```
LOCATION OBJECT CODE LINE     SOURCE LINE

                       1 "COCONUT"
                       2 * HP41C MAINFRAME MICROCODE ADDRESSES @0-1777
                       3 *
                       4                GLB             ALPDEF
                       5                GLB             END2
                       6                GLB             END3
                       7                GLB             CLCTMG
                       8                GLB             QUTCAT
                       9                GLB             STMSGF
                      10                GLB             XAVIEW
                      11                GLB             XVIEW
                      12                GLB             ADRFCH
                      13                GLB             TONSTF
                      14                GLB             BCDBIN
                      15                GLB             BIGBRC
                      16                GLB             INTINT
                      17                GLB             COLDST
                      18                GLB             DROWSY
                      19                GLB             DRSY05
                      20                GLB             DRSY25
                      21                GLB             DRSY51
                      22                GLB             ERRNE
                      23                GLB             ERROF
                      24                GLB             GOTINT
                      25                GLB             GTAINC
                      26                GLB             GTAI40
                      27                GLB             INCGT2
                      28                GLB             MSGDLY
                      29                GLB             NFRC
                      30                GLB             NFRENT
                      31                GLB             NFRFST
                      32                GLB             NFRKB
                      33                GLB             NFRKB1
                      34                GLB             NFRNC
                      35                GLB             NFRNIO
                      36                GLB             NFRPR
                      37                GLB             NFRPU
                      38                GLB             NFRSIG
                      39                GLB             NFRX
                      40                GLB             NFRXY
                      41                GLB             ROW10
                      42                GLB             RUNNK
                      43                GLB             WKUP70
                      44                GLB             XNNROW
                      45                GLB             XCUTB1
                      46                GLB             XCUTE
                      47                GLB             XCUTEB
                      48                GLB             XROW1
                      49 *
                      50                LEGAL
0000 00001002         51                GOLNC           LSWKUP
0002 00001002         52                GOLONG          DSWKUP
                      53 ***************************************************
                      54 *THE FOLLOWING ROUTINE TAKES A BINARY REGISTER
                      55 *NUMBER FROM STATUS AND RETURNS THAT REGISTER
                      56 *IN C, ITS ADDRESS IN N, AND X IN M. IT SENDS
                      57 *ILLEGAL ADDRESSES TO ERROR "NONEXISTENT."
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

                      58 *IT ALSO HANDLES INDIRECT ADDRESS. CYCLE TIMES
                      59 *AVERAGE ABOUT 30 FOR DIRECT AND 60 FOR INDIRECT
                      60 * USES: A,B,C,M,N,ACTIVE POINTER, S9,S8,S7, DADD, + 2 SUB LEVELS
                      61 * MAY EXIT TO ERRNE
                      62 * IN: ADDR IN S7:0 (MAY BE INDIRECT)
                      63 *     NO PERIPHERAL ENABLED
                      64 * OUT: C = C(EFFECTIVE ADDR)
                      65 *     N = EFFECTIVE ADDR
                      66 *     DADD = EFFECTIVE ADDR
                      67 *     M = X REGISTER CONTENTS
                      68 *     S7 = 0
                      69 ***********************************************
  0004 004E           70 ADRFCH          C=0             W               ;GETX
  0005 0270           71                 DADD=C
  0006 00F8           72                 C=REGN          3
  0007 0158           73                 M=C                             ;X IS STORED IN M
  0008 0398           74                 C=ST                            ;GET ADDRESS FROM STATUS
  0009 0056           75                 C=0             XS              ;CLEAR 9 FROM XS
  000A 0284           76                 ST=0            7               ;KILL INDIRECT FLAG
  000B 03D8           77                 CSTEX                           ;PUT ORIG STATUS BACK
  000C 014C           78                 ST=1?           6               ;STACK RCL?
  000D 0003           79                 GONC            OVRSTK          ;NO
  000E 008C           80                 ST=1?           5
  000F 0003           81                 GONC            OVRSTK          ;NO
  0010 004C           82                 ST=1?           4
  0011 0003           83                 GONC            OVRSTK          ;NO
  0012 031C           84                 PT=             1               ;SET TO CLEAR HIGH BITS
  0013 0042           85                 C=0             PT              ;CLEAR HIGH BITS
  0014 0270           86                 DADD=C                          ;PUT OUT ADDRESS
  0015 0070           87                 N=C                             ;SAVE ADDRESS IN N
  0016 0038           88                 C=DATA                          ;GET REGISTER
  0017 0003           89                 GOTO            FCHRTN          ; DONE
  0018 00AE           90 OVRSTK          ACEX            W               ;SAVE RELATIVE ADDRESS
  0019 0378           91                 C=REGN          13              ;GET STATUS REG
  001A 003C           92                 RCR             3               ;MOVE REGO TO POSITION
  001B 0206           93                 C=C+A           X               ;COMPUTE ADR OF REG
  001C 0070           94                 N=C                             ;SAV ADR FOR CALNG ROUT
  001D 00001000       95                 GOSUB           =CHKADR         ;CHECK ADR, VAL RTNS IN B
  001F 00CE           96                 C=B             W               ;BRING RCL VALUE TO C
  0020 028C           97 FCHRTN          ST=1?           7               ;INDIRECT
  0021 03A0           98                 RTNNC                           ;DONE IF NOT INDIRECT
  0022 00001000       99                 GOSUB           BCDBIN          ;DO BCD BIN
  0024 0284          100                 ST=0            7               ;CLEAR INDIRECT FLAG
  0025 0003          101                 GOTO            OVRSTK          ;NEW ADR STRT OVER
                     102                 FILLTO          45Q
                     103 ***************************************************
                     104 * THIS ROUTINE IS A SPECIAL "ROW" FOR X<>NN
                     105 ***************************************************
  0026 0276          106 XNNROW          C=C-1           XS              ;RESTORE BYTE 1
  0027 0276          107                 C=C-1           XS
                     108                 LEGAL
  0028 00001000      109                 GOSUB           INCGT2
  002A 00AE          110                 ACEX            W
  002B 0358          111                 ST=C
  002C 02FC          112                 RCR             13
  002D 0058          113                 G=C
  002E 0003          114                 GOTO            ADRGSB
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LOCATION OBJECT CODE LINE     SOURCE LINE

                     115 *
002F 00001002        116 XROW0          GOLONG          =ROW0
0031 00001002        117 XROW10         GOLONG          ROW10
0033 00001002        118 XROW11         GOLONG          =ROW11
0035 00001002        119 XROW12         GOLONG          =ROW12
0037 00001002        120 XROW13         GOLONG          =XGTO
0039 00001002        121 XROW14         GOLONG          =XXEQ
                     122 ***********************************************************
                     123 *ONE BYTE STORE AND RECALL FUNCTIONS ENTER HERE TO
                     124 *BE TRANSMOGRAPHIED INTO TWO BYTE FUNCTIONS
                     125 ***********************************************************
003B                 126 XROW2
C03B                 127 XROW3
003B 0262            128                C=C-1           PT                ;HIGH DIGIT -2
003C 0262            129                C=C-1           PT
003D 03C6            130                CSR             X                 ;CREATE BYTE TWO
003E 03CA            131                CSR             WPT               ;CREATE BYTE 1
003F 0250            132                LC              9
0040 001C            133                PT=             3
0041 0003            134                GOTO            REGADR
                     135 ***********************************************************
                     136 *TWO BYTE RCLS, STOS, DSP FORMAT ETC COMPRISE ROW 9
                     137 *ROW9 GETS BYTE TWO, FETCHES X (IN M), FETCHES
                     138 *REGISTER NN (IN B), AND LEAVE THE ADDRESS OF NN
                     139 *IN N FOR ALL DATA RELATED FUNTIONS (0-11). IT THEN
                     140 *DOES A SIXTEEN WAY BRANCH TO SORT OUT THE ROW.
                     141 ***********************************************************
0042 00001000        142 XROW9          GOSUB           INCGT2            ;GET BYTE TWO
0044 00AE            143                ACEX            W                 ;BRING BACK TO C
0045 0358            144 REGADR         ST=C                              ;SAVE BYTE 2
0046 02FC            145                RCR             13                ;MOVE TO G POSITION
0047 0058            146                G=C                               ;SAVE IN G
0048 01E2            147                C=C+C           PT                ;SEP OUT 0-7
0049 0003            148                GONC            ADRGSB            ;DO RCL ETC
004A 01E2            149                C=C+C           PT                ;SEP OUT DSP & TONE
004B 0007            150                GOC             TONETC
004C 00001000        151 ADRGSB         GOSUB           =ADRFCH           ;GET X,RNN, AND ADR
004E 00EE            152                BCEX            W                 ;SAVE VALUE IN RNN
004F 035C            153 BIGBRC         PT=             12                ;SET FOR G LOAD
0050 0098            154                C=G                               ;GET BYTE ONE BACK
0051 001C            155                PT=             3
0052 00001002        156                GOLONG          XCUTB1            ;DO 256 WAY BRANCH
                     157 ***********************************************************
                     158 *THIS SECTION SORTS OUT INDIRECT TONE, FIX, ENG, AND
                     159 *SCI FROM DIRECT. IF INDIRECT GOES THROUGH ADDRESS
                     160 *FETCH OTHERWISE GOES IMMEDIATELY TO 256 WAY BRANCH.
                     161 ***********************************************************
0054 028C            162 TONSTF         ST=1?           7                 ;INDIRECT
0055 03A0            163                RTNNC                             ;NO DO BRANCH
0056 0284            164                ST=0            7                 ;CLEAR INDIRECT BIT
0057 00001000        165                GOSUB           =ADRFCH           ;GET REG
0059 00001000        166                GOSUB           BCDBIN            ;CONVERT TO BINARY
005B 0358            167                ST=C                              ;SAVE BINARY STATUS
005C 010C            168                ST=1?           8                 ;MORE THAN ONE DIGIT
005D 03A0            169                RTNNC                             ;256 WAY BRANCH
005E 00001002        170                GOLONG          =ERRDE            ;YES THEN DATA ERROR
                     171                FILLTO          137Q
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LOCATION OBJECT CODE LINE     SOURCE LINE

    0060 0003          172 ROWTBL          GOTO            XROW0           ;ROWTBL MUST BE AT @140
    0061 0003          173                 GOTO            XROW1           ; OTHER LOGIC MAKES USE OF
    0062 0003          174                 GOTO            XROW2           ; THE FACT THAT ROWTBL IS IN
    0063 0003          175                 GOTO            XROW3           ; THE FIRST 256 WORDS OF CHIP 0
    0064 0003          176                 GOTO            XROW4           ; AND ON AN EVEN BOUNDARY OF
    0065 0003          177                 GOTO            XROW5           ; 16 WORDS.
    0066 0003          178                 GOTO            XROW6
    0067 0003          179                 GOTO            XCUTEB          ;ROW 7
    0068 0003          180                 GOTO            XCUTEB          ;ROW 8
    0069 0003          181                 GOTO            XROW9
    006A 0003          182                 GOTO            XROW10
    006B 0003          183                 GOTO            XROW11
    006C 0003          184                 GOTO            XROW12
    006D 0003          185                 GOTO            XROW13
    006E 0003          186                 GOTO            XROW14
    006F 00001002      187                 GOLONG          =TEXT           ;ROW 15
    0071 00001000      188 TONETC          GOSUB           =TONSTF
    0073 0003          189                 GOTO            BIGBRC
                       190 *
    0074 010E          191 XROW1           A=C             W               ;SAVE FC IN A
    0075 021C          192                 PT=             2
    0076 0350          193                 LC              13              ;SPLIT OFF DIGIT ENTRY
    0077 0316          194                 A<C?            XS
    0078 00001003      195                 GOLC            =DERUN          ;DIGIT ENTRY
                       196                                                 ;NOTE - WE GO TO DERUN WITH
                       197                                                 ;THE FC IN A[3:2] AND THE
                       198                                                 ;PTR AT 1.
    007A 00001000      199                 GOSUB           GTAINC          ;GET ALPHA OPERAND
    007C 00AE          200                 ACEX            W
    007D 010E          201                 A=C             W
                       202                                                 ;MUST GO TO XCUTEB WITH
                       203                                                 ;FC BACK IN C[3:2] AND PT=3
    007E 0003          204                 GOTO            XCUTEB
    007F 03C4          205 ROW7            CLRST                           ;FOR ISG DSE COMP MESG
    0080 0003          206                 GOTO            XCUTEB
                       207 *
                       208 *
    0081               209 XROW5
    0081 0070          210 XROW6           N=C
    0082 01FA          211                 C=C+C           M
    0083 0170          212                 STK=C                           ;PUTS ADDRESS OF NFRX ON STACK
    0084 02A0          213                 SETDEC
    0085 0003          214                 GOTO            MATH
    0086 00F0          215 XROW4           NCEX
    0087 00B8          216                 C=REGN          2
    0088 010E          217                 A=C             W
    0089 00001000      218                 GOSUB           =CHK_NO_S
    008B 00F8          219 MATH            C=REGN          3
    008C 00001000      220                 GOSUB           =CHK_NO_S2
    008E 03C4          221                 CLRST
    008F 00F0          222                 NCEX
                       223 * (FALL INTO XCUTEB HERE)
                       224 *
                       225 * XCUTEB - EXECUTE, PART B
                       226 * INPUT CONDITIONS: FC IN C[3:2], PT=3,  ASSUMES NONPROGRAMMABLE
                       227 *     XCUTB1 ASSUMES FC IN C[13:12]
                       228 *
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LOCATION OBJECT CODE LINE     SOURCE LINE

    0090 007C          229 XCUTEB          RCR             4
    0091 0130          230 XCUTB1          LDI
    0092 0014          231                 CON             24Q             ;@12000\256 MAIN FCN TABLE
    0093 027C          232                 RCR             9
    0094 0330          233                 CXISA
    0095 0050          234                 LC              1
    0096 01BC          235                 RCR             11
    0097 01E0          236                 GOTOC
                       237 *
                       238 *
                       239 *
                       240 * RSTKB - RESET AND DEBOUNCE KEYBOARD
                       241 * USES C.X
                       242 * WAITS 5 MILLISEC AFTER FIRST SEEING KEY RESET BEFORE
                       243 * ALLOWING A SECOND KEY TO BE SENSED.
                       244 *
                       245 * WAIT LOOP IS 4 WORDS LONG.
                       246 * 5 MILLISEC/ 4*155 MICROSEC = 8
                       247 *
                       248 * RST05 ENTRY POINT IS FOR DEBOUNCE ONLY
                       249 *
                       250                 GLB             RSTKB
                       251                 GLB             RST05
    0098 03C8          252 RSTKB           RSTKB
    0099 03CC          253                 CHKKB
    009A 0007          254                 GOC             RSTKB
    009B 0130          255 RST05           LDI
    009C 0008          256                 CON             8
    009D 03C8          257 RST10           RSTKB
    009E 03CC          258                 CHKKB
    009F 0266          259                 C=C-1           X
    00A0 0003          260                 GONC            RST10
    00A1 03E0          261                 RTN
                       262                 FILLTO          241Q
    00A2 00001000      263 ERROF           GOSUB           =ERROR          ;OVERFLOW TREATED AS ERROR
    00A4 0000          264                 CON             =MSGOF
                       265 *
    00A5               266 NFRNC                                           ;!! ASSUMES CHIP 0 ON
    00A5 00001000      267                 GOSUB           =OVFL10         ;FILL X AND Y FROM N AND C
    00A7 00F0          268                 NCEX                            ;GET Y. SAVE X.
    00A8 00D4          269                 PT=?            10
    00A9 0007          270                 GOC             XBAD            ;GO IF X OVERFLOWED
    00AA 00001000      271                 GOSUB           =OVFL10
    00AC 00D4          272                 PT=?            10
    00AD 0007          273                 GOC             YBAD            ;GO IF Y OVERFLOWED
    00AE 00A8          274 FILLY           REGN=C          2               ;FILL IN Y VALUE
    00AF 00F0          275                 CNEX                            ;GET X OUT OF STORAGE
    00B0 00EE          276                 BCEX            W               ;PUT X IN B. GOTO FILL X AND LASTX
    00B1 0003          277                 GOTO            FILLXL
    00B2 00001000      278 XBAD            GOSUB           =OVFL10         ;STILL NEED TO CONVERT Y TO 9 IF NEC
    00B4 00AE          279 YBAD            ACEX            W               ;SAVE Y VALUE WHILE GET FLAGS
    00B5 03B8          280                 C=REGN          14
    00B6 017C          281                 RCR             6               ;GET ERROR AND OVERFLOW FLAGS FOR STATUS
    00B7 0358          282                 ST=C
    00B8 00AE          283                 ACEX            W               ;PUT Y BACK INTO C
    00B9 028C          284                 ST=1?           7               ;OVERFLOW FLAG SET?
    00BA 0007          285                 GOC             FILLY           ;IF SO FILL Y AND GO TO FILLXL
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LOCATION OBJECT CODE LINE     SOURCE LINE

                     286                    GLB             ERRIGN
00BB 014C            287 ERRIGN             ST=1?           6                ;ERROR FLAG SET?
00BC 0003            288                    GONC            ERROF            ;IF NOT GOTO ERROR: OVERFLOW
00BD 0144            289                    ST=0            6                ;TURN OFF ERROR FLAG
00BE 0398            290                    C=ST
00BF 013C            291                    RCR             8
00C0 03A8            292                    REGN=C          14
00C1 0003            293                    GOTO            NFRC             ;NO PRINT, LEAVE PUSH ALONE
                     294 *
                     295 * NFRSIG IS USED BY SIGMA+, SIGMA-, CLX, AND CLST.
                     296 * NFRENT IS USED BY ENTER.
00C2 03B5            297 NFRSIG             CON             1665Q            ;GOSUB PRT1
00C3 01BC            298                    CON             674Q
00C4 0184            299 NFRENT             ST=0            11               ;CLEAR PUSHFLAG
00C5 0003            300                    GOTO            NFRC
                     301 *
00C6 024C            302 NFRKB1             ST=1?           9                ;KEY ALREADY RESET?
00C7 00001000        303 NFRKB              GSUBNC          =RSTKB
00C9 0003            304                    GOTO            NFRC
                     305 *
                     306                    FILLTO          311Q
00CA 0003            307                    GOTO            NFRX             ;MUST BE @0312 FOR ROW 5
00CB 0000            308                    NOP
00CC                 309 NFRX                                                ;!! ASSUMES CHIP 0 ON
00CC 00001000        310                    GOSUB           =OVFL10          ;MUST BE @0314 FOR ROW 6
00CE 00EE            311                    BCEX            W                ;SAVE X IN B
00CF 00D4            312                    PT=?            10
00D0 0003            313                    GONC            FILLXL
00D1 03B8            314                    C=REGN          14
00D2 017C            315                    RCR             6
00D3 0358            316                    ST=C
00D4 028C            317                    ST=1?           7                ;OVERFLOW FLAG?
00D5 0003            318                    GONC            ERRIGN
00D6 0003            319                    GOTO            FILLXL
                     320 *
                     321 * FILL THRU @331 - GETS SPACING RIGHT SO THAT NFRPU ENDS UP
                     322 * AT @360 AND THERE ARE NO INLINE NOPS
                     323 * PCTOC - PROGRAM COUNTER TO C
                     324 * THIS LITTLE SUBROUTINE SIMPLY COPIES THE ADDRESS OF THE ROM WORD
                     325 *- AFTER THE CALLING GOSUB INTO C AND RETURNS. IT IS INTENDED TO
                     326 *- FACILITATE THE WRITING OF ROUTINES IN PLUG IN ROMS FOR SUCH THINGS
                     327 *- AS CALLING ANOTHER ROM CHIP OR FOR OTHER ROUTINES REQUIRING
                     328 *- KNOWLEDGE OF THE CURRENT ABSOLUTE ADDRESS OF THE ROM.
                     329 *
00D7 01B0            330 PCTOC              C=STK
00D8 0170            331                    STK=C
00D9 03E0            332                    RTN
                     333                    FILLTO          331Q
00DA                 334 NFRXY                                               ;!! ASSUMES CHIP 0 ON
00DA 00001000        335                    GOSUB           =OVFL10
00DC 00EE            336                    BCEX            W                ;SAVE X IN B
00DD 00D4            337                    PT=?            10
00DE 0003            338                    GONC            DROPST           ;IF NO OVERFLOW GO DROP STACK
00DF 03B8            339                    C=REGN          14
00E0 017C            340                    RCR             6
00E1 0358            341                    ST=C
00E2 028C            342                    ST=1?           7                ;OVERFLOW FLAG?
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LOCATION OBJECT CODE LINE     SOURCE LINE

   00E3 0003          343                GONC          ERRIGN        ;IF NOT SET GO CHECK ERROR FLAG
                      344                GLB           DROPST
   00E4 0078          345 DROPST         C=REGN        1             ;GET Z
   00E5 00A8          346                REGN=C        2             ;PUT INTO Y
   00E6 004E          347                C=0           W
   00E7 0270          348                DADD=C
   00E8 0038          349                C=DATA                      ;GET T
   00E9 0068          350                REGN=C        1             ;PUT INTOZ
                      351
                      352 *THIS ENTRY CALLED BY "RCLALM" FUNCTION IN 41CX
                      353                GLB           FILLXL
   00EA 00F8          354 FILLXL         C=REGN        3             ;GET OLD X
   00EB 0128          355                REGN=C        4             ;FILL LASTX
   00EC 00EE          356                BCEX          W             ;GET NEW X FROM B
   00ED 00E8          357                REGN=C        3             ;FILL X
   00EE 03B5          358 NFRPR          CON           1665Q         ;GOSUB PRT1
   00EF 01BC          359                CON           674Q
                      360                FILLTO        357Q          ;@360 IS PUT ON THE STK
                      361                                            ;AT RUNNK - NFRPU MUST BE
                      362                                            ;AT @360
   00F0 0188          363 NFRPU          ST=1          11            ;SET PUSH
   00F1 0260          364 NFRC           SETHEX
   00F2 00A0          365                SELP
   00F3 004E          366                C=0           W             ;RE-ENABLE CHIP 0
   00F4 0270          367                DADD=C
   00F5 03B8          368                C=REGN        14
   00F6 0358          369                ST=C
   00F7               370 NFRFST
   00F7 0160          371                LLD?                        ;TEST LOW BATTERY
   00F8 0003          372                GONC          LOWBRT
   00F9 014C          373                ST=1?         6             ;LOWBAT?
   00FA 0007          374                GOC           LOWBRT        ;YES
   00FB 0148          375                ST=1          6             ;SET LOWBAT
   00FC 00001000      376                GOSUB         STOSTO        ;STORE STATUS SET 0
   00FE 00001000      377                GOSUB         =ANNOUT       ;TURN ON BAT ANNUNCIATOR
   0100               378 LOWBRT                                     ;LOW BATTERY LOGIC RETURN TO MAIN FLOW
                      379 *
   0100 02EC          380                FLG=1?        13            ;DOES A PERIPHERAL WANT
                      381                                            ;SERVICE?
   0101 0007          382                GOC           IOSERV        ;YES
   0102 020C          383                ST=1?         2             ;IOFLAG?
   0103 0003          384                GONC          NFRNIO        ;NO
   0104 00001000      385 IOSERV         GOSUB         =IORUN        ;YES
                      386 *
   0106               387 NFRNIO                                     ;NORMAL FUNCTION RETURN, NO I/O
   0106 02CC          388                ST=1?         13            ;RUNNING?
   0107 0003          389                GONC          DRWSYL        ;NO
                      390                                            ;!!! CHECK SSTFLAG HERE?
                      391 *
                      392                GLB           RUNING        ;NULLS RE-ENTER HERE
   0108               393 RUNING                                     ;RUNNING
   0108 03CC          394                CHKKB
   0109 0003          395                GONC          RUNNK
   010A 0220          396                C=KEYS
   010B 003C          397                RCR           3
   010C 0056          398                C=0           XS
   010D 0106          399                A=C           X             ;KEYCODE TO A.X
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LOCATION OBJECT CODE LINE     SOURCE LINE

    010E 0130         400                 LDI
    010F 0018         401                 CON             24              ;H18=OFF KEY
    0110 0366         402                 A#C?            X
    0111 00001002     403                 GOLNC           =OFF
    0113 0130         404                 LDI
    0114 0087         405                 CON             135             ;H87=R/S KEY
    0115 0366         406                 A#C?            X
    0116 0007         407                 GOC             IGNKEY          ;NOT RUNSTOP
    0117 00001000     408                 GOSUB           RSTSEQ          ;STOP THE PROGRAM
    0119 00001002     409                 GOLONG          =NFRKB
                      410 *
    011B 03C8         411 IGNKEY          RSTKB                           ;TRY TO RESET KEYBOARD
    011C 03CC         412                 CHKKB
                      413 *
    011D              414 RUNNK                                           ;RUNNING, NO KEY HIT
    011D 005C         415                 PT=             4               ;PUT NFRPU ON THE
    011E 005A         416                 C=0             M               ; SUBROUTINE STACK
    011F 03D0         417                 LC              15              ;  HERE
    0120 0170         418                 STK=C                           ;NFRPU ASSUMED = @360
                      419 *
                      420 * NXTBYT - NEXT BYTE
                      421 * - INCREMENTS PGMCTR IN PLACE
                      422 * - PLACES BYTE POINTED TO BY NEW VALUE OF PGMCTR IN C[13-12]
                      423 * - FOR RAM ONLY, S8=1 IF BYTE NUM = 0 OTHERWISE S8=0.
                      424 *   IF S8=0 THEN C[11-10] CONTAINS THE NEXT BYTE IN PROGRAM MEMORY.
                      425 * - FOR ROM, S8 IS LEFT UNDEFINED, AND ONLY THE FIRST BYTE IS
                      426 *   BROUGHT INTO C.
                      427 * - ASSUMES CHIP 0 SELECTED AND PT=3, LEAVES PT=3, USES C.
                      428 *
    0121 0338         429                 C=REGN          12              ;PGMCTR TO C[3-0]
    0122 00CC         430                 ST=1?           10              ;ROMFLAG?
    0123 0007         431                 GOC             NEXROM          ;YES
    0124 0104         432                 ST=0            8
    0125 0262         433                 C=C-1           PT              ;DECREMENT BYTE NUMBER
    0126 0007         434                 GOC             NXTBT1          ;BYTE 6 DESIRED
    0127 0328         435                 REGN=C          12              ;REPLACE PGMCTR
    0128 0270         436                 DADD=C                          ;TURN ON THE RIGHT SLEEPER CHIP
    0129 007C         437                 RCR             4               ;BYTE NUM TO C.S
    012A 0130         438                 LDI
    012B 0014         439                 CON             24Q             ;TBLGBR\16=@500\16
    012C 00FC         440                 RCR             10
    012D 01E0         441                 GOTOC
                      442 *
    012E 0190         443 NXTBT1          LC              6               ;DESIRED BYTE IS BYTE #6
    012F 0266         444                 C=C-1           X
    0130 0328         445                 REGN=C          12
    0131 001C         446                 PT=             3
    0132 0270         447                 DADD=C
    0133 0038         448                 C=DATA
    0134 0003         449                 GOTO            NXBEND
                      450 *
    0135 022E         451 NEXROM          C=C+1           W               ;INCREMENT PGMCTR
    0136 0328         452                 REGN=C          12              ;PUT PGMCTR BACK
    0137 01BC         453                 RCR             11
    0138 0330         454                 CXISA                           ;NEW BYTE TO C.X
    0139 0003         455                 GOTO            NXROM1
                      456 *
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LOCATION OBJECT CODE LINE     SOURCE LINE

    013A 0003          457 DRWSYL          GOTO            DROWSY
                       458 *
                       459 *
                       460 * STOSTO - STORE STATUS SET 0 BACK TO REG 14
                       461 * ENTRY REQUIREMENTS: CHIP 0 ENABLED, STATUS SET 0 IN STATUS BITS
                       462 * DESTROYS C (LEAVES A COPY OF REG 14 IN C)
                       463 *
                       464                 GLB             STOSTO
    013B 03B8          465 STOSTO          C=REGN          14
    013C 0398          466                 C=ST
    013D 03A8          467                 REGN=C          14
    013E 03E0          468                 RTN
    013F 0000          469                 FILLTO          477Q
                       470
    0140               471 TBLGBR                                          ;TABLE FOR GET BYTE ROTATE
                       472                                                 ;MUST BE ON 16 WORD BOUNDARY
    0140 0003          473                 GOTO            GBYTR0          ;NEW BYTE NUM = 0
    0141 0003          474                 GOTO            GBYTR1
    0142 0003          475                 GOTO            GBYTR2
    0143 0003          476                 GOTO            GBYTR3
    0144 0003          477                 GOTO            GBYTR4
    0145 0038          478 GBYTR5          C=DATA                          ;NOTE NO BYTE 6 THIS PATH
    0146 037C          479                 RCR             12
    0147 0003          480                 GOTO            NXBEND
    0148 0038          481 GBYTR4          C=DATA
    0149 00FC          482                 RCR             10
    014A 0003          483                 GOTO            NXBEND
    014B 0038          484 GBYTR3          C=DATA
    014C 013C          485                 RCR             8
    014D 0003          486                 GOTO            NXBEND
    014E 0038          487 GBYTR2          C=DATA
    014F 017C          488                 RCR             6
    0150 0003          489                 GOTO            NXBEND
    0151 0038          490 GBYTR1          C=DATA
    0152 007C          491                 RCR             4
    0153 0003          492                 GOTO            NXBEND
    0154 0038          493 GBYTR0          C=DATA
    0155 0108          494                 ST=1            8
    0156 023C          495 NXROM1          RCR             2
    0157               496 NXBEND                                          ;END OF NEXT BYTE
    0157 038C          497                 ST=1?           0               ;IS A PRINTER CONNECTED?
    0158 0003          498                 GONC            NOPRT           ;NO
    0159 03AD          499                 CON             1655Q           ;IN TRACE MODE, PRINT
                       500                                                 ; NEXT INSTRUCTION
    015A 01BC          501                 CON             674Q            ;GOSUB PRT2
                       502                 GLB             NOPRT           ;FOR THE PRINTER
    015B               503 NOPRT
                       504 *
                       505 * XCUTE - EXECUTE
                       506 * - DECODES AND SENDS TO EXECUTION THE BYTE FOUND IN
                       507 *   C[13-12].  IF S8=0 THEN C[11-10] CONTAINS THE
                       508 *   NEXT BYTE.
                       509 * - ON INPUT: HEXMODE, PTR P = 3, STATUS SET 0 UP AND VALID
                       510 * - SELECTS RAM CHIP 0.
                       511 *
    015B 0130          512 XCUTE           LDI
    015C 0006          513                 CON             006Q            ;ROWTBL\16
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

                     514                                        ;ROWTBL MUST BE IN 1ST 256 BYTES OF ROM
    015D 0270        515                DADD=C                  ;SELECT RAM 0
    015E 00FC        516                RCR            10
    015F 01E0        517                GOTOC
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

                     519 * DROWSY - REFRESH DISPLAY AND TRY TO SLEEP
                     520 *
0160 0248            521 DROWSY          ST=1            9              ;KEYBOARD ALREADY RESET
0161 00001000        522 DRSY05          GOSUB           =ANNOUT        ;REFRESH ANNUNCIATORS
0163 008C            523                 ST=1?           5              ;MSGFLG?
0164 0007            524                 GOC             DRSY25         ;YES
0165 000C            525                 ST=1?           3              ;PRGMMODE?
0166 0003            526                 GONC            DRSY10         ;NO
0167 00001000        527                 GOSUB           =DFRST8        ;DFILLF WITH SCROLL & NO PROMPT
0169 0003            528                 GOTO            DRSY25
016A 028C            529 DRSY10          ST=1?           7              ;ALPHAMODE?
016B 0003            530                 GONC            DRSY20         ;NO
016C 0104            531                 ST=0            8              ;SCROLL & NO PROMPT
016D 00001000        532                 GOSUB           =ARGOUT
016F 0003            533                 GOTO            DRSY25
0170 00F8            534 DRSY20          C=REGN          3              ;GET X
0171 00001000        535                 GOSUB           =DSPCRG        ;DISPLAY CONTENTS OF C REG
0173                 536 DRSY25
                     537 * SST (PRGMMODE ONLY) AND BST (PRGMMODE & NORMAL MODE) ENTER
                     538 * AT DRSY25 TO BYPASS BOTH MAIN LCD UPDATE AND ANNUNCIATOR
                     539 * UPDATE.  ENTRY CONDITIONS ARE THE SAME AS FOR DRSY51.
0173 024C            540                 ST=1?           9              ;KEYBOARD RESET YET?
0174 0007            541                 GOC             DRSY30         ;YES
0175 0130            542                 LDI                            ;DELAY 25 MILLISEC
0176 0051            543                 CON             81             ; FOR DEBOUNCE
0177 0266            544 DRSY26          C=C-1           X
0178 0003            545                 GONC            DRSY26
0179 00001000        546                 GOSUB           =RSTKB
                     547 *
017B 0044            548 DRSY30          ST=0            4              ;CLEAR SSTFLAG
017C 00001000        549                 GOSUB           =STOST0
017E 030C            550                 ST=1?           1              ;PAUSING?
017F 0007            551                 GOC             PAUSLP         ;YES
                     552 *
                     553 * LIGHT SLEEP WAKEUP LOGIC
                     554 *
                     555                 GLB             LSWKUP
0180 0001            556 LSWKUP          CON             0001Q          ;GOSUB DIAGNOSTIC
0181 0100            557                 CON             0400Q
0182 00001000        558                 GOSUB           PACH11         ;LEAVES SS0 UP
                     559                                                ;PACH11 GOES TO MEMCHK
                     560                 GLB             WKUP10         ;PARSE PKSEQ ENTERS HERE
0184 03CC            561 WKUP10          CHKKB
0185 0007            562                 GOC             WKUP20
0186 0130            563                 LDI
0187 0008            564                 CON             8              ;I O SERVICE
0188 00001000        565                 GOSUB           =ROMCHK        ;NEEDS CHIP 0,SS0,HEX,P SELECTED
018A 020C            566                 ST=1?           2              ;IOFLAG?
018B 0007            567                 GOC             WKUP10         ;YES
                     568                                                ;GOING TO LIGHT SLEEP NOW
018C 0388            569                 C=REGN          14
018D 023C            570                 RCR             2
018E 0358            571                 ST=C                           ;PUT UP SS1
018F 000C            572                 ST=1?           3              ;STAYON?
                     573                 GLB             DRSY50
0190                 574 DRSY50                                         ;OFF ENTERS HERE WITH
                     575                                                ;DISPLAY TURNED OFF
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

 0190 00001000      576                GSUBNC          =ENLCD          ;NO
 0192 00600000      577                POWOFF
                    578 *
                    579 *
 0194               580 DRSY51                                         ;THIS ENTRY USED TO BYPASS
                    581                                                ;DEFAULT DISPLAY LOGIC
                    582                                                ;ENTRY REQ: HEX, CHIP 0 ON,
                    583                                                ;S9 SAYS WHETHER KB HAS
                    584                                                ;BEEN RESET, SS 0 UP,
                    585                                                ;P SEL.
 0194 00001000      586                GOSUB           =ANNOUT
 0196 0003          587                GOTO            DRSY25
                    588 *
                    589 * PAUSE LOOP
                    590 *
 0197 00001000      591 PAUSLP         GOSUB           =PGMAON         ;TURN ON PRGM ANNUNCIATOR
 0199 0130          592                LDI                             ;INITIALIZE PAUSETIMER
 019A 005C          593                CON             92
 019B 0106          594                A=C             X               ;A.X=PAUSETIMER
                    595 * PAUSETIMER SET EMPIRICALLY TO MATCH HP67 ON A BENCHMARK PGM
                    596 * CONSISTING OF 100 PSE'S FOLLOWED BY FIX 9, STOP.
                    597 * THIS TIMING WAS SUBSEQUENTLY SCREWED UP BY EXTENDING ROMCHK'S
                    598 * SEARCH FROM ADDRESSES 6-F DOWN TO 5-F.  HP-41C'S PSE IS NOW
                    599 * .1-.2 SEC LONGER THAN HP-67'S.  DRC 10/20/79
 019C 03CC          600 PAUS10         CHKKB                           ;IS A KEY DOWN?
 019D 0007          601                GOC             WKUP20          ;YES
 019E 0130          602                LDI
 019F 000C          603                CON             12
 01A0 00001000      604                GOSUB           =RMCK05
 01A2 01A6          605                A=A-1           X               ;HAS PAUSE EXPIRED?
 01A3 0003          606                GONC            PAUS10          ;NO, NOT YET
 01A4 00001002      607                GOLONG          =RUN            ;YEP
                    608 *
                    609 *
 01A6 0220          610 WKUP20         C=KEYS
                    611                GLB             WKUP21          ;ADD FOR ADV IO ON 6/15/81
 01A7 001C          612 WKUP21         PT=             3
 01A8 01E2          613                C=C+C           PT              ;OFF KEY? (OFF KC=18HEX)
 01A9 00001002      614                GOLNC           =PARSE          ;NO
 01AB 00001002      615 OFFXFR         GOLONG          =OFF            ;YES
                    616 *
                    617 * DEEP SLEEP WAKEUP LOGIC
                    618 *
                    619                GLB             DSWKUP          ;WAKE UP FROM DEEP SLEEP
 01AD 0001          620 DSWKUP         CON             0001Q           ;GOSUB DIAGNOSTIC
 01AE 0100          621                CON             0400Q           ;CHIP 4
                    622 * ON WAKEUP FROM DEEP SLEEP, THE DISPLAY MAY BE EITHER OFF (IN THE
                    623 * CASE WHERE THE USER OR A PROGRAM TURNED THE CALCULATOR OFF
                    624 * EXPLICITLY) OR ON (IN THE CASE WHERE THE CALCULATOR WENT FROM
                    625 * LIGHT SLEEP TO DEEP SLEEP AUTOMATICALLY).
 01AF 02E0          626                DISOFF                          ;GET THE DISPLAY TO A KNOWN
                    627                                                ;STATE
 01B0 00001000      628                GOSUB           PACH11          ;PACH11 GOES TO MEMCHK
 01B2 03CC          629                CHKKB                           ;DID THE ON KEY WAKE US UP?
 01B3 0007          630                GOC             WKUP25          ;YES
 01B4 0130          631                LDI                             ;NO
 01B5 000A          632                CON             10
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    01B6 00001000     633                 GOSUB           =ROMCHK
    01B8 020C         634                 ST=1?           2                ;IOFLAG?
    01B9 0003         635                 GONC            DRSY50           ;NOPE - GO BACK TO SLEEP
                      636                 GLB             WKUP25
    01BA              637 WKUP25
                      638                                                  ;INITIALIZE STATUS BITS
    01BA 03B8         639                 C=REGN          14
    01BB 00001000     640                 GOSUB           PACH12           ;DECOMPILES & RTNS WITH R14 IN C,
                      641                                                  ;  SS0 UP(S0-S7=0), C.X= 0
    01BD 017C         642                 RCR             6
    01BE 03D8         643                 CSTEX                            ;PUT UP SS 3
    01BF 0304         644                 ST=0            1                ;CLEAR CATALOG FLAG
    01C0 0088         645                 ST=1            5                ;SET AUDIO ENABLE FLAG
    01C1 0144         646                 ST=0            6                ;CLEAR ERROR IGNORE FLAG
    01C2 0284         647                 ST=0            7                ;CLEAR OUT-OF-RANGE FLAG
    01C3 03D8         648                 CSTEX
    01C4 023C         649                 RCR             2                ;CLEAR FLAGS 12-23
    01C5 0046         650                 C=0             X
    01C6 017C         651                 RCR             6
    01C7 03A8         652                 REGN=C          14
    01C8 02C4         653                 ST=0            13               ;CLEAR RUNNING FLAG
    01C9 00001000     654                 GOSUB           =RSTKB
                      655 * CHECK FOR MASTER CLEAR HERE
                      656 * THE PROTOCOL FOR MASTER CLEAR IS TO PRESS AND HOLD THE
                      657 * BACKARROW KEY WHILE SIMULTANEOUSLY HITTING THE ON KEY.
                      658 * THIS SEQUENCE WAS MOVED AHEAD OF THE I/O BUFFER CHECK
                      659 * TO ALLOW THE USER TO RECOVER FROM AN INFINITE LOOP
                      660 * (733-752) BY USING MASTER CLEAR 12/21/81 WCW
    01CB 03CC         661                 CHKKB                            ;ANOTHER KEY DOWN?
    01CC 0003         662                 GONC            WKUP60           ;NO
    01CD 0130         663                 LDI                              ;YES. SEE IF IT IS BKARROW
    01CE 00C3         664                 CON             12*16+3          ;KC FOR BKARROW
    01CF 0106         665                 A=C             X
    01D0 0220         666                 C=KEYS
    01D1 003C         667                 RCR             3
    01D2 031C         668                 PT=             1
    01D3 036A         669                 A#C?            WPT
    01D4 0003         670                 GONC            WKUP90           ;MASTER CLEAR
    01D5              671 WKUP60
                      672                                                  ;RELEASE ALL I/O BUFFERS
    01D5 0378         673                 C=REGN          13
    01D6 00EE         674                 BCEX            W                ;CHAINHEAD TO B.X
    01D7 0130         675                 LDI
    01D8 00BF         676                 CON             191
    01D9 010E         677                 A=C             W                ;CURRENT REG ADDR TO A.X
    01DA 0166         678 WKUP30          A=A+1           X
    01DB 0326         679 WKUP40          A<B?            X                ;STILL BELOW CHAINHEAD?
    01DC 0003         680                 GONC            WKUP50           ;NO - DONE.
    01DD 00A60106     681                 C=A             X
    01DF 0270         682                 DADD=C
    01E0 0038         683                 C=DATA
    01E1 02EE         684                 C#0?            W                ;IS THIS REG OCCUPIED?
    01E2 0003         685                 GONC            WKUP50           ;NO - DONE.
    01E3 023E         686                 C=C+1           S                ;IS IT A KEY REASSIGNMENT?
    01E4 0007         687                 GOC             WKUP30           ;YES
    01E5 005E         688                 C=0             S                ;NO. MUST BE AN I/O BUFFER
    01E6 02F0         689                 DATA=C                           ;RELEASE IT
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    01E7 00FC          690                    RCR             10              ;ROTATE SIZE TO C[1:0]
    01E8 0056          691                    C=0             XS
    01E9 0146          692                    A=A+C           X               ;SKIP OVER BUFFER
                       693                    LEGAL
    01EA 0003          694                    GOTO            WKUP40
                       695 *
    01EB 0130          696 WKUP50             LDI
    01EC 0007          697                    CON             7               ;DEEP SLEEP
    01ED 0270          698                    DADD=C                          ;RE-ENABLE CHIP 0
    01EE 00001000      699                    GOSUB           =ROMCHK
    01F0 00001000      700                    GOSUB           =PKIOAS         ;GOSUB I/O AREA PACK SUBR.
                       701                                                    ;RETURNS WITH CHIP 0 DISABLED
    01F2 004E          702                    C=0             W               ;RE-ENABLE CHIP 0
    01F3 0270          703                    DADD=C
    01F4 0320          704                    DISTOG                          ;TURN THE DISPLAY BACK ON
    01F5 03B8          705 WKUP70             C=REGN          14
    01F6 01BC          706                    RCR             11
    01F7 0358          707                    ST=C
    01F8 038C          708                    ST=1?           0               ;FLAG 11?
    01F9 00001002      709                    GOLNC           =NFRC           ;NO
                       710                                                    ;GOTO NFRC TO INITIALIZE
                       711                                                    ;LOWBAT BEFORE GOING TO
                       712                                                    ;DROWSY
    01FB 0384          713                    ST=0            0               ;YES. CLEAR FLAG 11
    01FC 0398          714                    C=ST
    01FD 003C          715                    RCR             3
    01FE 03A8          716                    REGN=C          14
                       717                    GLB             WKUP80          ;FOR CARD RDR LOAD&GO
    01FF 02E0          718 WKUP80             DISOFF                          ;TURN OFF DISPLAY DURING BEEP
    0200 00001000      719                    GOSUB           =TONE7X
    0202 0320          720                    DISTOG                          ;TURN DISPLAY BACK ON
    0203 00001002      721                    GOLONG          =RUN            ;START RUNNING THE USER'S PGM
                       722 *
                       723 * MEMCHK (MEMORY CHECK) - CHECK INTEGRITY OF ROM AND RAM
                       724 *
                       725 * MEMCHK PERFORMS THREE QUICK TESTS OF RAM AND ROM IN AN
                       726 * EFFORT TO DETERMINE WHETHER ANY PLUG-IN MODULES OR THE
                       727 * BATTERIES HAVE BEEN REMOVED.
                       728 *
                       729 * 1. TEST DIGITS 8:6 OF REG 13 TO SEE WHETHER THE WARM START
                       730 * CONSTANT (@551) IS THERE.  IF NOT, COLD START.
                       731 * 2. READ/WRITE/READ/RESTORE REG0-1 TO JUDGE WHETHER THE LABEL
                       732 * CHAIN IS INTACT.  IF NOT, COLD START.
                       733 * 3. IF THE USER PC IS ON ROM, VERIFY THAT THE FIRST WORD OF THE
                       734 * ROM CHIP IS NON-ZERO TO JUDGE WHETHER THE ROM MODULE IS STILL
                       735 * PLUGGED IN.  IF NOT, SET THE PC TO THE TOP OF PROGRAM MEMORY IN
                       736 * RAM. (SEE CHKRPC COMMENTS BELOW)
                       737 *
                       738 * ON EXIT, CHIP 0 IS ENABLED, SS0 IS UP, HEXMODE.
                       739 * USES A AND C.
                       740 * DOESN'T CALL ANY SUBROUTINES (MUST NOT, BECAUSE MEMCHK IS CALLED
                       741 * DURING PARTIAL KEY SEQUENCES).  EXITS VIA PUTPCX.
                       742 * IF PC IS IN RAM, NORMALLY RETURNS IN 31 WORD-TIMES.
                       743 * IF PC IS IN ROM, NORMALLY RETURNS IN 39 WORD-TIMES.
                       744 *
                       745                    GLB             MEMCHK
    0205 03C8          746 MEMCHK             RSTKB                           ;THESE THREE STATES
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    0206 03CC         747                 CHKKB                           ; NECESSARY BECAUSE OF
    0207 0260         748                 SETHEX                          ;  PROBLEMS WITH CPU WAKEUP
    0208 0046         749                 C=0             X
    0209 03F0         750                 PFAD=C                          ;TURN OFF PERIPHERAL CHIPS
    020A 0270         751                 DADD=C                          ;TURN ON CHIP 0
    020B 0130         752                 LDI
    020C 0169         753                 CON             551Q            ;WARM START CONSTANT
    020D 0106         754                 A=C             X
    020E 0378         755                 C=REGN          13
                      756 ***********************************************************************
                      757 * WKUP90 ADDED 12/22/81 TO PROVIDE A MEANS FOR THE RELOCATED BACKARROW
                      758 * TEST GONC (724) TO REACH COLDST (1062).  SINCE THE JUMP AT 1021 IS A
                      759 * GOC, THE MASTER CLEAR SEQUENCE JUMPS IN AT WKUP90.  THE RCR 6 IN-
                      760 * SURES THAT THE CONTENTS OF C ARE NOT EQUAL TO A.  THE X FIELD OF C
                      761 * WILL BE X00 FOLLOWING THE RCR.  THE 00 REMAINS FROM 705.
                      762 ***********************************************************************
    020F 017C         763 WKUP90          RCR             6
    0210 0366         764                 A#C?            X               ;COLD START?
    0211 0007         765                 GOC             COLDST          ;YES
                      766                                                 ;NOW HEXMODE IS ASSUMED
    0212 01BC         767                 RCR             11              ;REG0 TO C.X
    0213 0266         768                 C=C-1           X               ;C.X=REG0-1
    0214 0270         769                 DADD=C
    0215 0038         770                 C=DATA                          ;GET C(REG0-1)
    0216 010E         771                 A=C             W               ; & SAVE IN A
    0217 02BA         772                 C=-C-1          M
                      773 * WE INVERT THE BIT PATTERN IN DIGITS 12:3.  CHARACTERISTICALLY,
                      774 * WHEN A NON-EXISTENT DATA STORAGE REGISTER IS READ, THE DATA
                      775 * IS EITHER ALL ONES OR ALL ZEROES.  INVERTING PART OF THE REGISTER
                      776 * GUARANTEES THAT, IF THE REGISTER EXISTS, EITHER WHAT WE READ
                      777 * ORIGINALLY OR THE PARTIALLY INVERTED PATTERN WILL BE DIFFERENT
                      778 * FROM ALL ZEROES AND FROM ALL ONES.
    0218 02F0         779                 DATA=C                          ;WRITE IT BACK
    0219 0038         780                 C=DATA                          ;READ IT AGAIN
    021A 02BA         781                 C=-C-1          M               ;INVERT IT AGAIN
    021B 036E         782                 A#C?            W               ;NON-EXISTENT REGISTER?
    021C 0007         783                 GOC             COLDST          ;YES
    021D 02F0         784                 DATA=C                          ;RESTORE THE REGISTER
                      785
    021E 0046         786                 C=0             X               ;RE-ENABLE CHIP 0
    021F 0270         787                 DADD=C
    0220 0388         788                 C=REGN          14              ;PUT UP SS0
    0221 0358         789                 ST=C
                      790
                      791 * CHKRPC (CHECK ROM PC) - CONFIRMS THAT, IF ROMFLAG IS SET, THE
                      792 * ROM CHIP POINTED TO BY THE USER PC IS ACTUALLY PLUGGED IN.
                      793 *
                      794 * ON ENTRY, CHIP 0 MUST BE ENABLED.
                      795 * IF ROMFLAG IS CLEAR, RETURNS IN 2 WORD-TIMES AND USES NOTHING.
                      796 * IF ROMFLAG IS SET, USES A[3:0] AND C AND PT AND USUALLY RETURNS
                      797 * IN 8 WORD-TIMES.
                      798 *
                      799                 GLB             CHKRPC
    0222 00CC         800 CHKRPC          ST=1?           10              ;ROMFLAG?
    0223 03A0         801                 RTNNC                           ;NO. ALL FINISHED.
    0224 0338         802                 C=REGN          12              ;GET PC
    0225 0046         803                 C=0             X               ;C[3:0]=ADDR OF 1ST WORD
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    0226 01BC         804                 RCR             11              ; ON CHIP
    0227 0330         805                 CXISA
    0228 02E6         806                 C#0?            X
    0229 0360         807                 RTNC
    022A 00C4         808                 ST=0            10              ;CHIP IS NOT THERE
    022B 0378         809                 C=REGN          13
    022C 003C         810                 RCR             3               ;C.X=REG0
    022D 001C         811                 PT=             3
    022E 0042         812                 C=0             PT
    022F 010A         813                 A=C             WPT
    0230 00001002     814                 GOLONG          =PUTPCX
                      815 *
                      816 * COLD START INITIALIZATION
                      817 *
    0232 0260         818 COLDST          SETHEX
    0233 01A0         819                 CLRABC
    0234 0158         820                 M=C
    0235 0070         821                 N=C
    0236 0058         822                 G=C
    0237 0358         823                 ST=C
    0238 0258         824                 F=SB
    0239 0170         825                 STK=C
    023A 0170         826                 STK=C
    023B 0170         827                 STK=C
    023C 0170         828                 STK=C
    023D 00E0         829                 SELQ
    023E 02DC         830                 PT=             13
    023F 00A0         831                 SELP
    0240 02C4         832                 ST=0            13
    0241 0344         833                 ST=0            12
    0242 0184         834                 ST=0            11
    0243 00C4         835                 ST=0            10
    0244 0244         836                 ST=0            9
    0245 0104         837                 ST=0            8
    0246 00001000     838                 GOSUB           =MSGA
    0248 0000         839                 CON             =MSGML          ;"MEMORY LOST" MESSAGE
                      840 * IS THE LCD ENABLE IN THE NEXT LINE REALLY NECESSARY?
    0249 00001000     841                 GOSUB           =ENLCD
    024B 00001000     842                 GOSUB           =RSTKB
    024D 0130         843                 LDI                             ;SET UP A.X FOR ILOOP
    024E 03FF         844                 CON             1777Q
                      845 * I THINK THIS CONSTANT COULD JUST AS WELL BE @777, WHICH WOULD
                      846 * RESULT IN FASTER COLD STARTS, BUT FOR NOW I'M LEAVING WELL ENOUGH
                      847 * ALONE.  DRC 3/26/79
    024F 010E         848                 A=C             W
    0250 004E         849                 C=0             W
    0251 02F0         850                 WRTEN                           ;CLEAR ANNUNCIATORS
    0252 02E0         851                 DISOFF
    0253 0320         852                 DISTOG
    0254 03F0         853                 PFAD=C
    0255 00AE         854 ILOOP           ACEX            W
    0256 0270         855                 DADD=C
    0257 00AE         856                 ACEX            W
    0258 02F0         857                 DATA=C
    0259 01A6         858                 A=A-1           X
    025A 0003         859                 GONC            ILOOP
                      860 *
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LOCATION OBJECT CODE LINE     SOURCE LINE

    025B 0130          861                LDI                                ;INITIALIZE REG0 (0EF)
    025C 00EF          862                CON            14*16+15
    025D 013C          863                RCR            8
    025E 0130          864                LDI                                ;INITIALIZE SIGMADDR (0FA)
    025F 00FA          865                CON            15*16+10
    0260 003C          866                RCR            3
    0261 0130          867                LDI
    0262 00EE          868                CON            14*16+14           ;INITIALIZE CHAINHEAD (0EE)
    0263 0368          869                REGN=C         13
    0264 005A          870                C=0            M
    0265 022E          871                C=C+1          W
    0266 0328          872                REGN=C         12                 ;PGMPTR (00EF)
    0267 0270          873                DADD=C                            ;PUT PERMANENT END AT CHAINHEAD
    0268 004E          874                C=0            W                  ; LOCATION
    0269 009C          875                PT=            5
    026A 0310          876                LC             12
    026B 0130          877                LDI
    026C 0020          878                CON            32
    026D 03A8          879                REGN=C         14
    026E 004E          880                C=0            W                  ;INITIALIZE STATUS BITS
    026F 0270          881                DADD=C
    0270 029C          882                PT=            7
    0271 0090          883                LC             2                  ; TURN ON AUDIO ENABLE
    0272 0310          884                LC             12                 ;SET DIGIT GROUPING & DP FLAGS
    0273 005C          885                PT=            4
    0274 0110          886                LC             4                  ;#DIGITS 4
    0275 0210          887                LC             8                  ;SET FIXFLAG
    0276 03A8          888                REGN=C         14                 ;STORE STATUS SETS EXCEPT SS0
    0277 0088          889                ST=1           5                  ;SET MSGFLG
                       890 * ROMCHK ASSUMES SS0 IS UP, CLEARS S2 (IOFLAG), AND STORES SS0
                       891 * BACK TO REG 14
    0278 0130          892                LDI
    0279 0006          893                CON            6                  ;COLD START
    027A 00001000      894                GOSUB          =ROMCHK
    027C 0130          895                LDI
    027D 0169          896                CON            551Q               ;WARM START CONSTANT
    027E 0106          897                A=C            X
    027F 0378          898                C=REGN         13
    0280 017C          899                RCR            6
    0281 00A6          900                ACEX           X
    0282 013C          901                RCR            8
    0283 0368          902                REGN=C         13
    0284 00001002      903                GOLONG         =WKUP70
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LOCATION OBJECT CODE LINE     SOURCE LINE

                     905 * INCGT2 - INCREMENT PGMCTR AND VALIDATE BYTE#2
                     906 * INPUT: C AS LEFT BY ROW DECODE (FC IN DIGITS 3:2, 2ND BYTE
                     907 *     MAY BE IN DIGITS 1:0).  PT=3. STATUS SET 0 UP.
                     908 * USES A AND C
                     909 * RETURNS WITH VALID BYTES IN A[3:0], PT=3, STATUS SET 0 UP.
                     910 * LEAVES S8 ALONE
                     911 *
  0286 010E          912 INCGT2          A=C             W               ;SAVE FIRST BYTE IN A[3:2]
  0287 02CC          913                 ST=1?           13              ;RUNNING?
  0288 0007          914                 GOC             INCG1           ;YES
  0289 004C          915                 ST=1?           4               ;SSTFLAG?
  028A 03A0          916                 RTNNC                           ;KEYBOARD - DO NOTHING.
                     917 *
  028B 0338          918 INCG1           C=REGN          12              ;GET PGMCTR
  028C 00CC          919                 ST=1?           10              ;ROMFLAG?
  028D 0003          920                 GONC            INCG2           ;RAM
  028E 022E          921                 C=C+1           W               ;ROM
  028F 0328          922                 REGN=C          12              ;PUT PGMPTR BACK
  0290 01BC          923                 RCR             11
  0291 0330          924                 CXISA
  0292 00B6          925                 ACEX            XS              ;PUT THE TWO BYTES TOGETHER
  0293 0106          926                 A=C             X
  0294 03E0          927                 RTN
                     928 *
  0295 010C          929 INCG2           ST=1?           8               ;IS BYTE 2 BAD?
  0296 0003          930                 GONC            INCG3           ;BYTE 2 IS GOOD
  0297 0190          931                 LC              6               ;INCREMENT PGMCTR ACROSS A
  0298 0266          932                 C=C-1           X               ; REGISTER BOUNDARY
  0299 0328          933                 REGN=C          12              ;PUT PGMCTR BACK
  029A 0270          934                 DADD=C                          ;GET SECOND BYTE
  029B 0038          935                 C=DATA
  029C 037C          936                 RCR             12
  029D 031C          937                 PT=             1
  029E 010A          938                 A=C             WPT
  029F 001C          939                 PT=             3               ;RESTORE POINTER
  02A0 004E          940                 C=0             W
  02A1 0270          941                 DADD=C                          ;RE-ENABLE STATUS CHIP
  02A2 03E0          942                 RTN
                     943 *
  02A3 0262          944 INCG3           C=C-1           PT              ;INCREMENT PGMCTR
  02A4 0328          945                 REGN=C          12              ;PUT PGMCTR BACK
  02A5 03E0          946                 RTN
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

                      948 ***********************************************************
                      949 *ROW10 INCLUDES FLAGS, EXEC ROM, NON-PROGRAMMABLE
                      950 *FUNCTIONS AND EXECUTE INDIRECT. FLAGS ARE THE ONLY
                      951 *FUNCTIONS IN ROW10 WHICH CAN BE PREPROCESSED. IN THE
                      952 *ROW 10 ROUTINE ERROR CHECKING IS DONE AND A MASK
                      953 *IS BUILT WITH A ONE IN THE POSITION OF THE FLAG
                      954 *OF INTEREST.
                      955 ***********************************************************
  02A6 00001000       956 ROW10          GOSUB          =INCGT2        ;GET BYTE 2
  02A8 00AE           957                ACEX           W
  02A9 0358           958                ST=C                          ;SAVE BYTE 2
  02AA 021C           959                PT=            2
  02AB 0058           960                G=C
                      961                GLB            P1ORTN
  02AC 01F6           962 P1ORTN         C=C+C          XS             ;SEP XEC ROM
  02AD 00001002       963                GOLNC          =XROM
  02AF 0244           964                ST=0           9              ;TEST ONLY FLAG SET
  02B0 01F6           965                C=C+C          XS             ;SEP SET AND CLEARS
  02B1 0003           966                GONC           FLAGS
  02B2 0248           967                ST=1           9              ;THESE 2 TEST ONLYS
  02B3 01F6           968                C=C+C          XS
  02B4 0003           969                GONC           FLAGS
  02B5 01F6           970                C=C+C          XS             ;SPARE FC?
  02B6 0360           971                RTNC                          ;YES
  02B7 00001002       972                GOLONG         =BIGBRC        ;XEQ/GTO INDIRECT
  02B9 0056           973 FLAGS          C=0            XS             ;CLEAR FRO ERROR CHECKS
  02BA 028C           974                ST=1?          7              ;INDIRECT FLAG?
  02BB 0003           975                GONC           CONFLG         ;NO
  02BC 0284           976                ST=0           7              ;DO INDIRECT ACCESS
  02BD 00001000       977                GOSUB          =ADRFCH
  02BF 00001002       978                GOLONG         PACH10
  02C1 00AE           979 CONFLG         ACEX           W              ;MOVE BINARY FLAG NUMBER TO A
  02C2 008E           980                B=A            W              ;SAVE N IN B
  02C3 0130           981                LDI                           ;LOAD DECIMAL 30
  02C4 001E           982                CON            36Q
  02C5 01C6           983                A=A-C          X              ;CHECK TO SEE IF SETCLR FLAG
  02C6 0007           984                GOC            ALLOK          ;YES THEN ALL OPS OK
  02C7 024C           985                ST=1?          9              ;TEST ONLY FLAG?
  02C8 0003           986                GONC           ERRNE          ;NO THIS ONE SET OR CLEARS
  02C9 0130           987                LDI                           ;SUBTRACT BALANCE OF FLAGS
  02CA 001A           988                CON            32Q
  02CB 01C6           989                A=A-C          X              ;IF NC NN>55
  02CC 0003           990                GONC           ERRNE
                      991 *
                      992 * THE ENTRY POINT "ALLOK" WAS ADDED BY STEVE CHOU ON 02-11-81
                      993 * FOR THE FUNCTION "STOFLAG" IN THE ADVANCED PROGRAMMING ROM
                      994 *
                      995                GLB            ALLOK
  02CD 006E           996 ALLOK          ABEX           W              ;NO ERRORS AT THIS POINT
  02CE 0130           997                LDI                           ;COUNT DOWN BY 8S
  02CF 0008           998                CON            10Q
  02D0 00EE           999                BCEX           W
  02D1 004E          1000                C=0            W              ;SET C=1 AND ADDRESS CHIP 0
  02D2 0270          1001                DADD=C
  02D3 022E          1002                C=C+1          W
  02D4 023C          1003 SHF8           RCR            2              ;SHIFT ONE RIGHT 8 AT A TIME
  02D5 0186          1004                A=A-B          X              ;COUNT N DOWN
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

   02D6 0003         1005                GONC            SHF8
   02D7 0003         1006                GOTO            PSTDBL
   02D8 01EE         1007 DBL            C=C+C           W               ;SHIFT BACK BY CARRY AMOUNT
   02D9 0166         1008 PSTDBL         A=A+1           X               ;COUNT BACK CARRY
   02DA 0003         1009                GONC            DBL
   02DB 00EE         1010                CBEX            W               ;SAVE MASK
   02DC 03B8         1011                C=REGN          14              ;GET STATUS SET
   02DD 00AE         1012                ACEX            W               ;SAVE IN A
   02DE 00001002     1013                GOLONG          =BIGBRC         ;DO 256 WAY BRANCH
   02E0 00001000     1014 ERRNE          GOSUB           =ERROR
   02E2 0000         1015                CON             =MSGNE          ;"NONEXISTENT"
                     1016 ***********************************************
                     1017 *THIS ROUTINE TAKES A STANDARD FLOATING POINT
                     1018 *NUMBER, STRIPS OFF AN ABSOLUTE INTEGER LESS THAN
                     1019 *1000, AND COVERTS THAT INTEGER TO BINARY.
                     1020 *IF THE FLOATING POINT INPUT IS A FRACTION ZERO
                     1021 *IS RETURNED, IF LARGER THAN 999 A NONEXISTANT
                     1022 *ERROR IS GENERATED. INPUT IS IN C, OUTPUT IS
                     1023 *IN C-X, CHARACTER DATA ALSO GENERATES ERROR.
                     1024 * USES: A.X, C, S8, AND 1 ADDITIONAL SUBROUTINE LEVEL
                     1025 * IN: C=FLOATING POINT NUMBER
                     1026 *      NO PERIPHERAL ENABLED
                     1027 * OUT: C.X = BINARY NUMBER
                     1028 *       CHIP 0 ENABLED
                     1029 * MAY EXIT TO ERRAD OR ERRNE .
                     1030 ***********************************************
   02E3 027E         1031 BCDBIN         C=C-1           S               ;CHECK FOR CHARACTER
   02E4 027E         1032                C=C-1           S
   02E5 00001003     1033                GOLC            =ERRAD
   02E7 0106         1034                A=C             X               ;MOVE EXPONENT
   02E8 005E         1035                C=0             S
   02E9 0104         1036                ST=0            8               ;CLEAR ZERO TO 9 FLAG
   02EA 0046         1037                C=0             X
   02EB 0270         1038                DADD=C
   02EC 0356         1039                A#0?            XS              ;NEGATIVE EXPONENT?
   02ED 0360         1040                RTNC                            ;YES WE ARE DONE
   02EE 037C         1041                RCR             12              ;MOVE DIGIT 1 TO 0
   02EF 01A6         1042                A=A-1           X               ;DEC EXP
   02F0 0007         1043                GOC             GOTINT          ;DONE IF X=0
   02F1 0108         1044                ST=1            8               ;SET FLAGS FOR 10 OR LARGER
   02F2 02FC         1045                RCR             13              ;ROT NXT DG IN
   02F3 01A6         1046                A=A-1           X               ;EXP=1?
   02F4 0007         1047                GOC             GOTINT          ;YES
   02F5 02FC         1048                RCR             13              ;SHIFT AGAIN
   02F6 01A6         1049                A=A-1           X               ;X=2
   02F7 0003         1050                GONC            ERRNE           ;VALUE TOO LARGE FOR ADR
                     1051 ****************************************************
                     1052 *THE FOLLOWING ROUTINE TAKES A BCD INTEGER IN C-X
                     1053 *(3 DIGITS) AND CONVERTS IT TO BINARY IN C-X
                     1054 *
                     1055 * IN: C.X= BCD NUMBER,   C[4:3]= 00
                     1056 * ASSUME: HEXMODE
                     1057 * OUT: C.X= BINARY NUMBER,   HEXMODE
                     1058 * USES: A.X, C, +1 SUB LEVEL       (NO ST, NO PT, NO DADD)
                     1059 ****************************************************
   02F8 023C         1060 GOTINT         RCR             2               ;GET FIRST DIGIT
   02F9 00001000     1061                GOSUB           INTINT
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LOCATION OBJECT CODE LINE     SOURCE LINE

    02FB 01E6        1062 INTINT          C=C+C           X                ;MULTIPLY BY 10
    02FC 0106        1063                 A=C             X
    02FD 01E6        1064                 C=C+C           X
    02FE 01E6        1065                 C=C+C           X
    02FF 0146        1066                 A=A+C           X
    0300 0046        1067                 C=0             X
    0301 02FC        1068                 RCR             13               ;SHIFT IN NEXT DIGIT
    0302 0206        1069                 C=C+A           X                ;COMBINE 10S
    0303 03E0        1070                 RTN
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LOCATION OBJECT CODE LINE     SOURCE LINE

                     1072 *
                     1073 *  GTAINC - GET ALPHA LABEL AND INCREMENT PROGRAM
                     1074 *           COUNTER
                     1075 *- GET AN ALPHA LABEL FROM VARIOUS LOCATIONS DEPENDING
                     1076 *- ON THE MODE OF OPERATION, AND FORMAT THE ALPHA
                     1077 *- LABEL APPROPRIATELY
                     1078 *- IN:  S9=1 IMPLIES AN ADDRESS IS RETURNED IN M
                     1079 *-      A[3:2]= FUNCTION CODE
                     1080 *-      CHIP 0 SELECTED
                     1081 *- OUT: M[13:0]= ALPHA LABEL (RIGHT JUSTIFIED)
                     1082 *-       OR ALPHA LABEL ADDRESS
                     1083 *       PC SET AT LAST BYTE OF ALPHA LABEL
                     1084 *- USES: A[13:0], B[13:0], C[13:0], M[13:0]
                     1085 *- USES: 1 SUBROUTINE LEVEL
                     1086
                     1087
                     1088
0304 001C            1089 GTAINC        PT=          3          ;-
0305 008E            1090               B=A          W          ;COPY FC FROM A[3:2]
0306 00CE            1091               C=B          W          ; TO B[3:2] AND C[3:2]
0307 02CC            1092               ST=1?        13         ;RUNNING?
0308 0007            1093               GOC          GTAI10     ;YES
0309 004C            1094               ST=1?        4          ;SSTFLAG?
030A 0007            1095               GOC          GTAI10     ;YES
030B 0278            1096               C=REGN       9          ;M_ALPHA STRING (KYBRD)
030C 024C            1097               ST=1?        9          ;ADDR IN M?
030D 0007            1098               GOC          $+2        ;YES
030E 0158            1099               M=C                     ;-
030F 03E0            1100               RTN                     ;-
0310 00CC            1101 GTAI10        ST=1?        10         ;ROM?
0311 0003            1102               GONC         GTAI40     ;NOPE
0312 0338            1103               C=REGN       12         ;B[6:3]_PGMCTR      (ROM)
0313 01BC            1104               RCR          11         ;-
0314 023A            1105               C=C+1        M          ;-
0315 00EE            1106               BCEX         W          ;C[3:2]_F.C.
0316 01E2            1107               C=C+C        PT         ;ALBL?
0317 0007            1108               GOC          GTAI22     ;YES
0318 00CE            1109               C=B          W          ;XEQ/GTO F.C.
0319 0330            1110               CXISA                   ;STRING OPERAND ADDR?
031A 008E            1111 GTAI26        B=A          W          ;SAVE F.C. & K.C.
031B 011A            1112               A=C          M          ;A[6:3]_PGMCTR
031C 033C            1113               RCR          1          ;A[13]_#CHARS
031D 027E            1114               C=C-1        S          ;-
031E 011E            1115               A=C          S          ;-
C31F 004E            1116               C=0          W          ;-
0320 031C            1117               PT=          1          ;-
0321 00AE            1118 GTAI30        ACEX         W          ;GET A CHAR
0322 023A            1119               C=C+1        M          ;-
0323 0330            1120               CXISA                   ;-
0324 00AE            1121               ACEX         W          ;-
0325 00AA            1122               ACEX         WPT        ;-
0326 023C            1123               RCR          2          ;POSITION CHAR
0327 01BE            1124               A=A-1        S          ;CHARS FINISHED?
0328 0003            1125               GONC         GTAI30     ;NOPE
0329 0003            1126               GOTO         $+2        ;-
032A 023C            1127               RCR          2          ;-
032B 02EA            1128               C#0?         WPT        ;-
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    032C 0003        1129                 GONC          $-2           ;-
    032D 0158        1130                 M=C                         ;M_ALPHA_STRING
    032E 00AE        1131                 ACEX          W             ;A[3:0]_F.C. & K.C.
    032F 006E        1132                 ABEX          W             ;-
    0330 001C        1133                 PT=           3             ;-
    0331 0003        1134                 GOTO          GTAI20        ;B[3:0]_PGMCTR
    0332 00CE        1135 GTAI22          C=B           W             ;POSITION PGMCTR
    0333 023A        1136                 C=C+1         M             ;-
    0334 0330        1137                 CXISA                       ;-
    0335 033C        1138                 RCR           1             ;-
    0336 0046        1139                 C=0           X             ;-
    0337 00FC        1140                 RCR           10            ;-
    0338 006E        1141                 ABEX          W             ;-
    0339 021A        1142                 C=A+C         M             ;-
    033A 023A        1143                 C=C+1         M             ;-
    033B 003C        1144 GTAI20          RCR           3             ;PLACE PGMCTR
    033C 00EA        1145                 BCEX          WPT           ;-
    033D 0338        1146                 C=REGN        12            ;-
    033E 00CA        1147                 C=B           WPT           ;-
    033F 0328        1148                 REGN=C        12            ;-
    0340 03E0        1149                 RTN                         ;-
                     1150
    0341 0244        1151 GTAI40          ST=0          9             ;-
    0342 01E2        1152                 C=C+C         PT            ;ALBL?
    0343 0003        1153                 GONC          GTAI50        ;NOPE
    0344 00001000    1154                 GOSUB         =GETPCA       ;INCREMENT
    0346 00001000    1155                 GOSUB         =INCADA       ;-
    0348 0003        1156                 GOTO          GTAI55        ;-
    0349 00001000    1157 GTAI50          GOSUB         =GETPCA       ;A[13]_#CHARS
    034B 00001000    1158 GTAI55          GOSUB         =NXBYTA       ;-
    034D 033C        1159                 RCR           1             ;-
    034E 011E        1160                 A=C           S             ;-
    034F 004E        1161                 C=0           W             ;-
    0350 01BE        1162 GTAI60          A=A-1         S             ;CHARS FINISHED?
    0351 0007        1163                 GOC           GTAI70        ;YES
    0352 0158        1164                 M=C                         ;-
    0353 00001000    1165                 GOSUB         =NXBYTA       ;-
    0355 03D8        1166                 CSTEX                       ;SHIFT CHAR IN
    0356 0198        1167                 C=M                         ;-
    0357 03D8        1168                 CSTEX                       ;-
    0358 023C        1169                 RCR           2             ;-
    0359 0003        1170                 GOTO          GTAI60        ;-
    035A 00001000    1171 GTAI70          GOSUB         =RTJLBL       ;RIGHT JUSTIFY
    035C 0158        1172                 M=C                         ;SAVE ALPHA STRING IN M
    035D 001C        1173                 PT=           3             ;-
    035E 00001000    1174                 GOSUB         =PUTPC        ;PLACE PGMCTR
    0360 006E        1175                 ABEX          W             ;A[3:0]_F.C. & K.C.
    0361 03B8        1176                 C=REGN        14            ;RESTORE SSO
    0362 0358        1177                 ST=C
    0363 03E0        1178                 RTN                         ;-
                     1179 *
                     1180 ***************************************************
                     1181 * VIEW ROUTINE
                     1182 ***************************************************
                     1183 *
    0364 0365        1184 XAVIEW          CON           1545Q
    0365 01BC        1185                 CON           674Q          ;GOSUB PRT11
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LOCATION OBJECT CODE LINE     SOURCE LINE

    0366 028C        1186                 ST=1?          7              ;ALPHAMODE?
    0367 0003        1187                 GONC           AVW10          ;NO
    0368 02CC        1188                 ST=1?          13             ;RUNNING?
    0369 03A0        1189                 RTNNC                         ;NO - KEYBOARD, ALPHAMODE
                     1190                                               ;DEFAULTDISPLAY IS THE SAME
                     1191                                               ;AS AVIEW - DON'T SET MSGFLG
    036A             1192 AVW10
    036A 0104        1193                 ST=0           8              ;SCROLL & NO PROMPT
    036B 0248        1194                 ST=1           9              ;KEYBOARD ALREADY BEEN RESET
    036C 00001000    1195                 GOSUB          =ARGOUT
    036E 0003        1196                 GOTO           XVIEWA
                     1197 *
    036F 036D        1198 XVIEW           CON            1555Q          ;GOSUB PRT10
    0370 01BC        1199                 CON            674Q
    0371 00CE        1200                 C=B            W
                     1201                 GLB            PR10RT         ;FOR THE PRINTER
    0372             1202 PR10RT                                        ;NOTE THE REG TO BE
                     1203 * VIEWED IS EXPECTED IN C WHEN THE PRT10 LOGIC RETURNS HERE
                     1204 * (IT WAS IN B WHEN WE WENT OFF TO PRT10)
    0372 00001000    1205                 GOSUB          =DSPCRG
    0374 00001000    1206 XVIEWA          GOSUB          STMSGF         ;SET MESSAGE FLAG
    0376 038C        1207                 ST=1?          0              ;DOES A PRINTER EXIST?
    0377 0007        1208                 GOC            XVW10          ;YES
    0378 013C        1209                 RCR            8              ;NO. CK PRINTER ENABLE FLG
    0379 0358        1210                 ST=C
    037A 020C        1211                 ST=1?          2              ;DID THE USER SET IT?
    037B 0007        1212                 GOC            STOPS          ;YES - STOP
    037C             1213 XVW10
    037C 00001000    1214 MSGDLY          GOSUB          =BLINK
    037E 0046        1215 STMSGF          C=0            X
                     1216 * GOSUB LDSSTO MIGHT BE USED HERE IN PLACE OF THE 4 INST SEQ
                     1217 * C=0 X, DADD=C, C=REGN 14, ST=C.  AN ANALYSIS OF WHO CALLS
                     1218 * STMSGF AND MSGDLY MUST BE DONE TO SEE IF THEY CAN AFFORD
                     1219 * ANOTHER SUBROUTINE LEVEL
    037F 0270        1220                 DADD=C
    0380 03B8        1221                 C=REGN         14
    0381 0358        1222                 ST=C
    0382 0088        1223                 ST=1           5              ;SET MSGFLAG
    0383 0003        1224                 GOTO           RSTMS2
                     1225
                     1226
                     1227
                     1228 *
                     1229 * RSTSEQ - RESET STATUS BITS AT END OF KEY SEQUENCE
                     1230 * CLEARS MSGFLG, DATAENTRY, PKSEQ, CATALOGFLAG, SHIFTSET, PSEFLAG
                     1231 * ALSO CLEARS RUNNING FLAG (S13)
                     1232 * CHIP 0 MUST BE ENABLED ON ENTRY
                     1233 * ON EXIT, SS0 IS UP AND C CONTAINS A COPY OF THE STATUS REGISTER
                     1234 * USES ONLY THE C REGISTER AND S0-S7
                     1235 *
                     1236                 GLB            RSTSEQ
                     1237                 GLB            RSTSQ
    0384 02C4        1238 RSTSEQ          ST=0           13             ;CLEAR RUNNING
    0385 03B8        1239 RSTSQ           C=REGN         14
    0386 023C        1240                 RCR            2
    0387 0358        1241                 ST=C                          ;LOAD SS 1
    0388 0304        1242                 ST=0           1              ;CLEAR PKSEQ
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LOCATION OBJECT CODE LINE     SOURCE LINE

    0389 0398        1243                 C=ST
    038A 037C        1244                 RCR            12
    038B 0358        1245                 ST=C                          ;LOAD SS0
    038C 0304        1246                 ST=0           1              ;CLEAR PAUSING
    038D 0003        1247                 GOTO           RSTMSC
                     1248 *                            THESE COMMENTS ACCURATE    RSW  6-13-80
                     1249 *
                     1250 *
                     1251 * RSTMSC - RESET MISCELLANEOUS STATUS BITS
                     1252 * RESETS CATALOGFLAG, SHIFT, DATAENTRY, AND MSGFLAG
                     1253 * ON ENTRY, REG 14 IN C EXCEPT SS0 IN ST, & CHIP 0 ENABLED.
                     1254 * ON EXIT, STATUS SETS HAVE BEEN STORED BACK TO CHIP 0, CHIP 0 IS ENABLED,
                     1255 *     SS 0 IS UP (AND C HAS A COPY OF THE STATUS SETS).
                     1256 *
                     1257 * RSTMS1 - SAME AS RSTMSC EXCEPT SETS UP C AND ST ON ENTRY
                     1258 * DATOFF - EXACTLY THE SAME AS RSTMS1
                     1259 * RSTMS0 - SAME AS RSTMS1, EXCEPT CALLS ENCP00 FIRST, THEREBY
                     1260 *     USING AN ADDITIONAL SUBROUTINE LEVEL
                     1261 *
                     1262 * USES: C, S0-S7,            (NO PT, +0 SUB LEVELS(EXCEPT RSTMS0))
                     1263 *
                     1264                 GLB            RSTMS0
                     1265                 GLB            DATOFF
                     1266                 GLB            RSTMS1
                     1267                 GLB            RSTMSC
    038E 00001000    1268 RSTMS0          GOSUB          =ENCP00
    0390             1269 DATOFF
    0390 03B8        1270 RSTMS1          C=REGN         14
    0391 0358        1271                 ST=C
    0392 017C        1272 RSTMSC          RCR            6
    0393 03D8        1273                 CSTEX                         ;PUT UP SS 3
    0394 0304        1274                 ST=0           1              ;CLEAR CATALOGFLAG
    0395 03D8        1275                 CSTEX
    0396 00FC        1276                 RCR            10
    0397 03D8        1277                 CSTEX                         ;PUT UP SS 1
    0398 0384        1278                 ST=0           0              ;CLEAR SHIFT
    0399 0204        1279                 ST=0           2              ;CLEAR DATAENTRY
    039A 03D8        1280                 CSTEX
    039B 037C        1281                 RCR            12
    039C 0084        1282                 ST=0           5              ;CLEAR MSGFLAG
    039D 0398        1283 RSTMS2          C=ST
    039E 03A8        1284                 REGN=C         14
    039F 03E0        1285                 RTN
                     1286
                     1287
                     1288
                     1289
                     1290
                     1291                 GLB            XPRMPT
                     1292 *
                     1293 * PROMPT - THIS FUNCTION COMBINES AVIEW AND R/S
                     1294 *
    03A0 0385        1295 XPRMPT          CON            1605Q          ;GOSUB PRT7
    03A1 01BC        1296                 CON            674Q
    03A2 00001000    1297                 GOSUB          =RSTMS0        ;CLEAR MSGFLG (IN CASE WE'RE
                     1298                                               ;IN ALPHAMODE) & LEAVE
                     1299                                               ;SS0 UP
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    03A4 0104        1300                 ST=0          8              ;SET UP FOR ARGOUT
    03A5 028C        1301                 ST=1?         7              ;ALPHAMODE?
    03A6 0003        1302                 GONC          PATCH8         ;NO.
    03A7             1303 P8RTN
                     1304                 GLB           STOPS          ;ERROR CALLS STOPS
    03A7 03B8        1305 STOPS           C=REGN        14             ;RETRIEVE SS 0
    03A8 0358        1306                 ST=C
                     1307                 GLB           STOPSB
    03A9             1308 STOPSB                                       ;STOP SUBROUTINE
                     1309                                              ;STOP A RUNNING OR PAUSING
                     1310                                              ;USER PROGRAM
                     1311                                              ;ON ENTRY, SS 0 UP
                     1312                                              ;USES 1 SUBROUTINE LEVEL
                     1313                                              ;AND C. LEAVES CHIP 0
                     1314                                              ;SELECTED.
    03A9 0304        1315                 ST=0          1              ;CLEAR PAUSEFLAG
    03AA 00001000    1316                 GOSUB         =STOSTO
                     1317                 GLB           PSESTP
    03AC             1318 PSESTP                                       ;ENTER FROM PAUSE FCN
    03AC 02C4        1319                 ST=0          13             ;CLEAR RUNNING FLAG
    03AD 03E0        1320                 RTN
                     1321 *
                     1322 *
                     1323 *
    03AE 01B0        1324 ALPDEF          C=STK                        ;GET RIGHT DEF
    03AF 021A        1325                 C=C+A         M
    03B0 0330        1326                 CXISA                        ;GET LOW 10 BITS
    03B1 02E6        1327                 C#0?          X              ;IF ZERO DONE CAT
    03B2 0003        1328                 GONC          QUTCAT
    03B3 001C        1329                 PT=           3
    03B4 0050        1330                 LC            1              ;BUILD ADR IN ROM 4
    03B5 01BC        1331                 RCR           11             ;MOVE TO MANTISSA
    03B6 00AE        1332 END2            ACEX          W              ;SAVE IN A
    03B7 00001000    1333                 GOSUB         =CLLCDE        ;ENABLE AND CLEAR LCD
    03B9 00AE        1334                 ACEX          W
    03BA 00001000    1335                 GOSUB         =PROMF2
    03BC 00001000    1336                 GOSUB         =LEFTJ         ;LEFT JUSTIFY STRING
    03BE 00001000    1337 END3            GOSUB         =ENCP00        ;TURN OFF LCD
    03C0 00001000    1338                 GOSUB         =BLINK
    03C2 035D        1339                 CON           1535Q          ;SEND DISPLAY TO PRINTER
    03C3 01BC        1340                 CON           674Q           ;GOSUB PRT12
    03C4 00001000    1341                 GOSUB         =RSTANN
    03C6 004C        1342                 ST=1?         4              ;SINGLE STEP?
    03C7 00001002    1343                 GOLNC         =CNTLOP        ;IF RUNNING CAT CONTINUE
    03C9 03B8        1344 CLCTMG          C=REGN        14             ;SET STATUS FOR RTN TO KBD
    03CA 0358        1345                 ST=C
    03CB 0088        1346                 ST=1          5
    03CC 0398        1347                 C=ST
    03CD 017C        1348                 RCR           6
    03CE 0358        1349                 ST=C
    03CF 0308        1350                 ST=1          1
    03D0 0398        1351 KBD             C=ST
    03D1 013C        1352                 RCR           8
    03D2 03A8        1353                 REGN=C        14
    03D3 00001002    1354                 GOLONG        =NFRKB
    03D5 03B8        1355 QUTCAT          C=REGN        14             ;CATALOG FINISH
    03D6 0358        1356                 ST=C
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    03D7 0084        1357                ST=0            5
    03D8 0398        1358                C=ST
    03D9 017C        1359                RCR             6
    03DA 0358        1360                ST=C
    03DB 0304        1361                ST=0            1
    03DC 0003        1362                GOTO            KBD
                     1363 *
                     1364 * PATCH8 - POST-RELEASE FIX TO AVOID PUTTING THE ALPHAREG TO THE LCD
                     1365 * AND SETTING MSGFLAG WHEN PROMPT IS EXECUTED IN ALPHAMODE.  THIS IS
                     1366 * DESIRABLE BECAUSE THE ALPHAREG IS THE DEFAULTDISPLAY IN ALPHAMODE.
                     1367 *
    03DD 00001000    1368 PATCH8          GOSUB           =ARGOUT         ;PUT ALPHAREG TO LCD
    03DF 00001000    1369                GOSUB           =STMSGF         ;SET MSGFLG
    03E1 0003        1370                GOTO            P8RTN
                     1371 *
                     1372 * PATCH4 - THIS POST-RELEASE PATCH SPEEDS UP THE EXECUTION OF THE
                     1373 *          RUN PORTION OF R/S
                     1374 *
                     1375                GLB             PACH4
    03E2 0130        1376 PACH4           LDI                             ;SET UP 100MS WAIT
    03E3 00A7        1377                CON             167
    03E4 03C8        1378 PTCH4A          RSTKB                           ;IS THE KEY STILL DOWN?
    03E5 03CC        1379                CHKKB
    03E6 00001002    1380                GOLNC           =XRS45          ;NO, GO RUN!
    03E8 0266        1381                C=C-1           X               ;TIME OUT OVER?
    03E9 0003        1382                GONC            PTCH4A          ;NO, KEEP CHECKING THE KEY
    03EA 00001002    1383                GOLONG          =LINNUM         ;DISPLAY THE STARTING STEP
                     1384 *
                     1385 * PACH10 - POST RELEASE PATCH TO FIX A BUG IN "SF IND NN"
                     1386 *
                     1387                GLB             PACH10
    03EC 00001000    1388 PACH10          GOSUB           =BCDBIN
    03EE 02F6        1389                C#0?            XS              ;ADDR>255?
    03EF 00001003    1390                GOLC            =ERRNE          ;YES
    03F1 021C        1391                PT=             2               ;RESTORE 1ST BYTE
    03F2 0098        1392                C=G                             ; OF FC TO C3:2
    03F3 00001002    1393                GOLONG          =P1ORTN
                     1394 *
                     1395 * PACH11 - POST-RELEASE FIX TO DISPLAY DRIVER SYNCHRONIZATION
                     1396 * PROBLEM, 3/26/79.  THE TWO DISPLAY DRIVER CHIPS RE-SYNCHRONIZE
                     1397 * EACH TIME THE CPU COMES WIDE AWAKE, NO MATTER WHETHER FROM LIGHT
                     1398 * SLEEP OR DEEP SLEEP.  EACH TIME THE C REGISTER CONTAINS BOTH ONES
                     1399 * AND ZEROES, THE DISPLAY DRIVERS SORT THEMSELVES OUT.  THIS PROCESS
                     1400 * CONTINUES UNTIL A DISPLAY READ INSTRUCTION IS EXECUTED.  HOWEVER,
                     1401 * IF THE DATA LINE FLOATS WHILE THE DISPLAY DRIVERS ARE TRYING TO
                     1402 * SORT THEMSELVES OUT, AND IF THE LEVEL ON THE DATA LINE DRIFTS,
                     1403 * THE DISPLAY DRIVERS MAY GET CONFUSED AND TANK THE SYSTEM.
                     1404 * THIS PATCH ENSURES THAT THE DISPLAY DRIVERS GET SYNCHRONIZED AND
                     1405 * THEN DISABLE THE SYNCHRONIZATION LOGIC BEFORE ANY MICROCODE
                     1406 * FLOATS THE DATA LINE (AS BY READING FROM A NON-EXISTENT DATA
                     1407 * STORAGE CHIP IN CHKADR OR FNDEND).
                     1408 *
                     1409                GLB             PACH11
    03F5 0130        1410 PACH11          LDI
    03F6 02FD        1411                CON             47*16+13
    03F7 0270        1412                DADD=C                          ;ENABLE NON-EXISTENT DATA CHIP 2FD
    03F8 03F0        1413                PFAD=C                          ;ENABLE DISPLAY
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    03F9 00B8        1414                 FLLDC                          ;NON-DESTRUCTIVE READ
    03FA 00001002    1415                 GOLONG          =MEMCHK
                     1416 *
                     1417 * PACH12 - POST RELEASE FIX TO DECOMPILE ON WAKEUP WHEN MACHINE GOES
                     1418 * TO SLEEP IN PROGRAM MODE.  DRC 10/20/79
                     1419 *
                     1420                 GLB             PACH12
    03FC 0046        1421 PACH12          C=0             X
    03FD 03A8        1422                 REGN=C          14
    03FE 00001002    1423                 GOLONG          =DECMPL
                     1424                 FILLTO          1777Q
                     1425                 END

Errors=    0
```

