                   MESS    DW       DOCOL
 1181 42 06                           DW       WARN
 1183 B4 04                           DW       AT
 1185 9A 01                           DW       ZBRAN    ; IF
 1187 1E 00                           DW       OFFSET MESS1-$
 1189 E3 07                           DW       DDUP
 118B 9A 01                           DW       ZBRAN    ; IF
 118D 14 00                           DW       OFFSET MESS2-$
 118F 6A 01 04 00                     DW       LIT,4
```

```
1193 9A Ø6                      DW      OFSET
1195 B4 Ø4                      DW      AT
1197 F8 Ø5                      DW      BSCR
1199 E3 1Ø                      DW      SLASH
119B 6Ø Ø7                      DW      SUBB
119D 6B 11                      DW      DLINE
119F D4 Ø7                      DW      SPACE    ; ENDIF
11A1 89 Ø1               MESS2  DW      BRAN     ; ELSE
11A3 ØD ØØ                      DW      OFFSET MESS3-$
11A5 6B ØA               MESS1  DW      PDOTQ
11A7 Ø6                         DB      6
11A8 4D 53 47 2Ø 23 2Ø          DB      'MSG # '
11AE 62 18                      DW      DOT      ; ENDIF
11BØ 9A Ø3               MESS3  DW      SEMIS
```

```
                                  EJECT

                           ;------------------------------------------
                           ;
                           ;      8Ø86/88 PORT FETCH AND STORE
                           ;


                           ; ***********
                           ; *   PC@   *
                           ; ***********
                           ;
                           ; FETCH CHARACTER (BYTE) FROM PORT.
                           ;
11B2 83                           DB      83H
11B3 5Ø 43                        DB      'PC'
11B5 CØ                           DB      '@'+8ØH
11B6 75 11                        DW      MESS-ØAH
11B8 BA 11                 PTCAT  DW      $+2
11BA 5A                           POP     DX        ; PORT ADDR
11BB EC                           IN      AL,DX     ; BYTE INPUT
11BC 2A E4                        SUB     AH,AH     ; ZERO AH
11BE E9 9A EF                     JMP     APUSH


                           ; ***********
                           ; *   PC!   *
                           ; ***********
                           ;
                           ; STORE CHARACTER (BYTE) AT PORT.
                           ;
11C1 83                           DB      83H
11C2 5Ø 43                        DB      'PC'
11C4 A1                           DB      '!'+8ØH
11C5 B2 11                        DW      PTCAT-6
11C7 C9 11                 PTCSTO DW      $+2
11C9 5A                           POP     DX        ; PORT ADDR
11CA 58                           POP     AX        ; DATA
11CB EE                           OUT     DX,AL     ; BYTE OUTPUT
11CC E9 8D EF                     JMP     NEXT


                           ; **********
                           ; *   P@   *
                           ; **********
                           ;
                           ; FETCH WORD FROM PORT.
                           ;
11CF 82                           DB      82H
11DØ 5Ø                           DB      'P'
11D1 CØ                           DB      '@'+8ØH
11D2 C1 11                        DW      PTCSTO-6
11D4 D6 11                 PTAT   DW      $+2
11D6 5A                           POP     DX        ; PORT ADDR
11D7 ED                           IN      AX,DX     ; WORD INPUT
11D8 E9 8Ø EF                     JMP     APUSH
```

```
                             ; ***********
                             ; *   PC!   *
                             ; ***********
                             ;
                             ; STORE WORD AT PORT.
                             ;
 11DB 82                            DB      82H
 11DC 5Ø                            DB      'P'
 11DD A1                            DB      '!'+8ØH
 11DE CF 11                         DW      PTAT-5
 11EØ E2 11                  PTSTO  DW      $+2
 11E2 5A                            POP     DX      ; PORT ADDR
 11E3 58                            POP     AX      ; DATA
 11E4 EF                            OUT     DX,AX   ; WORD OUTPUT
 11E5 E9 74 EF                      JMP     NEXT
```

```
                                      EJECT
                               ;---------------------------------------------
                               ;
                               ; DISK INTERFACE WORDS
                               ;
                               ;
                               ; DOUBLE DENSITY 8" FLOPPY CAPACITIES
                               ;
   ØØ34                        SPT2    EQU     52        ; SECTORS PER TRACK
   ØØ4D                        TRKS2   EQU     77        ; NUMBER OF TRACKS
   ØFA4                        SPDRV2  EQU     SPT2*TRKS2        ; SECTORS/DRIVE
                               ;
                               ; SINGLE DENSITY 8" FLOPPY CAPACITIES
                               ;
   ØØ1A                        SPT1    EQU     26        ; SECTORS/TRACK
   ØØ4D                        TRKS1   EQU     77        ; # TRACKS
   Ø7D2                        SPDRV1  EQU     SPT1*TRKS1        ; SECTORS/DRIVE
                               ;
   ØØ8Ø                        BPS     EQU     128       ; BYTES PER SECTOR
   ØØØ2                        MXDRV   EQU     2         ; MAX # DRIVES
                               ;
                               ;
                               ; FORTH VARIABLES AND CONSTANTS
                               ; USED IN THE DISK INTERFACE.
                               ;

                               ; *************
                               ; *   DRIVE   *
                               ; *************
                               ;
                               ; CURRENT DRIVE NUMBER
                               ;
 11E8 85                               DB      85H
 11E9 44 52 49 56                      DB      'DRIV'
 11ED C5                               DB      'E'+8ØH
 11EE DB 11                            DW      PTSTO-5
 11FØ 76 Ø5 ØØ ØØ              DRIVE   DW      DOVAR,Ø


                               ; ***********
                               ; *   SEC   *
                               ; ***********
                               ;
                               ; CURRENT SECTOR NUMBER
                               ;
 11F4 83                               DB      83H
 11F5 53 45                            DB      'SE'
 11F7 C3                               DB      'C'+8ØH
 11F8 E8 11                            DW      DRIVE-8
 11FA 76 Ø5                    SEC     DW      DOVAR
 11FC ØØ ØØ                            DW      Ø
```

```
                                        EJECT

                                ; *************
                                ; *   TRACK    *
                                ; *************
                                ;
                                ; CURRENT TRACK NUMBER
                                ;
 11FE 85                                DB      85H
 11FF 54 52 41 43                       DB      'TRAC'
 12Ø3 CB                                DB      'K'+8ØH
 12Ø4 F4 11                             DW      SEC-6
 12Ø6 76 Ø5 ØØ ØØ               TRACK   DW      DOVAR,Ø


                                ; ***********
                                ; *   USE   *
                                ; ***********
                                ;
                                ; ADDRESS OF NEXT BUFFER TO USE
                                ;
 12ØA 83                                DB      83H
 12ØB 55 53                             DB      'US'
 12ØD C5                                DB      'E'+8ØH
 12ØE FE 11                             DW      TRACK-8
 121Ø 76 Ø5                     USE     DW      DOVAR
 1212 EØ 3B                             DW      BUF1


                                ; ************
                                ; *   PREV   *
                                ; ************
                                ;
                                ; ADDRESS OF PREVIOUSLY USED BUFFER
                                ;
 1214 84                                DB      84H
 1215 5Ø 52 45                          DB      'PRE'
 1218 D6                                DB      'V'+8ØH
 1219 ØA 12                             DW      USE-6
 121B 76 Ø5                     PREV    DW      DOVAR
 121D EØ 3B                             DW      BUF1


                                ; ***************
                                ; *   SEC/BLK   *
                                ; ***************
                                ;
                                ; NUMBER OF SECTORS PER BLOCK
                                ;
 121F 87                                DB      87H
 122Ø 53 45 43 2F 42 4C                 DB      'SEC/BL'
 1226 CB                                DB      'K'+8ØH
 1227 14 12                             DW      PREV-7
 1229 5D Ø5                     SPBLK   DW      DOCON
 122B Ø1 ØØ                             DW      KBBUF/BPS
```

```
                                        EJECT

                                ; *************
                                ; *   #BUFF   *
                                ; *************
                                ;
                                ; NUMBER OF BUFFERS
                                ;
1220 85                                 DB      85H
122E 23 42 55 46                        DB      '#BUF'
1232 C6                                 DB      'F'+8ØH
1233 1F 12                              DW      SPBLK-1Ø
1235 5D Ø5 Ø8 ØØ                NOBUF   DW      DOCON,NBUF


                                ; ***************
                                ; *   DENSITY   *
                                ; ***************
                                ;
                                ; Ø = SINGLE, 1 = DOUBLE
                                ;
1239 87                                 DB      87H
123A 44 45 4E 53 49 54                  DB      'DENSIT'
124Ø D9                                 DB      'Y'+8ØH
1241 2D 12                              DW      NOBUF-8
1243 76 Ø5                      DENSTY  DW      DOVAR
1245 ØØ ØØ                              DW      Ø


                                ; ******************
                                ; *   DISK-ERROR   *
                                ; ******************
                                ;
                                ; DISK ERROR STATUS
                                ;
1247 8A                                 DB      8AH
1248 44 49 53 4B 2D 45                  DB      'DISK-ERRO'
     52 52 4F
1251 D2                                 DB      'R'+8ØH
1252 39 12                              DW      DENSTY-1Ø
1254 76 Ø5 ØØ ØØ                DSKERR  DW      DOVAR,Ø
```

```
                                             EJECT

                                  ; ************
                                  ; *   +BUF   *
                                  ; ************
                                  ;
 1258 84                                     DB        84H
 1259 2B 42 55                               DB        '+BU'
 125C C6                                     DB        'F'+80H
 125D 47 12                                  DW        DSKERR-13
 125F 20 05                       PBUF       DW        DOCOL
 1261 6A 01 84 00                            DW        LIT,CO
 1265 06 04 79 04                            DW        PLUS,DUP
 1269 E0 05 6D 07                            DW        LIMIT,EQUAL
 126D 9A 01                                  DW        ZBRAN
 126F 06 00                                  DW        OFFSET PBUF1-$
 1271 5F 04 D4 05                            DW        DROP,FIRST
 1275 79 04 1B 12                 PBUF1      DW        DUP,PREV
 1279 B4 04 60 07                            DW        AT,SUBB
 127D 9A 03                                  DW        SEMIS

                                  ; **************
                                  ; *   UPDATE   *
                                  ; **************
                                  ;
 127F 86                                     DB        86H
 1280 55 50 44 41 54                         DB        'UPDAT'
 1285 C5                                     DB        'E'+80H
 1286 58 12                                  DW        PBUF-7
 1288 20 05 1B 12                 UPDAT      DW        DOCOL,PREV
 128C B4 04 B4 04                            DW        AT,AT
 1290 6A 01 00 80                            DW        LIT,8000H
 1294 3D 03                                  DW        ORR
 1296 1B 12 B4 04                            DW        PREV,AT
 129A DF 04 9A 03                            DW        STORE,SEMIS

