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TITLE 'ASM SCANNER MODULE'
1100 ORG 1100H
1100 C34013 JMP ENDMOD ;END OF THIS MODULE
1103 C33211 JMP INITS ;INITIALIZE THE SCANNER
1106 C3C011 JMP SCAN ;CALL THE SCANNER

;
;
; ENTRY POINTS IN I/O MODULE
0200 = IOMOD EQU 200H
0206 = GNCF EQU IOMOD+6H
0215 = WOBUFF EQU IOMOD+15H
0218 = PERR EQU IOMOD+18H
;
1109 LASTC: DS 1 ;LAST CHAR SCANNED
110A NEXTC: DS 1 ;LOOK AHEAD CHAR
110B STYPE: DS 1 ;RADIX INDICATOR
;
; COMMON EQUATES
0078 = PBMAX EQU 120 ;MAX PRINT SIZE
010C = PBUFF EQU 10CH ;PRINT BUFFER
0184 = PBP EQU PBUFF+PBMAX ;PRINT BUFFER POINTER
;
0185 = TOKEN EQU PBP+1 ;CURRENT TOKEN UDER SCAN
0186 = VALUE EQU TOKEN+1 ;VALUE OF NUMBER IN BINARY
0188 = ACCLLEN EQU VALUE+2 ;ACCUMULATOR LENGTH
0040 = ACMAX EQU 64 ;MAX ACCUMULATOR LENGTH
0189 = ACCUM EQU ACCLLEN+1
;
01C9 = EVALUE EQU ACCUM+ACMAX ;VALUE FROM EXPRESSION ANALYSIS
;
01CB = SYTOP EQU EVALUE+2 ;CURRENT SYMBOL TOP
01CD = SYMAX EQU SYTOP+2 ;MAX ADDRESS+1
;
01CF = PASS EQU SYMAX+2 ;CURRENT PASS NUMBER
01D0 = FPC EQU PASS+1 ;FILL ADDRESS FOR NEXT HEX BYTE
01D2 = ASPC EQU FPC+2 ;ASSEMBLER'S PSEUDO PC
;
; GLOBAL EQUATES
0001 = IDEN EQU 1 ;IDENTIFIER
0002 = NUMB EQU 2 ;NUMBER
0003 = STRNG EQU 3 ;STRING
0004 = SPECL EQU 4 ;SPECIAL CHARACTER
;
0001 = PLABT EQU 0001B ;PROGRAM LABEL
0002 = DLABT EQU 0010B ;DATA LABEL
0004 = EQUT EQU 0100B ;EQUATE
0005 = SETT EQU 0101B ;SET
0006 = MACT EQU 0110B ;MACRO
;
0008 = EXTT EQU 1000B ;EXTERNAL
000B = REFT EQU 1011B ;REFER
000C = GLBT EQU 1100B ;GLOBAL
;
0002 = BINV EQU 2
0008 = OCTV EQU 8
000A = DECV EQU 10

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```

0010 =      HEXV   EQU    16
000D =      CR     EQU    0DH
000A =      LF     EQU    0AH
001A =      EOF    EQU    1AH
0009 =      TAB    EQU    09H      ;TAB CHARACTER
;
;
;

```

UTILITY SUBROUTINES

```

GNC:      ;GET NEXT CHARACTER AND ECHO TO PRINT FILE
110C CD0602 CALL    GNCF
110F F5     PUSH   PSW
1110 FE0D   CPI    CR
1112 CA3011 JZ     GNC0
1115 FE0A   CPI    LF      ;IF LF THEN DUMP CURRENT BUFFER
1117 CA3011 JZ     GNC0
;
;
;

```

```

;NOT A CR OR LF, PLACE INTO BUFFER IF THERE IS ENOUGH ROOM
111A 3A8401 LDA    PBP
111D FE78   CPI    PBMAX
111F D23011 JNC    GNC0
;

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ENOUGH ROOM, PLACE INTO BUFFER
1122 5F     MOV    E,A
1123 1600   MVI    D,0      ;DOUBLE PRECISION PBP IN D,E
1125 3C     INR    A
1126 328401 STA   PBP      ;INCREMENTED PBP IN MEMORY
1129 210C01 LXI    H,PBUFF
112C 19     DAD    D      ;PBUFF(PBP)
112D F1     POP    PSW
112E 77     MOV    M,A      ;PBUFF(PBP) = CHAR
112F C9     RET
;