LINE#	SYMBOL	TYPE	REFERENCES
70	ADRFCH	P	12,151,165,977
151	ADRGSB	P	114,148
996	ALLOK	P	984,995
1324	ALPDEF	P	4
	ANNOUT	E	377,522,586
	ARGOUT	E	532,1195,1368
1192	AVW10	P	1187
1031	BCDBIN	P	14,99,166,1388
153	BIGBRC	P	15,189,972,1013
	BLINK	E	1214,1338
	CHKADR	E	95
800	CHKRPC	P	799
	CHK_NO_S	E	218
	CHK_NO_S2	E	220
1344	CLCTMG	P	7
	CLLCDE	E	1333
	CNTLOP	E	1343
818	COLDST	P	17,765,783
979	CONFLG	P	975
1269	DATOFF	P	1265
1007	DBL	P	1009
	DECMPL	E	1423
	DERUN	E	195
	DFRST8	E	527
345	DROPST	P	338,344
521	DROWSY	P	18,457
522	DRSY05	P	19
529	DRSY10	P	526
534	DRSY20	P	530
536	DRSY25	P	20,524,528,533,587
544	DRSY26	P	545
548	DRSY30	P	541
574	DRSY50	P	573,635
580	DRSY51	P	21
457	DRWSYL	P	389
	DSPCRG	E	535,1205
620	DSWKUP	P	52,619
	ENCPOO	E	1268,1337
1332	END2	P	5
1337	END3	P	6
	ENLCD	E	576,841
	ERRAD	E	1033
	ERRDE	E	170
287	ERRIGN	P	286,318,343
1014	ERRNE	P	22,986,990,1050,1390
263	ERROF	P	23,288
	ERROR	E	263,1014
97	FCHRTN	P	89
354	FILLXL	P	277,313,319,353
274	FILLY	P	285
973	FLAGS	P	966,969
493	GBYTR0	P	473
490	GBYTR1	P	474
487	GBYTR2	P	475
484	GBYTR3	P	476
481	GBYTR4	P	477
478	GBYTR5	P	