                                  ; *********************
                                  ; *   EMPTY-BUFFERS   *
                                  ; *********************
                                  ;
 129E 8D                                     DB        8DH
 129F 45 4D 50 54 59 2D                      DB        'EMPTY-BUFFER'
      42 55 46 46 45 52
 12AB D3                                     DB        'S'+80H
 12AC 7F 12                                  DW        UPDAT-9
 12AE 20 05 D4 05                 MTBUF      DW        DOCOL,FIRST
 12B2 E0 05 50 04                            DW        LIMIT,OVER
 12B6 60 07 A1 0B                            DW        SUBB,ERASEE
 12BA 9A 03                                  DW        SEMIS
```

```
                                     EJECT

                              ; ***********
                              ; *   DRØ   *
                              ; ***********
                              ;
 12BC 83                              DB      83H
 12BD 44 52                           DB      'DR'
 12BF BØ                              DB      'Ø'+8ØH
 12CØ 9E 12                           DW      MTBUF-16
 12C2 2Ø Ø5 9D Ø5             DRZER   DW      DOCOL,ZERO
 12C6 9A Ø6 DF Ø4                     DW      OFSET,STORE
 12CA 9A Ø3                           DW      SEMIS


                              ; ***********
                              ; *   DR1   *
                              ; ***********
                              ;
 12CC 83                              DB      83H
 12CD 44 52                           DB      'DR'
 12CF B1                              DB      '1'+8ØH
 12DØ BC 12                           DW      DRZER-6
 12D2 2Ø Ø5                   DRONE   DW      DOCOL
 12D4 43 12 B4 Ø4                     DW      DENSTY,AT
 12D8 9A Ø1                           DW      ZBRAN
 12DA ØA ØØ                           DW      OFFSET DRON1-$
 12DC 6A Ø1 A4 ØF                     DW      LIT,SPDRV2
 12EØ 89 Ø1                           DW      BRAN
 12E2 Ø6 ØØ                           DW      OFFSET DRON2-$
 12E4 6A Ø1 D2 Ø7             DRON1   DW      LIT,SPDRV1
 12E8 9A Ø6 DF Ø4             DRON2   DW      OFSET,STORE
 12EC 9A Ø3                           DW      SEMIS
```

```
                               EJECT
                       ; **************
                       ; *   BUFFER   *
                       ; **************
                       ;
                       ; NOTE:  THIS WORD WON'T WORK IF ONLY
                       ;        USING SINGLE BUFFER.
                       ;
12EE 86                        DB      86H
12EF 42 55 46 46 45            DB      'BUFFE'
12F4 D2                        DB      'R'+80H
12F5 CC 12                     DW      DRONE-6
12F7 20 05 10 12       BUFFE   DW      DOCOL,USE
12FB B4 04 79 04               DW      AT,DUP
12FF BC 03                     DW      TOR
1301 5F 12             BUFF1   DW      PBUF
1303 9A 01                     DW      ZBRAN
1305 FC FF                     DW      OFFSET BUFF1-$
1307 10 12 DF 04               DW      USE,STORE
130B DA 03 B4 04               DW      RR,AT
130F F4 03                     DW      ZLESS
1311 9A 01                     DW      ZBRAN
1313 14 00                     DW      OFFSET BUFF2-$
1315 DA 03 14 07               DW      RR,TWOP
1319 DA 03 B4 04               DW      RR,AT
131D 6A 01 FF 7F               DW      LIT,7FFFH
1321 2F 03 9D 05               DW      ANDD,ZERO
1325 94 14                     DW      RSLW
1327 DA 03 DF 04       BUFF2   DW      RR,STORE
132B DA 03 1B 12               DW      RR,PREV
132F DF 04 CC 03               DW      STORE,FROMR
1333 14 07 9A 03               DW      TWOP,SEMIS
```

```
                               EJECT

                       ; *************
                       ; *   BLOCK   *
                       ; *************
                       ;
1337 85                        DB      85H
1338 42 4C 4F 43               DB      'BLOC'
133C CB                        DB      'K'+80H
133D EE 12                     DW      BUFFE-9
133F 20 05 9A 06       BLOCK   DW      DOCOL,OFSET
1343 B4 04 06 04               DW      AT,PLUS
1347 BC 03 1B 12               DW      TOR,PREV
134B B4 04 79 04               DW      AT,DUP
134F B4 04 DA 03               DW      AT,RR
1353 60 07                     DW      SUBB
1355 79 04 06 04               DW      DUP,PLUS
1359 9A 01                     DW      ZBRAN
135B 34 00                     DW      OFFSET BLOC1-$
135D 5F 12 E1 03       BLOC2   DW      PBUF,ZEQU
1361 9A 01                     DW      ZBRAN
1363 14 00                     DW      OFFSET BLOC3-$
1365 5F 04 DA 03               DW      DROP,RR
1369 F7 12 79 04               DW      BUFFE,DUP
136D DA 03 A5 05               DW      RR,ONE
1371 94 14                     DW      RSLW
1373 AD 05 60 07               DW      TWO,SUBB
1377 79 04 B4 04       BLOC3   DW      DUP,AT
137B DA 03 60 07               DW      RR,SUBB
137F 79 04 06 04               DW      DUP,PLUS
1383 E1 03                     DW      ZEQU
1385 9A 01                     DW      ZBRAN
1387 D6 FF                     DW      OFFSET BLOC2-$
1389 79 04 1B 12               DW      DUP,PREV
138D DF 04                     DW      STORE
138F CC 03 5F 04       BLOC1   DW      FROMR,DROP
1393 14 07 9A 03               DW      TWOP,SEMIS
```

```
                                          EJECT

                                  ; **************
                                  ; *   SET-IO   *
                                  ; **************
                                  ;
                                  ; SETS:  DMA OFFSET, DMA SEGMENT
                                  ;        TRACK AND SECTOR.
                                  ;
 1397 86                                  DB      86H
 1398 53 45 54 2D 49                      DB      'SET-I'
 139D CF                                  DB      'O'+8ØH
 139E 37 13                               DW      BLOCK-8
 13AØ A2 13                       SETIO   DW      $+2
 13A2 2E 8B ØE 12 12                      MOV     CX,USE+2          ; DMA OFFSET
 13A7 E8 45 Ø2                            CALL    SDMAO             ; SET IT
 13AA 8C C9                               MOV     CX,CS             ; GET SEGMENT
 13AC E8 45 Ø2                            CALL    SDMAS             ; SET IT
 13AF 2E 8B ØE FC 11                      MOV     CX,SEC+2          ; SECTOR #
 13B4 E8 33 Ø2                            CALL    SSEC              ; SET IT
 13B7 2E 8B ØE Ø8 12                      MOV     CX,TRACK+2        ; TRACK #
 13BC E8 26 Ø2                            CALL    STRK              ; SET IT
 13BF E9 9A ED                            JMP     NEXT


                                  ; ****************
                                  ; *   SET-DRIVE   *
                                  ; ****************
                                  ;
 13C2 89                                  DB      89H
 13C3 53 45 54 2D 44 52                   DB      'SET-DRIV'
      49 56
 13CB C5                                  DB      'E'+8ØH
 13CC 97 13                               DW      SETIO-9
 13CE DØ 13                       SETDRV  DW      $+2
 13DØ 2E 8B ØE F2 11                      MOV     CX,DRIVE+2
 13D5 E8 Ø8 Ø2                            CALL    SDSK     ; SELECT DISK
 13D8 E9 81 ED                            JMP     NEXT
```

```
                                                EJECT

                                ; ***************
                                ; *   T&SCALC    *
                                ; ***************
                                ;
                                ; (CALCULATES DRIVE#, TRACK#, & SECTOR# )
                                ; STACK:  SECTOR-DISPLACEMENT = BLK# * SEC/BLK
                                ; OUTPUT: VARIABLES DRIVE, TRACK, & SEC
                                ;
13DB 87                                 DB      87H
13DC 54 26 53 43 41 4C                  DB      'T&SCAL'
13E2 C3                                 DB      'C'+8ØH
13E3 C2 13                              DW      SETDRV-12
13E5 2Ø Ø5 43 12                TSCALC  DW      DOCOL,DENSTY
13E9 B4 Ø4                              DW      AT
13EB 9A Ø1                              DW      ZBRAN
13ED 38 ØØ                              DW      OFFSET TSCALS-$
13EF 6A Ø1 A4 ØF                        DW      LIT,SPDRV2
13F3 D3 1Ø                              DW      SLMOD
13F5 6A Ø1 Ø2 ØØ 58 1Ø                  DW      LIT,MXDRV,MIN
13FB 79 Ø4 FØ 11                        DW      DUP,DRIVE
13FF B4 Ø4 6D Ø7                        DW      AT,EQUAL
14Ø3 9A Ø1                              DW      ZBRAN
14Ø5 Ø8 ØØ                              DW      OFFSET TSCAL1-$
14Ø7 5F Ø4                              DW      DROP
14Ø9 89 Ø1                              DW      BRAN
14ØB Ø8 ØØ                              DW      OFFSET TSCAL2-$
14ØD FØ 11 DF Ø4                TSCAL1  DW      DRIVE,STORE
1411 CE 13                              DW      SETDRV
1413 6A Ø1 34 ØØ                TSCAL2  DW      LIT,SPT2
1417 D3 1Ø Ø6 12                        DW      SLMOD,TRACK
141B DF Ø4 Ø7 Ø7                        DW      STORE,ONEP
141F FA 11 DF Ø4                        DW      SEC,STORE
1423 9A Ø3                              DW      SEMIS

                                ;       SINGLE DENSITY
                                ;
1425 6A Ø1 D2 Ø7                TSCALS  DW      LIT,SPDRV1
1429 D3 1Ø                              DW      SLMOD
142B 6A Ø1 Ø2 ØØ 58 1Ø                  DW      LIT,MXDRV,MIN
1431 79 Ø4 FØ 11                        DW      DUP,DRIVE
1435 B4 Ø4 6D Ø7                        DW      AT,EQUAL
1439 9A Ø1                              DW      ZBRAN
143B Ø8 ØØ                              DW      OFFSET TSCAL3-$
143D 5F Ø4                              DW      DROP
143F 89 Ø1                              DW      BRAN
1441 Ø8 ØØ                              DW      OFFSET TSCAL4-$
1443 FØ 11 DF Ø4                TSCAL3  DW      DRIVE,STORE
1447 CE 13                              DW      SETDRV
1449 6A Ø1 1A ØØ                TSCAL4  DW      LIT,SPT1
144D D3 1Ø Ø6 12                        DW      SLMOD,TRACK
1451 DF Ø4 Ø7 Ø7                        DW      STORE,ONEP
1455 FA 11 DF Ø4                        DW      SEC,STORE
1459 9A Ø3                              DW      SEMIS
```

```
                                        EJECT

                                ; ****************
                                ; *   SEC-READ   *
                                ; ****************
                                ;
                                ; READ A SECTOR
                                ;
 145B 88                                DB      88H
 145C 53 45 43 2D 52 45                 DB      'SEC-REA'
      41
 1463 C4                                DB      'D'+8ØH
 1464 DB 13                             DW      TSCALC-1Ø
 1466 68 14                     SECRD   DW      $+2
 1468 E8 8E Ø1                          CALL    GSEC     ; GET (READ) SECTOR
 146B B4 ØØ                             MOV     AH,Ø
 146D 2E A3 56 12                       MOV     DSKERR+2,AX ; SAVE ERROR STATUS
 1471 E9 E8 EC                          JMP     NEXT