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GNC0:     ;CHAR NOT PLACED INTO BUFFER
1130 F1     POP    PSW
1131 C9     RET
;

```

INITS: ;INITIALIZE THE SCANNER

```

1132 CD4911 CALL   ZERO
1135 320A11 STA   NEXTC   ;CLEAR NEXT CHARACTER
1138 328401 STA   PBP
113B 3E0A   MVI    A,LF      ;SET LAST CHAR TO LF
113D 320911 STA   LASTC
1140 CD1502 CALL   WOBUFF  ;CLEAR BUFFER
1143 3E10   MVI    A,16      ;START OF PRINT LINE
1145 328401 STA   PBP
1148 C9     RET
;

```

```

ZERO:     XRA    A
1149 AF     STA   ACCLN
114A 328801 STA   ACCLN
114D 320B11 STA   STYPE
1150 C9     RET
;

```

SAVER: ;STORE THE NEXT CHARACTER INTO THE ACCUMULATOR AND UPDATE ACCL

```

1151 218801 LXI    H,ACCLN
1154 7E     MOV    A,M
1155 FE40   CPI    ACMAX
1157 DA5F11 JC     SAV1      ;JUMP IF NOT UP TO LAST POSITION
115A 3600   MVI    M,0

```

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115C CD1E13      CALL    ERRO
115F 5E          SAV1:  MOV     E,M      ;D,E WILL HOLD INDEX
1160 1600        MVI     D,0
1162 34          INR     M        ;ACCLN INCREMENTED
1163 23          INX     H        ;ADDRESS ACCUMULATOR
1164 19          DAD     D        ;ADD INDEX TO ACCUMULATOR
1165 3A0A11      LDA     NEXTC   ;GET CHARACTER
1168 77          MOV     M,A      ;INTO ACCUMULATOR
1169 C9          RET

```

; TDOLL: ;TEST FOR DECIMAL SIGN, ASSUMING H,L ADDRESS NEXTC

```

116A 7E          MOV     A,M
116B FE24        CPI     '$'
116D C0          RNZ
116E AF          XRA     A        ;TO GET A ZERO
116F 77          MOV     M,A      ;CLEARS NEXTC
1170 C9          RET         ;WITH ZERO FLAG SET

```

; NUMERIC: ;CHECK NEXTC FOR NUMERIC, RETURN ZERO FLAG IF NOT NUMERIC

```

1171 3A0A11      LDA     NEXTC
1174 D630        SUI     '0'
1176 FE0A        CPI     10

```

; CARRY RESET IF NUMERIC

```

1178 17          RAL
1179 E601        ANI     1B      ;ZERO IF NOT NUMERIC
117B C9          RET

```

; HEX: ;RETURN ZERO FLAG IF NEXTC IS NOT HEXADECIMAL

```

117C CD7111      CALL    NUMERIC
117F C0          RNZ         ;RETURNS IF 0-9
1180 3A0A11      LDA     NEXTC
1183 D641        SUI     'A'
1185 FE06        CPI     6

```

; CARRY SET IF OUT OF RANGE

```

1187 17          RAL
1188 E601        ANI     1B
118A C9          RET

```

; LETTER: ;RETURN ZERO FLAG IF NEXTC IS NOT A LETTER

```

118B 3A0A11      LDA     NEXTC
118E D641        SUI     'A'
1190 FE1A        CPI     26
1192 17          RAL
1193 E601        ANI     1B
1195 C9          RET

```

; AI.NUM: ;RETURN ZERO FLAG IF NOT ALPHANUMERIC

```

1196 CD8B11      CALL    LETTER
1199 C0          RNZ
119A CD7111      CALL    NUMERIC
119D C9          RET

```

; TRANS: ;TRANSLATE TO UPPER CASE

```

119E 3A0A11      LDA     NEXTC
11A1 FE61        CPI     'A' OR 1100000B ;LOWER CASE A
11A3 D8          RC

```

;CARRY IF LESS THAN LOWER A

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```

11A4 FE7B      CPI      ('Z' OR 1100000B)+1      ;LOWER CASE Z
11A6 DO        RNC                          ;NO CARRY IF GREATER THAN LOWER
11A7 E65F      ANI      1011111B             ;CONVERT TO UPPER CASE
11A9 320A11    STA      NEXTC
11AC C9        RET

```