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LINE#	SYMBOL	TYPE	REFERENCES
	GETPCA	E	1154,1157
1060	GOTINT	P	24,1043,1047
1101	GTAI10	P	1093,1095
1144	GTAI20	P	1134
1135	GTAI22	P	1108
1111	GTAI26	P	
1118	GTAI30	P	1125
1151	GTAI40	P	26,1102
1157	GTAI50	P	1153
1158	GTAI55	P	1156
1162	GTAI60	P	1170
1171	GTAI70	P	1163
1089	GTAINC	P	25,199
411	IGNKEY	P	407
854	ILOOP	P	859
	INCADA	E	1155
918	INCG1	P	914
929	INCG2	P	920
944	INCG3	P	930
912	INCGT2	P	27,109,142,956
1062	INTINT	P	16,1061
	IORUN	E	385
385	IOSERV	P	382
1351	KBD	P	1362
	LEFTJ	E	1336
	LINNUM	E	1383
378	LOWBRT	P	372,374
556	LSWKUP	P	51,555
219	MATH	P	214
746	MEMCHK	P	745,1415
	MSGA	E	838
1214	MSGDLY	P	28
	MSGML	E	839
	MSGNE	E	1015
	MSGOF	E	264
451	NEXROM	P	431
364	NFRC	P	29,293,300,304,709
299	NFRENT	P	30
370	NFRFST	P	31
303	NFRKB	P	32,409,1354
302	NFRKB1	P	33
266	NFRNC	P	34
387	NFRNIO	P	35,384
358	NFRPR	P	36
363	NFRPU	P	37
297	NFRSIG	P	38
309	NFRX	P	39,307
334	NFRXY	P	40
503	NOPRT	P	498,502
496	NXBEND	P	449,480,483,486,489,492
	NXBYTA	E	1158,1165
495	NXROM1	P	455
443	NXTBT1	P	434
	OFF	E	403,615
615	OFFXFR	P	
	OVFL10	E	267,271,278,310,335
90	OVRSTK	P	79,81,83,101

LINE#	SYMBOL	TYPE	REFERENCES
962	P10RTN	P	961,1393
1303	P8RTN	P	1370
1388	PACH10	P	978,1387
1410	PACH11	P	558,628,1409
1421	PACH12	P	640,1420
1376	PACH4	P	1375
	PARSE	E	614
1368	PATCH8	P	1302
600	PAUS10	P	606
591	PAUSLP	P	551
330	PCTOC	P	
	PGMA0N	E	591
	PKIOAS	E	700
1202	PR1ORT	P	1201
	PROMF2	E	1335
1318	PSESTP	P	1317
1008	PSTDBL	P	1006
1378	PTCH4A	P	1382
	PUTPC	E	1174
	PUTPCX	E	814
1355	QUTCAT	P	8,1328
144	REGADR	P	134
	RMCK05	E	604
	ROMCHK	E	565,633,699,894
	ROW0	E	116
956	ROW10	P	41,117
	ROW11	E	118
	ROW12	E	119
205	ROW7	P	
172	ROWTBL	P	
255	RST05	P	251
257	RST10	P	260
	RSTANN	E	1341
252	RSTKB	P	250,254,303,546,654,842
1268	RSTMS0	P	1264,1297
1270	RSTMS1	P	1266
1283	RSTMS2	P	1224
1272	RSTMSC	P	1247,1267
1238	RSTSEQ	P	408,1236
1239	RSTSQ	P	1237
	RTJLBL	E	1171
	RUN	E	607,721
393	RUNING	P	392
414	RUNNK	P	42,395
1003	SHF8	P	1005
1215	STMSGF	P	9,1206,1369
1305	STOPS	P	1212,1304
1308	STOPSB	P	1307
465	STOSTO	P	376,464,549,1316
471	TBLGBR	P	
	TEXT	E	187
	TONE7X	E	719
188	TONETC	P	150
162	TONSTF	P	13,188
561	WKUP10	P	560,567
610	WKUP20	P	562,601
612	WKUP21	P	611

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LINE#	SYMBOL	TYPE	REFERENCES
637	WKUP25	P	630,636
678	WKUP30	P	687
679	WKUP40	P	694
696	WKUP50	P	680,685
671	WKUP60	P	662
705	WKUP70	P	43,903
718	WKUP80	P	717
763	WKUP90	P	670
1184	XAVIEW	P	10
278	XBAD	P	270
230	XCUTB1	P	45,156
512	XCUTE	P	46
229	XCUTEB	P	47,179,180,204,206
	XGTO	E	120
106	XNNROW	P	44
1295	XPRMPT	P	1291
	XROM	E	963
116	XROW0	P	172
191	XROW1	P	48,173
117	XROW10	P	182
118	XROW11	P	183
119	XROW12	P	184
120	XROW13	P	185
121	XROW14	P	186
126	XROW2	P	174
127	XROW3	P	175
215	XROW4	P	176
209	XROW5	P	177
210	XROW6	P	178
142	XROW9	P	181
	XRS45	E	1380
1198	XVIEW	P	11
1206	XVIEWA	P	1196
1213	XVW10	P	1208
	XXEQ	E	121
279	YBAD	P	273

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LOCATION OBJECT CODE LINE     SOURCE LINE

                       1 "COCONUT"
                       2 * HP41C MAINFRAME MICROCODE ADDRESSES @2000-3777
                       3                 GLB             LDSST0
                       4                 GLB             OFSHFT
                       5                 GLB             ANNOUT
                       6                 GLB             ANN_14
                       7                 GLB             RSTANN
                       8                 GLB             AFORMT
                       9                 GLB             BLANK
                      10                 GLB             CHKFUL
                      11                 GLB             CHRLCD
                      12                 GLB             CPGMHD
                      13                 GLB             DEROW
                      14                 GLB             DERW00
                      15                 GLB             DFILLF
                      16                 GLB             DF060
                      17                 GLB             DF150
                      18                 GLB             DF160
                      19                 GLB             DF200
                      20                 GLB             DFKBCK
                      21                 GLB             DFRST8
                      22                 GLB             DFRST9
                      23                 GLB             GENNUM
                      24                 GLB             MEMLFT
                      25                 GLB             PROMF1
                      26                 GLB             PROMF2
                      27                 GLB             PROMFC
                      28                 GLB             ROMHED
                      29                 GLB             ROMH05
                      30                 GLB             ROMH35
                      31                 GLB             RW0141
                      32                 GLB             ROW120
                      33                 GLB             ROW933
                      34                 GLB             ROW940
                      35                 GLB             RW0110
                      36                 GLB             TXRW10
                      37                 GLB             TXTROW
                      38                 GLB             TXTSTR
                      39                 GLB             XMSGPR
                      40 *
                      41 * ROW JUMP TABLE
                      42 *
0000 0003             43                 GOTO            ROW0
0001 0003             44                 GOTO            ROW1
0002 0003             45                 GOTO            ROW2
0003 0003             46                 GOTO            ROW3
0004 0003             47                 GOTO            ROW4_8
0005 0003             48                 GOTO            ROW4_8
0006 0003             49                 GOTO            ROW4_8
0007 0003             50                 GOTO            ROW4_8
0008 0003             51                 GOTO            ROW4_8
0009 0003             52                 GOTO            ROW09
000A 0003             53                 GOTO            ROW10
000B 0003             54                 GOTO            ROW11
000C 0003             55                 GOTO            ROW12
000D 0003             56                 GOTO            RO1314
000E 0003             57                 GOTO            RO1314
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LOCATION OBJECT CODE LINE     SOURCE LINE

    000F 00001002      58                GOLONG          TXTROW
    0011 0130          59 ROW0           LDI
    0012 00CF          60                CON             12*16+15        ;PROMPT STRING IN C,F
    0013 01A6          61 ROW010         A=A-1           X               ;OPERAND MINUS ONE
                       62                LEGAL
    0014 0003          63                GOTO            DF120
    0015 00001002      64 ROW1           GOLONG          DEROW           ;THIS IS A DIGIT ENTRY ROW
    0017 0130          65 ROW2           LDI
    0018 0090          66                CON             9*16+0          ;PROMPT STRING IN 9,0
    0019 0003          67                GOTO            DF120
    001A 00001000      68 ROW4_8         GOSUB           PROMFC
    001C 00001002      69                GOLONG          DF150
    001E 0130          70 ROW3           LDI
    001F 0091          71                CON             9*16+1          ;PROMPT STRINE IN 9,1
    0020 0002          72 DF120          A=0             PT              ;A(1)  _ 0
    0021 0086          73                B=A             X               ;SAVE THE OPERAND IN B
    0022 0106          74                A=C             X
    0023 00001000      75                GOSUB           PROMFC          ;OUTPUT PROMPT STRING
    0025 0066          76                ABEX            X               ;A.X _ OPERAND
                       77 * NEXT INSTRUCTION (S0=0) MAY NOT BE NECESSARY.
    0026 0384          78                ST=0            0               ;SAY TWO DIGITS OPERAND
    0027 0003          79                GOTO            ROW931
    0028 0003          80 ROW09          GOTO            ROW9
    0029 0130          81 ROW11          LDI
    002A 00D0          82                CON             13*16+0         ;PROMPT STRING IN 13,0
    002B 0003          83                GOTO            ROW010
    002C 0130          84 ROW12          LDI
    002D 00CE          85                CON             12*16+14
    002E 0306          86                A<C?            X               ;IS IF LBLNN ?OR X<>NN?
    002F 0003          87                GONC            ROW910          ;YES
    0030 00001002      88                GOLONG          ROW120
    0032 039C          89 RO1314         PT=             0
    0033 0002          90                A=0             PT
    0034 00001000      91                GOSUB           PROMFC
    0036 00001000      92                GOSUB           =NBYTAO         ;SKIP ONE BYTE(THREE BYTE FC)
    0038 00001000      93                GOSUB           =NXTBYT
    003A 03D8          94                CSTEX
    003B 0284          95                ST=0            7
    003C 03D8          96                CSTEX
    003D 0003          97                GOTO            ROW930
    003E 0130          98 ROW10          LDI
    003F 00A8          99                CON             10*16+8         ;TEST FOT XECROM FC
    0040 0306         100                A<C?            X               ;IS IT A XECROM FC ?
    0041 00001003     101                GOLC            =XECROM         ;YES
    0043 0130         102                LDI
    0044 00AE         103                CON             10*16+14
    0045 0306         104                A<C?            X               ;IS IT A XEQ/GTO IND ?
    0046 0007         105                GOC             ROW910          ;NO
    0047 00001000     106                GOSUB           =NBYTAB         ;GET OPERAND
    0049 03D8         107                CSTEX
    004A 00001000     108                GOSUB           ENLCD
    004C 028C         109                ST=1?           7               ;IS IT A XEQ ?
    004D 0003         110                GONC            $+4             ;NO
    004E 0130         111                LDI
    004F 00E0         112                CON             14*16+0         ;LOAD XEQ FC
    0050 0003         113                GOTO            $+3
    0051 0130         114                LDI
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    0052 00D0          115                    CON             13*16+0          ;LOAD GTO FC
    0053 00001000      116                    GOSUB           PROMF1
    0055 0003          117                    GOTO            ROW933
                       118 *
                       119 * NUMERICAL OPERAND
                       120 * ROW 9
                       121 *
    0056 0388          122 ROW9               ST=1            0
    0057 0130          123                    LDI
    0058 009C          124                    CON             9*16+12          ; TEST FOR 1 OR 2 DIGIT OPERAND
    0059 0306          125                    A<C?            X                ;1 DIGIT OPERAND ?
    005A 0003          126                    GONC            $+2              ;YES
                       127 *
                       128 * NUMERICAL OPERAND
                       129 * B[3:0] HAS ADDR POINT TO ONE BYTE BEFORE OPERAND
                       130 * IF S0=1 MEANS 1 DIGIT OPERAND
                       131 * IF S0=0 MEANS 2 DIGITS OPERAND
                       132 *
    005B 0384          133 ROW910             ST=0            0
    005C 00001000      134                    GOSUB           PROMFC           ;PROMPT THE FUNCTION FIRST
    005E 00001000      135                    GOSUB           =NBYTA0          ;LOAD OPERAND
    0060 0106          136 ROW930             A=C             X                ;SAVE OPERAND IN A TEMP.
    0061 00001000      137                    GOSUB           ENLCD            ;ENABLE LCD CHIP
    0063 00A6          138 ROW931             ACEX            X                ;LOAD OPERAND BACK TO C.X
    0064 03D8          139                    CSTEX                            ;MOVE OPERAND TO STATUS BITS
    0065 028C          140                    ST=1?           7                ;INDIRECT ?
    0066 0003          141                    GONC            ROW935           ;NO
    0067 0284          142 ROW933             ST=0            7
    0068 03D8          143                    CSTEX
    0069 0384          144                    ST=0            0                ; TWO DIGITS OPERAND
    006A 00E6          145                    BCEX            X
    006B 00001000      146                    GOSUB           MESSL
    006D 0009          147                    CON             9                ;I
    006E 000E          148                    CON             14               ;N
    006F 0204          149                    CON             1004Q            ;D
    0070 00001000      150                    GOSUB           BLANK            ;OUTPUT A BLANK
    0072 0066          151                    ABEX            X
    0073 0003          152                    GOTO            ROW936
    0074 03D8          153 ROW935             CSTEX
    0075 0106          154                    A=C             X                ;A.(1:0) _ OPERAND
    0076 0016          155 ROW936             A=0             XS
    0077 0130          156                    LDI
    0078 0066          157                    CON             102
    0079 0306          158                    A<C?            X                ;NUMERICAL OPERAND ?
    007A 0003          159                    GONC            ROW940           ;NO
    007B 001E          160                    A=0             S
    007C 017E          161                    A=A+1           S
    007D 038C          162                    ST=1?           0                ;1 DIGIT NUMERICAL OPERAND ?
    007E 0007          163                    GOC             $+2              ;YES
    007F 017E          164                    A=A+1           S
                       165                    LEGAL
    0080 00001000      166                    GOSUB           GENNUM           ;OUTPUT OPERAND
                       167 *
                       168 * DFILLF EXIT POINT
                       169 *
    0082 030C          170 DF150              ST=1?           1                ;DISPLAY FULL ?
    0083 00001000      171                    GSUBNC          =LEFTJ           ;NO, LEFT JUSTIFY
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    0085 00001002     172 DF160          GOLONG          LDSSTO          ;ENABLE CHIP 0
                      173                                                ;& PUT UP SSO
    0087 0130         174 ROW940         LDI
    0088 0070         175                CON             112
    0089 0306         176                A<C?            X               ;CAPITAL A,B,C,D,E ?
    008A 0007         177                GOC             CAPABC          ;YES
    008B 0366         178                A#C?            X               ;IS IT A T'S ?
    008C 0003         179                GONC            RT              ;YES
    008D 0130         180                LDI
    008E 0074         181                CON             116
    008F 0366         182                A#C?            X               ; IS IT A LSTX ?
    0090 0003         183                GONC            RL              ;YES
    0091 0306         184                A<C?            X               ;IS IT SMALL A,B,C,D,E ?
    0092 0003         185                GONC            SMLABC          ;YES
    0093 0130         186                LDI                             ;IT IS A X,Y OR Z
    0094 0071         187                CON             113             ;BUT IN THE REVERSE ORDER
    0095 0246         188                C=A-C           X
    0096 033C         189                RCR             1               ;C.S _ OFFSET
    0097 0130         190                LDI
    0098 001A         191                CON             26              ;LOAD A Z'S
    0099 027E         192 ROW945         C=C-1           S
    009A 0007         193                GOC             ROW960
    009B 0266         194                C=C-1           X
                      195                LEGAL
    009C 0003         196                GOTO            ROW945
                      197 *
    009D 0130         198 RT             LDI
    009E 005C         199                CON             92
    009F 0246         200 ROW950         C=A-C           X
                      201                LEGAL
    00A0 03E8         202 ROW960         SLSABC
    00A1 0003         203                GOTO            DF150
    00A2 0130         204 CAPABC         LDI
    00A3 0065         205                CON             101
    00A4 0003         206                GOTO            ROW950
    00A5 0130         207 SMLABC         LDI
    00A6 007A         208                CON             122
    00A7 0246         209                C=A-C           X
    00A8 0236         210                C=C+1           XS
                      211                LEGAL
    00A9 0003         212                GOTO            ROW960
    00AA 0130         213 RL             LDI
    00AB 0068         214                CON             104
    00AC 0003         215                GOTO            ROW950
                      216 *
                      217 *
                      218 * ROW 1 - INCLUDING DIGIT ENTRY AND AGTO, AXEQ
                      219 * A[2:0] HAS THE FUNCTION CODE. B[3:0] POINTING 1ST BYTE OF
                      220 * DIGIT ENTRY STRING, IF ITS A DIGIT ENTRY FC.
                      221 *
    00AD              222 DEROW
    00AD 0130         223                LDI
    00AE 001D         224                CON             1*16+13
    00AF 0306         225                A<C?            X               ;IS IT A DIGIT ENTRY FC ?
    00B0 0003         226                GONC            RW0110          ;NO, EITHER AGTO OR AXEQ
    00B1 0003         227                GOTO            DERW70
                      228 *
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