                                ; *****************
                                ; *   SEC-WRITE   *
                                ; *****************
                                ;
                                ; WRITE A SECTOR
                                ;
 1474 89                                DB      89H
 1475 53 45 43 2D 57 52                 DB      'SEC-WRIT'
      49 54
 147D C5                                DB      'E'+8ØH
 147E 5B 14                             DW      SECRD-11
 148Ø 82 14                     SECWT   DW      $+2
 1482 E8 79 Ø1                          CALL    PSEC     ; PUT (WRITE) SECTOR
 1485 B4 ØØ                             MOV     AH,Ø
 1487 2E A3 56 12                       MOV     DSKERR+2,AX ; SAVE ERROR STATUS
 148B E9 CE EC                          JMP     NEXT
```

```
                                EJECT
                        ; ***********
                        ; *   R/W   *
                        ; ***********
                        ;
                        ; DISK READ/WRITE ROUTINE
                        ;
148E 83                         DB      83H
148F 52 2F                      DB      'R/'
1491 D7                         DB      'W'+8ØH
1492 74 14                      DW      SECWT-12
1494 2Ø Ø5              RSLW    DW      DOCOL
1496 1Ø 12 B4 Ø4                DW      USE,AT
149A BC Ø3                      DW      TOR
149C 6C Ø4 29 12                DW      SWAP,SPBLK
14AØ C4 1Ø C3 Ø7                DW      STAR,ROT
14A4 1Ø 12 DF Ø4                DW      USE,STORE
14A8 29 12 9D Ø5                DW      SPBLK,ZERO
14AC EØ Ø1                      DW      XDO
14AE 5Ø Ø4 5Ø Ø4        RSLW1   DW      OVER,OVER
14B2 E5 13 AØ 13                DW      TSCALC,SETIO
14B6 9A Ø1                      DW      ZBRAN
14B8 Ø8 ØØ                      DW      OFFSET RSLW2-$
14BA 66 14                      DW      SECRD
14BC 89 Ø1                      DW      BRAN
14BE Ø4 ØØ                      DW      OFFSET RSLW3-$
14CØ 8Ø 14              RSLW2   DW      SECWT
14C2 Ø7 Ø7              RSLW3   DW      ONEP
14C4 6A Ø1 8Ø ØØ                DW      LIT,8ØH
14C8 1Ø 12 95 Ø4                DW      USE,PSTOR
14CC AF Ø1                      DW      XLOOP
14CE EØ FF                      DW      OFFSET RSLW1-$
14DØ 5F Ø4 5F Ø4                DW      DROP,DROP
14D4 CC Ø3 1Ø 12                DW      FROMR,USE
14D8 DF Ø4 9A Ø3                DW      STORE,SEMIS
```

```
                                       EJECT

                              ; *************
                              ; *   FLUSH   *
                              ; *************
                              ;
 14DC 85                              DB      85H
 14DD 46 4C 55 53                     DB      'FLUS'
 14E1 C8                              DB      'H'+8ØH
 14E2 8E 14                           DW      RSLW-6
 14E4 2Ø Ø5                   FLUSH   DW      DOCOL
 14E6 35 12 Ø7 Ø7                     DW      NOBUF,ONEP
 14EA 9D Ø5 EØ Ø1                     DW      ZERO,XDO
 14EE 9D Ø5 F7 12             FLUS1   DW      ZERO,BUFFE
 14F2 5F Ø4                           DW      DROP
 14F4 AF Ø1                           DW      XLOOP
 14F6 F8 FF                           DW      OFFSET FLUS1-$
 14F8 9A Ø3                           DW      SEMIS


                              ; ************
                              ; *   LOAD   *
                              ; ************
                              ;
 14FA 84                              DB      84H
 14FB 4C 4F 41                        DB      'LOA'
 14FE C4                              DB      'D'+8ØH
 14FF DC 14                           DW      FLUSH-8
 15Ø1 2Ø Ø5 7Ø Ø6             LOAD    DW      DOCOL,BLK
 15Ø5 B4 Ø4 BC Ø3                     DW      AT,TOR
 15Ø9 79 Ø6 B4 Ø4                     DW      INN,AT
 15ØD BC Ø3 9D Ø5                     DW      TOR,ZERO
 1511 79 Ø6 DF Ø4                     DW      INN,STORE
 1515 F8 Ø5 C4 1Ø                     DW      BSCR,STAR
 1519 7Ø Ø6 DF Ø4                     DW      BLK,STORE ; BLK <- SCR * B/SCR
 151D 62 ØE                           DW      INTER     ; INTERPRET FROM OTHER
                              SCREEN
 151F CC Ø3 79 Ø6                     DW      FROMR,INN
 1523 DF Ø4                           DW      STORE
 1525 CC Ø3 7Ø Ø6                     DW      FROMR,BLK
 1529 DF Ø4                           DW      STORE
 152B 9A Ø3                           DW      SEMIS
```

```
                                        EJECT

                                ; ***********
                                ; *    -->    *
                                ; ***********
                                ;
 152D C3                                DB      ØC3H
 152E 2D 2D                             DB      '--'
 153Ø BE                                DB      '>'+8ØH
 1531 FA 14                             DW      LOAD-7
 1533 2Ø Ø5                     ARROW   DW      DOCOL
 1535 Ø4 Ø9                             DW      QLOAD
 1537 9D Ø5                             DW      ZERO
 1539 79 Ø6                             DW      INN
 153B DF Ø4                             DW      STORE
 153D F8 Ø5                             DW      BSCR
 153F 7Ø Ø6                             DW      BLK
 1541 B4 Ø4                             DW      AT
 1543 5Ø Ø4                             DW      OVER
 1545 F3 1Ø                             DW      MODD
 1547 6Ø Ø7                             DW      SUBB
 1549 7Ø Ø6                             DW      BLK
 154B 95 Ø4                             DW      PSTOR
 154D 9A Ø3                             DW      SEMIS
```

```
                               EJECT

                       ; **************************************
                       ; *   QUERY KEYBOARD FOR KEY PRESSED   *
                       ; **************************************
                       ;
                       ; (TRUE = CHAR READY, FALSE = NO CHAR)
                       ;
                       ; CALLED FROM "?TERMINAL".
                       ;
                       ; USE 'KEY' TO GET KEY VALUE.
                       ;
154F E8 57 ØØ          PQTER:  CALL    CSTAT   ; TEST FOR KEY
1552 ØA CØ                     OR      AL,AL   ; ANY KEY
1554 74 Ø2                     JZ      PQTER1  ; NO
1556 BØ Ø1                     MOV     AL,1    ; TRUE = CHAR FOUND
1558 B4 ØØ             PQTER1: MOV     AH,Ø    ; MAKE 16-BITS
155A E9 FE EB                  JMP     APUSH   ; SAVE STATUS


                       ; *****************************
                       ; *   CONSOLE INPUT ROUTINE   *
                       ; *****************************
                       ;
                       ; WAITS FOR A KEYBOARD CHARACTER.
                       ;
                       ; CONTROL-P KEY WILL TOGGLE PRINTER
                       ; ECHO FLAG.
                       ;
                       ; CALLED FROM "KEY".
                       ;
155D E8 4F ØØ          PKEY:   CALL    CI      ; CONSOLE INPUT
156Ø 3C 1Ø                     CMP     AL,DLE  ; PRINTER TOGGLE?
1562 75 Ø9                     JNE     PKEY1   ; NO
1564 2E 8Ø 36 97 15 Ø1         XOR     EPRINT,1 ; TOGGLE ECHO
156A E9 FØ FF                  JMP     PKEY    ; GET ANOTHER KEY
                       ;
156D B4 ØØ             PKEY1:  MOV     AH,Ø    ; MAKE 16-BITS
156F E9 E9 EB                  JMP     APUSH   ; SAVE KEY VALUE


                       ; ****************************************
                       ; *   CONSOLE/PRINTER CHARACTER OUTPUT   *
                       ; ****************************************
                       ;
                       ; CALLED FROM "EMIT".
                       ;
1572 74 15             PEMIT   DW      $+2             ; (EMIT) ORPHAN
1574 58                        POP     AX              ; GET CHAR
1575 E8 1Ø ØØ                  CALL    POUT            ; CHAR OUTPUT
1578 E9 E1 EB                  JMP     NEXT
```

```
                                   EJECT

                          ; ******************************
                          ; *   CRLF TO CONSOLE/PRINTER   *
                          ; ******************************
                          ;
                          ; CALLED FROM 'CR'
                          ;
157B BØ ØD                PCR:    MOV     AL,ACR
157D E8 Ø8 ØØ                     CALL    POUT            ; CHAR OUTPUT
158Ø BØ ØA                        MOV     AL,LF
1582 E8 Ø3 ØØ                     CALL    POUT
1585 E9 D4 EB                     JMP     NEXT


                          ; ****************************************
                          ; *                                      *
                          ; *   TRUE CONSOLE/PRINTER OUTPUT ROUTINE *
                          ; *                                      *
                          ; ****************************************
                          ;
1588 E8 2A ØØ             POUT:   CALL    CHO             ; CONSOLE OUT
158B 2E F6 Ø6 97 15 Ø1            TEST    EPRINT,1        ; PRINTER ECHO?
1591 74 Ø3                        JZ      POUT1           ; OFF
1593 E8 29 ØØ                     CALL    LO              ; LIST OUTPUT
1596 C3                   POUT1:  RET


                          ; PRINTER ECHO FLAG
                          ;
                          ; VALUE: Ø = OFF, 1 = ON
                          ;
1597 ØØ ØØ                EPRINT  DB      Ø,Ø
```

```
                                        EJECT

                                ;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
                                ;;;                                   ;;;
                                ;;;      CP/M-86 INTERFACE ROUTINES   ;;;
                                ;;;                                   ;;;
                                ;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
                                ;
                                ; ALL LOW LEVEL CONSOLE AND DISK I/O START
                                ; HERE.
                                ;
                                ; THE FOLLOWING I/O ROUTINES ARE SUPPORTED:
                                ;
                                ;       CONSOLE INPUT (CSTAT).
                                ;       CONSOLE OUTPUT (CHO).
                                ;       LIST OUTPUT (LO).
                                ;
                                ;       SELECT DISK (SDSK).
                                ;       SET TRACK (STRK).
                                ;       SET SECTOR (SSEC).
                                ;       SET DMA OFFSET (SDMAO).
                                ;       SET DMA SEGMENT (SDMAS).
                                ;       GET SECTOR (GSEC).
                                ;       PUT SECTOR (PSEC).
                                ;
                                ;
                                ;
                                ; *************************
                                ; *   BDOS FUNCTION CALL   *
                                ; *************************
                                ;
                                ; ENTRY TO CP/M-86 BDOS IS THROUGH SOFTWARE
                                ; INTERRUPT #224.
                                ;
                                ; ENTRY:          REG CL = FUNCTION CODE.
                                ;                  "  DX = PARAMETER(S).
                                ;
                                ; EXIT:           REGS. AX, BX AND ES CONTAIN
                                ;                       RETURNED PARAMETERS.
                                ;
                                ;                 REGS. SI, BP, FLAGS ARE SAVED.
                                ;                 ALL SEGMENT REGISTERS SAVED
                                ;                 EXCEPT ES.
                                ;
                                BDOSFUNC:
1599 9C                                 PUSHF               ; SAVE FLAGS
159A 56                                 PUSH    SI          ; SAVE "IP"
159B 55                                 PUSH    BP          ; AND "RPP"
159C CD EØ                              INT     224         ; SOFTWARE INTERRUPT
159E 5D                                 POP     BP
159F 5E                                 POP     SI
15AØ 9D                                 POPF
15A1 C3                                 RET
```