```

;
GNCN:          ;GET CHARACTER AND STORE TO NEXTC

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```

11AD CD0C11    CALL     GNC
11B0 320A11    STA      NEXTC
11B3 CD9E11    CALL     TRANS      ;TRANSLATE TO UPPER CASE
11B6 C9        RET

```

```

;
EOLT:          ;END OF LINE TEST FOR COMMENT SCAN

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```

11B7 FE0D      CPI      CR
11B9 C8        RZ
11BA FE1A      CPI      EOF
11BC C8        RZ
11BD FE21      CPI      '!'
11BF C9        RET

```

```

;
SCAN:          ;FIND NEXT TOKEN IN INPUT STREAM

```

```

11C0 AF        XRA      A
11C1 328501    STA      TOKEN
11C4 CD4911    CALL     ZERO

```

```

;
DEBLANK

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DEBL:          LDA      NEXTC
11C7 3A0A11    CPI      TAB      ;TAB CHARACTER TREATED AS BLANK OUTSIDE STRING
11CA FE09      JZ       DEBO
11CC CAF411    CPI      ';'      ;MAY BE A COMMENT
11CF FE3B      JZ       DEB1     ;DEBLANK THROUGH COMMENT
11D1 CAE111    CPI      '*'      ;PROCESSOR TECH COMMENT
11D4 FE2A      JNZ      DEB2     ;NOT *
11D6 C2ED11    LDA      LASTC
11D9 3A0911    CPI      LF       ;LAST LINE FEED?
11DC FE0A      JNZ      DEB2     ;NOT LF*
11DE C2ED11    ; COMMENT FOUND, REMOVE IT

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```

; COMMENT FOUND, REMOVE IT

```

```

DEB1:          CALL     GNCN
11E1 CDAD11    CALL     EOLT      ;CR, EOF, OR !
11E4 CDB711    JZ       FINDL     ;HANDLE END OF LINE
11E7 CAFA11    JMP      DEB1     ;OTHERWISE CONTINUE SCAN
DEB2:          ORI      ' '      ;MAY BE ZERO
11ED F620      CPI      ' '
11EF FE20      JNZ      FINDL
11F1 C2FA11    DEBO:   CALL     GNCN      ;GET NEXT AND STORE TO NEXTC
11F4 CDAD11    JMP      DEBL
11F7 C3C711

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```

;
; LINE DEBLANKED, FIND TOKEN TYPE
FINDL:         ;LOOK FOR LETTER, DECIMAL DIGIT, OR STRING QUOTE

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11FA CD8B11    CALL     LETTER
11FD CA0512    JZ       FINDO
1200 3E01      MVI      A, IDEN
1202 C33912    JMP      STOKEN

```