                     229 * DIGIT ENTRY START HERE
                     230 *
00B2 0130            231 DERW00          LDI
00B3 001A            232                 CON          1*16+10
00B4 0306            233                 A<C?         X            ;IS IT A DIGIT ?
00B5 0007            234                 GOC          DERW50       ;YES
00B6 0366            235                 A#C?         X            ;IS IT A D.P.?
00B7 0007            236                 GOC          DERW10       ;NO
00B8 03B8            237                 FRSABC
00B9 03D8            238                 CSTEX
00BA 0148            239                 ST=1         6            ;SET D.P.
00BB 015C            240                 PT=          6            ;CHECK FOR EUROPEAN NOTATION
00BC 00A2            241                 ACEX         PT
00BD 01E2            242                 C=C+C        PT
00BE 0007            243                 GOC          DERW05
00BF 0288            244                 ST=1         7            ;SET COMMA
00C0 03D8            245 DERW05          CSTEX
00C1 03E8            246                 SLSABC
00C2 0003            247                 GOTO         DERW60
00C3 0226            248 DERW10          C=C+1        X
00C4 0366            249                 A#C?         X            ;IS IT A EEX ?
00C5 0007            250                 GOC          DERW20       ;NO
00C6 00001000        251                 GOSUB        BLANK
00C8 0130            252                 LDI
00C9 0005            253                 CON          05Q          ;"E"
00CA 0003            254                 GOTO         DERW55
00CB 0130            255 DERW20          LDI                       ;IT GOT BE A CHS
00CC 002D            256                 CON          55Q
00CD 0003            257                 GOTO         DERW55
00CE 00A6            258 DERW50          ACEX         X
00CF 031C            259                 PT=          1
00D0 00D0            260                 LC           3
00D1 00001000        261 DERW55          GOSUB        CHRLCD
00D3 00001000        262 DERW60          GOSUB        =NBYTA0      ; ENABLE CHIP 0
                     263                                           ;& GET NEXT BYTE
00D5 006E            264                 ABEX         W            ;PUT THE PGMPTR BACK TO B
00D6 0056            265                 C=0          XS
00D7 0106            266                 A=C          X            ;A.X _ NEXT BYTE
00D8 00001000        267 DERW70          GOSUB        ENLCD
00DA 0130            268                 LDI
00DB 001D            269                 CON          1*16+13
00DC 031C            270                 PT=          1
00DD 0362            271                 A#C?         PT           ;IS THIS BYTE A ROW 1 FC ?
00DE 0007            272                 GOC          DF190        ;NO
00DF 0306            273                 A<C?         X            ;IS IT A DIGIT ENTRY FC ?
00E0 0007            274                 GOC          DERW00       ;YES
00E1 010C            275 DF190           ST=1?        8            ;PROMPT ?
00E2 0003            276                 GONC         DF200        ;NO
00E3 0130            277                 LDI
00E4 001F            278                 CON          37Q
00E5 00001000        279                 GOSUB        CHRLCD
00E7 00001002        280 DF200           GOLONG       DF150
00E9 03E6            281 RW0110          ASL          X            ;CONVERT FC FROM 1D TO D0
00EA 0016            282                 A=0          XS           ;        OR FROM 1E TO E0
00EB 00001000        283                 GOSUB        PROMFC
00ED 00001000        284                 GOSUB        =NBYTA0
00EF 006E            285                 ABEX         W
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LOCATION OBJECT CODE LINE     SOURCE LINE

    00F0 0106          286 RW0140          A=C             X
    00F1 0104          287 RW0141          ST=0            8
                       288 *
                       289 * TXTSTR - TEXT STRING
                       290 * A[0] HAS THE LENGTH OF THE STRING. B[3:0] POINTING ONE BYTE
                       291 * BEFORE 1ST CHAR.
                       292 * IF S2=1 ALPHA STRING IS KNOWN IN ROM
                       293 * IF S2=0, STRING IS IN RAM
                       294 *
                       295 * TXTROM - SETS S2 AND DROPS INTO TXTSTR
                       296 *
                       297 * TXRW10 - IDENTICAL TO TXTSTR
                       298 *
                       299 * TXTROW - COPIES S10 (ROMFLAG) INTO S2 AND FALLS INTO TXTSTR
                       300 *
    00F2 0204          301 TXTROW          ST=0            2
    00F3 00CC          302                 ST=1?           10              ;ROMFLAG?
    00F4 0003          303                 GONC            TXTSTR          ;NO
                       304                 GLB             TXTROM
    00F5 0208          305 TXTROM          ST=1            2               ;YES
    00F6               306 TXTSTR
    00F6 031C          307 TXRW10          PT=             1
    00F7 0002          308                 A=0             PT
    00F8 00A6          309                 ACEX            X
    00F9 005A          310                 C=0             M
    00FA 0056          311                 C=0             XS
    00FB 01BC          312                 RCR             11
    00FC 011A          313                 A=C             M               ;A.M _ CHAR COUNTER.
    00FD 00001000      314                 GOSUB           ENLCD
    00FF 03B8          315                 FRSABC
    0100 0130          316                 LDI
    0101 0107          317                 CON             407Q
    0102 03E8          318                 SLSABC
    0103 01BA          319 TXRW30          A=A-1           M               ;ALL DONE ?
    0104 0007          320                 GOC             DF190           ;YES
    0105 006E          321                 ABEX            W
    0106 00001000      322                 GOSUB           =ENCP00
    0108 001C          323                 PT=             3               ;SET UP FOR NXBYTA
    0109 020C          324                 ST=1?           2               ;ROM?
    010A 00001001      325                 GSUBC           =NXBYTO         ;YES
    010C 020C          326                 ST=1?           2               ;SAME QUESTION
    010D 00001000      327                 GSUBNC          =NXBYTA         ;NO
    010F 006E          328                 ABEX            W
    0110 0106          329                 A=C             X               ;A.X _ CHAR
    0111 00001000      330                 GOSUB           ENLCD
    0113 00A6          331                 ACEX            X
    0114 00001000      332                 GOSUB           =ASCLCD
    0116 00001000      333                 GOSUB           CHKFUL          ; SEE IF LCD FULL
    0118 0003          334                 GOTO            TXRW30
                       335 *
    0119 006E          336 ROW120          ABEX            W
    011A 00001000      337                 GOSUB           =INCAD
    011C 00001000      338                 GOSUB           =NXTBYT         ;LOAD OPERAND
    011E 008E          339                 B=A             W               ;SAVE PC IN B
    011F 0106          340                 A=C             X
    0120 00001000      341                 GOSUB           ENLCD
    0122 031C          342                 PT=             1
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LOCATION OBJECT CODE LINE     SOURCE LINE

    0123 0162          343                 A=A+1          PT              ;IS IT LBL ?
    0124 0003          344                 GONC           ROW122          ;NO, ITS A END
    0125 0130          345                 LDI
    0126 00CF          346                 CON            12*16+15        ;LOAD LBL FC
    0127 00001000      347                 GOSUB          PROMF1          ;PROMPT THE FUNCTION
    0129 00001000      348                 GOSUB          =ENCP00         ;ENABLE CHIP 0
    012B 006E          349                 ABEX           W
    012C 00001000      350                 GOSUB          =INCAD
    012E 006E          351                 ABEX           W
    012F 01AE          352                 A=A-1          W               ;CHAR COUNTER -1 (SKIP KC)
                       353                 LEGAL
    0130 00001002      354                 GOLONG         =RW0141
    0132 00AA          355 ROW122          ACEX           WPT
    0133 0262          356                 C=C-1          PT              ;RESTORE THE "END"
    0134 0358          357                 ST=C
    0135 0130          358                 LDI
    0136 00C0          359                 CON            12*16+0         ;PROMPT "END"
    0137 00001000      360                 GOSUB          PROMF1
    0139 00CC          361                 ST=1?          10              ;ARE WE IN ROM ?
    013A 0007          362                 GOC            ROW125          ;YES, PROMPT "END" ONLY
    013B 008C          363                 ST=1?          5               ;FINAL END ?
    013C 0003          364                 GONC           ROW125          ;NO
    013D 02E0          365                 DISOFF
    013E 03B8          366                 RABCR
    013F 03B8          367                 RABCR
    0140 0130          368                 LDI
    0141 0044          369                 CON            104Q
    0142 03E8          370                 SLSABC
    0143 00001000      371                 GOSUB          REGLFT
    0145 0106          372                 A=C            X
    0146 001E          373                 A=0            S
    0147 00001000      374                 GOSUB          ENLCD
    0149 00001000      375                 GOSUB          GENNUM
    014B 0130          376                 LDI
    014C 0020          377                 CON            40Q
    014D 03E8          378                 SLSABC
    014E 03F8          379                 RABCL                          ;READ IN LEFT MOST CHAR
    014F 039C          380                 PT=            0
    0150 02E2          381                 C#0?           PT              ;IS IT A BLANK ?
    0151 0003          382                 GONC           $+2             ;YES, THROW IT AWAY
    0152 03A8          383                 SRSABC                         ;IS AN "E", PUT IT BACK
    0153 0130          384                 LDI
    0154 0060          385                 CON            140Q            ;LOAD A DOT
    0155 03A8          386                 SRSABC                         ;SHIFT IN LEFT END
    0156 0320          387                 DISTOG
    0157 0304          388 ROW125          ST=0           1
    0158 0003          389                 GOTO           DF040
                       390 *
                       391 * DFILLF _ DISPLAY ONE PROGRAM STEP
                       392 *
                       393 * CALLING SEQUENCE:
                       394 *          PGMPTR  _ POINT TO LAST BYTE OF PREVIOUS STEP
                       395 *          GOSUB  DFILLF
                       396 *          IF PRIVATE, DISPLAY "PRIVATE" AND RETURN
                       397 *          ELSE DISPLAY ONE LINE OF PROGRAM MEMORY
                       398 * FOUR ENTRY POINTS :
                       399 * 1. DFILLF - NORMAL ENTRY
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LOCATION OBJECT CODE LINE     SOURCE LINE

                     400 * 2. DFRST9 - RESET S9 REMEMBER KEYBOARD NOT BEEN RESET YET
                     401 *             RESET S8 SAY NO PROMPT & SCROLL
                     402 * 3. DFRST8 - ONLY RESET S8
                     403 * 4. DFKBCK - SPEND APPROXIMATELY 100 MILLISEC CHECKING FOR
                     404 *             KEY UP BEFORE DROPPING INTO DFRST9
                     405 * USED S0,S1,S2, A,B,C. ASSUMED NOTHING.
                     406 * NOT TRUE! CALLS LINNUM.  SEE COMMENTS ON LINNUM.
                     407 * USES AT LEAST TWO SUBROUTINE LEVELS
                     408 * RETURN WITH CHIP ENABLE & STATUS SET #0 ENABLE
                     409 * EXCEPT ON THE KEY UP PATH OUT OF DFKBCK THE CHIP ENABLE AND
                     410 * STATUS SET ARE UNCHANGED.
                     411 *
   0159 0130         412 DFKBCK          LDI
   015A 00C8         413                 CON          200
   015B 0248         414                 ST=1         9              ;ASSUME KB WILL BE RESET
   015C 03C8         415 DF010           RSTKB
   015D 03CC         416                 CHKKB
   015E 03A0         417                 RTNNC
   015F 0266         418                 C=C-1        X
   0160 0003         419                 GONC         DF010
   0161 0244         420 DFRST9          ST=0         9              ;SAY KEYBOARD NOT RESET YET
   0162 0104         421 DFRST8          ST=0         8              ;SAY NO PROMPT, SCROLLING
   0163 0304         422 DFILLF          ST=0         1              ;SAY LCD NOT FULL YET
   0164 0384         423                 ST=0         0              ;ASSUME 2D OPERAND
   0165 00001000     424                 GOSUB        =ENCP00
   0167 00001000     425                 GOSUB        =LINNUM        ;LOAD LINE #
   0169 0106         426                 A=C          X              ;A.X _ LINE #
   016A 0086         427                 B=A          X              ;SAVE LINE # IN B.X
   016B 034C         428                 ST=1?        12             ;PRIVATE?
   016C 0003         429                 GONC         DF030          ;NOT PRIVATE
   016D 00001000     430 XMSGPR          GOSUB        =MSG
   016F 0000         431                 CON          =MSGPR         ;SAY PRIVATE
   0170 0003         432                 GOTO         DF040
   0171 00001000     433 DF030           GOSUB        =CLLCDE
   0173 001E         434                 A=0          S
   0174 00001000     435                 GOSUB        GENNUM         ;OUTPUT LINE #
   0176 02C6         436                 B#0?         X              ;LINE# = 0 ?
   0177 0007         437                 GOC          DF050          ;NO
   0178 00CC         438                 ST=1?        10             ;ARE WE IN ROM
   0179 0007         439                 GOC          DF040          ;YES, NO PROMPT FOR LINE#=0
   017A 00001000     440                 GOSUB        REGLFT
   017C 0106         441                 A=C          X              ;A.X _ MEM LEFT
   017D 001E         442                 A=0          S
   017E 00001000     443                 GOSUB        ENLCD
   0180 00001000     444                 GOSUB        GENNUM
   0182 00001002     445 DF040           GOLONG       DF150
   0184 0130         446 DF050           LDI
   0185 0020         447                 CON          40Q
   0186 03E8         448                 SLSABC                      ;OUTPUT A BLANK
   0187 00001000     449 DF060           GOSUB        =ENCP00        ;ENABLE CHIP 0
   0189 03B8         450                 C=REGN       14             ;SET UP FOR D.P.(COMMA) CHECK
   018A 010E         451                 A=C          W
   018B 00001000     452                 GOSUB        =GETPC         ;LOAD PROGRAM POINTER
   018D 00001000     453 DF100           GOSUB        =NXTBYT        ;NEXT BYTE
   018F 031C         454                 PT=          1
   0190 02EA         455                 C#0?         WPT            ;IS IT A NULL ?
   0191 0003         456                 GONC         DF100          ;YES, SKIP IT
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LOCATION OBJECT CODE LINE     SOURCE LINE

    0192 008E          457                B=A             W               ;SAVE THE PGMPTR IN B
    0193 0056          458                C=0             XS
    0194 0106          459                A=C             X               ;A.X _ FUNCTION CODE
    0195 023C          460                RCR             2
    0196 0130          461                LDI                             ;JUMP TABLE START FROM
    0197 0040          462                CON             100Q            ;  QUAD 1
    0198 00FC          463                RCR             10
    0199 01E0          464                GOTOC
                       465 *
                       466 * REGLFT - PUSHES " REG " INTO LCD FROM RIGHT END & FALLS INTO
                       467 *     MEMLFT
                       468 * ASSUMES LCD ENABLED ON ENTRY
                       469 * SEE MEMLFT FOR EXIT CONDITIONS
                       470 * USES ONE ADDITIONAL SUBROUTINE LEVEL AND USES C[6:0] - SEE
                       471 *     MEMLFT FOR ADDITIONAL REGISTER USAGE
                       472 *
                       473                GLB             REGLFT
    019A 00001000      474 REGLFT         GOSUB           MESSL
    019C 0020          475                CON             32              ;BLANK
    019D 0012          476                CON             22Q             ;R
    019E 0005          477                CON             5               ;E
    019F 0007          478                CON             7               ;G
    01A0 0220          479                CON             1040Q           ;BLANK
                       480 *
                       481 * MEMLFT - COMPUTE HOW MANY UNUSED REG LEFT IN MEM
                       482 * ASSUME NOTHING.
                       483 * RETURN WITH # OF REG LEFT IN C[2:0] AND CHIP 0 ENABLED.
                       484 * USES A AND C. USES ONE ADDITIONAL SUBROUTINE LEVEL.
                       485 *
    01A1 00001000      486 MEMLFT         GOSUB           =ENCP00
    01A3 0378          487                C=REGN          13              ;LOAD CHAIN HEAD
    01A4 005A          488                C=0             M
    01A5 010E          489                A=C             W
    01A6 0003          490                GOTO            MEMLF2
    01A7 0266          491 MEMLF1         C=C-1           X               ;POINT TO NEXT REG.
    01A8 010E          492                A=C             W
    01A9 0270          493                DADD=C
    01AA 0038          494                C=DATA                          ;LOAD THE REG.
    01AB 02EE          495                C#0?            W               ;ZERO IN IT ?
    01AC 0007          496                GOC             MEMLF3          ;NO, REACH END OF MEM
    01AD 017A          497                A=A+1           M               ;COUNT 1
    01AE 0130          498 MEMLF2         LDI
    01AF 00C0          499                CON             12*16+0
    01B0 0366          500                A#C?            X               ;REACH REG.(C,0) ?
    01B1 0003          501                GONC            MEMLF3          ;YES
    01B2 00AE          502                ACEX            W
    01B3 0003          503                GOTO            MEMLF1
    01B4 00AE          504 MEMLF3         ACEX            W
    01B5 003C          505                RCR             3
    01B6 03E0          506                RTN
                       507 *
                       508 * CHRLCD - OUTPUT A CHAR TO LCD AND CHECK SCROLLING
                       509 * IF S1=1 MEANS DISPLAY ALREADY FULL, THEN AFTER SENDING THE CHAR
                       510 * TO DISPLAY CHECK IF A DELAY IS REQUIRED BY CALLING SCROLL ROUTINE.
                       511 * THE LCD CODE IS EXPECTED IN C[2:0]. ASSUMED LCD ENABLE.
                       512 * USES A.X, C    MAY SET S1,S9  MAY RTN VIA SCROLO
                       513 * MAY USE A SUBROUTINE LEVEL
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LOCATION OBJECT CODE LINE     SOURCE LINE

                     514 *
01B7 0130            515 BLANK          LDI
01B8 0020            516                CON          40Q          ;OUTPUT A BLANK
01B9 03E8            517 CHRLCD         SLSABC
01BA 030C            518 CHKFUL         ST=1?        1            ;LCD ALREADY FULL ?
01BB 0007            519                GOC          CKFL10       ;YES, DO DELAY BEFORE RETURN
01BC 0130            520                LDI
01BD 0020            521                CON          40Q
01BE 0106            522                A=C          X
01BF 03F8            523                RABCL                     ;READ THE LEFT MOST CHAR
01C0 03A8            524                SRSABC                    ;PUT IT BACK
01C1 0056            525                C=0          XS
01C2 0366            526                A#C?         X            ;IS IT A BLANK ?
01C3 03A0            527                RTNNC                     ;YES, NO NEED FOR SCROLLING YET
01C4 0308            528                ST=1         1            ;REMEMBER LCD FULL
01C5 00001002        529 CKFL10         GOLONG       =SCROLO
                     530 *
                     531 * PROMFC - OUTPUT A PROMPT STRING FOR A MICROCODE FUNCTION
                     532 *
                     533 * PROMFC ENTRY: A[1:0]=MAINFRAME FC, LCD NEED NOT BE ENABLED
                     534 * PROMF1 ENTRY: C[1:0]=MAINFRAME FC, LCD MUST BE ENABLED
                     535 * PROMF2 ENTRY: C[6:3]=XADR, LCD ENABLED
                     536 * ALL ENTRY POINTS USE C AND LEAVE S8=0 AND LCD ENABLED
                     537 * PROMFC AND PROMF1 LEAVE PT=2
                     538 * PROMFC USES A SUBROUTINE LEVEL TO CALL ENLCD
                     539 *
01C7 00001000        540 PROMFC         GOSUB        ENLCD
01C9 00A60106        541                C=A          X            ;C.X _ FC
01CB 023C            542 PROMF1         RCR          2
01CC 0130            543                LDI                       ;MAIN FUNCTION TABLE
01CD 0014            544                CON          24Q          ;  START FROM @12000
01CE 027C            545                RCR          9
01CF 0330            546                CXISA                     ;LOAD XADR
01D0 001C            547                PT=          3
01D1 0050            548                LC           1
01D2 01BC            549                RCR          11
01D3 0108            550 PROMF2         ST=1         8            ;INITIALIZE FINAL CHAR FLAG
01D4 027A            551 PMPT20         C=C-1        M
01D5 0330            552                CXISA                     ;GET CHARACTER
01D6 0056            553                C=0          XS
01D7 03D8            554                CSTEX
01D8 014C            555                ST=1?        6            ;SPECIAL CHARACTER?
01D9 0003            556                GONC         PMPT30       ;NO
01DA 0236            557                C=C+1        XS           ;YES. SET BIT FOR DISPLAY CREG
01DB 0144            558                ST=0         6
01DC 028C            559 PMPT30         ST=1?        7            ;FINAL CHARACTER?
01DD 0003            560                GONC         PMPT40
01DE 0104            561                ST=0         8            ;YES
01DF 0284            562                ST=0         7
01E0 03D8            563 PMPT40         CSTEX
01E1 03E8            564                SLSABC                    ;PUT CHAR TO LCD
01E2 010C            565                ST=1?        8            ;MORE CHARS?
01E3 0007            566                GOC          PMPT20       ;YES
01E4 0130            567                LDI
01E5 0020            568                CON          40Q
01E6 03E8            569                SLSABC                    ;OUTPUT A BLANK
01E7 03E0            570                RTN
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LOCATION OBJECT CODE LINE     SOURCE LINE