```
                                EJECT

                        ; ***************************
                        ; *   EXIT BACK TO CP/M-86   *
                        ; ***************************
                        ;
15A2 B2 00              EXIT:   MOV     DL,0     ; STANDARD ABORT
15A4 B1 00                      MOV     CL,0     ; RESET FUNCTION #
15A6 E9 F0 FF                   JMP     BDOSFUNC


                        ; **************************
                        ; *   GET KEYBOARD STATUS   *
                        ; **************************
                        ;
                        ; RETURNS KEYBOARD STATUS
                        ;
                        ; *** USES DIRECT CALL TO "BIOS" ***
                        ;      (THROUGH THE "BDOS")
                        ;
                        ; EXIT: REG AX = 0 IF NO KEY PRESSED
                        ;       REG AX = NON-ZERO IF KEY PRESSED
                        ;
15A9 B0 02              CSTAT:  MOV     AL,2     ; 'CONST' FUNCTION
15AB E8 1B 00                   CALL    DCBIOS   ; DIRECT BIOS CALL
15AE C3                         RET


                        ; *******************
                        ; *   CONSOLE INPUT  *
                        ; *******************
                        ;
                        ; WAITS FOR KEY FROM KEYBOARD
                        ;
                        ; *** USES DIRECT CALL TO "BIOS" ***
                        ;      (THROUGH THE "BDOS")
                        ;
15AF B0 03              CI:     MOV     AL,3     ; 'CONIN' FUNC
15B1 E8 15 00                   CALL    DCBIOS   ; CALL BIOS
15B4 C3                         RET
```

```
                                      EJECT

                       ; **********************
                       ; *   CONSOLE OUTPUT   *
                       ; **********************
                       ;
                       ; OUTPUTS CHARACTER IN REG AL
                       ; TO CONSOLE.
                       ;
                       ; EXIT: REG AL = CHARACTER
                       ;
15B5 5Ø                CHO:    PUSH    AX      ; SAVE CHAR
15B6 8A DØ                     MOV     DL,AL
15B8 B1 Ø6                     MOV     CL,6    ; BDOS FUNCTION #
15BA E8 DC FF                  CALL    BDOSFUNC
15BD 58                        POP     AX
15BE C3                        RET

                       ; *******************
                       ; *   LIST OUTPUT   *
                       ; *******************
                       ;
                       ; OUTPUTS CHARACTER IN REG AL
                       ; TO LIST DEVICE (PRINTER).
                       ;
                       ; EXIT: REG AL = CHARACTER
                       ;
15BF 5Ø                LO:     PUSH    AX      ; SAVE CHAR
15CØ 8A DØ                     MOV     DL,AL
15C2 B1 Ø5                     MOV     CL,5    ; BDOS FUNCTION #
15C4 E8 D2 FF                  CALL    BDOSFUNC
15C7 58                        POP     AX
15C8 C3                        RET
```

```
                                    EJECT
                              ; ********************************
                              ; *                              *
                              ; *   DIRECT BIOS CALL FUNCTION   *
                              ; *                              *
                              ; ********************************
                              ;
                              ; ALLOWS DIRECT CALLS (THROUGH 'BDOS')
                              ; TO THE 'BIOS' PROGRAM.
                              ;
                              ; ENTER:          REG AL = BIOS FUNCTION NO.
                              ;                  "  CX = PARAMETER 1
                              ;                  "  DX = PARAMETER 2
                              ;
                              ; NOTE: THE ABOVE PARAMETERS ARE OPTIONAL
                              ;       DEPENDING UPON THE FUNCTION CALLED.
                              ;
 15C9 BB DB 15                DCBIOS: MOV     BX,OFFSET BIOSPAR
 15CC 88 Ø7                           MOV     [BX],AL             ; FUNC #
 15CE 89 4F Ø1                        MOV     1[BX],CX            ; PARM. 1
 15D1 89 57 Ø3                        MOV     3[BX],DX            ; PARM. 2
 15D4 8B D3                           MOV     DX,BX               ; PARM. POINTER
 15D6 B1 32                           MOV     CL,5Ø               ; DIRECT CALL
 15D8 E9 BE FF                        JMP     BDOSFUNC            ; ...DO-IT...

                              ; THE FOLLOWING IS A SCRATCH AREA FOR
                              ; STORING THE FUNCTION # AND PARAMETERS
                              ; DURING A DIRECT BIOS CALL.
                              ;
 15DB                         BIOSPAR RB      5


                              ; ******************
                              ; *   SELECT DISK   *
                              ; ******************
                              ;
                              ; ENTER DISK NUMBER IN REG CL.
                              ;
 15EØ BØ Ø9                   SDSK:   MOV     AL,9     ; BIOS FUNCTION NO.
 15E2 E9 E4 FF                        JMP     DCBIOS


                              ; ****************
                              ; *   SET TRACK   *
                              ; ****************
                              ;
                              ; ENTER TRACK NUMBER IN REG CL.
                              ;
 15E5 BØ ØA                   STRK:   MOV     AL,1Ø    ; BIOS FUNC #
 15E7 E9 DF FF                        JMP     DCBIOS
```

```
                                        EJECT

                                ; *****************
                                ; *   SET SECTOR   *
                                ; *****************
                                ;
 15EA BØ ØB                     SSEC:   MOV     AL,11   ; BIOS FUNC. #
 15EC E9 DA FF                          JMP     DCBIOS


                                ; *********************
                                ; *   SET DMA OFFSET   *
                                ; *********************
                                ;
                                ; ENTER DMA OFFSET IN REG CX
                                ;
 15EF BØ ØC                     SDMAO:  MOV     AL,12   ; BIOS FUNC. #
 15F1 E9 D5 FF                          JMP     DCBIOS


                                ; **********************
                                ; *   SET DMA SEGMENT   *
                                ; **********************
                                ;
                                ; ENTER DMA SEGMENT IN REG CX
                                ;
 15F4 BØ 11                     SDMAS:  MOV     AL,17   ; BIOS FUNC. #
 15F6 E9 DØ FF                          JMP     DCBIOS


                                ; ************************
                                ; *   GET (READ) SECTOR   *
                                ; ************************
                                ;
                                ; EXITS WITH STATUS IN REG AL
                                ;
 15F9 BØ ØD                     GSEC:   MOV     AL,13   ; BIOS FUNC. #
 15FB E9 CB FF                          JMP     DCBIOS


                                ; *************************
                                ; *   PUT (WRITE) SECTOR   *
                                ; *************************
                                ;
                                ; EXITS WITH STATUS IN REG AL
                                ;
 15FE BØ ØE                     PSEC:   MOV     AL,14   ; BIOS FUNC. #
 16ØØ E9 C6 FF                          JMP     DCBIOS


                                ;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
                                ;                                     ;
                                ;     END OF CP/M-86 I/O INTERFACE    ;
                                ;                                     ;
                                ;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
```

```
                                      EJECT

                              ; *********
                              ; *   '   *
                              ; *********
                              ;
 1603 C1                              DB      0C1H
 1604 A7                              DB      0A7H
 1605 2D 15                           DW      ARROW-6
 1607 20 05                   TICK    DW      DOCOL
 1609 E0 0C                           DW      DFIND
 160B E1 03                           DW      ZEQU
 160D 9D 05                           DW      ZERO
 160F 8B 08                           DW      QERR
 1611 5F 04                           DW      DROP
 1613 FA 0D                           DW      LITER
 1615 9A 03                           DW      SEMIS


                              ; *************
                              ; *   FORGET   *
                              ; *************
                              ;
 1617 86                              DB      86H
 1618 46 4F 52 47 45                  DB      'FORGE'
 161D D4                              DB      'T'+80H
 161E 03 16                           DW      TICK-4
 1620 20 05                   FORG    DW      DOCOL
 1622 B6 06                           DW      CURR
 1624 B4 04                           DW      AT
 1626 A8 06                           DW      CONT
 1628 B4 04                           DW      AT
 162A 60 07                           DW      SUBB
 162C 6A 01 18 00                     DW      LIT,18H
 1630 8B 08                           DW      QERR
 1632 07 16                           DW      TICK
 1634 79 04                           DW      DUP
 1636 4E 06                           DW      FENCE
 1638 B4 04                           DW      AT
 163A 79 07                           DW      LESS
 163C 6A 01 15 00                     DW      LIT,15H
 1640 8B 08                           DW      QERR
 1642 79 04                           DW      DUP
 1644 4D 08                           DW      NFA
 1646 57 06                           DW      DP
 1648 DF 04                           DW      STORE
 164A 2F 08                           DW      LFA
 164C B4 04                           DW      AT
 164E A8 06                           DW      CONT
 1650 B4 04                           DW      AT
 1652 DF 04                           DW      STORE
 1654 9A 03                           DW      SEMIS
```

```
                                      EJECT

                             ; ************
                             ; *   BACK   *
                             ; ************
                             ;
1656 84                               DB      84H
1657 42 41 43                         DB      'BAC'
165A CB                               DB      'K'+8ØH
165B 17 16                            DW      FORG-9
165D 2Ø Ø5                   BACK     DW      DOCOL
165F 23 Ø7                            DW      HERE
1661 6Ø Ø7                            DW      SUBB
1663 3F Ø7                            DW      COMMA
1665 9A Ø3                            DW      SEMIS


                             ; *************
                             ; *   BEGIN   *
                             ; *************
                             ;
1667 C5                               DB      ØC5H
1668 42 45 47 49                      DB      'BEGI'
166C CE                               DB      'N'+8ØH
166D 56 16                            DW      BACK-7
166F 2Ø Ø5                   BEGIN    DW      DOCOL
1671 A5 Ø8                            DW      QCOMP
1673 23 Ø7                            DW      HERE
1675 A5 Ø5                            DW      ONE
1677 9A Ø3                            DW      SEMIS