```

;
FINDO:         CALL     NUMERIC
1205 CD7111    JZ       FIND1
1208 CA1012

```

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```

120B 3E02          MVI    A,NUMB
120D C33912        JMP     STOKEN

;
1210 3A0A11        FIND1: LDA     NEXTC
1213 FE27          CPI     ' '
1215 C22112        JNZ     FIND2
1218 AF            XRA     A
1219 320A11        STA     NEXTC ;DON'T STORE THE QUOTE
121C 3E03          MVI     A,STRNG
121E C33912        JMP     STOKEN

;
1221 FEOA          FIND2: ;ASSUME IT IS A SPECIAL CHARACTER
1223 C23712        CPI     LF ;IF LF THEN DUMP THE BUFFER
;                  JNZ     FIND3
;                  LF FOUND
1226 3ACF01        LDA     PASS
1229 B7            ORA     A
122A C41502        CNZ     WOBUFF
122D 210C01        LXI     H,PBUFF ;CLEAR ERROR CHAR ON BOTH PASSES
1230 3620          MVI     M,' '
1232 3E10          MVI     A,16
1234 328401        STA     PBP ;START NEW LINE
1237 3E04          FIND3: MVI     A,SPECL

;
1239 328501        STOKEN: STA     TOKEN

;
;
;                  LOOP WHILE CURRENT ITEM IS ACCUMULATING
123C 3A0A11        SCTOK: LDA     NEXTC
123F 320911        STA     LASTC ;SAVE LAST CHARACTER
1242 B7            ORA     A
1243 C45111        CNZ     SAVER ;STORE CHARACTER INTO ACCUM IF NOT ZERO
1246 CDAD11        CALL    GNCN ;GET NEXT TO NEXTC
1249 3A8501        LDA     TOKEN
124C FE04          CPI     SPECL
124E C8            RZ ;RETURN IF SPECIAL CHARACTER
124F FE03          CPI     STRNG
1251 C49E11        CNZ     TRANS ;TRANSLATE TO UPPER CASE IF NOT IN STRING
1254 210A11        LXI     H,NEXTC
1257 3A8501        LDA     TOKEN

;
125A FE01          CPI     IDEN
125C C26C12        JNZ     SCT2

;
;                  ACCUMULATING AN IDENTIFIER
125F CD6A11        CALL    TDOLL ;$?
1262 CA3C12        JZ      SCTOK ;IF SO, SKIP IT
1265 CD9611        CALL    ALNUM ;ALPHA NUMERIC?
1268 C8            RZ ;RETURN IF END

;                  NOT END OF THE IDENTIFIER
1269 C33C12        JMP     SCTOK

;
SCT2: ;NOT SPECIAL OR IDENT, CHECK NUMBER
126C FE02          CPI     NUMB
126E C20213        JNZ     SCT3

;

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; ACCUMULATING A NUMBER, CHECK FOR $
1271 CD6A11 CALL TDOLL
1274 CA3C12 JZ SCTOK ;SKIP IF FOUND
1277 CD7C11 CALL HEX ;HEX CHARACTER?
127A C23C12 JNZ SCTOK ;STORE IT IF FOUND
;
; END OF NUMBER, LOOK FOR RADIX INDICATOR
;
127D 3A0A11 LDA NEXTC
1280 FE4F CPI 'O' ;OCTAL INDICATOR
1282 CA8A12 JZ NOCT
1285 FE51 CPI 'Q' ;OCTAL INDICATOR
1287 C28F12 JNZ NUM2
;
; NOCT: ;OCTAL
128A 3E08 MVI A,OCTV
128C C39612 JMP SSTYP
;
; NUM2: CPI 'H'
128F FE48 JNZ NUM3
1291 C2A012 MVI A,HEXV
1294 3E10 SSTYP: STA STYPE
1296 320B11 XRA A
1299 AF STA NEXTC ;CLEARS THE LOOKAHEAD CHARACTER
129A 320A11 JMP NCON
129D C3BB12
;
; RADIX MUST COME FROM ACCUM
12A0 3A0911 NUM3: LDA LASTC
12A3 FE42 CPI 'B'
12A5 C2AD12 JNZ NUM4
12A8 3E02 MVI A,BINV
12AA C3B412 JMP SSTY1
;
; NUM4: CPI 'D'
12AD FE44 MVI A,DECV
12AF 3E0A JNZ SSTY2
12B1 C2B812 SSTY1: LXI H,ACCLN
12B4 218801 DCR M ;ACCLN DECREMENTED TO REMOVE RADIX INDICATOR
12B7 35 SSTY2: STA STYPE
12B8 320B11
;
; NCON: ;NUMERIC CONVERSION OCCURS HERE
12BB 210000 LXI H,0
12BE 228601 SHLD VALUE ;VALUE ACCUMULATES BINARY EQUIVALENT
12C1 218801 LXI H,ACCLN
12C4 4E MOV C,M ;C=ACCLN
12C5 23 INX H ;ADDRESSES ACCUM
CLOP: ;NEXT DIGIT IS PROCESSED HERE
12C6 7E MOV A,M
12C7 23 INX H ;READY FOR NEXT LOOP
12C8 FE41 CPI 'A'
12CA D2D212 JNC CLOP1 ;NOT HEX A-F
12CD D630 SUI 'O' ;NORMALIZE
12CF C3D412 JMP CLOP2
;
; CLOP1: ;HEX A-F
12D2 D637 SUI 'A'-10
; CLOP2: ;CHECK SIZE AGAINST RADIX

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```

12D4 E5             PUSH    H            ;SAVE ACCUM ADDR
12D5 C5             PUSH    B            ;SAVE CURRENT POSITION
12D6 4F             MOV     C,A
12D7 210B11         LXI    H,STYPE
12DA BE             CMP     M
12DB D41813         CNC     ERRV        ;VALUE ERROR IF DIGIT>=RADIX
12DE 0600           MVI    B,0        ;DOUBLE PRECISION DIGIT
12E0 7E             MOV    A,M        ;RADIX TO ACCUMULATOR
12E1 2A8601         LHLD   VALUE
12E4 EB             XCHG             ;VALUE TO D,E - ACCUMULATE RESULT IN H,L
12E5 210000         LXI    H,0        ;ZERO ACCUMULATOR
                   CLOP3: ;LOOP UNTIL RADIX GOES TO ZERO
12E8 B7             ORA    A
12E9 CAF712         JZ     CLOP4
12EC 1F             RAR               ;TEST LSB
12ED D2F112         JNC    TTWO       ;SKIP SUMMING OPERATION IF LSB=0
12F0 19             DAD    D        ;ADD IN VALUE
                   TTWO: ;MULTIPLY VALUE * 2 FOR SHL OPERATION
12F1 EB             XCHG
12F2 29             DAD    H
12F3 EB             XCHG
12F4 C3E812         JMP    CLOP3
                   ;
                   ;
                   CLOP4: ;END OF NUMBER CONVERSION
12F7 09             DAD    B        ;DIGIT ADDED IN
12F8 228601         SHLD   VALUE
12FB C1             POP    B
12FC E1             POP    H
12FD 0D             DCR    C        ;MORE DIGITS?
12FE C2C612         JNZ    CLOP
1301 C9             RET               ;DONE WITH THE NUMBER
                   ;
                   SCT3: ;MUST BE A STRING
1302 3A0A11         LDA    NEXTC
1305 FE0D           CPI    CR        ;END OF LINE?
1307 CA1E13         JZ     ERRO     ;AND RETURN
130A FE27           CPI    ' '
130C C23C12         JNZ    SCTOK
130F CDAD11         CALL   GNCN
1312 FE27           CPI    ' '
1314 C0             RNZ               ;RETURN IF SINGLE QUOTE ENCOUNTERED
1315 C33C12         JMP    SCTOK     ;OTHERWISE TREAT AS ONE QUOTE
                   ;
                   ;             END OF SCANNER
                   ;
                   ;             ERROR MESSAGE ROUTINES
                   ERRV:        ;'V' VALUE ERROR
1318 F5             PUSH   PSW
1319 3E56           MVI    A,'V'
131B C32413         JMP    ERR
                   ;
                   ERRO:        ;'O' OVERFLOW ERROR
131E F5             PUSH   PSW
131F 3E4F           MVI    A,'O'
1321 C32413         JMP    ERR

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;
ERR:      ;PRINT ERROR MESSAGE
1324 C5   PUSH      B
1325 E5   PUSH      H
1326 CD1802 CALL     PERR
1329 E1   POP       H
132A C1   POP       B
132B F1   POP       PSW
132C C9   RET

;
140 =     ENDMOD   EQU      ($ AND OFFEOH) + 20H
132D     END
```