                     571 *
                     572 * GENNUM - CONVERT A HEX NUMBER TO DECIMAL & OUTPUT TO LCD
                     573 * CALLING SEQUENCE:
                     574 *          A.X _ HEX NUMBER
                     575 *          A.S _ # OF OUTPUT DIGITS. IF A.S=0, # OF OUTPUT
                     576 *              _ DIGITS WILL BE EITHER 2,3 OR 4.
                     577 *          IF OUTPUT TO LCD IS DESIRED, ENTER WITH LCD CHIP ENABLED.
                     578 *          IF LCD IS TO REMAIN UNCHANGED, ENTER WITH A NON-EXISTENT
                     579 *              DATA STORAGE CHIP (I.E. CHIP 1) ENABLED.
                     580 *          GOSUB  GENNUM
                     581 * LEAVES # OF DIGITS IN B.S
                     582 * LEAVES DIGIT STRING IN A.M LEFT-JUSTIFIED
                     583 * RETURNS ACTIVE POINTER=0 FOR HISTORICAL REASONS
                     584 * USED A,C,B[13]. DOESN'T CALL ANY SUBROUTINES.
                     585 * DOESN'T CHANGE WHICH CHIP (SLEEPER OR LCD) IS ENABLED.
                     586 *
   01E8 009E         587 GENNUM          B=A             S
   01E9 004E         588                 C=0             W
   01EA 02A0         589                 SETDEC
   01EB 00A6         590                 ACEX            X
   01EC 010E         591                 A=C             W
   01ED 023C         592                 RCR             2               ;C(0)   MOST SIGN. DIGIT
   01EE 0226         593                 C=C+1           X               ;CONVERT IF TO DECIMAL
   01EF 0266         594                 C=C-1           X
   01F0 01EE         595                 C=C+C           W               ;MULTIPLY IT BY 16
   01F1 01EE         596                 C=C+C           W
   01F2 01EE         597                 C=C+C           W
   01F3 01EE         598                 C=C+C           W
   01F4 03E6         599                 ASL             X
   01F5 00A6         600                 ACEX            X
   01F6 023C         601                 RCR             2               ;C(0)   SECOND DIGIT
   01F7 0226         602                 C=C+1           X               ;CONVERT IT TO DECIMAL
   01F8 0266         603                 C=C-1           X
   01F9 0206         604                 C=A+C           X
   01FA 00BE         605                 ACEX            S               ;A.S   LEAST SIG. DIGIT
   01FB 01EE         606                 C=C+C           W               ;MULTIPLY 16
   01FC 01EE         607                 C=C+C           W
   01FD 01EE         608                 C=C+C           W
   01FE 01EE         609                 C=C+C           W
   01FF 0006         610                 A=0             X
   0200 00AE         611                 ACEX            W
   0201 02FC         612                 RCR             13              ;C(0)   LEAST SIGN. DIGIT
   0202 022E         613                 C=C+1           W               ;CONVERT IT TO DECIMAL
   0203 026E         614                 C=C-1           W
   0204 020E         615                 C=A+C           W
   0205 0260         616                 SETHEX
   0206 02DE         617                 B#0?            S               ;OUTPUT DIGITS = 0 ?
   0207 0007         618                 GOC             GENN20          ;NO
   0208 02DC         619                 PT=             13
   0209 0110         620                 LC              4
   020A 011E         621                 A=C             S               ;DETERMINE MIN. OUTPUT DIGITS
   020B 007C         622                 RCR             4
   020C 02FE         623                 C#0?            S               ;NEEDS 4 DIGITS ?
   020D 0007         624                 GOC             GENN40          ;YES
   020E 02FC         625                 RCR             13
   020F 01BE         626                 A=A-1           S
   0210 02FE         627                 C#0?            S               ;NEEDS THREE DIGITS ?
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    0211 0007          628                GOC          GENN40        ;YES
    0212 02FC          629                RCR          13
    0213 01BE          630                A=A-1        S             ;TWO DIGITS
                       631                LEGAL
    0214 0003          632                GOTO         GENN40
    0215 007E009E      633 GENN20         A=B          S
    0217 01BE          634 GENN25         A=A-1        S
    0218 0007          635                GOC          GENN30
    0219 033C          636                RCR          1
    021A 0003          637                GOTO         GENN25
    021B 007E          638 GENN30         ABEX         S
    021C 033C          639 GENN40         RCR          1             ;COPY DIGIT STRING TO A.M
    021D 011A          640                A=C          M
    021E 009E          641                B=A          S             ;COPY # OF DIGITS TO B.S
    021F 02FC          642                RCR          13            ;LEFT-JUSTIFY DIGIT STRING IN C
    0220 039C          643                PT=          0             ;AS ADVERTISED FOR EXIT
    0221 01BE          644 GENN55         A=A-1        S
    0222 0360          645                RTNC
    0223 0130          646                LDI
    0224 0003          647                CON          3
    0225 02FC          648                RCR          13
    0226 03E8          649                SLSABC
    0227 0003          650                GOTO         GENN55
                       651 *
                       652 * AFORMT - FORMAT A NUMBER AND PUT IT TO ALPHA STRING
                       653 * CALLED BY ARCL, THE NUMBER:IS EXPECTED IN B
                       654 * ASSUMED NOTHING. USED A,B,C. RETURN WITH CHIP 0 ENABLE.
                       655 * CALLED APPEND TO PUT THE CHAR IN ALPHA REG.
                       656 * CALLED FORMAT. 2 SUB LEVELS.
                       657 *
    0228 0046          658 AFORMT         C=0          X
    0229 0270          659                DADD=C                     ;ENABLE CHIP 0
    022A 00CE          660                C=B          W             ;LOAD THE NUMBER
    022B 00001000      661                GOSUB        =FORMAT
    022D 0104          662                ST=0         8             ;ASSUME FIX MODE
    022E 0014          663                PT=?         3             ;FIX MODE ?
    022F 0003          664                GONC         $+2           ;YES
    0230 0108          665                ST=1         8             ;SCI OR ENG MODE
    0231 00AE          666                ACEX         W             ;LOAD DISPLAY REG.A
    0232 0158          667                M=C                        ;SAVE IN M
    0233 02FE          668                C#0?         S             ;MANTISSA NEGATIVE ?
    0234 00001001      669                GSUBC        =APND_        ;YES
    0236 00E0          670                SELQ
    0237 035C          671                PT=          12            ;Q=12
    0238 00E0          672 AFMT10         SELQ
    0239 02D4          673 AFMT11         PT=?         13            ;JUST DONE WITH EXP ?
    023A 0360          674                RTNC                       ;YES, WE ARE ALL DONE
    023B 00D0          675 AFMT12         LC           3
    023C 03DC          676                INCPT
    023D 0062          677                ABEX         PT
    023E 0302          678                A<C?         PT            ;ENCOUNTER A BLANK ?
    023F 0007          679                GOC          AFMT30        ;YES, END OF MANTISSA
    0240 0362          680                A#C?         PT            ;IS IT A DIGIT ONLY ?
    0241 0003          681                GONC         AFMT20        ;YES
    0242 0062          682                ABEX         PT
    0243 00001000      683                GOSUB        =APNDDG       ;OUTPUT THR DIGIT FIRST
    0245 00E0          684                SELQ
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    0246 00C2          685                    C=B             PT
    0247 01E2          686                    C=C+C           PT              ;IS A COMMA ?
    0248 0003          687                    GONC            $+4             ;NO, IS A D.P.
    0249 0130          688                    LDI
    024A 002C          689                    CON             54Q             ;COMMA
    024B 0003          690                    GOTO            $+3
    024C 0130          691                    LDI
    024D 002E          692                    CON             56Q             ;D.P.
    024E 03D4          693                    DECPT
    024F 00A0          694                    SELP
    0250 00001000      695                    GOSUB           =APND10
    0252 0003          696                    GOTO            AFMT10
    0253 00001000      697 AFMT20             GOSUB           =APNDDG         ;OUTPUT THE DIGIT
    0255 00E0          698                    SELQ
    0256 03D4          699                    DECPT
    0257 0214          700                    PT=?            2               ;END OF MANTISSA ?
    0258 0003          701                    GONC            AFMT10          ;NOT YET
    0259 010C          702 AFMT30             ST=1?           8               ;FIX MODE ?
    025A 03A0          703                    RTNNC                           ;YES, ALL DONE
    025B 031C          704                    PT=             1
    025C 0198          705                    C=M
    025D 02E2          706                    C#0?            PT
    025E 0007          707                    GOC             $+2
    025F 03D4          708                    DECPT
    0260 00A0          709                    SELP
    0261 0130          710                    LDI
    0262 0045          711                    CON             105Q            ;E
    0263 00001000      712                    GOSUB           =APND10
    0265 0198          713                    C=M
    0266 02F6          714                    C#0?            XS              ;EXP NEGATIVE ?
    0267 00001001      715                    GSUBC           =APND           ;YES
    0269 0003          716                    GOTO            AFMT10
                       717 *
                       718 * APNDDG (INCLUDING APND , APND10, APND20) HAS BEEN MOVED TO
                       719 * QUAD 0 TO FILL UP A HOLE THERE
                       720 *
                       721 *  ROMHED - LOCATE ROM HEAD ADDRESS
                       722 *- RETURNS THE ADDRESS OF THE BEGIN STATEMENT AT
                       723 *- THE START OF A PROGRAM IN ROM
                       724 *- IN:  CHIP 0 SELECTED
                       725 *- OUT: A[3:0]= ROM HEAD ADDRESS
                       726 *- USES: C[13:0], STATUS BIT 12, & A[3:0]
                       727 *-
                       728 *  ENTRY POINT- ROMHO5
                       729 *- IN: PT= 3
                       730 *-      C[6:3]= ROM ADDRESS
                       731
                       732
                       733
                       734
                       735
                       736
                       737
    026A 001C          738 ROMHED             PT=             3               ;-
    026B 0338          739                    C=REGN          12              ;GET PGMCTR
    026C 01BC          740 ROMHO5             RCR             11              ;-
    026D 0344          741                    ST=0            12              ;-
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    026E 0003          742                    GOTO            $+2             ;-
    026F 027A          743 ROMH06             C=C-1           M               ;FIND BEGIN STMT
    0270 0330          744                    CXISA                           ;-
    0271 0276          745                    C=C-1           XS              ;-
    0272 0007          746                    GOC             ROMH06          ;-
    0273 0276          747                    C=C-1           XS              ;-
    0274 0007          748                    GOC             ROMH06          ;-
    0275 0276          749                    C=C-1           XS              ;SET PRIVACY BIT
    0276 0007          750                    GOC             $+2             ;-
    0277 0348          751                    ST=1            12              ;-
    0278 003C          752 ROMH35             RCR             3               ;A[3:0]_HEAD ADDR
    0279 010A          753                    A=C             WPT             ;-
    027A 03E0          754                    RTN                             ;-
                       755
                       756
                       757
                       758
                       759 *  CPGMHD - CURRENT PROGRAM HEAD
                       760 *- RETURNS THE ADDRESS OF THE BEGIN STATEMENT IN
                       761 *- ROM AND THE ADDRESS OF THE FIRST STEP OF A
                       762 *- PROGRAM IN RAM
                       763 *- IN:  A[3:0]= PROGRAM COUNTER (MUST BE THE ADDRESS OF A LINK,
                       764 *               I.E., THE FIRST BYTE OF A GLOBAL LBL OR END)
                       765 *       NO PERIPHERAL ENABLED.
                       766 *-      PT= 3
                       767 *- OUT: A[3:0]= CURRENT PROGRAM HEAD ADDRESS
                       768 *-      PT= 3
                       769 *- USES: A[3:0], C[13:0], B[4:0]
                       770 *- USES: 1 SUBROUTINE LEVEL
                       771
                       772
                       773
    027B 00CC          774 CPGMHD             ST=1?           10              ;ROMFLAG?
    027C 0003          775                    GONC            CPGM10          ;NOPE
    027D 00AA          776                    ACEX            WPT             ;-
    027E 0003          777                    GOTO            ROMH05          ;-
                       778                    GLB             CPGM10          ;FOR CARD READER & PRINTER
    027F 00001000      779 CPGM10             GOSUB           =GTLINK         ;GET LINK
    0281 02E6          780 CPGM15             C#0?            X               ;CHAIN END?
    0282 00001002      781                    GOLNC           =FSTIN          ;YES
    0284 00001000      782                    GOSUB           =UPLINK         ;NO, TRAVERSE CHAIN
    0286 023E          783                    C=C+1           S               ;ALPHA LBL?
    0287 0007          784                    GOC             CPGM15          ;YES
    0288 00001002      785                    GOLONG          =INCAD2         ;A[3:0]_HEAD ADDRESS
                       786
                       787
                       788
                       789
                       790
                       791
                       792                    GLB             ALCL00
                       793                    GLB             KEYOP
                       794                    GLB             RAK60
                       795 *
                       796 * KEYOP - KEYCODE OPERAND - PARSE LOGIC FOR ASSIGN FCN
                       797 *
    028A               798 KEYOP                                              ;ON ENTRY, CHIP 0 IS ON,
```

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LOCATION OBJECT CODE LINE     SOURCE LINE
                     799                                          ;PTR=1, C.X=H01F,
                     800                                          ;A[1:0]=H1F
028A 00001000        801              GOSUB       OFSHFT
028C 00001000        802              GOSUB       ENLCD
028E 0130            803              LDI
028F 0020            804              CON         32
0290 03E8            805              SLSABC                       ;INSERT BLANK
0291 00001000        806 KYOP10       GOSUB       =NEXT1
                     807                                          ;ON RETURN FROM NEXT, PT=1,
                     808                                          ;LCD CHIP ON, SS PTEMP1 UP
                     809                                          ;& B.X=" "
                     810                                          ;& N[2:1]=LOGICAL KC(0-79)
                     811              GLB         KYOPCK          ;FOR WAND 11/26/79
0293                 812 KYOPCK
0293 0000            813              NOP                          ;BKARROW IS A LEGAL OPERAND
0294 014C            814              ST=1?       6               ;SHIFT KEY?
0295 0003            815              GONC        KYOP40          ;NO
0296 00B0            816              C=N                         ;RETRIEVE LOGICAL KC TO C[2:1]
0297 01E2            817              C=C+C       PT              ;SHIFT ALREADY ON?
0298 0007            818              GOC         KYOP11          ;YES
0299 0130            819              LDI                         ;NO.
029A 002D            820              CON         45              ;"-"
029B 03E8            821              SLSABC                      ;PUT HYPHEN TO LCD
029C 0003            822              GOTO        KY11A
029D 03B8            823 KYOP11       RABCR                       ;SHIFT OFF HYPHEN
029E                 824 KY11A
029E 00001000        825              GOSUB       =TOGSHF         ;TOGGLE THE SHIFT FLAG
02A0 00001000        826              GOSUB       ENLCD
02A2 0003            827              GOTO        KYOP10
                     828 *
02A3                 829 KYOP40
02A3 0130            830              LDI
02A4 00C3            831              CON         12*16+3         ;HEX C3
02A5 010E            832              A=C         W
02A6 0220            833              C=KEYS
02A7 003C            834              RCR         3               ;KC TO C[1:0]
02A8 030A            835              A<C?        WPT             ;KC>C3?
02A9 0003            836              GONC        KYOP50          ;NO. LEGITIMATE KEY
02AA 00001000        837              GOSUB       =BLINK          ;YES. USER,PRGM,OR ALPHA KEY
02AC 0003            838              GOTO        KYOP10
                     839 *
02AD                 840 KYOP50
02AD 004E            841              C=0         W
02AE 0220            842              C=KEYS
02AF 003C            843              RCR         3
02B0 00D0            844              LC          3
02B1 0226            845              C=C+1       X
02B2 03E8            846              SLSABC                      ;SEND ROW TO LCD
02B3 0106            847              A=C         X               ;COPY ASCII ROW TO A.X
02B4 0130            848              LDI
02B5 0034            849              CON         64Q             ;"4"
02B6 0104            850              ST=0        8               ;ASSUME ROW#4
02B7 0366            851              A#C?        X               ;ROW#4?
02B8 0007            852              GOC         KYOP60          ;YES, NOT "ENTER" ROW
02B9 0108            853              ST=1        8               ;"ENTER" ROW
02BA 00B0            854 KYOP60       C=N                         ;RECOVER LOG KC TO C[2:1]
02BB 03C6            855              CSR         X               ;LOG KC TO C[1:0], 0 TO C[2]
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LOCATION OBJECT CODE LINE     SOURCE LINE

   02BC 0106          856                  A=C             X               ;SAVE LOG KC IN A.X
   02BD 03C6          857                  CSR             X               ;LOG COL TO C[0]
   02BE 031C          858                  PT=             1
   02BF 00D0          859                  LC              3
   02C0 010C          860                  ST=1?           8               ;"ENTER" ROW
   02C1 0003          861                  GONC            KYOP70          ;NO
   02C2 02E2          862                  C#0?            PT              ;A KEY TO THE RIGHT OF "ENTER"?
   02C3 0007          863                  GOC             KYOP80          ;YES - DON'T INC COLUMN #
   02C4 0222          864 KYOP70           C=C+1           PT              ;INCREMENT COLUMN #
   02C5 03E8          865 KYOP80           SLSABC                          ;SEND COL TO LCD
   02C6 0166          866                  A=A+1           X               ;KC INTERNAL FORM (1-80)
                      867                  LEGAL
   02C7 00001002      868                  GOLONG          =NULT_3
                      869 *
                      870 * ALCL00 - LOGIC TO MAP LOCAL ALPHA OPERANDS ONTO NUMERIC OPERANDS
                      871 *
   02C9               872 ALCL00
   02C9 010E          873                  A=C             W               ;CHARACTER TO A.[1:0]
                      874                                                  ;REMAINDER OF A IS ZERO
   02CA 0130          875                  LDI
   02CB 0041          876                  CON             101Q            ;"A"
   02CC 0306          877                  A<C?            X               ;CHAR<"A"?
   02CD 0360          878                  RTNC                            ;NOT LOCAL
   02CE 0130          879                  LDI
   02CF 004B          880                  CON             113Q            ;"K"
   02D0 0306          881                  A<C?            X               ;CHAR<"K"?
   02D1 0003          882                  GONC            ALCL50          ;NO. TEST FOR LOWER CASE
   02D2 0130          883                  LDI
   02D3 0025          884                  CON             37              ;MAP 65 ONTO 102
   02D4 0206          885 ALCL10           C=A+C           X
   02D5 02FC          886                  RCR             13
   02D6 00E6          887                  BCEX            X               ;ARGUMENT TO B[2:1],
                      888                                                  ;FC TO C[1:0]
   02D7 031C          889                  PT=             1
   02D8 010A          890                  A=C             WPT             ;FC TO A[1:0]
   02D9 0130          891                  LDI
   02DA 001E          892                  CON             1*16+14         ;FC FOR AXEQ
   02DB 036A          893                  A#C?            WPT             ;FC#AXEQ?
   02DC 0003          894                  GONC            ALCL20          ;THIS IS AXEQ
   02DD 0266          895                  C=C-1           X               ;CONVERT AXEQ TO AGTO
   02DE 036A          896                  A#C?            WPT             ;FC#AGTO?
   02DF 0007          897                  GOC             ALCL30          ;NOT AGTO
   02E0 00FC          898 ALCL20           RCR             10              ;NEW FC TO C[4:3]
   02E1 010E          899                  A=C             W               ;NEW FC TO A[4:3]
   02E2 0066          900                  ABEX            X               ;MERGE ARGUMENT WITH
   02E3 00001002      901                  GOLONG          =NLT020         ; IN A[4:1]
                      902 *
   02E5 0130          903 ALCL30           LDI
   02E6 00CD          904                  CON             12*16+13        ;FC FOR ALBL
   02E7 036A          905                  A#C?            WPT             ;FC#ALBL?
   02E8 0007          906                  GOC             ALCL40          ;NOT ALBL.
   02E9 033C          907                  RCR             1
   02EA 023E          908                  C=C+1           S
   02EB 023E          909                  C=C+1           S               ;LBL NN FC (CF) TO C[0:13]
                      910                  LEGAL
   02EC 0003          911                  GOTO            ALCL20
                      912 *
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

   02ED 0066          913 ALCL40          ABEX            X               ;FC BACK TO B.X
   02EE 03E0          914                 RTN
                      915 *
   02EF 0130          916 ALCL50          LDI                             ;TEST FOR LOWER CASE A...E
   02F0 0061          917                 CON             141Q            ;SMALL A
   02F1 0306          918                 A<C?            X               ;CHAR<SMALL A?
   02F2 0360          919                 RTNC                            ;YES. NOT LOCAL
   02F3 0130          920                 LDI
   02F4 0066          921                 CON             146Q            ;SMALL F
   02F5 0306          922                 A<C?            X               ;CHAR<SMALL F?
   02F6 03A0          923                 RTNNC                           ;NO. NOT LOCAL
   02F7 0130          924                 LDI
   02F8 001A          925                 CON             26              ;MAP 97 TO 123
   02F9 0003          926                 GOTO            ALCL10
                      927 *
                      928 * ENTER HERE FROM PARSE NEWFCN LOGIC IN USER MODE WHEN THE
                      929 * BIT IN THE BIT MAP IS SET.
   02FA               930 RAK60                                           ;BIT SET IN BIT MAP
   02FA 00B0          931                 C=N                             ;RECOVER KC FROM N
   02FB 033C          932                 RCR             1               ;SETUP
   02FC 010E          933                 A=C             W               ; FOR
   02FD 0166          934                 A=A+1           X               ;-
   02FE 0304          935                 ST=0            1               ;  GPCKC
   02FF 00001000      936                 GOSUB           =GCPKC          ;FIND REASSIGNED FCN  (@25600)
                      937                                                 ;OUT: IF S3=0, C(3:0)= FUNCTION CODE
                      938                                                 ;     IF S3=1, C(3:0)= LABEL ADDRESS
   0301 000C          939                 ST=1?           3               ;RAM?
   0302 0007          940                 GOC             RAK100          ;YES
   0303 001C          941                 PT=             3
   0304 02E2          942                 C#0?            PT              ;XROM FC?
   0305 0007          943                 GOC             RAK70           ;YES
   0306 010E          944                 A=C             W               ;-
   0307 0016          945                 A=0             XS              ;MUST BE MAINFRAME
   0308 00001002      946                 GOLONG          =NAME4A
                      947 *
                      948                 GLB             RAK70           ;FOR WAND XROM
                      949 * ENTRY POINT ADD FOR WAND ON 3-13-79
                      950 *
   030A               951 RAK70                                           ;XROM
   030A 0070          952                 N=C                             ;SAVE FC IN N
   030B 00001000      953                 GOSUB           =GTRMAD         ;        (@4000)
                      954 * GTRMAD RETURNS XADR IN A[3:0]
   030D 0003          955                 GOTO            RAK90           ;(P+1) MISSING ROM
   030E 00AE          956                 ACEX            W               ;(P+2)
   030F 01D8          957                 MCEX                            ;PUT XADR TO M
   0310 000C          958                 ST=1?           3               ;USER LANGUAGE?
   0311 0007          959                 GOC             RAK80           ;YES
   0312 00B0          960                 C=N                             ;RETRIEVE FC FROM N
   0313 00001002      961                 GOLONG          =NAME4D
                      962 *
   0315               963 RAK80                                           ;ROM USER LANGUAGE
                      964                                                 ;XROM FC IN N[3:0]
                      965                                                 ;XADR IN M[3:0]
   0315 0208          966                 ST=1            2               ;STRING IN ROM
   0316 0003          967                 GOTO            NM44_X
                      968 *
   0317 00001000      969 RAK90           GOSUB           =CLLCDE         ;MISSING ROM
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LOCATION OBJECT CODE LINE     SOURCE LINE

    0319 00001000     970                    GOSUB          =XROMNF
    031B 00001000     971                    GOSUB          =ENCP00
    031D 0244         972                    ST=0           9                ;SAY ADDR UNKNOWN
    031E 00B0         973                    C=N                             ;XROM TO C
    031F 00001000     974                    GOSUB          STORFC
    0321 00001002     975                    GOLONG         =NM44_5
                      976 *
    0323              977 RAK100                                             ;RAM
    0323 0158         978                    M=C                             ;SAVE ADDR IN M
    0324 039D         979                    CON            1635Q            ;GOSUB PRT4
    0325 01BC         980                    CON            674Q             ; PRINT DATAENTRY, IF ANY
    0326 0198         981                    C=M                             ;RECOVER ADDRESS
    0327 001C         982                    PT=            3
    0328 00001000     983                    GOSUB          =GTLNKA          ;GET # OF CHARS
    032A 02FC         984                    RCR            13               ;# OF CHARS TO
    032B 011E         985                    A=C            S                ; A.S
    032C 01BE         986                    A=A-1          S                ;SKIP OVER KEYCODE
    032D 01BE         987                    A=A-1          S
                      988                    LEGAL
    032E 00001000     989                    GOSUB          =NXBYT3          ;MOVE PTR TO KEYCODE
    0330 004E         990                    C=0            W                ;INITIALIZE STRING
    0331 0070         991 RAK110             N=C                             ;SAVE STRING IN N
    0332 00001000     992                    GOSUB          =NXBYTA
    0334 03D8         993                    CSTEX
    0335 00B0         994                    C=N
    0336 03D8         995                    CSTEX
    0337 023C         996                    RCR            2
    0338 01BE         997                    A=A-1          S
    0339 0003         998                    GONC           RAK110
    033A 00001000     999                    GOSUB          =RTJLBL
    033C 0070        1000                    N=C
    033D 0046        1001                    C=0            X
    033E 0270        1002                    DADD=C
    033F 00B0        1003                    C=N
    0340 0268        1004                    REGN=C         9
    0341 0130        1005                    LDI
    0342 001E        1006                    CON            1*16+14          ;FC FOR AXEQ
    0343 037C        1007                    RCR            12
    0344 00001000    1008                    GOSUB          STORFC
    0346 0204        1009                    ST=0           2                ;RAM
    0347 00001002    1010 NM44_X             GOLONG         =NAM44_
                     1011
                     1012
                     1013 * OFSHFT - TURN OFF SHIFTSET AND SHIFT ANNUNCIATOR
                     1014 * REQUIRES CHIP 0 ENABLED ON INPUT
                     1015 * USES: C, +1 SUB LEVEL, DADD, PFAD
                     1016 * OUT:  CHIP 0 ENABLED, PERIPHERALS DISABLED
                     1017 *
    0349 03B8        1018 OFSHFT             C=REGN         14
    034A 033C        1019                    RCR            1
    034B 03D8        1020                    CSTEX                           ;GET STATUS SET 1/2
    034C 0044        1021                    ST=0           4                ;CLEAR SHIFTSET
    034D 03D8        1022                    CSTEX
    034E 02FC        1023                    RCR            13
    034F 03A8        1024                    REGN=C         14
                     1025 *
                     1026 * IN & ASSUME: NOTHING
```

```
LOCATION OBJECT CODE LINE     SOURCE LINE

                     1027 * OUT:  CHIP 0 ENABLED, PERIPHERALS DISABLED
                     1028 * USES: C, +1 SUB LEVEL, DADD, PFAD
                     1029 *       (NO PT, NO ST, NO ARITH MODE)
                     1030 *
                     1031                GLB             OFFSHF
 0350 00001000       1032 OFFSHF         GOSUB           ENLCD
 0352 0178           1033                READEN
 0353 03D8           1034                CSTEX
 0354 0284           1035                ST=0            7               ;RESET BIT FOR SHIFT ANNUNCIATOR
 0355 03D8           1036                CSTEX
 0356 02F0           1037                WRTEN
 0357 00001002       1038                GOLONG          =ENCP00
                     1039 ***************************************************
                     1040 * RSTANN -- RESET ANNUNCIATORS                        2/16/82
                     1041 *
                     1042 * IN & ASSUME: CHIP 0 ENABLED, HEXMODE, PERIPHERALS DISABLED
                     1043 * OUT:  STATUS SET 0 UP, C= REG 14,
                     1044 *       CATALOG, SHIFT, DATA ENTRY, MESSAGE FLAGS CLEARED
                     1045 *       ANNUNCIATORS UPDATED (DISPLAY NOT TURNED ON)
                     1046 * USES: A,C, S0-S7, +1 SUB LEVEL, DADD, PFAD
                     1047 *         (NO PT)
                     1048 *
                     1049 ***************************************************
                     1050 * ANNOUT -- THIS ROUTINE SETS ALL ANNUNCIATORS.
                     1051 *       ON ENTRY, ANY DATA STORAGE OR PERIPHERAL CHIP MAY BE ENABLED.
                     1052 *       ON EXIT, CHIP 0 IS ENABLED, REG 14 IS IN C, AND
                     1053 *                SS 0 IS IN ST
                     1054 * USES 0 SUBROUTINE LEVELS.  USES A.X
                     1055 ***************************************************
 0359 00001000       1056 RSTANN         GOSUB           =RSTMS1
 035B 03A8           1057 ANN_14         REGN=C          14              ;SAVE REG 14
 035C 0130           1058 ANNOUT         LDI                             ;LOAD LOW BAT CONST
 035D 0080           1059                CON             200Q
 035E 00A6           1060                ACEX            X
 035F 03E6           1061                ASL             X
 0360 004E           1062                C=0             W
 0361 03F0           1063                PFAD=C
 0362 0270           1064                DADD=C
 0363 03B8           1065                C=REGN          14
 0364 0358           1066                ST=C                            ;BRING UP SS0
 0365 02CC           1067                ST=1?           13              ;RUNNING?
 0366 0007           1068                GOC             SETPGM          ;YES. TURN ON PRGM ANNUN
 0367 000C           1069                ST=1?           3               ;PGM MODE
 0368 0003           1070                GONC            LOWBAT          ;NO
 0369 0166           1071 SETPGM         A=A+1           X
 036A 0166           1072                A=A+1           X
 036B 014C           1073 LOWBAT         ST=1?           6               ;LOW BATTERY?
 036C 0007           1074                GOC             ALPHA           ;YES
 036D 0016           1075                A=0             XS              ;CLEAR LOW BAT
 036E 028C           1076 ALPHA          ST=1?           7
 036F 0003           1077                GONC            SHIFT
 0370 016E           1078                A=A+1           W
 0371 023C           1079 SHIFT          RCR             2
 0372 0358           1080                ST=C
 0373 038C           1081                ST=1?           0
 0374 0003           1082                GONC            RAD
 0375 0130           1083                LDI
```

```
LOCATION OBJECT CODE LINE     SOURCE LINE

    0376 0080        1084                 CON          200Q
    0377 0146        1085                 A=A+C        X
    0378 004C        1086 RAD             ST=1?        4
    0379 0007        1087                 GOC          RADSET
    037A 008C        1088 GRAD            ST=1?        5
    037B 0003        1089                 GONC         USER
    037C 0176        1090                 A=A+1        XS
    037D 0176        1091                 A=A+1        XS
    037E 0176        1092 RADSET          A=A+1        XS
    037F 008C        1093 USER            RCR          5
    0380 0358        1094                 ST=C
    0381 038C        1095                 ST=1?        0
    0382 0003        1096                 GONC         FLAGS
    0383 0176        1097                 A=A+1        XS
    0384 0176        1098                 A=A+1        XS
    0385 0176        1099                 A=A+1        XS
    0386 0176        1100                 A=A+1        XS
    0387 008C        1101 FLAGS           RCR          5
    0388 0056        1102                 C=0          XS
    0389 01EE        1103                 C=C+C        W
    038A 033C        1104                 RCR          1
    038B 0056        1105                 C=0          XS
    038C 01EE        1106                 C=C+C        W
    038D 01EE        1107                 C=C+C        W
    038E 014E        1108                 A=A+C        W
    038F 0130        1109                 LDI
    0390 0010        1110                 CON          20Q
    0391 0270        1111                 DADD=C
    0392 0130        1112                 LDI
    0393 00FD        1113                 CON          375Q
    0394 03F0        1114                 PFAD=C
    0395 00AE        1115                 ACEX         W
    0396 02F0        1116                 WRTEN
    0397 0046        1117 LDSST0          C=0          X
    0398 03F0        1118                 PFAD=C
    0399 0270        1119                 DADD=C
    039A 03B8        1120                 C=REGN       14
    039B 0358        1121                 ST=C
    039C 03E0        1122                 RTN
                     1123 *
                     1124 *
                     1125                 GLB          XR_S
    039D             1126 XR_S                                      ;EXECUTE R/S
    039D 017C        1127                 RCR          6
    039E 03D8        1128                 CSTEX                      ;PUT UP SS 3
    039F 030C        1129                 ST=1?        1             ;CATALOG FLAG?
    03A0 00001003    1130                 GOLC         =R_SCAT       ;YES. GOTO CATALOG FCN.   (@5667)
    03A2 0358        1131                 ST=C                       ;RETRIEVE SS0
    03A3 000C        1132                 ST=1?        3             ;PROGRAM MODE?
    03A4 0003        1133                 GONC         XRS20         ;NO
    03A5             1134 XRS10
    03A5 0130        1135                 LDI
    03A6 0084        1136                 CON          8*16+4        ;FC FOR STOP
    03A7 00001002    1137                 GOLONG       =PARS56
                     1138 *
    03A9 030C        1139 XRS20           ST=1?        1             ;PAUSEFLAG?
    03AA 0007        1140                 GOC          XRS10         ;YES
```

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```
LOCATION OBJECT CODE LINE     SOURCE LINE

03AB 00001000     1141                GOSUB           =PACH4          ;CHECK FOR KEY DOWN FOR ABOUT 100MS.
                  1142 *
                  1143 * IF KEY IS LET UP, GO RUN. OTHERWISE PUT UP DESCRIPTION OF STEP.
                  1144 * THIS IS A PATCH TO SPEED UP EXECUTION OF R/S.
                  1145 *
03AD 034C         1146                ST=1?           12              ;PRIVACY?
03AE 0003         1147                GONC            XRS25           ;NO
03AF 0104         1148                ST=0            8               ;YES
03B0 00001000     1149                GOSUB           =MSGA
03B2 0000         1150                CON             =MSGPR          ;"PRIVATE"
03B3 0003         1151                GOTO            XRS40
                  1152 *
03B4 03F8         1153 XRS25          C=REGN          15
03B5 02E6         1154                C#0?            X               ;LINE NUMBER # 0?
03B6 0007         1155                GOC             XRS30           ;YES, NON-ZERO
03B7 0226         1156                C=C+1           X               ;ZERO. SET TO 1
03B8 03E8         1157                REGN=C          15
03B9 00001000     1158 XRS30          GOSUB           =DFKBCK         ;DISPLAY NEXT STEP
03BB 024C         1159                ST=1?           9               ;KEYBOARD RESET YET?
03BC 00001000     1160 XRS40          GSUBNC          =NULTST         ;NO
                  1161                GLB             XRS45
03BE 037D         1162 XRS45          CON             1575Q           ;GOSUB PRT8
03BF 01BC         1163                CON             674Q
03C0 00001000     1164                GOSUB           =RSTANN
                  1165 *
                  1166                GLB             RUN
03C2              1167 RUN                                            ;GET A USER PROGRAM RUNNING
03C2 02C8         1168                ST=1            13              ;SET RUNNING FLAG
03C3 03F8         1169                C=REGN          15              ;SET LINE # TO FFF
03C4 0046         1170                C=0             X
03C5 0266         1171                C=C-1           X
03C6 03E8         1172                REGN=C          15
03C7 03B8         1173                C=REGN          14
03C8 0358         1174                ST=C                            ;PUT UP SSO
03C9 01F6         1175                C=C+C           XS
03CA 01F6         1176                C=C+C           XS              ;DATA ENTRY FLAG?
03CB 0003         1177                GONC            RUN11           ;NO
                  1178                                                ;YES. MUST BE PAUSE
                  1179                                                ;TERMINATION
03CC 039D         1180                CON             1635Q           ;GOSUB PRT4
03CD 01BC         1181                CON             674Q            ; PRINT DATAENTRY STRING
03CE 00001000     1182                GOSUB           =RSTMS1         ;CLEAR MSGFLG, DATAENTRY FLAG, ETC.
03D0 0304         1183 RUN11          ST=0            1               ;CLEAR PAUSING
03D1 03B8         1184                C=REGN          14              ;PUT
03D2 0398         1185                C=ST                            ; SSO
03D3 03A8         1186                REGN=C          14              ;  BACK
                  1187 *
                  1188 * LOGIC FOR CLD ENTERS AT NWGOOS.
                  1189 * ENTRY CONDITION: SSO UP
                  1190 *
                  1191                GLB             NWGOOS
03D4 00001000     1192 NWGOOS         GOSUB           =PGMAON         ;TURN ON PRGM ANNUNCIATOR
                  1193                                                ;& ENABLE LCD
03D6 008C         1194                ST=1?           5               ;MSGFLAG?
                  1195                                                ;MSGFLG CAN ONLY BE SET
                  1196                                                ;HERE ON PAUSE TERMINATION
03D7 0007         1197                GOC             RUN20           ;YES
```

```
LOCATION OBJECT CODE LINE     SOURCE LINE

    03D8 00001000    1198                GOSUB           =CLLCDE
    03DA 0130        1199                LDI
    03DB 002E        1200                CON             2*16+14          ;EAST GOOSE
    03DC 03A8        1201                SRSABC
    03DD 00001000    1202                GOSUB           =ENCP00
    03DF 00001002    1203 RUN20          GOLONG          =NFRPU           ;CAN'T BE A RTN BECAUSE
                     1204 * XR/S IS XKD AND DOESN'T HAVE NFRPU ON THE STACK
                     1205 *
                     1206 * INTARG - ZERO THE ALPHA REG AND STORE THE CHAR IN G AS THE
                     1207 *          FIRST CHAR.
                     1208 *
                     1209                GLB             INTARG
    03E1 004E        1210 INTARG         C=0             W
    03E2 0228        1211                REGN=C          8
    03E3 01E8        1212                REGN=C          7
    03E4 01A8        1213                REGN=C          6
    03E5 0098        1214                C=G
    03E6 0168        1215                REGN=C          5
    03E7 03E0        1216                RTN
                     1217                GLB             STORFC
                     1218 *
                     1219 * STORFC - STORE FUNCTION CODE TO REG 10
                     1220 * ON ENTRY, DESIRED FC IS IN C[3:0], LEFT JUSTIFIED IN THAT FIELD.
                     1221 * ON EXIT, FC (4 DIGITS) STORED TO REG 10[4:1]
                     1222 *     REG 10[0] IS SCRATCH, A[4:0] AND C ARE USED, AND PT=4.
                     1223 *
    03E8 02FC        1224 STORFC         RCR             13
    03E9 005C        1225                PT=             4
    03EA 010A        1226                A=C             WPT
    03EB 02B8        1227                C=REGN          10
    03EC 00AA        1228                ACEX            WPT
    03ED 02A8        1229                REGN=C          10
    03EE 03E0        1230                RTN
                     1231 *
                     1232 * MESSL - LEFT SHIFT INTO LCD FROM RIGHT END
                     1233 * CALLING SEQUENCE: GOSUB MESSL
                     1234 *                   CON   1ST CHAR, LCD FORM
                     1235 *                   CON   2ND CHAR, ...
                     1236 *                   ...
                     1237 *                   CON   FINAL CHAR + @1000
                     1238 * SPECIAL CHARACTERS (THOSE HAVING LCD CREG=1) CAN ONLY BE USED
                     1239 * AS THE FINAL CHARACTER OF THE MESSAGE.
                     1240 * ASSUMES LCD ENABLED ON ENTRY.
                     1241 * USES C[6:0] AND LEAVES LCD ENABLED ON EXIT
                     1242 *
                     1243                GLB             MESSL
    03EF 01B0        1244 MESSL          C=STK
    03F0 0330        1245 MESS10         CXISA
    03F1 03E8        1246                SLSABC
    03F2 023A        1247                C=C+1           M
    03F3 02F6        1248                C#0?            XS
    03F4 0003        1249                GONC            MESS10
    03F5 01E0        1250                GOTOC
                     1251 *
                     1252 * ENLCD - ENABLE LCD DRIVER CHIP
                     1253 * USES C.X ONLY
                     1254 *
```

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```
LOCATION OBJECT CODE LINE     SOURCE LINE

                     1255                 GLB          ENLCD
    03F6 0130        1256 ENLCD           LDI
    03F7 0010        1257                 CON          1*16+0
    03F8 0270        1258                 DADD=C                        ;DISABLE SLEEPER CHIPS
    03F9 0130        1259                 LDI
    03FA 00FD        1260                 CON          15*16+13
    03FB 03F0        1261                 PFAD=C                        ;TURN ON LCD DRIVER CHIP
    03FC 03E0        1262                 RTN
    03FD 00000000    1263                 FILLTO       1777Q
                     1264                 END

Errors=    0
```

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LINE#	SYMBOL	TYPE	REFERENCES
672	AFMT10	P	696,701,716
673	AFMT11	P	
675	AFMT12	P	
697	AFMT20	P	681
702	AFMT30	P	679
658	AFORMT	P	8
872	ALCL00	P	792
885	ALCL10	P	926
898	ALCL20	P	894,911
903	ALCL30	P	897
913	ALCL40	P	906
916	ALCL50	P	882
1076	ALPHA	P	1074
1058	ANNOUT	P	5
1057	ANN_14	P	6
	APND10	E	695,712
	APNDDG	E	683,697
	APND_	E	669,715
	ASCLCD	E	332
515	BLANK	P	9,150,251
	BLINK	E	837
204	CAPABC	P	177
518	CHKFUL	P	10,333
517	CHRLCD	P	11,261,279
529	CKFL10	P	519
	CLLCDE	E	433,969,1198
779	CPGM10	P	775,778
780	CPGM15	P	784
774	CPGMHD	P	12
222	DEROW	P	13,64
231	DERW00	P	14,274
245	DERW05	P	243
248	DERW10	P	236
255	DERW20	P	250
258	DERW50	P	234
261	DERW55	P	254,257
262	DERW60	P	247
267	DERW70	P	227
415	DF010	P	419
433	DF030	P	429
445	DF040	P	389,432,439
446	DF050	P	437
449	DF060	P	16
453	DF100	P	456
72	DF120	P	63,67
170	DF150	P	17,69,203,280,445
172	DF160	P	18
275	DF190	P	272,320
280	DF200	P	19,276
422	DFILLF	P	15
412	DFKBCK	P	20,1158
421	DFRST8	P	21
420	DFRST9	P	22
	ENCP00	E	322,348,424,449,486,971,1038,1202
1256	ENLCD	P	108,137,267,314,330,341,374,443,540,802,826,1032,1255
1101	FLAGS	P	1096
	FORMAT	E	661

LINE#	SYMBOL	TYPE	REFERENCES
	FSTIN	E	781
	GCPKC	E	936
633	GENN20	P	618
634	GENN25	P	637
638	GENN30	P	635
639	GENN40	P	624,628,632
644	GENN55	P	650
587	GENNUM	P	23,166,375,435,444
	GETPC	E	452
1088	GRAD	P	
	GTLINK	E	779
	GTLNKA	E	983
	GTRMAD	E	953
	INCAD	E	337,350
	INCAD2	E	785
1210	INTARG	P	1209
798	KEYOP	P	793
824	KY11A	P	822
806	KYOP10	P	827,838
823	KYOP11	P	818
829	KYOP40	P	815
840	KYOP50	P	836
854	KYOP60	P	852
864	KYOP70	P	861
865	KYOP80	P	863
812	KYOPCK	P	811
1117	LDSST0	P	3,172
	LEFTJ	E	171
	LINNUM	E	425
1073	LOWBAT	P	1070
491	MEMLF1	P	503
498	MEMLF2	P	490
504	MEMLF3	P	496,501
486	MEMLFT	P	24
1245	MESS10	P	1249
1244	MESSL	P	146,474,1243
	MSG	E	430
	MSGA	E	1149
	MSGPR	E	431,1150
	NAM44	E	1010
	NAME4A	E	946
	NAME4D	E	961
	NBYTA0	E	92,135,262,284
	NBYTAB	E	106
	NEXT1	E	806
	NFRPU	E	1203
	NLT020	E	901
	NM44_5	E	975
1010	NM44_X	P	967
	NULTST	E	1160
	NULT_3	E	868
1192	NWGOOS	P	1191
	NXBYT3	E	989
	NXBYTA	E	327,992
	NXBYT0	E	325
	NXTBYT	E	93,338,453
1032	OFFSHF	P	1031

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LINE#	SYMBOL	TYPE	REFERENCES
1018	OFSHFT	P	4,801
	PACH4	E	1141
	PARS56	E	1137
	PGMAON	E	1192
551	PMPT20	P	566
559	PMPT30	P	556
563	PMPT40	P	560
542	PROMF1	P	25,116,347,360
550	PROMF2	P	26
540	PROMFC	P	27,68,75,91,134,283
1086	RAD	P	1082
1092	RADSET	P	1087
977	RAK100	P	940
991	RAK110	P	998
930	RAK60	P	794
951	RAK70	P	943,948
963	RAK80	P	959
969	RAK90	P	955
474	REGLFT	P	371,440,473
213	RL	P	183
89	RO1314	P	56,57
740	ROMH05	P	29,777
743	ROMH06	P	746,748
752	ROMH35	P	30
738	ROMHED	P	28
59	ROW0	P	43
61	ROW010	P	83
80	ROW09	P	52
64	ROW1	P	44
98	ROW10	P	53
81	ROW11	P	54
84	ROW12	P	55
336	ROW120	P	32,88
355	ROW122	P	344
388	ROW125	P	362,364
65	ROW2	P	45
70	ROW3	P	46
68	ROW4_8	P	47,48,49,50,51
122	ROW9	P	80
133	ROW910	P	87,105
136	ROW930	P	97
138	ROW931	P	79
142	ROW933	P	33,117
153	ROW935	P	141
155	ROW936	P	152
174	ROW940	P	34,159
192	ROW945	P	196
200	ROW950	P	206,215
202	ROW960	P	193,212
1056	RSTANN	P	7,1164
	RSTMS1	E	1056,1182
198	RT	P	179
	RTJLBL	E	999
1167	RUN	P	1166
1183	RUN11	P	1177
1203	RUN20	P	1197
281	RW0110	P	35,226

LINE#	SYMBOL	TYPE	REFERENCES
286	RW0140	P	
287	RW0141	P	31,354
	R_SCAT	E	1130
	SCROLO	E	529
1071	SETPGM	P	1068
1079	SHIFT	P	1077
207	SMLABC	P	185
1224	STORFC	P	974,1008,1217
	TOGSHF	E	825
307	TXRW10	P	36
319	TXRW30	P	334
305	TXTROM	P	304
301	TXTROW	P	37,58
306	TXTSTR	P	38,303
	UPLINK	E	782
1093	USER	P	1089
	XECROM	E	101
430	XMSGPR	P	39
	XROMNF	E	970
1134	XRS10	P	1140
1139	XRS20	P	1133
1153	XRS25	P	1147
1158	XRS30	P	1155
1160	XRS40	P	1151
1162	XRS45	P	1161
1126	XR_S	P	1125

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```
LOCATION OBJECT CODE LINE     SOURCE LINE

                       1 "COCONUT"
                       2 * HP41C MAINFRAME MICROCODE ADDRESSES @4000-5777
                       3 *
                       4 *
                       5                GLB             CAT2
                       6                GLB             XCAT
                       7                GLB             CNTLOP
                       8                GLB             GTCNTR
                       9                GLB             SSTCAT
                      10                GLB             R_SCAT
                      11                GLB             BSTCAT
                      12                GLB             CAT1
                      13                GLB             BAKAPH
                      14                GLB             BAKDE
                      15                GLB             BLINK
                      16                GLB             BLINK1
                      17                GLB             DEEXP
                      18                GLB             DEROVF
                      19                GLB             DERUN
                      20                GLB             DIGENT
                      21                GLB             DIGST_
                      22                GLB             DSPCA_
                      23                GLB             DSPCRG
                      24                GLB             FIX57
                      25                GLB             FORMAT
                      26                GLB             GTRMAD
                      27                GLB             INPTDG
                      28                GLB             LDD_P_
                      29                GLB             NOREG9
                      30                GLB             NOTFIX
                      31                GLB             RFDS55
                      32                GLB             RG9LCD
                      33                GLB             ROUND
                      34                GLB             RSTST
                      35                GLB             SETQ_P
```