                             ; *************
                             ; *   ENDIF   *
                             ; *************
                             ;
1679 C5                               DB      ØC5H
167A 45 4E 44 49                      DB      'ENDI'
167E C6                               DB      'F'+8ØH
167F 67 16                            DW      BEGIN-8
1681 2Ø Ø5                   ENDIFF   DW      DOCOL
1683 A5 Ø8                            DW      QCOMP
1685 AD Ø5                            DW      TWO
1687 D4 Ø8                            DW      QPAIR
1689 23 Ø7                            DW      HERE
168B 5Ø Ø4                            DW      OVER
168D 6Ø Ø7                            DW      SUBB
168F 6C Ø4                            DW      SWAP
1691 DF Ø4                            DW      STORE
1693 9A Ø3                            DW      SEMIS
```

```
                                  EJECT
                          ;  ************
                          ;  *   THEN   *
                          ;  ************
                          ;
1695 C4                           DB      0C4H
1696 54 48 45                     DB      'THE'
1699 CE                           DB      'N'+80H
169A 79 16                        DW      ENDIFF-8
169C 20 05                THEN    DW      DOCOL
169E 81 16                        DW      ENDIFF
16A0 9A 03                        DW      SEMIS


                          ;  **********
                          ;  *   DO   *
                          ;  **********
                          ;
16A2 C2                           DB      0C2H
16A3 44                           DB      'D'
16A4 CF                           DB      'O'+80H
16A5 95 16                        DW      THEN-7
16A7 20 05                DO      DW      DOCOL
16A9 1E 09                        DW      COMP
16AB E0 01                        DW      XDO
16AD 23 07                        DW      HERE
16AF B5 05                        DW      THREE
16B1 9A 03                        DW      SEMIS


                          ;  ************
                          ;  *   LOOP   *
                          ;  ************
                          ;
16B3 C4                           DB      0C4H
16B4 4C 4F 4F                     DB      'LOO'
16B7 D0                           DB      'P'+80H
16B8 A2 16                        DW      DO-5
16BA 20 05                LOOPC   DW      DOCOL
16BC B5 05                        DW      THREE
16BE D4 08                        DW      QPAIR
16C0 1E 09                        DW      COMP
16C2 AF 01                        DW      XLOOP
16C4 5D 16                        DW      BACK
16C6 9A 03                        DW      SEMIS
```

```
                               EJECT

                       ; *************
                       ; *   +LOOP   *
                       ; *************
                       ;
16C8 C5                        DB      ØC5H
16C9 2B 4C 4F 4F               DB      '+LOO'
16CD DØ                        DB      'P'+8ØH
16CE B3 16                     DW      LOOPC-7
16DØ 2Ø Ø5             PLOOP   DW      DOCOL
16D2 B5 Ø5                     DW      THREE
16D4 D4 Ø8                     DW      QPAIR
16D6 1E Ø9                     DW      COMP
16D8 D3 Ø1                     DW      XPLOO
16DA 5D 16                     DW      BACK
16DC 9A Ø3                     DW      SEMIS


                       ; *************
                       ; *   UNTIL   *
                       ; *************
                       ;
16DE C5                        DB      ØC5H
16DF 55 4E 54 49               DB      'UNTI'
16E3 CC                        DB      'L'+8ØH
16E4 C8 16                     DW      PLOOP-8
16E6 2Ø Ø5             UNTIL   DW      DOCOL
16E8 A5 Ø5                     DW      ONE
16EA D4 Ø8                     DW      QPAIR
16EC 1E Ø9                     DW      COMP
16EE 9A Ø1                     DW      ZBRAN
16FØ 5D 16                     DW      BACK
16F2 9A Ø3                     DW      SEMIS


                       ; ***********
                       ; *   END   *
                       ; ***********
                       ;
16F4 C3                        DB      ØC3H
16F5 45 4E                     DB      'EN'
16F7 C4                        DB      'D'+8ØH
16F8 DE 16                     DW      UNTIL-8
16FA 2Ø Ø5             ENDD    DW      DOCOL
16FC E6 16                     DW      UNTIL
16FE 9A Ø3                     DW      SEMIS
```

```
                                        EJECT
                              ; *************
                              ; *   AGAIN   *
                              ; *************
                              ;
1700 C5                                 DB      0C5H
1701 41 47 41 49                        DB      'AGAI'
1705 CE                                 DB      'N'+80H
1706 F4 16                              DW      ENDD-6
1708 20 05                    AGAIN     DW      DOCOL
170A A5 05                              DW      ONE
170C D4 08                              DW      QPAIR
170E 1E 09                              DW      COMP
1710 89 01                              DW      BRAN
1712 5D 16                              DW      BACK
1714 9A 03                              DW      SEMIS

                              ; **************
                              ; *   REPEAT   *
                              ; **************
                              ;
1716 C6                                 DB      0C6H
1717 52 45 50 45 41                     DB      'REPEA'
171C D4                                 DB      'T'+80H
171D 00 17                              DW      AGAIN-8
171F 20 05                    REPEA     DW      DOCOL
1721 BC 03                              DW      TOR
1723 BC 03                              DW      TOR
1725 08 17                              DW      AGAIN
1727 CC 03                              DW      FROMR
1729 CC 03                              DW      FROMR
172B AD 05                              DW      TWO
172D 60 07                              DW      SUBB
172F 81 16                              DW      ENDIFF
1731 9A 03                              DW      SEMIS

                              ; **********
                              ; *   IF   *
                              ; **********
                              ;
1733 C2                                 DB      0C2H
1734 49                                 DB      'I'
1735 C6                                 DB      'F'+80H
1736 16 17                              DW      REPEA-9
1738 20 05                    IFF       DW      DOCOL
173A 1E 09                              DW      COMP
173C 9A 01                              DW      ZBRAN
173E 23 07                              DW      HERE
1740 9D 05                              DW      ZERO
1742 3F 07                              DW      COMMA
1744 AD 05                              DW      TWO
1746 9A 03                              DW      SEMIS
```

```
                                        EJECT

                                ; ************
                                ; *   ELSE   *
                                ; ************
                                ;
 1748 C4                                DB      ØC4H
 1749 45 4C 53                          DB      'ELS'
 174C C5                                DB      'E'+8ØH
 174D 33 17                             DW      IFF-5
 174F 2Ø Ø5                     ELSEE   DW      DOCOL
 1751 AD Ø5                             DW      TWO
 1753 D4 Ø8                             DW      QPAIR
 1755 1E Ø9                             DW      COMP
 1757 89 Ø1                             DW      BRAN
 1759 23 Ø7                             DW      HERE
 175B 9D Ø5                             DW      ZERO
 175D 3F Ø7                             DW      COMMA
 175F 6C Ø4                             DW      SWAP
 1761 AD Ø5                             DW      TWO
 1763 81 16                             DW      ENDIFF
 1765 AD Ø5                             DW      TWO
 1767 9A Ø3                             DW      SEMIS

                                ; *************
                                ; *   WHILE   *
                                ; *************
                                ;
 1769 C5                                DB      ØC5H
 176A 57 48 49 4C                       DB      'WHIL'
 176E C5                                DB      'E'+8ØH
 176F 48 17                             DW      ELSEE-7
 1771 2Ø Ø5                     WHILE   DW      DOCOL
 1773 38 17                             DW      IFF
 1775 14 Ø7                             DW      TWOP
 1777 9A Ø3                             DW      SEMIS
```

```
                                        EJECT
                               ; **************
                               ; *   SPACES   *
                               ; **************
                               ;
 1779 86                                DB      86H
 177A 53 5Ø 41 43 45                    DB      'SPACE'
 177F D3                                DB      'S'+8ØH
 178Ø 69 17                             DW      WHILE-8
 1782 2Ø Ø5                    SPACS    DW      DOCOL
 1784 9D Ø5                             DW      ZERO
 1786 6E 1Ø                             DW      MAX
 1788 E3 Ø7                             DW      DDUP
 178A 9A Ø1                             DW      ZBRAN    ; IF
 178C ØC ØØ                             DW      OFFSET SPAX1-$
 178E 9D Ø5                             DW      ZERO
 179Ø EØ Ø1                             DW      XDO      ; DO
 1792 D4 Ø7                    SPAX2    DW      SPACE
 1794 AF Ø1                             DW      XLOOP    ; LOOP  ENDIF
 1796 FC FF                             DW      OFFSET SPAX2-$
 1798 9A Ø3                    SPAX1    DW      SEMIS

                               ; **********
                               ; *   <#   *
                               ; **********
                               ;
 179A 82                                DB      82H
 179B 3C                                DB      '<'
 179C A3                                DB      '#'+8ØH
 179D 79 17                             DW      SPACS-9
 179F 2Ø Ø5                    BDIGS    DW      DOCOL
 17A1 D9 ØB                             DW      PAD
 17A3 FE Ø6                             DW      HLD
 17A5 DF Ø4                             DW      STORE
 17A7 9A Ø3                             DW      SEMIS

                               ; **********
                               ; *   #>   *
                               ; **********
                               ;
 17A9 82                                DB      82H
 17AA 23                                DB      '#'
 17AB BE                                DB      '>'+8ØH
 17AC 9A 17                             DW      BDIGS-5
 17AE 2Ø Ø5                    EDIGS    DW      DOCOL
 17BØ 5F Ø4                             DW      DROP
 17B2 5F Ø4                             DW      DROP
 17B4 FE Ø6                             DW      HLD
 17B6 B4 Ø4                             DW      AT
 17B8 D9 ØB                             DW      PAD
 17BA 5Ø Ø4                             DW      OVER
 17BC 6Ø Ø7                             DW      SUBB
 17BE 9A Ø3                             DW      SEMIS
```

```
                              EJECT
                      ; ************
                      ; *   SIGN   *
                      ; ************
                      ;
17CØ 84                       DB      84H
17C1 53 49 47                 DB      'SIG'
17C4 CE                       DB      'N'+8ØH
17C5 A9 17                    DW      EDIGS-5
17C7 2Ø Ø5            SIGN    DW      DOCOL
17C9 C3 Ø7                    DW      ROT
17CB F4 Ø3                    DW      ZLESS
17CD 9A Ø1                    DW      ZBRAN    ; IF
17CF Ø8 ØØ                    DW      OFFSET SIGN1-$
17D1 6A Ø1 2D ØØ              DW      LIT,2DH
17D5 C1 ØB                    DW      HOLD     ; ENDIF
17D7 9A Ø3            SIGN1   DW      SEMIS

                      ; *********
                      ; *   #   *
                      ; *********
                      ;
17D9 81                       DB      81H
17DA A3                       DB      '#'+8ØH
17DB CØ 17                    DW      SIGN-7
17DD 2Ø Ø5            DIG     DW      DOCOL
17DF CD Ø6                    DW      BASE
17E1 B4 Ø4                    DW      AT
17E3 26 11                    DW      MSMOD
17E5 C3 Ø7                    DW      ROT
17E7 6A Ø1 Ø9 ØØ              DW      LIT,9
17EB 5Ø Ø4                    DW      OVER
17ED 79 Ø7                    DW      LESS
17EF 9A Ø1                    DW      ZBRAN    ; IF
17F1 Ø8 ØØ                    DW      OFFSET DIG1-$
17F3 6A Ø1 Ø7 ØØ              DW      LIT,7
17F7 Ø6 Ø4                    DW      PLUS     ; ENDIF
17F9 6A Ø1 3Ø ØØ      DIG1    DW      LIT,3ØH
17FD Ø6 Ø4                    DW      PLUS
17FF C1 ØB                    DW      HOLD
18Ø1 9A Ø3                    DW      SEMIS