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0188 ACCLEN	0189 ACCUM	0040 ACMAX	1196 ALNUM	01D2 ASPC
0002 BINV	12C6 CLOP	12D2 CLOP1	12D4 CLOP2	12E8 CLOP3
12F7 CLOP4	000D CR	11F4 DEBO	11E1 DEB1	11ED DEB2
11C7 DEBL	000A DECV	0002 DLABT	1340 ENDMOD	001A EOF
11B7 EOLT	0004 EQUT	131E ERRO	1324 ERR	1318 ERRV
01C9 EVALUE	0008 EXTT	1205 FINDO	1210 FIND1	1221 FIND2
1237 FIND3	11FA FINDL	01D0 FPC	000C GLBT	1130 GNCO
0206 GNCF	110C GNC	11AD GNCN	117C HEX	0010 HEXV
0001 IDEN	1132 INITS	0200 IOMOD	1109 LASTC	118B LETTER
000A LF	0006 MACT	12BB NCON	110A NEXTC	128A NOCT
128F NUM2	1740 NUM3	12AD NUM4	0002 NUMB	1171 NUMERIC
0008 OCTV	01CF PASS	0078 PBMAX	0184 PBP	010C PBUFF
0218 PERR	0001 PLABT	000B REFT	115F SAV1	1151 SAVER
11C0 SCAN	126C SCT2	1302 SCT3	123C SCTOK	0005 SETT
0004 SPECL	12B4 SSTY1	12B8 SSTY2	1296 SSTYP	1239 STOKEN
0003 STRNG	110B STYPE	01CD SYMAX	01CB SYTOP	0009 TAB
116A TDOLL	0795 TOKEN	119E TRANS	12F1 TTWO	0186 VALUE
0215 WOBUFF	1149 ZERO			

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