```
LOCATION OBJECT CODE LINE     SOURCE LINE

                        37 *
                        38 * GTRMAD - GET XEQ ROM FUNCTION ENTRY ADDR
                        39 *
                        40 * CALLING SEQUENCE :
                        41 *   C(2:0) = LOWER 1&HALF BYTES OF THE XEQ ROM FUNCTION CODE
                        42 *   GOSUB GTRMAD
                        43 *   <RETURN HERE IF ROM NOT PULGGED IN OR FC # TOO BIG>
                        44 *   <RETURN HERE IF ROM PLUGGED IN AND FC # IN LIMIT>
                        45 *   WHEN RETURN REG.B ALWAYS HAS:
                        46 *       B(2:0) = FUNCTION NUMBER
                        47 *       B(4:3) = ROM ID NUMBER
                        48 *   IF THE FUNCTION FOUND IN THE ROM THEN
                        49 *       A.[3:0] = AUXILIARY ROM FUNCTION EXECUTION ADDRESS
                        50 *       S2  = BIT 8 OF THE UPPER WORD IN FUNCTION TABLE
                        51 *       S3  = BIT 9 OF THE UPPER WORD IN FUNCTION TABLE
                        52 *       USED A,C,B(6:0), STATUS SET, AND ACTIVE POINTER
                        53 *
 0000 005A              54 GTRMAD          C=0             M
 0001 01EE              55                 C=C+C           W
 0002 01EE              56                 C=C+C           W               ;ROM ID IN C(3:2) NOW
 0003 02FC              57                 RCR             13              ;C(4:3) _ ROM ID
 0004 03C6              58                 CSR             X
 0005 01E6              59                 C=C+C           X
 0006 01E6              60                 C=C+C           X
 0007 03C6              61                 CSR             X               ;C.X _ FC #
 0008 003C              62                 RCR             3               ;C.X _ ROM ID
 0009 0106              63                 A=C             X               ;A.X _ ROM ID
 000A 01BC              64                 RCR             11
 000B 015C              65                 PT=             6
 000C 00EA              66                 BCEX            WPT             ;B(4:0) _ ROM ID & FC #
 000D 005A              67                 C=0             M
 000E 0150              68                 LC              5               ;START FROM HEX 5000 ( ASL 1)
 000F 015C              69                 PT=             6
 0010 0330              70 RMAD10          CXISA                           ;READ ID FROM ONE PORT
 0011 0366              71                 A#C?            X               ;IS THE ID MATCH ?
 0012 0003              72                 GONC            RMAD20          ;YES
 0013 0222              73 RMAD15          C=C+1           PT              ;ADDR _ ADDR + HEX 1000
 0014 0003              74                 GONC            RMAD10          ;CHECK ANOTHER PORT
 0015 03E0              75                 RTN                             ;ROM NOT PLUGGED IN
 0016 023A              76 RMAD20          C=C+1           M               ;POINT TO 2ND WORD OF ROM
 0017 00C6              77                 C=B             X               ;LOAD THE FC #
 0018 010E              78                 A=C             W
 0019 0330              79                 CXISA                           ;LOAD # OF FC'S IN THE ROM
 001A 0000              80                 NOP                             ; (DELETED BUG) 12/8/81 WCW
 001B 0306              81                 A<C?            X               ;IS THE FC IN THE ROM ?
 001C 0003              82                 GONC            RMAD30          ;NO, FC # TOO BIG
 001D 00A6              83                 ACEX            X               ;C.X   FC #
 001E 01E6              84                 C=C+C           X               ;MULTIPLY FC # BY 2
 001F 017A              85                 A=A+1           M               ;POINT TO BEGINNING OF FC TABLE
 0020 005A              86                 C=0             M
 0021 01BC              87                 RCR             11
 0022 021A              88                 C=A+C           M               ;C.M _ FUNCTION TABLE ENTRY
 0023 0330              89                 CXISA
 0024 01F6              90                 C=C+C           XS
 0025 01F6              91                 C=C+C           XS
 0026 023C              92                 RCR             2
 0027 0358              93                 ST=C                            ;SET TOP 2 BITS TO S3,S2
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LOCATION OBJECT CODE LINE     SOURCE LINE

    0028 00FC          94                 RCR             10
    0029 010E          95                 A=C             W               ;A(3:2) _ UPPER BYTE OF XADR
    002A 023C          96                 RCR             2
    002B 023A          97                 C=C+1           M               ;POINT TO LOWER BYTE OF XADR
    002C 0330          98                 CXISA                           ;GET LOWER BYTE
    002D 031C          99                 PT=             1
    002E 010A         100                 A=C             WPT             ;A(3:0) _ XADR
    002F 003C         101                 RCR             3
    0030 015A         102                 A=A+C           M               ;COMPUTE CHIP ADDRESS
    0031 01B0         103                 C=STK
    0032 023A         104                 C=C+1           M               ;POINT TO P+2
    0033 01E0         105                 GOTOC                           ;RETURN TO P+2
                      106 *
    0034 027A         107 RMAD30          C=C-1           M
                      108                 LEGAL
    0035 0003         109                 GOTO            RMAD15
                      110 *
                      111 *
                      112 *
                      113 * DIGIT ENTRY
                      114 *       DIGIT ENTRY USE REG.9 & STATUS SET IN REG.10
                      115 *   TO REMEMBER ALL THE KEYS ENTERED.
                      116 *   FORMAT OF REG.9 :
                      117 *
                      118 *   DIGIT 13  : D.P. POSITION, WHICH IS THE # OF DIGITS
                      119 *               BETWEEN D.P. AND DIGIT 3. ITS INITIAL
                      120 *               VALUE IS 10.
                      121 *   DIGIT 12-3: MANTISSA DIGITS, INITIAL VALUE ARE F'S
                      122 *   DIGIT 2   : EXP. SIGN. =0 IF EXP POSITIVE
                      123 *                          =D IF EXP NEGATIVE
                      124 *   DIGIT 1-0 : EXP. DIGITS, INITIAL VALUE ARE F'S
                      125 *
                      126 *   STATUS INFORMATION :
                      127 *          S0 = 1 IF D.P. HIT, OTHERWISE = 0
                      128 *          S1 = 1 IF EEX HIT, OTHERWISE = 0
                      129 *          S2 = 1 IF MANTISSA NEGATIVE, OTHERWISE = 0
                      130 *          S3 = 1 IF MANTISSA NONZERO
                      131 * IF S9=1 MEANS THIS CALL IS FROM DERUN(DIGENT IN RUN TIME),
                      132 * THEN CHS SHALL NOT CHECK IF MANTISSA ZERO.
                      133 *
                      134                 GLB             DGENS8
    0036 0104         135 DGENS8          ST=0            8               ;SAY NO CHS WHEN X=0
    0037 0238         136 DIGENT          C=REGN          8
    0038 01BC         137                 RCR             11
    0039 0358         138                 ST=C                            ;RESTORE DIGENT STATUS SET
    003A 035C         139                 PT=             12
    003B 0098         140                 C=G                             ;PUT THE DIGIT TO C(13)
    003C 02FE         141                 C#0?            S               ;IS THIS A BACK ARROW ?
    003D 00001002     142                 GOLNC           BAKDE           ;YES
    003F 02FC         143                 RCR             13
    0040 0310         144                 LC              12              ;LOAD CHS
    0041 02D0         145                 LC              11              ;LOAD EEX
    0042 0290         146                 LC              10              ;LOAD D.P.
    0043 010E         147                 A=C             W               ;COPY C TO A
    0044 03EE         148                 ASL             W               ;GET READY FOR COMPARISON
    0045 037E         149                 A#C?            S               ;IS IT A CHS ?
    0046 0003         150                 GONC            DECHS           ;YES
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LOCATION OBJECT CODE LINE     SOURCE LINE

    0047 03EE          151                ASL          W
    0048 030C          152                ST=1?        1            ;EEX HIT ?
    0049 00001003      153                GOLC         DEEXP        ;YES
    004B 037E          154                A#C?         S            ;IS IT A EEX ?
    004C 0003          155                GONC         DEEEX        ;YES
    004D 03EE          156                ASL          W
    004E 037E          157                A#C?         S            ;IS IT A D.P. ?
    004F 0003          158                GONC         DEDP         ;YES
    0050 02FE          159                C#0?         S            ;IT A NONZERO DIGIT ?
    0051 0003          160                GONC         DE200        ;NO
    0052 0008          161                ST=1         3            ;REMEMBER MANTISSA NONZERO
    0053 001C          162 DE200          PT=          3            ;FIND A PLACE IN MANTISSA
    0054 0278          163                C=REGN       9
    0055 0222          164 DE210          C=C+1        PT
    0056 0003          165                GONC         DE220        ;FOUND THE LAST DIGIT
    0057 03DC          166                INCPT                     ;POINT TO LEFT NEXT DIGIT
                       167                LEGAL
    0058 0003          168                GOTO         DE210
    0059 0014          169 DE220          PT=?         3            ;MANTISSA FULL ?
    005A 00001003      170                GOLC         BLINK1       ;YES, IGNORE THIS ENTRY
    005C 038C          171                ST=1?        0            ;D.P. HIT ?
    005D 0007          172                GOC          INDGJ        ;YES, PUT IT TO MANTISSA
    005E 0278          173                C=REGN       9            ;MOVE THE POTENTIAL D.P.
    005F 027E          174                C=C-1        S            ;  TO RIGHT ONE DIGIT
    0060 0268          175                REGN=C       9
    0061 00001002      176 INDGJ          GOLONG       INPTDG
    0063 038C          177 DEDP           ST=1?        0            ;D.P. HIT ALREADY ?
    0064 0007          178                GOC          BLINK1       ;YES, IGNORE THIS D.P.
    0065 0388          179                ST=1         0            ;SAY D.P. HIT
    0066 0003          180                GOTO         RSTSTJ       ;PUT THE STATUS BACK
    0067 0278          181 DEEEX          C=REGN       9            ;SEE DO WE ALLOW EEX NOW
    0068 010E          182                A=C          W
    0069 02DC          183                PT=          13
    006A 0090          184                LC           2
    006B 031E          185                A<C?         S            ;HAVE WE GONE TOO FAR ?
    006C 0007          186                GOC          BLINK1       ;YES, NOT EXCEPT EEX NOW
    006D 0308          187                ST=1         1            ;SAY EEX HIT
    006E 000C          188                ST=1?        3            ;MANTISSA ZERO ?
    006F 0007          189                GOC          RSTST        ;NO
    0070 004E          190                C=0          W            ;SET MANTISSA TO 1
    0071 026E          191                C=C-1        W
    0072 0056          192                C=0          XS
    0073 02DC          193                PT=          13
    0074 0250          194                LC           9            ; D.P. POSITION = 9
    0075 0050          195                LC           1            ; MANTISSA  1
    0076 0008          196                ST=1         3            ;REMEMBER MANTISSA NONZERO
    0077 0003          197                GOTO         RSTOR9
    0078 030C          198 DECHS          ST=1?        1            ;EEX HIT ?
    0079 0007          199                GOC          CHSEXP       ;YES, CHS OF EXP.
    007A 010C          200                ST=1?        8            ;CHECK X=0 ?
    007B 0007          201                GOC          DECHS1       ;NO
    007C 000C          202                ST=1?        3            ;MAMTISSA NONZERO
    007D 0003          203                GONC         BLINK1       ;YES, IGNORE CHS
    007E 020C          204 DECHS1         ST=1?        2            ;CHS HIT ?
    007F 0007          205                GOC          $+3          ;  YES
    0080 0208          206                ST=1         2
    0081 0003          207 RSTSTJ         GOTO         RSTST        ;PUT STATUS BACK
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LOCATION OBJECT CODE LINE     SOURCE LINE

    0082 0204          208                 ST=0            2
    0083 0003          209                 GOTO            RSTST           ;PUT STATUS BACK
    0084 0278          210 CHSEXP          C=REGN          9
    0085 010E          211                 A=C             W
    0086 0056          212                 C=0             XS              ;ASSUME EXP WAS NEGATIVE
    0087 021C          213                 PT=             2
    0088 0356          214                 A#0?            XS              ;WAS EXP NEGATIVE ?
    0089 0007          215                 GOC             $+2             ;YES
    008A 0350          216                 LC              13              ;LOAD A "D" TO REG.9(2)
    008B 0003          217 RST09J          GOTO            RSTOR9          ;RESTORE REG.9
    008C 037E          218 DEEXP           A#C?            S               ;IS IT A EEX ?
    008D 0003          219                 GONC            BLINK1          ;YES, IGNORE IT
    008E 03EE          220                 ASL             W
    008F 037E          221                 A#C?            S               ;IS IT A D.P. ?
    0090 0003          222                 GONC            BLINK1          ;YES, IGNORE IT
    0091 039C          223                 PT=             0               ;FIND A PLACE IN EXP
    0092 0278          224                 C=REGN          9
    0093 0222          225 EXPDG1          C=C+1           PT
    0094 0003          226                 GONC            EXPDG2          ;FOUND THE LAST EXP DIGIT
    0095 03DC          227                 INCPT
                       228                 LEGAL
    0096 0003          229                 GOTO            EXPDG1
    0097 0394          230 EXPDG2          PT=?            0               ;EXP FULL ?
    0098 0003          231                 GONC            INPTDG          ;NOT YET
                       232 *
    0099               233 BLINK1
    0099               234 BLINK                                           ;DISOFF IGNORE A KEY, TURN DISPLAY OF
    0099 02E0          235                 DISOFF
    009A 0130          236                 LDI
    009B 00D0          237                 CON             208
    009C 0266          238                 C=C-1           X
    009D 0003          239                 GONC            $-1
    009E 0320          240                 DISTOG
    009F 03E0          241                 RTN
    00A0 03D4          242 INPTDG          DECPT                           ;INSERT A DIGIT TO REG.9
    00A1 0000          243                 NOP
    00A2 0098          244                 C=G
    00A3 0102          245                 A=C             PT
    00A4 0278          246                 C=REGN          9
    00A5 00A2          247                 ACEX            PT
    00A6 0268          248 RSTOR9          REGN=C          9
    00A7 0238          249 RSTST           C=REGN          8
    00A8 01BC          250                 RCR             11
    00A9 0398          251                 C=ST                            ;PUT THE STATUS BITS BACK
    00AA 003C          252                 RCR             3
    00AB 0228          253                 REGN=C          8
    00AC 03E0          254                 RTN
                       255 *
                       256 * DERUN - ENTRY POINT OF DIGIT ENTRY IN RUN TIME
                       257 *  COME IN FROM MAINLOOP WITH THE 1ST DIGIT IN A[3:2], PC POINT
                       258 *  TO 1ST BYTE OF DIGIT ENTRY IN MEM.
                       259 *
    00AD 021C          260 DERUN           PT=             2
    00AE 00AE          261                 ACEX            W
    00AF 0058          262                 G=C                             ;SAVE THE DIGIT IN G
    00B0 0108          263                 ST=1            8               ;REMEMBER IN RUN TIME
                       264                                                 ;TELL DIGENT CALLING FROM DERUN
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LOCATION OBJECT CODE LINE     SOURCE LINE

    00B1 0003          265                    GOTO            DIGST1
                       266 *
                       267 * DIGST* - DIGIT ENTRY INITIALIZATION
                       268 * SET UP REG.9(REFER THE FORMAT TO DIGENT)
                       269 * RESET DIGENT STATUS(CHS,D.P.,EEX) AND SAVE IT IN REG.10[1:0]
                       270 * PUSH THE STACK IF PUSHFLAG SET
                       271 * IF NOT IN PROGRAM, CLEAR X
                       272 * CALLED BY DATAENTRY WITH DIGIT CODE IN G
                       273 * ASSUME CHIP 0 ENABLE
                       274 * NOT A SUBROUTINE, RETURN TO VARIES PLACE
                       275 *
    00B2 0104          276 DIGST              ST=0            8                 ; REMEMBER NOT IN RUN TIME
    00B3 004E          277 DIGSTI             C=0             W                 ;INITIALIZE REG.9
    00B4 026E          278                    C=C-1           W
    00B5 0056          279                    C=0             XS                ;EXP POSITIVE
    00B6 02DC          280                    PT=             13
    00B7 0290          281                    LC              10                ;INITIAL D.P. POSITION
    00B8 0268          282                    REGN=C          9
    00B9 00001000      283                    GOSUB           =STBT10           ;MOVE STATUS BITS TO REG.10
    00BB 03B8          284                    C=REGN          14
    00BC 0358          285                    ST=C                              ;LOAD SET #0
    00BD 000C          286                    ST=1?           3                 ;PROGMODE ?
    00BE 0003          287                    GONC            DIGST2            ;NO
    00BF 00001000      288                    GOSUB           =INSSUB           ;INCREMENT LINE# BY 1
    00C1 00001002      289                    GOLONG          =DAT320           ;RETURN TO DATAENTRY
    00C3 018C          290 DIGST2             ST=1?           11                ;PUSH FLAG SET ?
    00C4 00001001      291                    GSUBC           =R_SUB            ;YES, PUSH STACK
    00C6 0188          292                    ST=1            11
    00C7 004E          293                    C=0             W
    00C8 00E8          294                    REGN=C          3                 ;CLEAR X
    00C9 010C          295                    ST=1?           8                 ;RUNNING ?
    00CA 00001002      296                    GOLNC           =DAT231           ;NO, RETURN TO DATAENTRY
                       297                                                      ;DROP THRU TO DERUN
                       298 *
                       299 * DIGIT ENTRY DURING RUN TIME
                       300 *
    00CC 00001000      301                    GOSUB           =GETPC
    00CE 008A          302                    B=A             WPT
    00CF 00001000      303 DERUN5             GOSUB           ENCP00
    00D1 00001000      304                    GOSUB           =DIGENT
    00D3 00001000      305                    GOSUB           NOREG9            ;NORMALIZE DIGIT ENTRY
    00D5 00001000      306                    GOSUB           =NBYTAB
    00D7 006A          307                    ABEX            WPT               ;SAVE PC IN B
    00D8 031C          308                    PT=             1
    00D9 010A          309                    A=C             WPT               ;A[2:0] _ NEXT FC
    00DA 0130          310                    LDI
    00DB 001D          311                    CON             1*16+13
    00DC 0362          312                    A#C?            PT                ;IS A ROW 1 FC ?
    00DD 0007          313                    GOC             DERNRT            ;NO, EXIT
    00DE 030A          314                    A<C?            WPT               ;IS A DIGIT FC ?
    00DF 0003          315                    GONC            DERNRT            ;NO, EXIT
    00E0 00AE          316                    ACEX            W
    00E1 039C          317                    PT=             0
    00E2 0058          318                    G=C                               ;PUT THE DIGIT TO G
    00E3 0003          319                    GOTO            DERUN5
                       320 * END OF DIGIT ENTRY UPDATE PC
                       321 *
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LOCATION OBJECT CODE LINE     SOURCE LINE

  00E4 006E          322 DERNRT          ABEX            W
  00E5 00001000      323                 GOSUB           =DECAD          ;POINT TO LAST BYTE OF DIGITENTRY
  00E7 00001000      324 DERRT1          GOSUB           =PUTPC
  00E9 00001002      325                 GOLONG          =NFRPU
                     326 *
                     327 * OVERFLOW- OVERFLOW DETECT BY DIGIT ENTRY ROUTINE
                     328 *
  00EB 006E          329 DEROVF          ABEX            W
  00EC 0260          330                 SETHEX
  00ED 001C          331                 PT=             3
  00EE 0003          332                 GOTO            DERRT1
                     333 *
                     334 * CONSTRUCT DIGIT ENTRY DISPLAY FROM REG. 9
                     335 * (PLEASE REFER THE REG.9 FORMAT TO DIGENT)
                     336 * CALLED BY DATAENTRY. DIGENT ROUTINE ITSELF WON'T REFRESH
                     337 * THE DISPLAY, IT ONLY UPDATE THE REG.9. SO, DURING DIGIT
                     338 * ENTRY, DATAENTRY HAVE TO CALL THIS ROUTINE FOR EACH DIGIT
                     339 * TO REFRESH DISPLAY.
                     340 * STATUS BITS MEANING:
                     341 * S0 - D.P. HIT                S1 - EEX HIT
                     342 * S2 - CHS HIT                 S4 - DIGIT GROUPING FLAG
                     343 * S5 - DECIMAL POINT FLAG
                     344 *
                     345 * RG9LCD BUILDS REGS A & C AND SETS UP P AND Q FOR A SUBSEQUENT
                     346 * CALL TO RFDS55. RFDS55 IS THE ONE THAT ACTUALLY SENDS STUFF TO
                     347 * THE LCD.
                     348 *
  00EF 0238          349 RG9LCD          C=REGN          8               ;LOAD FLAGS - S2:CHS
  00F0 01BC          350                 RCR             11
  00F1 0358          351                 ST=C                            ;  S1 : EEX   S0:D.P.
  00F2 0278          352                 C=REGN          9
  00F3 010E          353                 A=C             W               ;A   REG.9
  00F4 00001000      354                 GOSUB           =ENLCD          ;ENABLE LCD CHIP
  00F6 00001000      355                 GOSUB           =LOAD3          ;LOAD ALL 3'S INTO C
  00F8 001C          356                 PT=             3               ;START FROM END OF MANTISSA
  00F9 0162          357 RFDS10          A=A+1           PT              ;FIND THE LAST DIGIT ?
  00FA 0003          358                 GONC            RFDS15          ;YES
  00FB 0262          359                 C=C-1           PT              ;C(PT)   2
  00FC 01BE          360                 A=A-1           S               ;DECREMENT D.P. POS COUNTER
  00FD 03DC          361                 INCPT                           ;POINT TO LEFT NEXT DIGIT
                     362                 LEGAL
  00FE 0003          363                 GOTO            RFDS10
  00FF 01A2          364 RFDS15          A=A-1           PT              ;RESTORE THE DIGIT
  0100 030C          365                 ST=1?           1               ;EEX HIT ?
  0101 0007          366                 GOC             RFDS17          ;YES, DON'T PROMPT MANTISSA
  0102 0014          367                 PT=?            3               ;MANTISSA FULL ?
  0103 0007          368                 GOC             RFDS17          ;YES, DON'T PROMPT
  0104 03D4          369                 DECPT                           ;POINT TO PROMPT POSITION
  0105 01A2          370                 A=A-1           PT              ;A(PT)   1
  0106 0050          371                 LC              1               ; UNDER SCORE = "1F"
  0107 03DC          372                 INCPT
  0108 03DC          373                 INCPT                           ;RESTORE THE POINTER
  0109 038C          374 RFDS17          ST=1?           0               ;D.P. HIT ?
  010A 0003          375                 GONC            RFDS25          ;NO, DON'T LOOK FOT D.P.
  010B 01BE          376 RFDS19          A=A-1           S               ;LOOK FOR D.P.
  010C 0007          377                 GOC             RFDS20          ;FOUND IT !
  010D 03DC          378                 INCPT                           ;POINT TO LEFT NEXT DIGIT
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LOCATION OBJECT CODE LINE     SOURCE LINE

                     379                LEGAL
 010E 0003           380                GOTO        RFDS19
 010F 008C           381 RFDS20         ST=1?       5          ;LOAD THE D.P. TO C
 0110 0003           382                GONC        $+3        ;LOAD A COMMA INSTEAD OF
 0111 01D0           383                LC          7
 0112 0003           384                GOTO        $+2
 0113 03D0           385                LC          15
 0114 03DC           386                INCPT                  ;RESTORE THE POINTER
 0115 004C           387 RFDS25         ST=1?       4          ;GROUPING FLAG SET ?
 0116 0003           388                GONC        RFDS35     ;NO
 0117 02D4           389                PT=?        13
 0118 0007           390                GOC         RFDS30
 0119 011E           391 RFDS26         A=C         S          ;A(13) _ 3
 011A 01BE           392 RFDS27         A=A-1       S          ;COUNT 3 FROM LEFT
 011B 0007           393                GOC         RFDS28     ;SHALL WE PUT A COMMA HERE ?
 011C 0354           394                PT=?        12         ;REACH LEFT END OF MANTISSA ?
 011D 0007           395                GOC         RFDS35     ;YES, WE ARE DONE
 011E 03DC           396                INCPT                  ;POINT TO LEFT NEXT DIGIT
                     397                LEGAL
 011F 0003           398                GOTO        RFDS27
 0120 008C           399 RFDS28         ST=1?       5          ;LOAD A COMMA TO C
 0121 0003           400                GONC        $+3
 0122 03D0           401                LC          15
 0123 0003           402                GOTO        $+2
 0124 01D0           403                LC          7          ;LOAD A D.P. INSTEAD OF
 0125 03DC           404                INCPT                  ;RESTORE POINTER
                     405                LEGAL
 0126 0003           406                GOTO        RFDS26
 0127 00BE           407 RFDS30         ACEX        S
 0128 0003           408                GOTO        $+2
 0129 011E           409 RFDS35         A=C         S          ;TAKE CARE OF THE SIGN
 012A 01BE           410                A=A-1       S          ;A(13) _ 2
 012B 005E           411                C=0         S          ;ASSUME POSITIVE MANTISSA
 012C 02DC           412                PT=         13
 012D 020C           413                ST=1?       2          ;CHS HIT ?
 012E 0003           414                GONC        $+2        ;NO, MANTISSA POSITIVE
 012F 0350           415                LC          13         ;"-" = 2D
 0130 00BE           416                ACEX        S
 0131 00E0           417                SELQ
 0132 02DC           418                PT=         13         ;Q= 13
 0133 00A0           419                SELP
 0134 0276           420                C=C-1       XS         ;C(2) _ 2
 0135 030C           421                ST=1?       1          ;EEX HIT ?
 0136 0003           422                GONC        RFDS50     ;NO, LET'S GOTO DISPLAY
 0137 031C           423                PT=         1          ;LOOK AT DIGIT 1
 0138 0162           424                A=A+1       PT         ;IS THERE A DIGIT THERE ?
 0139 0007           425                GOC         RFDS40     ;NO, LET'S PROMPT AT DIGIT 1
 013A 01A2           426                A=A-1       PT         ;RESTORE DIGIT 1
 013B 039C           427                PT=         0          ;LOOK AT DIGIT 0
 013C 0162           428                A=A+1       PT         ;IS THERE A DIGIT ?
 013D 0007           429                GOC         RFDS42     ;NO, LET'S PROMPT AT DIGIT 0
 013E 01A2           430                A=A-1       PT         ;RESTORE DIGIT 0
 013F 0222           431                C=C+1       PT         ;C(0) _ 3
                     432                LEGAL
 0140 0003           433                GOTO        RFDS45     ;WE ARE READY FOR LCD
 0141 000A           434 RFDS40         A=0         WPT
 0142 01A2           435 RFDS42         A=A-1       PT
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LOCATION OBJECT CODE LINE     SOURCE LINE

    0143 0050         436                    LC              1
    0144 001C         437 RFDS45             PT=             3              ;SAY DISPLAY EXP
    0145 03E0         438                    RTN
    0146 0016         439 RFDS50             A=0             XS
    0147 039C         440                    PT=             0              ;SAY ONLY DISPLAY MANTISSA
    0148 03E0         441                    RTN
    0149 03D2         442 RFDS55             CSR             PQ             ;DISPLAY ONLY 12 DIGITS
    014A 03D2         443                    CSR             PQ
    014B 0068         444                    SRLDB                          ;SHIFT INTO DISPLAY REG.B
    014C 00AE         445                    ACEX            W
    014D 03D2         446                    CSR             PQ
    014E 03D2         447                    CSR             PQ
    014F 0028         448                    SRLDA                          ;SHIFT INTO DISPLAY REG.A
    0150 004E         449                    C=0             W
    0151 00A8         450                    SRLDC                          ;CLEAR DISPLAY REG.C
    0152 0046         451 ENCP00             C=0             X              ;ENABLE CHIP 0 & RETURN
                      452                    GLB             ENCP00
    0153 03F0         453                    PFAD=C                         ;DISABLE PERIPHERALS
    0154 0270         454                    DADD=C                         ;ENABLE CHIP 0
    0155 03E0         455                    RTN
                      456 *
                      457 * PGMAON - TURN ON PROGRAM ANNUNCIATOR
                      458 * NO ENTRY REQUIREMENTS
                      459 * LEAVES CHIP 0 ENABLED ON EXIT
                      460 * USES C AND ONE SUBROUTINE LEVEL
                      461 *
                      462                    GLB             PGMAON
    0156 00001000     463 PGMAON             GOSUB           =ENLCD
    0158 0178         464                    READEN
    0159 03D8         465                    CSTEX
    015A 0308         466                    ST=1            1              ;TURN ON PRGM ANNUNCIATOR
    015B 03D8         467                    CSTEX
    015C 02F0         468                    WRTEN
    015D 0003         469                    GOTO            ENCP00
                      470 *
                      471 *
                      472 * NOREG9 - NORMALIZE THE DIGIT ENTRY STRIN IN REG.9 AND STORE
                      473 *          IT TO X-REG
                      474 * (PLEASE REFER THE INFORMATION TO DIGIT ENTRY)
                      475 * ASSUMED CHIP 0 ENABLE. USED A,C. 1 SUB LEVEL.
                      476 * RETURN IN HEX MODE, CHIP 0 ENABLE.
                      477 * STATUS BITS MEANING :
                      478 * S1 - EEX HIT              S2 - CHS HIT
                      479 * S9 - RUNNING OR SST
                      480 *
    015E 0278         481 NOREG9             C=REGN          9
    015F 001C         482                    PT=             3              ;LOOK FOR LAST DIGIT
    0160 0222         483 NORG05             C=C+1           PT
    0161 0003         484                    GONC            NORG10
    0162 03DC         485                    INCPT                          ;POINT TO LEFT NEXT DIGIT
                      486                    LEGAL
    0163 0003         487                    GOTO            NORG05
    0164 0262         488 NORG10             C=C-1           PT             ;RESTORE THE DIGIT
    0165 0106         489                    A=C             X              ;NORMALIZE EXP
    0166 0056         490                    C=0             XS
    0167 039C         491                    PT=             0
    0168 0162         492 NORG20             A=A+1           PT             ;SHIFT BLANK OUT OF EXP
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LOCATION OBJECT CODE LINE     SOURCE LINE

    0169 0003          493                GONC          NORG30
    016A 03C6          494                CSR           X
    016B 03DC          495                INCPT
    016C 0214          496                PT=?          2
    016D 0003          497                GONC          NORG20
    016E 02A0          498 NORG30         SETDEC
    016F 0356          499                A#0?          XS            ;EXP SIGN NEGATIVE ?
    0170 0003          500                GONC          $+2           ;NO
    0171 0286          501                C=-C          X             ;COMPLIMENT EXP
    0172 010E          502                A=C           W             ;COPT C TO A
    0173 02DC          503                PT=           13
    0174 0250          504                LC            9
    0175 00BE          505                ACEX          S             ;C(13)=# OF DIGITS AFTER D.P.
    0176 01DE          506                A=A-C         S             ;A(13)=# OF DIGITS BEFORE D.P..
    0177 0007          507                GOC           NORG50
    0178 0342          508 NORG40         A#0?          PT            ;LEADING ZERO ?
    0179 0007          509                GOC           NORG51        ;NO
    017A 03FA          510                ASL           M             ;SHIFT OUT LEADING ZERO
    017B 01BE          511                A=A-1         S             ;PASS D.P. ?
    017C 0003          512                GONC          NORG40        ;NOT YET
    017D 01A6          513 NORG42         A=A-1         X             ;ZERO FOLLOWS BY D.P.
    017E 0342          514 NORG45         A#0?          PT            ;LEADING ZERO PASS D.P. ?
    017F 0007          515                GOC           NORG55        ;NO
    0180 027E          516                C=C-1         S             ;END OF MANTISSA ?
    0181 0007          517                GOC           NORG65        ;YES, EXIT
    0182 01A6          518                A=A-1         X             ;EXP   EXP-1
    0183 03FA          519                ASL           M             ;SHIFT OUT LEADING ZERO
    0184 0003          520                GOTO          NORG45
    0185 001E          521 NORG50         A=0           S
    0186 0003          522                GOTO          NORG42
    0187 01BE          523 NORG51         A=A-1         S             ;PASSED D.P. ?
    0188 0007          524                GOC           NORG55        ;YES
    0189 0166          525                A=A+1         X
    018A 0003          526                GONC          NORG51        ;USUALLY NO CARRY HERE
    018B 0003          527                GOTO          NORG51        ;CATCHES CARRIES
    018C 001E          528 NORG55         A=0           S             ;ASSUME MENTISSA POSITIVE
    018D 020C          529                ST=1?         2             ;CHS HIT ?
    018E 0003          530                GONC          $+2           ;NO
    018F 01BE          531                A=A-1         S
    0190 00AE          532                ACEX          W
    0191 030C          533                ST=1?         1             ;EEX HIT ?
    0192 0003          534                GONC          NORG70        ;NO, DON'T CHECK OVERFLOW
    0193 00001000      535                GOSUB         =OVFL10
    0195 00E8          536                REGN=C        3
    0196 0354          537                PT=?          12            ;OVERFLOW ?
    0197 0007          538                GOC           NORG75        ;NO
    0198 010C          539                ST=1?         8             ;RUNNING ?
    0199 00001003      540                GOLC          =DEROVF       ;YES
    019B 0355          541                CON           1525Q         ;GOSUB PRT13
    019C 01BC          542                CON           674Q
    019D 00001000      543                GOSUB         =DATOFF
    019F 00001002      544                GOLONG        =NFRKB
    01A1 004E          545 NORG65         C=0           W
    01A2 00E8          546 NORG70         REGN=C        3
    01A3 0260          547 NORG75         SETHEX
    01A4 03E0          548                RTN
                       549 *
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LOCATION OBJECT CODE LINE     SOURCE LINE

                     550 *
                     551 *
                     552 * BAKDE - BACK SPACE DURING DIGIT ENTRY
                     553 * BAKDE LIKES DIGENT ONLY UPDATE THE DIGIT ENTRY STRING IN REG.9.
                     554 * ASSUMED CHIP 0 ENABLE. USED A,C. RETURN WITH CHIP 0 ENABLE.
                     555 *
  01A5 0278          556 BAKDE          C=REGN        9
  01A6 00E0          557                SELQ
  01A7 035C          558                PT=           12
  01A8 00A0          559                SELP
  01A9 011E          560                A=C           S              ;A(13)   D.P. POSITION
  01AA 030C          561                ST=1?         1              ;EEX HIT ?
  01AB 0003          562                GONC          BKMANT         ;NO, LOOK AT MANTISSA
  01AC 039C          563 BKEXP          PT=           0              ;LAST DIGIT IN EXP
  01AD 0003          564                GOTO          BKDE10         ;LOOK FOR LAST DIGIT IN EXP
  01AE 001C          565 BKMANT         PT=           3              ;LAST DIGIT IN MANTISSA
  01AF 0222          566 BKDE10         C=C+1         PT
  01B0 0003          567                GONC          BKDE20         ;FOUND THE LAST DIGIT !
  01B1 0262          568                C=C-1         PT             ;C(PT) _ F
  01B2 01BE          569                A=A-1         S
  01B3 03DC          570                INCPT                        ;POINT TO LEFT NEXT DIGIT
                     571                LEGAL
  01B4 0003          572                GOTO          BKDE10
  01B5 030C          573 BKDE20         ST=1?         1              ;EEX HIT ?
  01B6 0003          574                GONC          BKMN20         ;NO
  01B7 0214          575 BKEX10         PT=?          2              ;OVER EXP ?
  01B8 0007          576                GOC           BKEX20         ;YES, EXP OUT
  01B9 0042          577 BKDG           C=0           PT             ;TAKE THE DIGIT OUT
  01BA 02F2          578                C#0?          PQ             ;MANTISSA ZERO ?
  01BB 0007          579                GOC           BKDG1          ;NO
  01BC 0204          580                ST=0          2              ;MANT. CAN'T BE NEGATIVE ZERO
  01BD 0004          581                ST=0          3              ;REMEMBER MANTISSA ZERO
  01BE 03D0          582 BKDG1          LC            15
  01BF 0003          583                GOTO          RSTRG9         ;RESTORE REG.9
  01C0 0276          584 BKEX20         C=C-1         XS
  01C1 0276          585                C=C-1         XS             ;WAS EXP NEGATIVE ?
  01C2 0003          586                GONC          BKEX30         ;YES
  01C3 0304          587                ST=0          1              ;SAY EEX NOT HIT
  01C4 0056          588 BKEX30         C=0           XS
  01C5 0003          589                GOTO          RSTRG9         ;RESTORE REG.9
  01C6 02D4          590 BKMN20         PT=?          13             ;PASSED LAST DIGIT ?
  01C7 0007          591                GOC           BKMN30         ;YES,DIGENT OFF
  01C8 038C          592                ST=1?         0              ;D.P. HIT ?
  01C9 0007          593                GOC           BKMN25         ;YES
  01CA 0354          594                PT=?          12             ;LAST DIGIT IN MANTISSA ?
  01CB 0007          595                GOC           BKMN30         ;YES DIGENT OUT
  01CC 023E          596                C=C+1         S              ;D.P. POS _ D.P. POS-1
                     597                LEGAL
  01CD 0003          598                GOTO          BKDG           ;BACK OUT ONE DIGIT
  01CE 01BE          599 BKMN25         A=A-1         S              ;IS THIS A D.P. ?
  01CF 0003          600                GONC          BKDG           ;NO, BACK OUT ONE DIGIT
  01D0 0384          601                ST=0          0
  01D1 0003          602                GOTO          RSTSS
  01D2 03B8          603 BKMN30         C=REGN        14
  01D3 0358          604                ST=C                         ;LOAD SET #0
  01D4 000C          605                ST=1?         3              ;PROGMODE ?
  01D5 0003          606                GONC          BKDE30         ;NO
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LOCATION OBJECT CODE LINE     SOURCE LINE