                      ; **********
                      ; *   #S   *
                      ; **********
                      ;
18Ø3 82                       DB      82H
18Ø4 23                       DB      '#'
18Ø5 D3                       DB      'S'+8ØH
18Ø6 D9 17                    DW      DIG-4
18Ø8 2Ø Ø5            DIGS    DW      DOCOL
18ØA DD 17            DIGS1   DW      DIG      ; BEGIN
18ØC 5Ø Ø4                    DW      OVER
18ØE 5Ø Ø4                    DW      OVER
181Ø 3D Ø3                    DW      ORR
```

```
1812 E1 Ø3                            DW        ZEQU
1814 9A Ø1                            DW        ZBRAN    ; UNTIL
1816 F4 FF                            DW        OFFSET DIGS1-$
1818 9A Ø3                            DW        SEMIS

                            ; ***********
                            ; *   D.R   *
                            ; ***********
                            ;
181A 83                               DB        83H
181B 44 2E                            DB        'D.'
181D D2                               DB        'R'+8ØH
181E Ø3 18                            DW        DIGS-5
182Ø 2Ø Ø5                  DDOTR     DW        DOCOL
1822 BC Ø3                            DW        TOR
1824 6C Ø4                            DW        SWAP
1826 5Ø Ø4                            DW        OVER
1828 4A 1Ø                            DW        DABS
182A 9F 17                            DW        BDIGS
182C Ø8 18                            DW        DIGS
182E C7 17                            DW        SIGN
183Ø AE 17                            DW        EDIGS
1832 CC Ø3                            DW        FROMR
1834 5Ø Ø4                            DW        OVER
1836 6Ø Ø7                            DW        SUBB
1838 82 17                            DW        SPACS
183A ØA ØA                            DW        TYPES
183C 9A Ø3                            DW        SEMIS

                            ; **********
                            ; *   .R   *
                            ; **********
                            ;
183E 82                               DB        82H
183F 2E                               DB        '.'
184Ø D2                               DB        'R'+8ØH
1841 1A 18                            DW        DDOTR-6
1843 2Ø Ø5                  DOTR      DW        DOCOL
1845 BC Ø3                            DW        TOR
1847 Ø5 1Ø                            DW        STOD
1849 CC Ø3                            DW        FROMR
184B 2Ø 18                            DW        DDOTR
184D 9A Ø3                            DW        SEMIS
```

```
                                        EJECT

                                ; **********
                                ; *   D.   *
                                ; **********
                                ;
 184F 82                                DB      82H
 1850 44                                DB      'D'
 1851 AE                                DB      '.'+80H
 1852 3E 18                             DW      DOTR-5
 1854 20 05                     DDOT    DW      DOCOL
 1856 9D 05                             DW      ZERO
 1858 20 18                             DW      DDOTR
 185A D4 07                             DW      SPACE
 185C 9A 03                             DW      SEMIS


                                ; *********
                                ; *   .   *
                                ; *********
                                ;
 185E 81                                DB      81H
 185F AE                                DB      '.'+80H
 1860 4F 18                             DW      DDOT-5
 1862 20 05                     DOT     DW      DOCOL
 1864 05 10                             DW      STOD
 1866 54 18                             DW      DDOT
 1868 9A 03                             DW      SEMIS


                                ; *********
                                ; *   ?   *
                                ; *********
                                ;
 186A 81                                DB      81H
 186B BF                                DB      '?'+80H
 186C 5E 18                             DW      DOT-4
 186E 20 05                     QUES    DW      DOCOL
 1870 B4 04                             DW      AT
 1872 62 18                             DW      DOT
 1874 9A 03                             DW      SEMIS


                                ; **********
                                ; *   U.   *
                                ; **********
                                ;
 1876 82                                DB      82H
 1877 55                                DB      'U'
 1878 AE                                DB      '.'+80H
 1879 6A 18                             DW      QUES-4
 187B 20 05                     UDOT    DW      DOCOL
 187D 9D 05                             DW      ZERO
 187F 54 18                             DW      DDOT
 1881 9A 03                             DW      SEMIS
```

```
                                      EJECT

                              ; *************
                              ; *   VLIST   *
                              ; *************
                              ;
1883 85                               DB      85H
1884 56 4C 49 53                      DB      'VLIS'
1888 D4                               DB      'T'+80H
1889 76 18                            DW      UDOT-5
188B 20 05                    VLIST   DW      DOCOL
188D 6A 01 80 00                      DW      LIT,80H
1891 83 06                            DW      OUTT
1893 DF 04                            DW      STORE
1895 A8 06                            DW      CONT
1897 B4 04                            DW      AT
1899 B4 04                            DW      AT
189B 83 06                    VLIS1   DW      OUTT      ; BEGIN
189D B4 04                            DW      AT
189F C8 05                            DW      CSLL
18A1 B5 07                            DW      GREAT
18A3 9A 01                            DW      ZBRAN     ; IF
18A5 0A 00                            DW      OFFSET VLIS2-$
18A7 DF 02                            DW      CR
18A9 9D 05                            DW      ZERO
18AB 83 06                            DW      OUTT
18AD DF 04                            DW      STORE     ; ENDIF
18AF 79 04                    VLIS2   DW      DUP
18B1 4F 0D                            DW      IDDOT
18B3 D4 07                            DW      SPACE
18B5 D4 07                            DW      SPACE
18B7 63 08                            DW      PFA
18B9 2F 08                            DW      LFA
18BB B4 04                            DW      AT
18BD 79 04                            DW      DUP
18BF E1 03                            DW      ZEQU
18C1 D5 02                            DW      QTERM
18C3 3D 03                            DW      ORR
18C5 9A 01                            DW      ZBRAN     ; UNTIL
18C7 D4 FF                            DW      OFFSET VLIS1-$
18C9 5F 04                            DW      DROP
18CB 9A 03                            DW      SEMIS


                              ; ***********
                              ; *   BYE   *
                              ; ***********
                              ;
                              ; EXIT TO CP/M OR YOUR MONITOR
                              ;
18CD 83                               DB      83H       ; BYE
18CE 42 59                            DB      'BY'
18D0 C5                               DB      'E'+80H
18D1 83 18                            DW      VLIST-8
18D3 D5 18                    BYE     DW      $+2
18D5 E9 CA FC                         JMP     EXIT      ; BACK TO SYSTEM
```

```
                                        EJECT

                                ; ************
                                ; *   LIST   *
                                ; ************
                                ;
18D8 84                                 DB      84H
18D9 4C 49 53                           DB      'LIS'
18DC D4                                 DB      'T'+80H
18DD CD 18                              DW      BYE-6
18DF 20 05 7F 09                LISTC   DW      DOCOL,DECA
18E3 DF 02 79 04                        DW      CR,DUP
18E7 8D 06 DF 04                        DW      SCR,STORE
18EB 6B 0A                              DW      PDOTQ
18ED 06 53 43 52 20 23                  DB      6,'SCR # '
     20
18F4 62 18                              DW      DOT
18F6 6A 01 10 00                        DW      LIT,10H
18FA 9D 05 E0 01                        DW      ZERO,XDO
18FE DF 02 F1 01                LIST1   DW      CR,IDO
1902 6A 01 03 00                        DW      LIT,3
1906 43 18 D4 07                        DW      DOTR,SPACE
190A F1 01 8D 06                        DW      IDO,SCR
190E B4 04 6B 11                        DW      AT,DLINE
1912 D5 02                              DW      QTERM           ; ?TERMINAL
1914 9A 01                              DW      ZBRAN
1916 04 00                              DW      OFFSET LIST2-$  ; IF
1918 AC 03                              DW      LEAVE           ; LEAVE
191A AF 01                      LIST2   DW      XLOOP
191C E2 FF                              DW      OFFSET LIST1-$  ; ENDIF
191E DF 02 9A 03                        DW      CR,SEMIS


                                ; *************
                                ; *   INDEX   *
                                ; *************
                                ;
1922 85                                 DB      85H
1923 49 4E 44 45                        DB      'INDE'
1927 D8                                 DB      'X'+80H
1928 D8 18                              DW      LISTC-7
192A 20 05                      INDEX   DW      DOCOL
192C 6A 01 0C 00                        DW      LIT,FF
1930 B2 02 DF 02                        DW      EMIT,CR
1934 07 07 6C 04                        DW      ONEP,SWAP
1938 E0 01                              DW      XDO
193A DF 02 F1 01                INDE1   DW      CR,IDO
193E 6A 01 03 00                        DW      LIT,3
1942 43 18 D4 07                        DW      DOTR,SPACE
1946 9D 05 F1 01                        DW      ZERO,IDO
194A 6B 11 D5 02                        DW      DLINE,QTERM
194E 9A 01                              DW      ZBRAN
1950 04 00                              DW      OFFSET INDE2-$
1952 AC 03                              DW      LEAVE
1954 AF 01                      INDE2   DW      XLOOP
1956 E4 FF                              DW      OFFSET INDE1-$
1958 9A 03                              DW      SEMIS
```

```
                                EJECT
                        ; *************
                        ; *   TRIAD   *
                        ; *************
                        ;
195A 85                         DB      85H
195B 54 52 49 41                DB      'TRIA'
195F C4                         DB      'D'+8ØH
196Ø 22 19                      DW      INDEX-8
1962 2Ø Ø5              TRIAD   DW      DOCOL
1964 6A Ø1 ØC ØØ                DW      LIT,FF
1968 B2 Ø2                      DW      EMIT
196A 6A Ø1 Ø3 ØØ                DW      LIT,3
196E E3 1Ø                      DW      SLASH
197Ø 6A Ø1 Ø3 ØØ                DW      LIT,3
1974 C4 1Ø                      DW      STAR
1976 6A Ø1 Ø3 ØØ                DW      LIT,3
197A 5Ø Ø4 Ø6 Ø4                DW      OVER,PLUS
197E 6C Ø4 EØ Ø1                DW      SWAP,XDO
1982 DF Ø2 F1 Ø1        TRIA1   DW      CR,IDO
1986 DF 18                      DW      LISTC
1988 D5 Ø2                      DW      QTERM            ; ?TERMINAL
198A 9A Ø1                      DW      ZBRAN
198C Ø4 ØØ                      DW      OFFSET TRIA2-$   ; IF
198E AC Ø3                      DW      LEAVE            ; LEAVE
199Ø AF Ø1              TRIA2   DW      XLOOP            ; ENDIF
1992 FØ FF                      DW      OFFSET TRIA1-$
1994 DF Ø2                      DW      CR
1996 6A Ø1 ØF ØØ                DW      LIT,15
199A 7F 11 DF Ø2                DW      MESS,CR
199E 9A Ø3                      DW      SEMIS