   01D6 00001000      607                GOSUB          =DATOFF
   01D8 00001002      608                GOLONG         =ERR120
   01DA 004E          609 BKDE30         C=0            W
   01DB 00E8          610                REGN=C         3              ;CLEAR X
   01DC 0020          611                SPOPND
   01DD 0130          612                LDI
   01DE 0077          613                CON            7*16+7         ;LOAD THE "CLX" FC
   01DF 03E0          614                RTN                           ;GO BACK TO PARSE
   01E0 0268          615 RSTRG9         REGN=C         9              ;RESTORE REGISTER 9
   01E1 00001002      616 RSTSS          GOLONG         =RSTST         ;PUT STATUS BACK TO REG.10
                      617 *
                      618 * BAKAPH - BACK SPACE DURING ALPHA ENTRY(ONLY IN NROMAL MODE)
                      619 * ASSUMED CHIP 0 ENABLE.
                      620 * USED A,C. N[13] & B[13] USED AS LCD COUNTER.
                      621 *
   01E3 0244          622 BAKAPH         ST=0           9              ;KEY BOARD HAS NOT BEEN RESET
   01E4 0178          623                C=REGN         5
   01E5 031C          624                PT=            1
   01E6 02EA          625                C#0?           WPT            ;IS ANY CHAR IN ALPHA REG. ?
   01E7 00001002      626                GOLNC          =DAT106        ;NO. DO A CLA
   01E9 010E          627                A=C            W              ;SHIFT THE LAST CHAR OUT
   01EA 01B8          628                C=REGN         6
   01EB 00AA          629                ACEX           WPT
   01EC 00AE          630                ACEX           W
   01ED 023C          631                RCR            2
   01EE 0168          632                REGN=C         5
   01EF 01F8          633                C=REGN         7
   01F0 00AA          634                ACEX           WPT
   01F1 00AE          635                ACEX           W
   01F2 023C          636                RCR            2
   01F3 01A8          637                REGN=C         6
   01F4 0238          638                C=REGN         8
   01F5 00AA          639                ACEX           WPT
   01F6 00AE          640                ACEX           W
   01F7 023C          641                RCR            2
   01F8 01E8          642                REGN=C         7
   01F9 0238          643                C=REGN         8
   01FA 017C          644                RCR            6
   01FB 004A          645                C=0            WPT
   01FC 00FC          646                RCR            10
   01FD 0228          647                REGN=C         8
   01FE 0278          648                C=REGN         9
   01FF 02FE          649                C#0?           S              ;LCD FULL ?
   0200 0003          650                GONC           BKPH50         ;YES, DO ARGOUT AGAIN
   0201 00001000      651                GOSUB          =ROLBAK
   0203 03B8          652                FRSABC                        ;READ LAST CHAR FROM LCD
   0204 03D8          653                CSTEX                         ;TEST FOR PUNC. CHAR
   0205 014C          654                ST=1?          6
   0206 0007          655                GOC            BKPH20
   0207 028C          656                ST=1?          7
   0208 0007          657                GOC            BKPH20
   0209 03D8          658                CSTEX
   020A 00DE          659 BKPH10         C=B            S
   020B 023E          660                C=C+1          S
   020C 00FE          661                CBEX           S
   020D 00001000      662 PROMPT         GOSUB          =OPROMT        ;OUT PUT PROMPT CHAR
   020F 0003          663                GOTO           NFRKBO
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LOCATION OBJECT CODE LINE     SOURCE LINE

    0210 0144          664 BKPH20          ST=0            6
    0211 0284          665                 ST=0            7
    0212 03D8          666                 CSTEX
    0213 0106          667                 A=C             X
    0214 0130          668                 LDI
    0215 0020          669                 CON             40Q             ;LOAD A BLANK
    0216 0366          670                 A#C?            X               ;IS LAST CHAR A BLANK ?
    0217 0007          671                 GOC             BKPH30          ;NO
    0218 0046          672                 C=0             X
    0219 03F0          673                 PFAD=C
    021A 0270          674                 DADD=C
    021B 0238          675                 C=REGN          8               ;LOAD LAST CHAT FROM AREG.
    021C 0056          676                 C=0             XS
    021D 0366          677                 A#C?            X               ;IS IT A BLANK ?
    021E 0007          678                 GOC             BKPH40          ;NO
    021F 00001000      679                 GOSUB           =ENLCD
    0221 00A6          680 BKPH30          ACEX            X
    0222 03E8          681                 SLSABC                          ;PUT THE LAST CHAR BACK
    0223 0003          682                 GOTO            PROMPT
    0224 00001000      683 BKPH40          GOSUB           =ENLCD
    0226 0003          684                 GOTO            BKPH10
    0227 0108          685 BKPH50          ST=1            8               ;NO SCROLL, PROMPT
    0228 00001000      686                 GOSUB           =ARGOUT
    022A 00CE          687                 C=B             W
    022B 00001000      688                 GOSUB           =STOLCC
    022D 00001002      689 NFRKB0          GOLONG          =NFRKB1
                       690                 GLB             XRND
                       691 *
                       692 * RND FUNCTION
                       693 *
    022F 03B8          694 XRND            C=REGN          14              ;LOAD DISPLAY FORMAT
    0230 023C          695                 RCR             2
    0231 0358          696                 ST=C                            ;LOAD STATUS SET 1
    0232 0106          697                 A=C             X
    0233 00F8          698                 C=REGN          3               ; LOAD THE X
    0234 0104          699                 ST=0            8
                       700 *
                       701 *
                       702 * ROUNDING ROUTINE
                       703 *   CALLING SEQUENCE :
                       704 *           C     = NORMALIZED NUMBER
                       705 *           A(2)  = DSP #
                       706 *           S8    = 1 IF CALLED FROM "FORMAT"
                       707 *                   0 IF CALLED FROM "XRND"
                       708 *           GOSUB  ROUND
                       709 *   RETURN WITH ROUNDED NUMBER IN REG.C
                       710 *   USED A,B,C
                       711 *
    0235 02A0          712 ROUND           SETDEC
    0236 0096          713                 B=A             XS
    0237 035C          714 ROUNDA          PT=             12              ;MOVE POINTER TO 12-(DSP# +1)
    0238 0214          715 RND20           PT=?            2               ;END OF MANTISSA ?
    0239 0007          716                 GOC             RND90           ;YES, NO ROUNDING
    023A 03D4          717                 DECPT
    023B 0186          718                 A=A-1           XS              ;STOP ?
    023C 0003          719                 GONC            RND20           ;NO, KEEP GOING
    023D 010E          720                 A=C             W               ;COPY THE NUMBER TO A
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LOCATION OBJECT CODE LINE     SOURCE LINE

    023E 02F6          721                C#0?          XS            ;EXP POSITIVE ?
    023F 0003          722                GONC          RND30         ;YES
    0240 028C          723                ST=1?         7             ;FIX MODE ?
    0241 0003          724                GONC          RND60         ;NO, LET'S ROUND IT UP
    0242 03DC          725 RND40          INCPT
    0243 0354          726                PT=?          12            ;PASS LEFT END OF MANTISSA?
    0244 0007          727                GOC           RND100        ;YES, FIX MODE INFEASIBLE
    0245 0166          728                A=A+1         X             ;KEEP MOVING TO ROUNDING POINT
    0246 0003          729                GONC          RND40
    0247 0003          730                GOTO          RND60         ;LET'S ROUND IT NOW
    0248 03D4          731 RND70          DECPT                       ;EXP POSITIVE
    0249 0214          732 RND75          PT=?          2             ;PASS END OF MANTISSA ?
    024A 0007          733                GOC           RND120        ;YES, FIX MODE INFEASIBLE
    024B 01A6          734                A=A-1         X
    024C 0003          735                GONC          RND70
    024D 002E          736 RND60          B=0           W             ;HERE IS THE ROUNDING
    024E 008A          737                B=A           WPT
    024F 013A          738                A=A+B         M
    0250 0003          739                GONC          RND50         ;ROUNDING OK !
    0251 010E          740 RND45          A=C           W             ;SAVE THE # IN CASE OF OVERFLOW
    0252 000A          741                A=0           WPT
    0253 0106          742                A=C           X
    0254 031C          743                PT=           1             ;TEST FOR OVERFLOW NUMBER
    0255 022A          744                C=C+1         WPT
    0256 0007          745                GOC           RND95         ;OVERFLOW
    0257 000E          746 RND47          A=0           W
    0258 017E          747                A=A+1         S
    0259 038E          748                ASR           W             ;SET MANTISSA TO 1
    025A 019C          749                PT=           11
    025B 000A          750 RND50          A=0           WPT
    025C 00BA          751                ACEX          M             ;C_ROUNDED NUMBER
    025D 0260          752 RND90          SETHEX
    025E 03E0          753                RTN
    025F 00AE          754 RND95          ACEX          W             ;NO ROUNDING FOR OVERFLOW #
    0260 0356          755                A#0?          XS            ;EXP NEGATIVE ?
    0261 0003          756                GONC          RND90         ;NO
    0262 0046          757                C=0           X             ;IT'S NOT REALLY A OVERFLW
    0263 0003          758                GOTO          RND47
    0264 028C          759 RND30          ST=1?         7             ;FIX MODE ?
    0265 0003          760                GONC          RND60         ;NO, LET'S ROUND IT UP
    0266 0003          761                GOTO          RND75
    0267 0166          762 RND100         A=A+1         X
    0268 0003          763                GONC          RND105
    0269 009A          764                B=A           M
    026A 013A          765                A=A+B         M
    026B 0007          766                GOC           RND45
    026C 010C          767 RND105         ST=1?         8             ;CALLED FROM "FORMAT" ?
    026D 0007          768                GOC           RND110        ;YES
    026E 004E          769                C=0           W             ;RETURN ZERO
    026F 0003          770                GOTO          RND90
    0270 0284          771 RND110         ST=0          7             ;DISPLAY THE # IN SCI MODE
    0271 0076          772                ABEX          XS
    0272 0003          773                GOTO          ROUNDA        ;ROUND IT AGAIN
    0273 010C          774 RND120         ST=1?         8             ;CALLED FROM "FORMAT" ?
    0274 0003          775                GONC          RND90         ;NO, NO DOUNDING THEN
    0275 0006          776                A=0           X             ;IS FIX MODE FEASIBLE ?
    0276 039C          777                PT=           0
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    0277 01A2          778                    A=A-1          PT             ;A(1) _ 9
    0278 0306          779                    A<C?           X              ;EXP < 9
    0279 0007          780                    GOC            RND110         ;NO, FIX MODE INFEASIBLE
    027A 0003          781                    GOTO           RND90          ;FIX MODE , NO ROUNDING
                       782 *
                       783 *
                       784 * FORMAT ROUTINE - FORMAT A NORMALIZED NUMBER
                       785 * CALLING SEQUENCE :
                       786 *          C= NORMALIZED NUMBER
                       787 *          GOSUB FORMAT
                       788 * RETURN  < A : READY FOR DISPLAY REG.A >
                       789 *          < B : READY FOR DISPLAY REG.B >
                       790 * USED A,B,C. ASSUMED CHIP 0 ENABLE
                       791 * USED STATUS BITS 0-8
                       792 * S4 = DIGIT GROUPING FLAG
                       793 * S5 = DECIMAL POINT FLAG
                       794 * S6 = ENG MODE FLAG
                       795 * S7 = FIX MODE FLAG
                       796 * S8 = FIX MODE FEASIBLE FLAG
                       797 *
                       798 * CALLS STBT10, ROUND, LOAD3, LDD_P, SETQ_P
                       799 * PROBABLY USES ONLY ONE ADDITIONAL SUBROUTINE LEVEL
                       800 *
    027B 00EE          801 FORMAT             BCEX           W              ;SAVE THE NUMBER TO B
    027C 0260          802                    SETHEX
    027D 00001000      803                    GOSUB          =STBT10        ;MOVE STATUS BITS TO REG.10
    027F 00CE          804                    C=B            W              ;GET THE NUMBER BACK
    0280 0108          805                    ST=1           8              ;SIGNAL ROUNDING ROUTINE
    0281 00001000      806                    GOSUB          =ROUND         ;ROUND THE NUMBER
    0283 00EE          807                    BCEX           W              ;MOVE THE NUMBER TO B TEMP.
    0284 00001000      808                    GOSUB          =LOAD3         ;LOAD ALL 3'S TO C
    0286 022E          809                    C=C+1          W              ;C(0) _ 3
    0287 010E          810                    A=C            W              ;A _ ALL 3'S
    0288 02A0          811                    SETDEC
    0289 03B8          812                    C=REGN         14
    028A 00BC          813                    RCR            5              ;C(13)  DSP #
    028B 00EE          814                    BCEX           W              ;B(13)_DSP# , C ROUNDED NO.
    028C 007E          815                    ABEX           S              ;A(13)_DSP# , B(13)_3
    028D 00E600C6      816                    B=C            X              ;COPY EXP TO B
    028F 02FE          817                    C#0?           S              ;MANTISSA POSITIVE ?
    0290 0003          818                    GONC           $+3            ;YES
    0291 02DC          819                    PT=            13
    0292 0350          820                    LC             13             ;LOAD THE MINUS SIGN
    0293 028C          821                    ST=1?          7              ;FIX MODE ?
    0294 00001002      822                    GOLNC          NOTFIX         ;NO
    0296 035C          823 FIX00              PT=            12
    0297 02F6          824                    C#0?           XS             ;EXP POSITIVE ?
    0298 0003          825                    GONC           FIX20          ;YES
    0299 00001000      826                    GOSUB          LDD_P          ;LOAD DECIMAL POINT
    029B 00001000      827                    GOSUB          SETQ_P
    029D 03D4          828 FIX10              DECPT
    029E 03DA          829                    CSR            M              ;SHIFT IN LEADING ZERO
    029F 01BE          830                    A=A-1          S              ;DECREMENT DSP #
    02A0 0226          831                    C=C+1          X              ;UNTIL EXP = 0
    02A1 0003          832                    GONC           FIX10
    02A2 0003          833                    GOTO           FIX40          ;PUT IN THE TAIL BLANKS
    02A3 0266          834 FIX20              C=C-1          X              ;PASSING D.P. ?
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LOCATION OBJECT CODE LINE     SOURCE LINE

    02A4 0007          835                GOC          FIX30          ;YES, GOTO LOAD D.P.
    02A5 03D4          836                DECPT
                       837                LEGAL
    02A6 0003          838                GOTO         FIX20
    02A7 0046          839 FIX30          C=0          X
    02A8 01BE          840                A=A-1        S
    02A9 0007          841                GOC          FIX60          ;FIX MODE, DSP# = 0
    02AA 00001000      842                GOSUB        LDD_P          ;LOAD THE D.P.
    02AC 00001000      843                GOSUB        SETQ_P         ;SET Q=P
    02AE 03D4          844 FIX35          DECPT                       ;PASSING THE DSP #
    02AF 0214          845                PT=?         2              ;END OF MANTISSA ?
    02B0 0007          846                GOC          FIX50          ;YES
    02B1 01BE          847 FIX40          A=A-1        S              ;DSP# _ DSP# -1
    02B2 0003          848                GONC         FIX35
    02B3 03D4          849 FIX45          DECPT
    02B4 0214          850                PT=?         2              ;END OF MANTISSA ?
    02B5 0007          851                GOC          FIX50
    02B6 01A2          852                A=A-1        PT             ;FILLING TAILING BLANK
                       853                LEGAL
    02B7 0003          854                GOTO         FIX45
    02B8 039C          855 FIX50          PT=          0
    02B9 00E0          856                SELQ
    02BA 004C          857                ST=1?        4              ;GROUPING FLAG SET ?
    02BB 0003          858                GONC         FIX57          ;NO
    02BC 007E009E      859 SETCOM         A=B          S              ;A.S _ 3(COMMA COUNTER)
    02BE 01BE          860 FIX55          A=A-1        S              ;COUNT 3 AND LOAD A COMMA
    02BF 0007          861                GOC          LDCOMA
    02C0 03DC          862                INCPT                       ;MOVE THE POINTER TO LEFT
    02C1 02D4          863                PT=?         13
    02C2 0003          864                GONC         FIX55
    02C3 02DC          865 FIX57          PT=          13             ;Q _ 13
    02C4 00A0          866                SELP
    02C5 007E          867                ABEX         S              ;A(13) _ 3
    02C6 0003          868                GOTO         FMTRTN
    02C7 00A2          869 LDCOMA         ACEX         PT
    02C8 008C          870                ST=1?        5              ;LOAD A COMMA
    02C9 0003          871                GONC         $+3
    02CA 03D0          872                LC           15
    02CB 0003          873                GOTO         $+2
    02CC 01D0          874                LC           7              ;LOAD A D.P. INSTEAD OF
    02CD 03DC          875                INCPT
    02CE 00A2          876                ACEX         PT
    02CF 0003          877                GOTO         SETCOM
    02D0 00001000      878 FIX60          GOSUB        SETQ_P
    02D2 004C          879                ST=1?        4
    02D3 00001001      880                GSUBC        LDD_P_
    02D5 0003          881                GOTO         FIX45
    02D6 01BE          882 FMTRTN         A=A-1        S              ;A(13) _ 2
    02D7 01B6          883                A=A-1        XS             ;A(2) _ 2
    02D8 00AE          884                ACEX         W
    02D9 0260          885                SETHEX
    02DA 00EE          886                BCEX         W
    02DB 00001002      887                GOLONG       =LDSST0
    02DD 035C          888 NOTFIX         PT=          12
    02DE 014C          889                ST=1?        6              ;ENG MODE ?
    02DF 0003          890                GONC         SCI00          ;NO, SCI MODE
    02E0 0106          891                A=C          X              ;A.X _ EXP
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    02E1 0130         892                 LDI
    02E2 0003         893                 CON          3
    02E3 0356         894                 A#0?         XS           ;EXP NEGATIVE ?
    02E4 0007         895                 GOC          ENG10        ;YES
    02E5 01C6         896                 A=A-C        X            ;COMPUTE EXP MOD 3
    02E6 0003         897                 GONC         $-1
    02E7 0146         898                 A=A+C        X
    02E8 0007         899                 GOC          ENG60
    02E9 0146         900 ENG10           A=A+C        X            ;ADD 3 TO NEGATIVE EXP
    02EA 0003         901                 GONC         $-1
    02EB 00C6         902 ENG20           C=B          X            ;COPY EXP BACK TO C.X
    02EC 0286         903                 C=-C         X            ;COMPLIMENT NEGATIVE EXP
    02ED 0206         904                 C=C+A        X
    02EE 01A6         905 ENG25           A=A-1        X            ;MOVE THE D.P. TO RIGHT
    02EF 0007         906                 GOC          ENG30
    02F0 03D4         907                 DECPT
    02F1 01BE         908                 A=A-1        S            ;DECREMENT THE DSP #
    02F2 0003         909                 GONC         ENG25
    02F3 001E         910                 A=0          S            ;DSP# _ 0
    02F4 0003         911                 GOTO         ENG25
    02F5 00001000     912 ENG30           GOSUB        LDD_P_
    02F7 03D4         913 ENG35           DECPT                     ;PASSING DSP #
    02F8 0214         914                 PT=?         2
    02F9 0007         915                 GOC          ENG45
    02FA 01BE         916                 A=A-1        S
    02FB 0003         917                 GONC         ENG35
    02FC 01A2         918 ENG40           A=A-1        PT           ;A(PT)_2, FILL TAILING BLANK
    02FD 03D4         919                 DECPT
    02FE 0214         920                 PT=?         2            ;END OF MANTISSA ?
    02FF 0003         921                 GONC         ENG40
    0300 02D6         922 ENG45           B#0?         XS           ;EXP NEGATIVE ?
    0301 0003         923                 GONC         ENG50        ;NO
    0302 021C         924                 PT=          2
    0303 0350         925                 LC           13           ;LOAD THE MINUS SIGN
    0304 001C         926 ENG50           PT=          3
    0305 00A6         927                 ACEX         X
    0306 0130         928                 LDI
    0307 0333         929                 CON          1463Q
    0308 00A6         930                 ACEX         X
    0309 00E0         931                 SELQ
    030A 00001002     932                 GOLONG       =FIX57
    030C 00C6         933 ENG60           C=B          X            ;C.X _ EXP
    030D 00A6         934                 ACEX         X
    030E 01C6         935                 A=A-C        X
    030F 00A6         936                 ACEX         X
    0310 0003         937                 GOTO         ENG25
    0311 0006         938 SCI00           A=0          X
    0312 02F6         939                 C#0?         XS           ;EXP POSITIVE ?
    0313 0007         940                 GOC          ENG20        ;NO
    0314 0003         941                 GOTO         ENG30
    0315 00E0         942 SETQ_P          SELQ
    0316 02DC         943                 PT=          13
    0317 0120         944 SETQ10          P=Q?
    0318 0007         945                 GOC          SETQ20
    0319 03D4         946                 DECPT
                      947                 LEGAL
    031A 0003         948                 GOTO         SETQ10
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    031B 00A0          949 SETQ20          SELP
    031C 03E0          950                 RTN
    031D 00A2          951 LDD_P_          ACEX            PT
                       952                 GLB             LDDP10          ;FOR PRINTER ROM
    031E 008C          953 LDDP10          ST=1?           5
    031F 0003          954                 GONC            $+3
    0320 01D0          955                 LC              7
    0321 0003          956                 GOTO            $+2
    0322 03D0          957                 LC              15              ;LOAD A COMMA INSTEAD OF
    0323 03DC          958                 INCPT
    0324 00A2          959                 ACEX            PT
    0325 03E0          960                 RTN
                       961 *
                       962 * DSPCRG - OUTPUT REG.C TO LCD
                       963 * IF C[13] = 0 OR 9 IT MEANS A NORMALIZED NUMBER
                       964 * IF C[13] = 1 IT MEANS A ALPHA STRING
                       965 * ASSUMED CHIP 0 ENABLE.
                       966 * USED A,B,C,N, STATUS BITS 0-8. RETURN CHIP 0 ENABLE.
                       967 * 2 SUB LEVELS.
                       968 *
    0326 00A0          969 DSPCRG          SELP
    0327 001E          970                 A=0             S
    0328 017E          971                 A=A+1           S               ;A.S _ 1
    0329 037E          972                 A#C?            S               ;IS IT A STRING ?
    032A 0003          973                 GONC            VIEW05          ;YES
    032B 00001000      974                 GOSUB           =FORMAT
    032D 00001000      975                 GOSUB           =ENLCD
    032F 00EE          976                 CBEX            W
    0330 00001002      977                 GOLONG          =RFDS55
    0332 02DC          978 VIEW05          PT=             13
    0333 0310          979                 LC              12
    0334 00FE          980                 BCEX            S
    0335 02E0          981 DSPCA           DISOFF
    0336 02DC          982                 PT=             13
    0337 03D0          983                 LC              15
    0338 03D0          984                 LC              15
    0339 037C          985                 RCR             12              ;C(1:0) _ FF:DELIMINATOR
    033A 0070          986                 N=C                             ;SAVE THE REG. IN N
    033B 00001000      987                 GOSUB           =ENLCD
    033D 00B0          988 VIEW20          C=N
    033E 037C          989                 RCR             12              ;C(1:0) _ OUT GOING CHAR
    033F 0070          990                 N=C
    0340 0106          991                 A=C             X
    0341 031C          992                 PT=             1
    0342 034A          993                 A#0?            WPT             ;LEADING ZERO ?
    0343 0003          994                 GONC            VIEW20          ;YES, IGNORE IT
    0344 016A          995                 A=A+1           WPT             ;HIT DELIMINATOR ?
    0345 0007          996                 GOC             VIEW30          ;YES
    0346 00001000      997                 GOSUB           =ASCLCD         ;SEND IT TO LCD
    0348 0003          998                 GOTO            VIEW20
    0349 0130          999 VIEW30          LDI
    034A 0020         1000                 CON             40Q
    034B 00DE         1001                 C=B             S               ;LEFT JUSTIFY
    034C 027E         1002 VIEW35          C=C-1           S
    034D 0003         1003                 GONC            VIEW40
    034E 0320         1004                 DISTOG
    034F 00001002     1005                 GOLONG          ENCP00
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LOCATION OBJECT CODE LINE     SOURCE LINE

    0351 03E8        1006 VIEW40          SLSABC
    0352 0003        1007                 GOTO            VIEW35
                     1008
                     1009
                     1010
                     1011 ************************************************************
                     1012 *THIS IS THE START OF THE CATALOG ROUTINE. CATALOG 2
                     1013 *DISPLAYS PLUG IN ROM FUNCTIONS.
                     1014 ************************************************************
    0353 004E        1015 CAT2            C=0             W
    0354 0066        1016                 ABEX            X
    0355 01A6        1017                 A=A-1           X                ;GET NUMBER
    0356 023A        1018                 C=C+1           M                ;ADDR= 2ND WORD OF ROM
    0357 015C        1019                 PT=             6                ;2ND WORD= # FUNCTIONS IN ROM
    0358 0110        1020                 LC              4
    0359 015C        1021                 PT=             6
    035A 0222        1022 NXTROM          C=C+1           PT               ;ADDR= 2ND WORD OF NEXT ROM
    035B 00001003    1023                 GOLC            =QUTCAT
    035D 0330        1024                 CXISA                            ;GET 2ND WORD= # FUNCTIONS
    035E 01C6        1025                 A=A-C           X
    035F 0003        1026                 GONC            NXTROM
    0360 0146        1027                 A=A+C           X                ;A IS NUMBER IN ROM
    0361 001A        1028                 A=0             M                ;ADD A TO STRT DEF ADRS
    0362 00AE        1029                 ACEX            W
    0363 01BC        1030                 RCR             11
    0364 01FA        1031                 C=C+C           M                ;DOUBLE DISTANCE
    0365 021A        1032                 C=C+A           M                ;ADDRESS OF DEF - 1
    0366 023A        1033                 C=C+1           M                ;GET ADDRESS OF CHARACTERS
    0367 0330        1034                 CXISA
    0368 00E6        1035                 BCEX            X
    0369 023A        1036                 C=C+1           M
    036A 0330        1037                 CXISA
    036B 023C        1038                 RCR             2
    036C 00C6        1039                 C=B             X
    036D 031C        1040                 PT=             1                ;BUILD ADDRESS
    036E 003C        1041                 RCR             3
    036F 00A2        1042                 ACEX            PT
    0370 01BC        1043                 RCR             11
    0371 0202        1044                 C=C+A           PT
    0372 01F6        1045                 C=C+C           XS
    0373 01F6        1046                 C=C+C           XS
    0374 01F6        1047                 C=C+C           XS
    0375 0007        1048                 GOC             USLNG            ;USLNG CODE
    0376 027C        1049                 RCR             9                ;MICRO DONE
    0377 00001002    1050                 GOLONG          =END2            ;PUT OUT PROMPT
    0379             1051 USLNG
    0379 037C        1052                 RCR             12
    037A 00AE        1053                 ACEX            W
    037B 0208        1054                 ST=1            2
    037C 00001000    1055                 GOSUB           =TXTLB1
    037E 00001002    1056                 GOLONG          =END3
                     1057 ***************************************************
                     1058 *CATALOG SUBROUTINES AND ENTRY LOGIC.
                     1059 ***************************************************
    0380 00AE        1060 XCAT            ACEX            W                ;GET CATALOG NUMBER
    0381 0358        1061                 ST=C
    0382 00001000    1062                 GOSUB           =TONSTF
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

                     1063 **IN THE NEXT PART, THE CONTENTS OF THE C REG WILL BE SHOWN.
                     1064 **"C"= CATALOG #, "E"= DIGIT OF ENTRY #, "A"= ALPHA CHARACTER.
     0384 000E       1065                A=0          W
     0385 0238       1066                C=REGN       8              ;C= "* ******AAA AAA"
     0386 009C       1067                PT=          5              ; *= DON'T KNOW OR DON'T CARE (OR BOTH)
     0387 010A       1068                A=C          WPT            ;SAVE ALPHA IN A
     0388 0398       1069                C=ST                        ;GET CATALOG #
     0389 033C       1070                RCR          1              ;C= "C ********* ***"
     038A 00BE       1071                ACEX         S              ;SAVE CATALOG # IN A(S)
     038B 00AE       1072                ACEX         W              ;C= "C 0000000AAA AAA"
     038C 0228       1073                REGN=C       8
     038D 0238       1074 GTCNTR         C=REGN       8              ;GET CAT # AND ENTRY #, "E"=ENTRY#
     038E 00FC       1075                RCR          10             ;C= "0 000AAAAAAC EEE"
     038F 0226       1076 NOCHG          C=C+1        X              ;MOVE TO NEXT ENTRY
     0390 0384       1077                ST=0         0              ;CLEAR BST FLAG
     0391 00E600C6   1078 BSTCNT         B=C          X              ;SAVE ENTRY #
     0393 007C       1079                RCR          4              ;C= "C EEE0000AAA AAA"
     0394 0228       1080                REGN=C       8
     0395 027E       1081                C=C-1        S              ;CHECK FOR CAT 0
     0396 027E       1082                C=C-1        S              ;CHECK FOR CAT 1
     0397 0007       1083                GOC          CAT1
     0398 027E       1084                C=C-1        S              ;CHECK FOR CAT 2
     0399 00001003   1085                GOLC         CAT2
     039B 00001002   1086                GOLONG       =CAT3
                     1087 ***************************************************
     039D 0130       1088 CNTLOP         LDI                         ;LOAD TIME OUT CONSTANT
     039E 0100       1089                CON          400Q
     039F 00EE       1090 KPCNT          BCEX         W
     03A0 03CC       1091                CHKKB
     03A1 0003       1092                GONC         DECCNT
     03A2 0220       1093                C=KEYS
     03A3 003C       1094                RCR          3
     03A4 0056       1095                C=0          XS
     03A5 0106       1096                A=C          X
     03A6 039C       1097                PT=          0
     03A7 01E2       1098                C=C+C        PT             ;CHECK FOR "ON" KEY
     03A8 00001003   1099                GOLC         =OFF
     03AA 0130       1100                LDI
     03AB 0087       1101                CON          135            ;R/S KEY?
     03AC 0366       1102                A#C?         X
     03AD 00001002   1103 XCCTMG         GOLNC        =CLCTMG        ;CLEAR CATALOG AND MESSAGE
     03AF 03C8       1104 RSTKBD         RSTKB
     03B0 00EE       1105 DECCNT         BCEX         W
     03B1 0266       1106                C=C-1        X
     03B2 0003       1107                GONC         KPCNT
     03B3 0003       1108                GOTO         GTCNTR
     03B4 00001000   1109 SSTCAT         GOSUB        =SETSST        ;SET SST FLAG
     03B6 0003       1110                GOTO         GTCNTR         ;INC CNT IN B
     03B7 00001000   1111 R_SCAT         GOSUB        =RSTKB         ;CLEAR KEYBOARD
     03B9 0003       1112                GOTO         GTCNTR
     03BA 00001000   1113 BSTCAT         GOSUB        =SETSST        ;SET SST FLAG
     03BC 0388       1114                ST=1         0              ;SET BST FLAG
     03BD 0238       1115                C=REGN       8
     03BE 00FC       1116                RCR          10             ;BST COUNTER
     03BF 0266       1117                C=C-1        X
     03C0 02E6       1118                C#0?         X              ;INDEX#0?
     03C1 0007       1119                GOC          BSTCNT
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

   03C2 0003         1120                GOTO            NOCHG
                     1121 ****************************************************
                     1122 *THE ROUTINES WHICH GET AND DISPLAY THE CHARACTERS
                     1123 *FOR THE THREE TYPES OF CATALOGS ARE LISTED BELOW.
                     1124 ****************************************************
   03C3 001C         1125 CAT1                PT=             3
   03C4 00C4         1126                     ST=0            10              ;SET RAM FLAG
   03C5 00E6         1127                     BCEX            X               ;CHK FOR FIST TIME
   03C6 0266         1128                     C=C-1           X
   03C7 0266         1129                     C=C-1           X
   03C8 0003         1130                     GONC            PC
   03C9 00001000     1131                     GOSUB           =FSTIN
   03CB 0110         1132                     LC              4
   03CC 0384         1133                     ST=0            0               ;  CLEAR BST FLAG
   03CD 001C         1134                     PT=             3
   03CE 00EE         1135                     CBEX            W
   03CF 00001000     1136                     GOSUB           =CLRSB2         ;CLR STK,L#,SAVE NEW PC
   03D1 00001000     1137 PC                  GOSUB           =GETPC          ;FETCH PC TO A(0,3)
   03D3 0378         1138                     C=REGN          13
   03D4 0190         1139                     LC              6
   03D5 001C         1140                     PT=             3
   03D6 038C         1141                     ST=1?           0
   03D7 0007         1142                     GOC             OVRINC          ;DO BST?
   03D8 036A         1143                     A#C?            WPT
   03D9 00001002     1144                     GOLNC           =QUTCAT
   03DB 00001000     1145                     GOSUB           =INCAD2
   03DD 00001000     1146                     GOSUB           =INCAD          ;GET BY START OF LINK
   03DF 00001000     1147 OVRINC              GOSUB           =FLINKA
   03E1 038C         1148                     ST=1?           0               ; BST
   03E2 0007         1149                     GOC             OVRROT          ; LEAVE A(0:3) ALONE
   03E3 007C         1150                     RCR             4
   03E4 00AA         1151                     ACEX            WPT
   03E5 00001000     1152 OVRROT              GOSUB           =PUTPCD
   03E7 00001000     1153                     GOSUB           =CLLCDE
   03E9 0304         1154                     ST=0            1               ;NO SCROLLING
   03EA 00001000     1155                     GOSUB           =DF060
   03EC 00001002     1156                     GOLONG          =END3
                     1157 ****************************************************
                     1158                     GLB             NFRST_PLUS
                     1159 ********************************************
                     1160 *THIS CODE FINISHES REGISTER ARITHMETIC.
                     1161 ********************************************
   03EE 00001000     1162 NFRST_PLUS          GOSUB           =OVFL10         ;CHECK OVERFLOW
   03F0 00EE         1163                     BCEX            W
   03F1 00D4         1164                     PT=?            10              ;IF PT = 10 OVERFLOW
   03F2 0003         1165                     GONC            NOOVF
   03F3 0046         1166                     C=0             X               ;RE-ENABLE CHIP 0
   03F4 0270         1167                     DADD=C
   03F5 03B8         1168                     C=REGN          14
   03F6 017C         1169                     RCR             6
   03F7 0358         1170                     ST=C
   03F8 028C         1171                     ST=1?           7               ;RANGE ERROR IGNORE?
   03F9 00001002     1172                     GOLNC           =ERRIGN         ;NO. GO TEST ERROR IGNORE FLAG
   03FB 00B0         1173 NOOVF               C=N
   03FC 0270         1174                     DADD=C
   03FD 00EE         1175                     BCEX            W
   03FE 02F0         1176                     DATA=C
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    03FF 03E0        1177                 RTN
                     1178                 FILLTO          1777Q
                     1179                 END