                        ; ************
                        ; *   .CPU   *
                        ; ************
                        ;
                        ; PRINT CPU TYPE (8Ø86)
                        ;
19AØ 84                         DB      84H
19A1 2E 43 5Ø                   DB      '.CP'
19A4 D5                         DB      'U'+8ØH
19A5 5A 19                      DW      TRIAD-8
19A7 2Ø Ø5              DOTCPU  DW      DOCOL
19A9 CD Ø6 B4 Ø4                DW      BASE,AT
19AD 6A Ø1 24 ØØ                DW      LIT,36
19B1 CD Ø6 DF Ø4                DW      BASE,STORE
19B5 6A Ø1 22 ØØ                DW      LIT,22H
19B9 Ø6 Ø6 DØ Ø4                DW      PORIG,TAT
19BD 54 18                      DW      DDOT
19BF CD Ø6 DF Ø4                DW      BASE,STORE
19C3 9A Ø3                      DW      SEMIS
```

```
                                       EJECT

                               ; **************************************
                               ; *                                    *
                               ; *      CODE LEVEL "MATCH" DEFINITION *
                               ; *                                    *
                               ; **************************************
                               ;
                               ; STACK PARAMETERS:
                               ;
                               ;   ( cursor:addr  byte:left   str:addr  str:len
                               ;                ---  flag  new:cursor:offset)
                               ;
                               ; This version of MATCH will handle string length
                               s
                               ; up to 65335 bytes in length.
                               ;
 19C5 85                               DB      85H     ; MATCH
 19C6 4D 41 54 43                      DB      'MATC'
 19CA C8                               DB      'H'+8ØH
 19CB AØ 19                            DW      DOTCPU-7
 19CD CF 19                    MATCH   DW      $+2
 19CF 8B FE                            MOV     DI,SI   ; SAVE IP
 19D1 59                               POP     CX      ; STRING COUNT
 19D2 5B                               POP     BX      ; STRING ADDR
 19D3 5A                               POP     DX      ; BYTES LEFT TO SEARCH
 19D4 5E                               POP     SI      ; CURSOR ADDR
 19D5 56                               PUSH    SI      ; SAVE COPY
                               ;
 19D6 AC                       MAT1:   LODS    AL      ; GET FIRST BYTE
 19D7 3A Ø7                            CMP     AL,[BX] ; MATCH?
 19D9 75 12                            JNZ     MAT3    ; NO
 19DB 53                               PUSH    BX      ; SAVE STRING ADDR
 19DC 51                               PUSH    CX      ;  &   STRING COUNT
 19DD 56                               PUSH    SI      ;  &   CURSOR ADDR

                               ; TRY TO MATCH REMAINNING CHARACTERS IN STRING
                               ;
 19DE 49                       MAT2:   DEC     CX      ; STR COUNT -1
 19DF 74 12                            JZ      MATCHOK ; EXIT...MATCH FOUND
 19E1 4A                               DEC     DX      ; BYTES LEFT -1
 19E2 74 ØF                            JZ      NOMATCH ; EXIT...NO MATCH
 19E4 43                               INC     BX      ; NEXT STR CHAR ADDR
 19E5 AC                               LODS    AL      ; GET NEXT BYTE
 19E6 3A Ø7                            CMP     AL,[BX] ; MATCH?
 19E8 74 F4                            JZ      MAT2    ; YES, GET MORE
```

```
                               EJECT

                       ; NO MATCH YET.
19EA 5E                        POP     SI
19EB 59                        POP     CX
19EC 5B                        POP     BX      ; RESTORE POINTERS
19ED 4A                MAT3:   DEC     DX      ; BYTE LEFT COUNT -1
19EE 75 E6                     JNZ     MAT1    ; START OVER
19FØ E9 Ø3 ØØ                  JMP     MAT4    ; EXIT...NO MATCH

                       MATCHOK:
                       NOMATCH:
19F3 59                        POP     CX      ; ADJUST STACK
19F4 59                        POP     CX      ; FOR EXIT...
19F5 59                        POP     CX

                       ; EXIT HERE:  DX = TRUE/FALSE FLAG (Ø=NO MATCH)
                       ;
19F6 8B C6             MAT4:   MOV     AX,SI   ; NEW CURSOR ADDR
19F8 5E                        POP     SI      ; GET STARTING ADDR
19F9 2B C6                     SUB     AX,SI   ; COMPUTE CURSOR OFFSET
19FB 8B F7                     MOV     SI,DI   ; GET BACK IP
19FD E9 5A E7                  JMP     DPUSH   ; BYE...BYE
```

```
                                    EJECT

                                ; ********************************
                                ; *                              *
                                ; *     LAST DICTIONARY WORD     *
                                ; *                              *
                                ; *            "TASK"            *
                                ; *                              *
                                ; ********************************
                                ;
                                ;
  1AØØ 84                               DB      84H     ; TASK
  1AØ1 54 41 53                         DB      'TAS'
  1AØ4 CB                               DB      'K'+8ØH
  1AØ5 C5 19                            DW      MATCH-8
  1AØ7 2Ø Ø5                    TASK    DW      DOCOL
  1AØ9 9A Ø3                            DW      SEMIS

                                ;
    1AØB                        INITDP  EQU     $       ; SHOW END OF DICT.


                                ; THE REMAINNING MEMORY (UP TO 'EM') IS
                                ; USED FOR:
                                ;
                                ;       1. EXTENSION DICTIONARY
                                ;       2. PARAMETER STACK
                                ;       3. TERMINAL INPUT BUFFER
                                ;       4. RETURN STACK
                                ;       5. USER VARIABLE AREA
                                ;       6. DISK BUFFERS
                                ;
                                ;
                                ; THE FOLLOWING ZERO BYTE IS NEEDED
                                ; IN CP/M-86 TO TELL THE 'GENCMD'
                                ; ROUTINE THE MAXIMUM AMOUNT OF
                                ; MEMORY NEEDED IN THIS PROGRAM.
                                ;
                                        ORG     EM-1    ; LAST MEMORY ADDR-1
  3FFF ØØ                               DB      Ø       ; LAST LOCATION

                                        END

END OF ASSEMBLY. NUMBER OF ERRORS:   Ø
```

```
Page 1              ----------    8Ø86 Fig-Forth Symbols    ----------

............... ØØØØ VARIABLES

Ø59D ZERO      Ø634 WIDTH     Ø8A5 QCOMP     Ø957 SMUDG     ØDFA LITER
1Ø9E MSLAS     1126 MSMOD     Ø39A SEMIS     Ø6Ø6 PORIG     Ø69A OFSET
Ø6C2 STATE     Ø6F4 RNUM      ØC3D PNUMB     ØE62 INTER     14E4 FLUSH
ØEF9 FORTH     ØF32 QUIT      Ø164 DPØ       Ø4Ø6 PLUS      ØFAF CLD1
13AØ SETIO     Ø3E1 ZEQU      17F9 DIG1      Ø3CC FROMR     11Ø3 SSMOD
148Ø SECWT     1Ø83 MSTAR     12C2 DRZER     Ø313 USLAS     Ø414 DPLUS
Ø5D4 FIRST     ØA6B PDOTQ     1494 RSLW      Ø2D5 QTERM     Ø9F7 COUNT
Ø714 TWOP      Ø83F CFA       ØD1A ERROR     1425 TSCALS    16DØ PLOOP
Ø34C XORR      Ø4ED CSTOR     1254 DSKERR    1533 ARROW     Ø429 MINUS
Ø683 OUTT      Ø795 ULESS     ØD9C CREA1     16E6 UNTIL     Ø4DF STORE
Ø97F DECA      1Ø21 PM1       Ø3Ø4 USTAR     ØBEC WORDS     19A7 DOTCPU
15DB BIOSPAR   Ø3F4 ZLESS     138F BLOC1     165D BACK      193A INDE1
Ø1AF XLOOP     Ø1D3 XPLOO     Ø61E RZERO     ØDØØ DFIN1     1Ø33 DPM1
135D BLOC2     1597 EPRINT    188B VLIST     1954 INDE2     Ø615 SZERO
Ø82F LFA       1377 BLOC3     16A7 DO        Ø657 DP        13Ø1 BUFF1
17DD DIG       Ø2DF CR        Ø4B4 AT        Ø84D NFA       ØAØA TYPES
ØBD9 PAD       1Ø64 MIN1      1327 BUFF2     1738 IFF       Ø6E1 FLD
ØB33 QUERY     1Ø3B ABS       Ø32F ANDD      Ø863 PFA       1Ø7A MAX1
1243 DENSTY    Ø388 RPSTO     Ø495 PSTOR     Ø4C1 CAT       Ø6FE HLD
13CE SETDRV    18ØA DIGS1     Ø368 SPSTO     Ø67Ø BLK       1Ø4A DABS
11EØ PTSTO     Ø12A BIP       Ø6CD BASE      11FA SEC       16FA ENDD
Ø1F1 IDO       Ø4FB TSTOR     ØA4Ø DTRA1     ØA5A DTRA2     1Ø17 PM
11C7 PTCSTO    Ø7ED DDUP1     ØA5E DTRA3     ØE27 DLIT1     1275 PBUF1
Ø5EC BBUF      Ø628 TIB       Ø9B5 SEMI1     ØEØA LITE1     Ø12C BIPE
Ø553 CON       Ø6D7 DPL       15Ø1 LOAD      17Ø8 AGAIN     18D3 BYE
Ø5BE BLS       Ø64E FENCE     ØE64 INTE1     1Ø29 DPM       1982 TRIA1
Ø27A ENCL      Ø5A5 ONE       ØE86 INTE2     ØFB8 COLD      17D7 SIGN1
199Ø TRIA2     Ø189 BRAN      ØAC1 EXPE1     ØCA6 NUMB1     ØE7C INTE3
Ø3DA RR        Ø723 HERE      Ø934 LBRAC     ØAFB EXPE2     ØCCC NUMB2
ØE8Ø INTE4     1Ø58 MIN       1ØF3 MODD      12E4 DRON1     Ø126 UP
Ø17A EXEC      Ø679 INN       Ø969 HEX       ØB21 EXPE3     ØCD6 NUMB3
ØCEØ DFIND     ØEAØ INTE5     12E8 DRON2     166F BEGIN     ØB13 EXPE4
ØE9A INTE6     ØF11 DEFIN     1Ø6E MAX       ØB15 EXPE5     ØB8A FILL
ØBC1 HOLD      ØE9E INTE7     ØF87 WRM1      18Ø8 DIGS      1862 DOT
Ø68D SCR       ØAF3 EXPE6     ØBB2 BLANK     12F7 BUFFE     14ØD TSCAL1
Ø16A LIT       Ø2C4 KEY       Ø479 DUP       Ø4DØ TAT       Ø57Ø VAR
ØAA4 DOTQ1     ØAF7 EXPE7     ØD28 ERRO1     11A5 MESS1     1413 TSCAL2
179F BDIGS     Ø5F8 BSCR      Ø7AB ULES1     Ø942 RBRAC     ØAAC DOTQ2
ØD47 ERRO2     11A1 MESS2     1443 TSCAL3    Ø1EØ XDO       Ø7AF ULES2
Ø899 QERR1     Ø9D3 DOES      ØEC9 VOCAB     11BØ MESS3     133F BLOCK
1449 TSCAL4    14EE FLUS1     16Ø7 TICK      1854 DDOT      Ø76Ø SUBB
Ø7D4 SPACE     Ø89B QERR2     ØB7D NULL1     ØEBØ IMMED     116B DLINE
1681 ENDIFF    17AE EDIGS     Ø3AC LEAVE     Ø73F COMMA     Ø7E3 DDUP
ØB79 NULL2     ØCØØ WORD1     121Ø USE       125F PBUF      171F REPEA
1798 SPAX1     18FE LIST1     19CD MATCH     Ø52F SEMI      Ø5C8 CSLL
Ø7FE TRAV1     ØB81 NULL3     ØCØ4 WORD2     162Ø FORG      174F ELSEE
1792 SPAX2     191A LIST2     Ø2B2 EMIT      Ø75Ø CCOMM     Ø91E COMP
ØD86 CREAT     169C THEN      189B VLIS1     Ø9C3 BUILD     18AF VLIS2
```

```
Ø1ØØ ORIG       Ø2Ø1 DIGIT      Ø22E PFIND      Ø9Ø4 QLOAD      Ø9AB SEMIC
ØC3F PNUM1      ØDDE BCOMP      1466 SECRD      17C7 SIGN       Ø128 RPP
Ø7Ø7 ONEP       ØC7B PNUM2      ØC88 NUMB       ØE17 DLITE      Ø33D ORR
Ø7B5 GREAT      ØA28 TYPE1      ØC75 PNUM3      1114 SSLA       1AØ7 TASK
Ø666 VOCL       Ø6A8 CONT       ØA1A TYPE2      ØA38 DTRAI      ØDØC PABOR
ØD4F IDDOT      ØF3C QUIT1      1962 TRIAD      Ø3BC TOR        Ø45F DROP
Ø7C3 ROT        ØA2A TYPE3      ØAB7 EXPEC      ØBA1 ERASEE     ØF53 QUIT2
12Ø6 TRACK      Ø6EB CSPP       Ø8BD QEXEC      ØF21 PAREN      Ø37B RPAT
Ø779 LESS       Ø8E7 QCSP       ØF9Ø WARM       Ø35B SPAT       Ø5B5 THREE
Ø642 WARN       Ø76D EQUAL      ØA84 DOTQ       ØF5F ABORT      1145 PLINE
117F MESS       12D2 DRONE      192A INDEX      Ø81F LATES      Ø878 SCSP
Ø995 PSCOD      11D4 PTAT       14AE RSLW1      1771 WHILE      1843 DOTR
Ø2EC CMOVE      Ø5AD TWO        Ø88B QERR       1ØØ5 STOD       1ØC4 STAR
11FØ DRIVE      1235 NOBUF      13E5 TSCALC     14CØ RSLW2      1782 SPACS
Ø46C SWAP       Ø5ØC COLON      ØB4B NULL       ØEE9 DOVOC      1ØE3 SLASH
14C2 RSLW3      Ø45Ø OVER       Ø544 NOOP       Ø6B6 CURR       Ø733 ALLOT
ØE32 QSTAC      11B8 PTCAT      1229 SPBLK      187B UDOT       Ø19A ZBRAN
Ø43A DMINU      Ø487 TDUP       Ø4A7 TOGGL      Ø7FA TRAV       Ø8D4 QPAIR
121B PREV       16BA LOOPC      182Ø DDOTR      1288 UPDAT      12AE MTBUF
186E QUES       Ø582 USER       Ø5EØ LIMIT      1ØD3 SLMOD      1572 PEMIT
18DF LISTC

............... ØØØØ NUMBERS

Ø7D2 SPDRV1     ØFA4 SPDRV2     ØØØØ FIGREV     ØØØC FF         ØØØ8 BSOUT
3BEØ BUF1       ØØ2Ø ABL        ØØØ2 MXDRV      ØØØA LF         4ØØØ EM
ØØ84 CO         ØØ1Ø DLE        ØØØD ACR        ØØØ7 BELL       ØØ8Ø BPS
ØØØØ USRVER     ØØ2E ADOT       ØØ4Ø US         ØØ1A SPT1       ØØ34 SPT2
ØØ8Ø KBBUF      ØØØ8 NBUF       ØØ5F BSIN       ØØ4D TRKS1      ØØØ1 NSCR
3BAØ INITRØ     ØØ4D TRKS2      3BØØ INITSØ     ØØØ1 FIGREL     ØØAØ RTS

............... ØØØØ LABELS

Ø588 DOUSE      Ø15B APUSH      Ø3FF ZLESS1     Ø14F TNEXT1     Ø15A DPUSH
Ø321 DZERO      15E5 STRK       Ø153 TNEXT2     Ø155 TNEXT3     19F3 MATCHOK
1588 POUT       1AØB INITDP     19F3 NOMATCH    154F PQTER      15AF CI
Ø213 DIGI1      Ø22Ø DIGI2      Ø12E TNEXT      Ø285 ENCL1      ØF96 CLD
19D6 MAT1       Ø18B BRAN1      Ø296 ENCL2      1599 BDOSFUNC   19DE MAT2
Ø2AØ ENCL3      Ø785 LES1       19ED MAT3       Ø2A5 ENCL4      Ø78D LES2
19F6 MAT4       15B5 CHO        15BF LO         Ø236 PFIN1      Ø242 PFIN2
Ø25A PFIN5      15F9 GSEC       Ø264 PFIN6      Ø151 BREAK      157B PCR
156D PKEY1      Ø9DF DODOE      1ØØF STOD1      15FE PSEC       15EA SSEC
Ø15F NEXT1      Ø52Ø DOCOL      Ø1B4 XLOO1      Ø55D DOCON      15C9 DCBIOS
15EF SDMAO      15EØ SDSK       Ø3EC ZEQU1      ØF81 WRM        15F4 SDMAS
155D PKEY       1596 POUT1      15A2 EXIT       Ø576 DOVAR      1558 PQTER1
Ø15C NEXT       15A9 CSTAT
```

Fig-Forth for the 8Ø86/88
Version 1.Ø
by
Thomas Newman

1. INTRODUCTION

This document will briefly describe Forth-86 and how it differs from the Fig model. It is assumed that the reader is familiar with the 8Ø86/88 CPU and Fig Forth's installation manual.

This version of 8Ø86 Forth was derived from 8Ø8Ø Fig Forth (version 1.1). The extra registers and extended addressing modes of the 8Ø86 were used to optimize the code portion of Forth-86 (refer to the source listing for 8Ø86 register usage).

2. IMPLEMENTATION

Forth was implemented and tested on an 8Ø88 CPU running Digital Research's CP/M-86 (version 1.Ø).

All console, printer and disk drivers call tneir respected routines in the "BIOS" through the "BDOS" function #5Ø. These calls are all located in a common program area and can be easily modified to call your own I/O routines (if your're not using CP/M).

The following are notes about loading and executing Forth:

o The source program was assembled using CP/M's ASM86. The mnemonics should be compatible with Intel's assembler (except for the far CALLs and JMPs which are not used in this version of forth).

o The forth program can be loaded into any free portion of memory that is large enough to hold the forth kernel, dictionary and buffers (from "ORIG" thru "EM").

o The program is executed at the offset address 1ØØ hex with the Code Segment (CS) equal to the base address (this is the way CP/M executes "CMD" type files).

o The "COLD" entry routine in forth will set all other segment registers to the value of the CS register. This version of forth assumes all data, code and stack offset addresses are in the current code segment. This limits forth's addressing range to 64k bytes (this should be changed in future versions).

4. FORTH'S MEMORY MAP

Uses the standard Fig-Forth memory map described in the installation manual.

5. MODIFIED FORTH WORDS

U/ (ud1 ud2 --- u2 u3)

Same as the fig model except returns a -1 for both the quotient and remainder (u2 and u3) when the divisor is zero (ud2).

+LOOP (---)

The run-time portion of this word "(LOOP)" was modified to conform to Forth-79 standards when dealing with an "index" that is less than zero (negative). The loop will stop when the "index" is less than the "limit" (the fig model will stop when less than or equal to).

ENCLOSE (addr1 c --- addr1 n1 n2 n3)

Modified to return 16-bit offset values for n1, n2 and n3. The Fig model only returns 8-bit offsets which could limit the range of word searches in blocks larger than 256 bytes.

6. ADDED FORTH WORDS

These are words that are not found in the Fig-Forth model (some of these words are in 8Ø8Ø Forth 1.1).

U< (u1 u2 --- f)

Leaves a true flag if "u1" is less tnan "u2"; otherwise leaves a false flag. (This is an unsigned comparison).

P@ (port# --- n)

Fetches (inputs) a 16-bit value "n" from the I/O port.

P! (n port# ---)

Stores (outputs) a 16-bit number "n" at the I/O port.

PC@ (port# --- c)

Fetches (inputs) an 8-bit value "c" from the I/O port.

PC! (c port# ---)

Stores (outputs) an 8-bit number "c" at the I/O port.

DRIVE (--- addr)

A variable that contains the current disk drive number.

SEC (--- addr)

A variable that contains the current sector number.

TRACK (--- addr)

A variable that contains the current track number.

#BUFF (--- n)

A constant that returns the number of disk buffers in the current Forth system.

DENSITY (--- addr)

A variable that contains the current disk density. Zero = single density (26 sectors/track). Non-zero = double density (52 sectors/track). Sector size is 128 bytes in both densities.

Note: In CP/M the "BIOS" program must be modified
to handle double density formats.

DISK-ERROR (--- addr)

A variable that contains disk error status (non-zero indicates a disk error). The disk status is saved after each sector read/write but error trapping has not been implemented (the error status could be tested in "R/W").

SET-IO (---)

Sets up the disk controller with Sector number, Track number and DMA address.

SET-DRIVE (---)

Sends the disk controller the new disk drive number.

T&SCALC (n ---)

Calculates: Drive, Track and Sector values from a sector displacement number "n". The results are stored in the appropriate variables.

SECRD (---)

The basic sector read routine (assumes SET-IO and SET-DRIVE have been executed). Called from "R/W".

SECWT (---)

The basic sector write routine (assumes SET-IO and SET-DRIVE have been executed). Called from "R/W".

BYE (---)

Exits Forth and returns to CP/M.
(Change back to your CP/M boot disk before typing this word.)

.CPU (---)

Prints the type of CPU (8Ø86) on the console. This routine is called from "COLD". The CPU type is coded as 32-bits in base 36 and is located at "ORIGIN" + 22 hex.

MATCH (cursor:addr bytes:left str:length
--- flag new:cursor:offset)

This word is used by the Fig-Forth editor for finding and deleting text within Forth source blocks. The word has been included to ease the implementation of the Forth model editor.