Errors=    0
```

LINE#	SYMBOL	TYPE	REFERENCES
	ARGOUT	E	686
	ASCLCD	E	997
622	BAKAPH	P	13
556	BAKDE	P	14,142
566	BKDE10	P	564,572
573	BKDE20	P	567
609	BKDE30	P	606
577	BKDG	P	598,600
582	BKDG1	P	579
575	BKEX10	P	
584	BKEX20	P	576
588	BKEX30	P	586
563	BKEXP	P	
565	BKMANT	P	562
590	BKMN20	P	574
599	BKMN25	P	593
603	BKMN30	P	591,595
659	BKPH10	P	684
664	BKPH20	P	655,657
680	BKPH30	P	671
683	BKPH40	P	678
685	BKPH50	P	650
234	BLINK	P	15
233	BLINK1	P	16,170,178,186,203,219,222
1113	BSTCAT	P	11
1078	BSTCNT	P	1119
1125	CAT1	P	12,1083
1015	CAT2	P	5,1085
	CAT3	E	1086
210	CHSEXP	P	199
	CLCTMG	E	1103
	CLLCDE	E	1153
	CLRSB2	E	1136
1088	CNTLOP	P	7
	DAT106	E	626
	DAT231	E	296
	DAT320	E	289
	DATOFF	E	543,607
162	DE200	P	160
164	DE210	P	168
169	DE220	P	165
	DECAD	E	323
1105	DECCNT	P	1092
198	DECHS	P	150
204	DECHS1	P	201
177	DEDP	P	158
181	DEEEX	P	155
218	DEEXP	P	17,153
322	DERNRT	P	313,315
329	DEROVF	P	18,540
324	DERRT1	P	332
260	DERUN	P	19
303	DERUN5	P	319
	DF060	E	1155
135	DGENS8	P	134
136	DIGENT	P	20,304
277	DIGST1	P	265

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LINE#	SYMBOL	TYPE	REFERENCES
290	DIGST2	P	287
276	DIGST_	P	21
981	DSPCA	P	22
969	DSPCRG	P	23
451	ENCP00	P	303,452,469,1005
	END2	E	1050
	END3	E	1056,1156
900	ENG10	P	895
902	ENG20	P	940
905	ENG25	P	909,911,937
912	ENG30	P	906,941
913	ENG35	P	917
918	ENG40	P	921
922	ENG45	P	915
926	ENG50	P	923
933	ENG60	P	899
	ENLCD	E	354,463,679,683,975,987
	ERR120	E	608
	ERRIGN	E	1172
225	EXPDG1	P	229
230	EXPDG2	P	226
823	FIX00	P	
828	FIX10	P	832
834	FIX20	P	825,838
839	FIX30	P	835
844	FIX35	P	848
847	FIX40	P	833
849	FIX45	P	854,881
855	FIX50	P	846,851
860	FIX55	P	864
865	FIX57	P	24,858,932
878	FIX60	P	841
	FLINKA	E	1147
882	FMTRTN	P	868
801	FORMAT	P	25,974
	FSTIN	E	1131
	GETPC	E	301,1137
1074	GTCNTR	P	8,1108,1110,1112
54	GTRMAD	P	26
	INCAD	E	1146
	INCAD2	E	1145
176	INDGJ	P	172
242	INPTDG	P	27,176,231
	INSSUB	E	288
1090	KPCNT	P	1107
869	LDCOMA	P	861
953	LDDP10	P	952
951	LDD_P_	P	28,826,842,880,912
	LDSSTO	E	887
	LOAD3	E	355,808
	NBYTAB	E	306
	NFRKB	E	544
689	NFRKB0	P	663
	NFRKB1	E	689
	NFRPU	E	325
1162	NFRST_PLUS	P	1158
1076	NOCHG	P	1120

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LINE#	SYMBOL	TYPE	REFERENCES
1173	NOOVF	P	1165
481	NOREG9	P	29,305
483	NORG05	P	487
488	NORG10	P	484
492	NORG20	P	497
498	NORG30	P	493
508	NORG40	P	512
513	NORG42	P	522
514	NORG45	P	520
521	NORG50	P	507
523	NORG51	P	509,526,527
528	NORG55	P	515,524
545	NORG65	P	517
546	NORG70	P	534
547	NORG75	P	538
888	NOTFIX	P	30,822
1022	NXTROM	P	1026
	OFF	E	1099
	OPROMT	E	662
	OVFL10	E	535,1162
1147	OVRINC	P	1142
1152	OVRROT	P	1149
1137	PC	P	1130
463	PGMAON	P	462
662	PROMPT	P	682
	PUTPC	E	324
	PUTPCD	E	1152
	QUTCAT	E	1023,1144
357	RFDS10	P	363
364	RFDS15	P	358
374	RFDS17	P	366,368
376	RFDS19	P	380
381	RFDS20	P	377
387	RFDS25	P	375
391	RFDS26	P	406
392	RFDS27	P	398
399	RFDS28	P	393
407	RFDS30	P	390
409	RFDS35	P	388,395
434	RFDS40	P	425
435	RFDS42	P	429
437	RFDS45	P	433
439	RFDS50	P	422
442	RFDS55	P	31,977
349	RG9LCD	P	32
70	RMAD10	P	74
73	RMAD15	P	109
76	RMAD20	P	72
107	RMAD30	P	82
762	RND100	P	727
767	RND105	P	763
771	RND110	P	768,780
774	RND120	P	733
715	RND20	P	719
759	RND30	P	722
725	RND40	P	729
740	RND45	P	768

LINE#	SYMBOL	TYPE	REFERENCES
746	RND47	P	758
750	RND50	P	739
736	RND60	P	724,730,760
731	RND70	P	735
732	RND75	P	761
752	RND90	P	716,756,770,775,781
754	RND95	P	745
	ROLBAK	E	651
712	ROUND	P	33,806
714	ROUNDA	P	773
	RSTKB	E	1111
1104	RSTKBD	P	
217	RST09J	P	
248	RSTOR9	P	197,217
615	RSTRG9	P	583,589
616	RSTSS	P	602
249	RSTST	P	34,189,207,209,616
207	RSTSTJ	P	180
1111	R_SCRT	P	10
	R_SUB	E	291
938	SCI00	P	890
859	SETCOM	P	877
944	SETQ10	P	948
949	SETQ20	P	945
942	SETQ_P	P	35,827,843,878
	SETSST	E	1109,1113
1109	SSTCAT	P	9
	STBT10	E	283,803
	STOLCC	E	688
	TONSTF	E	1062
	TXTLB1	E	1055
1051	USLNG	P	1048
978	VIEW05	P	973
988	VIEW20	P	994,998
999	VIEW30	P	996
1002	VIEW35	P	1007
1006	VIEW40	P	1003
1060	XCAT	P	6
1103	XCCTMG	P	
694	XRND	P	690

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```
LOCATION OBJECT CODE LINE     SOURCE LINE

                        1 "COCONUT"
                        2 * HP41C MAINFRAME MICROCODE ADDRESSES @6000-7777
                        3 *
                        4                GLB             DSPLN_
                        5                GLB             ABTSEQ
                        6                GLB             ABTS10
                        7                GLB             AJ2
                        8                GLB             AJ3
                        9                GLB             FDIGIT
                       10                GLB             FDIG20
                       11                GLB             IND
                       12                GLB             MIDDIG
                       13                GLB             NEXT
                       14                GLB             NEXT1
                       15                GLB             NEXT2
                       16                GLB             NEXT3
                       17                GLB             NLT000
                       18                GLB             NLT020
                       19                GLB             NULT_
                       20                GLB             NULT_3
                       21                GLB             NULT_5
                       22                GLB             NULTST
                       23                GLB             PAR112
                       24                GLB             PARSE
                       25                GLB             PARSEB
                       26                GLB             PARS56
                       27                GLB             PARA60
                       28                GLB             PARS75
                       29                GLB             STK
                       30 *
                       31 * CLRSB2 - CLEAR USER SUBROUTINE STACK AND CLOBBER LINE NUMBER
                       32 * ON ENTRY - PT=3, CHIP 0 ENABLED, NEW PC IN B[3:0] IN MM FORM
                       33 * USES B[3:0], A[3:0], C
                       34 * EXITS VIA PUTPCX, WHICH CLOBBERS THE LINE NUMBER ONLY IF S13=0.
                       35 *
                       36 * CLRSB3 - ENTRY POINT TO FINISH PUSHING THE SUBROUTINE STACK
                       37 * ON ENTRY - C[13:4] HAS WHAT SHOULD GO INTO REG 12[13:4],
                       38 *      PT=3, CHIP 0 ENABLED, NEW PC IN B[3:0] IN MM FORM
                       39 * OTHERWISE THE SAME AS CLRSB2
                       40 *
                       41                GLB             CLRSB2
                       42                GLB             CLRSB3
0000 004E              43 CLRSB2         C=0             W
0001 02E8              44                REGN=C          11
0002 0328              45 CLRSB3         REGN=C          12
0003 006A              46                ABEX            WPT
0004 0003              47                GOTO            CLRSBX
                       48                FILLTO          4Q
                       49 *
                       50 * PARSE - KEY SEQUENCE PARSER
                       51 * ENTRY CONDITIONS: CHIP 0 SELECTED, HEX, P SEL
                       52 *
0005                   53 PARSE
0005 03B8              54                C=REGN          14              ;LOAD STATUS SET 1/2
0006 033C              55                RCR             1
0007 0358              56                ST=C
0008 01A0              57                CLRABC
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    0009 0220          58                  C=KEYS
    000A 00BC          59                  RCR             5               ;KC TO C[13:12]
    000B 0130          60                  LDI
    000C 00C1          61                  CON             301Q            ;@6020\16
    000D 00FC          62                  RCR             10
    000E 001C          63                  PT=             3
    000F 01E0          64                  GOTOC
                       65                  FILLTO          17Q
    0010 0000          66                  NOP                             ;CAUSES COL 0 TO MAP
                       67                                                  ;ONTO COLUMN 1
    0011 0010          68                  LC              0               ;1
    0012 0003          69                  GOTO            PAR003          ;2
    0013 0050          70                  LC              1               ;3
    0014 0003          71                  GOTO            PAR003          ;4
    0015 0090          72 PAR001           LC              2               ;5
    0016 0003          73                  GOTO            PAR003          ;6
    0017 0003          74                  GOTO            PAR001          ;7
    0018 00D0          75                  LC              3               ;8
    0019 0003          76                  GOTO            PAR003          ;9
    001A 00001002      77 CLRSBX           GOLONG          =PUTPCX
                       78                  FILLTO          33Q
    001C 0110          79                  LC              4               ;C
    001D 033C          80 PAR003           RCR             1               ;C[2:1]=LOGCOL,ROW
    001E 0106          81                  A=C             X               ;A[2:1]=LOGCOL,ROW
    001F 004C          82                  ST=1?           4               ;SHIFTSET?
    0020 0003          83                  GONC            PARC05          ;NO
    0021 0130          84                  LDI
    0022 0080          85                  CON             8*16+0          ;ADJ ROW FOR SHIFT
    0023 0206          86                  C=A+C           X
    0024 0070          87 PAR005           N=C                             ;N[2:1]=LOG KC
    0025 008C          88                  ST=1?           5               ;PKSEQ?
    0026 0003          89                  GONC            NEWFCN          ;NO
                       90 *
                       91                                                  ;CONTINUING KEY SEQUENCE
                       92                                                  ;A[2:1]=LOGCOL, ROW
                       93                                                  ;A[0]=0, A.M=0
                       94                                                  ;ROW DOES NOT HAVE SHIFT
                       95                                                  ;ADJUSTMENT IN IT
    0027 00AE          96                  ACEX            W
    0028 031C          97                  PT=             1
    0029 01E2          98                  C=C+C           PT
    002A 01EE          99                  C=C+C           W
    002B 01EE         100                  C=C+C           W
    002C 01EE         101                  C=C+C           W
    002D 02FC         102                  RCR             13
    002E 015C         103                  PT=             6
    002F 0050         104                  LC              1               ;PKTTAB IS AT @10000
    0030 0330         105                  CXISA
    0031 033C         106                  RCR             1               ;CONSTRUCT PTEMP1
    0032 01E6         107                  C=C+C           X
    0033 01E6         108                  C=C+C           X
                      109                  GLB             PARS05
                      110 * ENTRY POINT FOR WAND ON 3-13-79
                      111 *
    0034              112 PARS05
    0034 010E         113                  A=C             W
    0035 039C         114                  PT=             0
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LOCATION OBJECT CODE LINE     SOURCE LINE

    0036 03F8          115                    C=REGN          15
    0037 003C          116                    RCR             3
    0038 0058          117                    G=C                             ;RESTORE PTEMP2 TO G
    0039 0142          118                    A=A+C           PT              ;MERGE OPERAND TYPE INFO
    003A 00A6          119                    ACEX            X
    003B 0358          120                    ST=C                            ;PUT UP PTEMP1
    003C 0244          121                    ST=0            9               ;SAY ADDRESS NOT FOUND YET
    003D 00001000      122                    GOSUB           =ENLCD          ;TURN ON LCD CHIP
    003F 0130          123                    LDI
    0040 0020          124                    CON             32              ;BLANK
    0041 0106          125                    A=C             X               ;BLANK TO A.X
    0042 0086          126                    B=A             X               ; AND B.X
    0043 031C          127                    PT=             1
    0044 03B8          128 PARS10             RABCR                           ;RIGHT JUSTIFY LCD
    0045 036A          129                    A#C?            WPT
    0046 0003          130                    GONC            PARS10
    0047 01AA          131                    A=A-1           WPT             ;TURN BLANK INTO PROMPT
    0048 036A          132 PARS20             A#C?            WPT             ;NOT A PROMPT?
    0049 0007          133                    GOC             PARS30          ;NOT A PROMPT
    004A 00C6          134                    C=B             X               ;RETRIEVE BLANK
    004B 03E8          135                    SLSABC                          ;GET RID OF PROMPT
    004C 03A8          136                    SRSABC
    004D 03B8          137                    RABCR                           ;SHIFT OFF SOMETHING
    004E 0003          138                    GOTO            PARS20
    004F 03F8          139 PARS30             RABCL
                       140 *
    0050 017E          141                    A=A+1           S               ;CHECK FOR BACKARROW
    0051 0360          142                    RTNC
    0052 01BE          143                    A=A-1           S
    0053 01B0          144                    C=STK
    0054 023A          145                    C=C+1           M               ;INCREMENT RETURN ADDRESS
    0055 01E0          146                    GOTOC                           ;ON EXIT, PT=1, LCD CHIP ON,
                       147                                                    ;SS PTEMP1 UP, B.X=BLANK
                       148 *
                       149 * NEWFCN - NEW FUNCTION
                       150 * FIRST KEY OF A NEW KEY SEQUENCE
    0056               151 NEWFCN                                             ;ON ENTRY, SS1/2 UP, CHIP 0
                       152                                                    ;ON, KC IN C[2:1], B=0
    0056 0106          153                    A=C             X               ;A[2:1]=LOG KC
    0057 03B8          154                    C=REGN          14
    0058 0358          155                    ST=C                            ;PUT UP SS0
    0059 028C          156                    ST=1?           7               ;ALPHAMODE?
    005A 0003          157                    GONC            PARS50          ;NO
    005B 0130          158                    LDI
    005C 0155          159                    CON             525Q            ;H1550\16=@525
    005D 0003          160                    GOTO            PARS55
                       161 *
    005E 017C          162 PARS50             RCR             6
    005F 0358          163                    ST=C                            ;PUT UP SS3
    0060 004C          164                    ST=1?           4               ;USERMODE?
    0061 0003          165                    GONC            PARS52          ;NO
    0062 00001000      166                    GOSUB           =TBITMP         ;YES. TEST BIT MAP
    0064 02EE          167                    C#0?            W               ;KEY REASSIGNED?
    0065 00001003      168                    GOLC            =RAK60          ;YES
    0067 03B8          169                    C=REGN          14
    0068 0358          170                    ST=C                            ;PUT UP SS0 AGAIN
    0069 000C          171                    ST=1?           3               ;PRGMMODE?
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    006A 0007          172                GOC             RAK10           ;YES - SKIP AUTO-ASSIGN TESTS
    006B 00B0          173                C=N
    006C 005A          174                C=0             M
    006D 023C          175                RCR             2               ;LOG ROW TO C.S
    006E 0106          176                A=C             X               ;LOG COL TO A.X
    006F 0130          177                LDI
    0070 0066          178                CON             6*16+6          ;ROW 0 OFFSET
    0071 027E          179                C=C-1           S               ;ROW 0?
    0072 0007          180                GOC             RAK05           ;YES
    0073 039C          181                PT=             0
    0074 02D0          182                LC              11              ;SET UP ROW 1 OFFSET
    0075 02FE          183                C#0?            S               ;ROW#1?
    0076 0003          184                GONC            RAK05           ;ROW 1
    0077 031C          185                PT=             1
    0078 01D0          186                LC              7               ;SET UP SHIFTED ROW 0 OFFSET
    0079 023E          187                C=C+1           S
    007A 01FE          188                C=C+C           S               ;SHIFTED?
    007B 0003          189                GONC            RAK10           ;NO
    007C 02FE          190                C#0?            S               ;NOT SHIFTED ROW 0?
    007D 0007          191                GOC             RAK10           ;NOT AUTO-ASSIGNED
    007E 0206          192 RAK05          C=A+C           X               ;C.X=IMPLIED LOCAL LABEL
                       193 *
                       194                GLB             RAK06
                       195 * ENTRY POINT ADD FOR WAND ON 3-13-79
                       196 *
    007F               197 RAK06
    007F 0158          198                M=C                             ;SAVE OPERAND IN M
    0080 010E          199                A=C             W               ;SET UP A[1:0] FOR SEARCH
    0081 00001000      200                GOSUB           =SEARCH
    0083 02EE          201                C#0?            W               ;FOUND?
    0084 0007          202                GOC             PARS60          ;YES
    0085               203 RAK10                                          ;KEY IS NOT REASSIGNED
    0085 00B0          204                C=N                             ;RETRIEVE LOGICAL KC
    0086 010E          205                A=C             W               ;RESTORE LOG KC TO A[2:1]
    0087 03B8          206 PARS52         C=REGN          14
    0088 0358          207                ST=C                            ;PUT UP SS0
    0089 0130          208                LDI
    008A 0150          209                CON             520Q            ;H1500\16=@520
                       210                                                ;NORMAL MODE DEFAULT TABLE
    008B               211 PARS55                                         ;ST HAS SS0
                       212                                                ;LOG KC IN A[2:1]
                       213                                                ;DEFAULT TABLE ADDR\16 IN C.X
    008B 005E          214                C=0             S
    008C 037C          215                RCR             12
    008D 0206          216                C=A+C           X
    008E 037C          217                RCR             12              ;C[6:3]=TABLE ADDRESS
    008F 0330          218                CXISA
                       219 *
                       220                GLB             PARSDE
                       221 * ENTRY POINT FOR WAND TO EXECUTE DATA ENTRY KEY (3-15-79)
                       222 *
    0090               223 PARSDE
    0090 0276          224                C=C-1           XS              ;DATA ENTRY KEY?
    0091 00001001      225                GSUBC           =DATENT         ;GOES TO DATENT W/ ASCII
                       226                                                ;OR DE FC OR 0 FOR BKARROW
                       227                                                ;IN C[1:0] & W/ SS0 UP
    0093               228 PARS56                                         ;CHS, CLX, DELETE,
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

                     229                                                ;STORAGE ARITHMETIC,
                     230                                                ;AND STOP RE-ENTER HERE.
                     231                                                ;ENTRY REQUIREMENTS:
                     232                                                ;FC IN C.X, CHIP 0 ON,
                     233                                                ;SS 0 UP
   0093 01BC         234                RCR          11                 ;FC TO DIGITS 4,3
   0094 00EE         235                BCEX         W                  ;SAVE IN B
   0095 02B8         236                C=REGN       10
   0096 005C         237                PT=          4
   0097 00CA         238                C=B          WPT                ;MERGE FC TO DIGITS 4,3 OF REG 10
   0098 0046         239                C=0          X
   0099 02A8         240                REGN=C       10
   009A 000C         241                ST=1?        3                  ;PROGRAM MODE?
   009B 0003         242                GONC         PARS57
   009C 02E2         243                C#0?         PT                 ;PROGRAMMABLE?
   009D 0003         244                GONC         PARS57             ;NOT PROGRAMMABLE
   009E 031C         245                PT=          1
   009F 0222         246                C=C+1        PT                 ;SET INSERT BIT
   00A0 039C         247 PARS57         PT=          0                  ;SAVE PTEMP2 IN G
   00A1 0058         248                G=C
   00A2 0358         249                ST=C                            ;PUT UP PTEMP2
   00A3 00CE         250                C=B          W                  ;RECOVER FC TO C[4:3]
   00A4 00BC         251                RCR          5                  ;FC TO DIGITS 13:12
   00A5 0130         252                LDI
   00A6 0014         253                CON          24Q                ;@24=@12000\256 MAIN FCN TABLE
   00A7 027C         254                RCR          9
   00A8 0330         255                CXISA                           ;GET XADR
   00A9 001C         256                PT=          3
   00AA 0050         257                LC           1
   00AB 01BC         258                RCR          11                 ;FULL XADR IN C[6:3]
   00AC 0158         259                M=C                             ;SAVE XADR IN M
   00AD 0170         260                STK=C                           ; AND ON SUBR STACK
   00AE 0330         261                CXISA                           ;GET C(XADR)
   00AF 02E6         262                C#0?         X                  ;NOT XKD?
   00B0 0007         263                GOC          PARS70             ;NOT XKD.
   00B1 03B8         264                C=REGN       14
   00B2 0358         265                ST=C                            ;PUT UP SS 0
   00B3 03E0         266                RTN                             ;GO EXECUTE IMMEDIATELY
                     267 *
   00B4              268 PARS60
   00B4 01D8         269                CMEX                            ;SAVE ADR IN M,
                     270                                                ;RETRIEVE ARGUMENT TO C
   00B5 00A6         271                ACEX         X                  ;PUT ARG TO A.X FOR ROW940
   00B6 0086         272                B=A          X                  ; & SAVE ARG IN B.X
   00B7 00001000     273                GOSUB        =OFSHFT
   00B9 00001000     274                GOSUB        =CLLCDE
   00BB 0130         275                LDI
   00BC 00E0         276                CON          14*16+0            ;FC FOR XEQ
   00BD 00001000     277                GOSUB        =PROMF1            ;PROMPT "XEQ "
   00BF 0304         278                ST=0         1                  ;SET UP FOR ROW940
   00C0 00001000     279                GOSUB        =ROW940            ;PROMPT ARGUMENT
   00C2 0130         280                LDI                             ;SET UP FOR NLT020
   00C3 00E0         281                CON          14*16+0            ;FC FOR XEQNN
   00C4 039C         282                PT=          0                  ;CLEAR INSERT BIT IN G
   00C5 0058         283                G=C                             ; FOR NLT020
   00C6 01BC         284                RCR          11
   00C7 010E         285                A=C          W
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

00C8 0066          286                ABEX          X              ;NOW FC IN A[4:3],
                   287                                             ;ARG IN A[1:0]
                   288 * ARG IS PRESERVED HERE FOR THE BENEFIT OF THE PRINTER.  SINCE S9 IS
                   289 * SET WHEN WE GET TO XEQ NN, XEQNN NEVER LOOKS AT THE ARGUMENT AT ALL.
00C9 0248          290                ST=1          9              ;TELL XEQNN THAT ADDRESS
                   291                                             ;IS ALREADY KNOWN IN M
00CA 00001002      292                GOLONG        NULT_5
                   293 *
00CC 0244          294 PARS70         ST=0          9              ;INITIALIZE S9.
                   295                                             ;S9=1 TELLS AXEQ & XEQNN
                   296                                             ;THAT THEIR ADDRESS HAS
                   297                                             ;ALREADY BEEN FOUND AND IS
                   298                                             ;IN M.
00CD               299 PARS75                                      ;RETURN FROM AXEQ & RASNKY
                   300                                             ;FOR MICROCODED XROM FCNS
                   301                                             ;* ENTRY REQ FOR PARS75:
                   302                                             ;* PTEMP2 IN STATUS BITS
                   303                                             ;* & M=XADR
00CD 00001000      304                GOSUB         =OFSHFT        ;TURN OFF SHIFT
00CF 00001000      305                GOSUB         DSPLN_         ;ENABLE AND CLEAR LCD
                   306                                             ;IF INSERT THEN INC & DSP LINE#
00D1 0198          307                C=M                          ;RETRIEVE XADR
00D2 00001000      308                GOSUB         =PROMF2        ;PROMF2 RETURNS S8=0
                   309                                             ;XROM MICROCODE FCNS RELY ON
                   310                                             ;S8=0 HERE
                   311                                             ;(WHEN S9 IS SET, S8 TELLS
                   312                                             ;XROM WHETHER THE FCN IS
                   313                                             ;MICROCODE OR USER LANG)
00D4 0198          314                C=M                          ;RETRIEVE XADR AGAIN
00D5 027A          315                C=C-1         M              ;POINT TO XADR-1
00D6 0330          316                CXISA                        ;OP1 TO C.XS
00D7 02F6          317                C#0?          XS             ;OP1#0?
00D8 00001002      318                GOLNC         NLT000         ;NO OPERAND
00DA 01F6          319                C=C+C         XS
00DB 01F6          320                C=C+C         XS
00DC 0116          321                A=C           XS             ;A.XS=4*OP1
00DD 027A          322                C=C-1         M              ;POINT TO XADR-2
00DE 0330          323                CXISA                        ;C.XS=OP2
00DF 0216          324                C=A+C         XS
00E0 023C          325                RCR           2
00E1 0358          326                ST=C
00E2 0004          327                ST=0          3              ;CLEAR OP1 BIT 1
00E3 03D8          328                CSTEX                        ;OP1 BIT 1 STILL EXISTS
                   329                                             ;IN ST, BUT IS CLEAR IN C
00E4 039C          330                PT=           0
00E5 00A2          331                ACEX          PT
00E6 0098          332                C=G
00E7 00A2          333                ACEX          PT             ;MERGE OPTYPE INTO PTEMP2
00E8 0058          334                G=C                          ;PUT PTEMP2 BACK TO G
00E9 000C          335                ST=1?         3              ;OP1 BIT 1?
00EA 0003          336                GONC          PARSEA         ;NO
                   337 *
                   338 *
00EB 00001000      339 PAR110         GOSUB         NEXT2
                   340                GLB           PAR111         ;ADDED FOR WAND 11/5/79
00ED               341 PAR111
00ED 0003          342                GOTO          ABTSEQ         ;MUST BE SHORT GTO!!!
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LOCATION OBJECT CODE LINE     SOURCE LINE

   00EE 004C          343                    ST=1?          4              ;A...J?
   00EF 00001003      344                    GOLC           AJ2            ;YES
   00F1 000C          345                    ST=1?          3              ;DIGIT?
   00F2 0003          346                    GONC           PAR115         ;NO
   00F3 00001000      347                    GOSUB          FDIGIT
   00F5 00001000      348 PAR112             GOSUB          =BLINK
   00F7 0003          349                    GOTO           PAR110
   00F8 020C          350 PAR115             ST=1?          2              ;OP1 BIT 0?
   00F9 00001003      351                    GOLC           PARSEB         ;YES
   00FB 014C          352                    ST=1?          6              ;SHIFT?
   00FC 00001003      353                    GOLC           IND            ;YES
   00FE 030C          354                    ST=1?          1              ;OP2 BIT 1?
   00FF 0007          355                    GOC            PAR112         ;YES
   0100 028C          356 PAR130             ST=1?          7              ;DP?
   0101 00001003      357                    GOLC           STK            ;YES
   0103 038C          358                    ST=1?          0              ;OP2 BIT 0?
   0104 0007          359                    GOC            PAR112
                      360                                                   ;MUST BE STO
   0105 035E          361                    A#0?           S              ;+-*/ ?
   0106 0003          362                    GONC           PAR112         ;NO
   0107 0130          363                    LDI                           ;YES
   0108 0091          364                    CON            145
   0109 00AE          365                    ACEX           W
   010A 02FC          366                    RCR            13
   010B 039C          367                    PT=            0
   010C 0142          368                    A=A+C          PT
                      369                    LEGAL
   010D 00001000      370                    GOSUB          =LDSST0
   010F 00AE          371                    ACEX           W
   0110 00001002      372                    GOLONG         =PARS56        ;START OVER WITH NEW FC
                      373 *
                      374 * ABTSEQ - ABORT PARTIAL KEY SEQUENCE
                      375 *
                      376 * NOTE THAT ABTSEQ DOESN'T CLEAR ALPHAMODE, WHICH MAY BE SET IF WE'RE
                      377 * IN THE MIDDLE OF KEYING IN AN ALPHA OPERAND.  IF IT IS DESIRED TO
                      378 * ENSURE THAT THE ALPHAMODE FLAG AND ANNUNCIATOR ARE CLEARED, THE
                      379 * DO A GOLONG TO NAME33, WHICH CLEARS ALPHAMODE AND THEN JUMPS TO
                      380 * ABTSEQ.
                      381 *
   0112 00001000      382 ABTSEQ             GOSUB          =CLLCDE        ;CLEAR DISPLAY
   0114 00001000      383                    GOSUB          =ANNOUT
   0116 039D          384 ABTS10             CON            1635Q
   0117 01BC          385                    CON            674Q           ;GOSUB PRT4
   0118 00001000      386                    GOSUB          =RSTSEQ        ;CLEAR SHIFTSET, PKSEQ,
                      387                                                   ;MSGFLG, DATAENTRY,
                      388                                                   ;CATALOGFLAG, & PAUSING
   011A 00001002      389                    GOLONG         =NFRKB
                      390 *
   011C               391 PARSEA                                            ;ALPHA NAME ALPHA
                      392                                                   ;1 DIGIT NUMERIC
                      393                                                   ;3 DIGIT NUMERIC
   011C 038C          394                    ST=1?          0              ;OP2 BIT 0?
   011D 0003          395                    GONC           PARA05
                      396                                                   ;1 DIG OR 3 DIG NUMERIC
   011E 030C          397                    ST=1?          1              ;OP2 BIT 1?
   011F 0003          398                    GONC           PARA50
                      399 *
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LOCATION OBJECT CODE LINE     SOURCE LINE

                     400 *
                     401                                                  ;1 DIGIT NUMERIC
                     402                                                  ;ALPHA NAME ALPHA
0120 00001000        403 PARA05          GOSUB           NEXT1
                     404                 GLB             PARA06           ;ADDED FOR WAND 11/5/79
0122                 405 PARA06
0122 0003            406                 GOTO            ABTSEQ           ;MUST BE SHORT GTO!!
0123 038C            407                 ST=1?           0                ;OP2 BIT 0?
0124 0003            408                 GONC            PARA45
0125 004C            409                 ST=1?           4                ;A...J?
0126 00001003        410                 GOLC            FDIG20           ;YES
0128 000C            411                 ST=1?           3                ;DIGIT?
0129 00001003        412                 GOLC            FDIG20           ;YES
012B 014C            413                 ST=1?           6                ;SHIFT?
012C 00001003        414                 GOLC            IND              ;YES
012E 00001000        415 PARA10          GOSUB           =BLINK
0130 0003            416                 GOTO            PARA05
                     417 *
0131                 418 PARA45                                           ;ALPHA NAME ALPHA
0131 008C            419                 ST=1?           5                ;ALPHA KEY?
0132 00001003        420                 GOLC            NAMEA            ;YES
0134 0003            421                 GOTO            PARA10
                     422 *
0135                 423 PARA50                                           ;3 DIGIT NUMERIC
0135 00001000        424 PARA60          GOSUB           NEXT3
                     425                 GLB             PARA61           ;FOR THE WAND
0137                 426 PARA61
0137 0003            427                 GOTO            ABTSEQ
0138 004C            428                 ST=1?           4                ;A..J?
0139 00001003        429                 GOLC            AJ3              ;YES
013B 000C            430                 ST=1?           3                ;DIGIT?
013C 0003            431                 GONC            PARA70           ;NO
013D 00001000        432                 GOSUB           MIDDIG
013F 00001000        433 PARA65          GOSUB           =BLINK
0141 0003            434                 GOTO            PARA60
                     435 *
                     436 *
0142 0220            437 PARA70          C=KEYS                           ;CHECK FOR EEX
0143 003C            438                 RCR             3
0144 010A            439                 A=C             WPT
0145 0130            440                 LDI
0146 0083            441                 CON             8*16+3           ;KC FOR EEX
0147 036A            442                 A#C?            WPT
0148 0007            443                 GOC             PRA110
                     444 *
                     445                 GLB             PARA75
                     446 * ENTRY POINT ADD FOR WAND ON 3-13-79
                     447 *
0149                 448 PARA75
0149 0130            449                 LDI
014A 0031            450                 CON             61Q
014B 03E8            451                 SLSABC
014C 00001000        452 PARA80          GOSUB           NEXT3
014E 0003            453                 GOTO            PRA100
014F 000C            454                 ST=1?           3                ;DIGIT?
0150 00001001        455                 GSUBC           MIDDIG
0152 00001000        456 PARA90          GOSUB           =BLINK
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    0154 0003         457                 GOTO            PARA80
                      458 *
    0155 03B8         459 PRA100          RABCR
    0156 0003         460                 GOTO            PARA60
                      461 *
    0157 030C         462 PRA110          ST=1?           1               ;OP2 BIT 1? (GTO.?)
    0158 0003         463                 GONC            PARA65          ;NO
    0159 028C         464                 ST=1?           7               ;DP KEY?
    015A 0007         465                 GOC             PRA115          ;YES
    015B 008C         466                 ST=1?           5               ;ALPHA KEY?
    015C 0003         467                 GONC            PARA65          ;NO
    015D 00001000     468                 GOSUB           =ENCP00         ;YES
    015F 0006         469                 A=0             X
    0160 01A6         470                 A=A-1           X
    0161 01A6         471                 A=A-1           X               ;GENERATE FFE IN A.X
    0162 02B8         472                 C=REGN          10
    0163 00A6         473                 ACEX            X               ;MERGE FFE WITH REG 10
    0164 02A8         474                 REGN=C          10
    0165 0003         475                 GOTO            XFRNMA
    0166              476 PRA115                                          ;GTO..
    0166 03B8         477                 RABCR                           ;RETRIEVE DP FROM LCD
    0167 03F8         478                 RABCL                           ;PUT BACK FIRST DP
    0168 03E8         479                 SLSABC                          ;ADD A SECOND DP
    0169 0006         480                 A=0             X               ;SET ARGUMENT
    016A 01A6         481                 A=A-1           X               ; TO FFF
    016B 00001003     482                 GOLC            NULT_3
                      483 *
    016D              484 PARSEB                                          ;INPUT: SS=PTEMP1, LCD ON,
                      485                                                 ; HEX, PSEL, P=1
                      486                                                 ;GTO,LBL, AND XEQ
    016D 00001000     487                 GOSUB           =ENCP00         ;RE-ENABLE CHIP 0
    016F 02B8         488                 C=REGN          10              ;GET PARSE TEMPS
    0170 003C         489                 RCR             3               ;FC NOW IN DIGITS 1:0
    0171 010E         490                 A=C             W               ;SAVE REG 10 IN A
                      491
    0172 038C         492                 ST=1?           0               ;OP2 BIT 0?
    0173 0007         493                 GOC             PARB20          ;YES
                      494                                                 ;LBL
    0174 0130         495                 LDI                             ;LOAD FC FOR ALBL
    0175 00CD         496                 CON             12*16+13
    0176 008C         497 PARB10          ST=1?           5               ;ALPHA KEY?
    0177 0007         498                 GOC             PARB15
    0178 00001000     499                 GOSUB           =ENLCD
    017A 00001002     500                 GOLONG          =PAR112
                      501 *
    017C 00AA         502 PARB15          ACEX            WPT
    017D 00AE         503                 ACEX            W
    017E 01BC         504                 RCR             11
    017F 02A8         505                 REGN=C          10
    0180 0098         506                 C=G                             ;PT=1 HERE FROM NEXT
    0181 0358         507                 ST=C                            ;SET BIT 1 OF PTEMP2
    0182 0088         508                 ST=1            5               ; (SAY NULL STRING NOT ALLOWED)
    0183 0398         509                 C=ST
    0184 0058         510                 G=C
    0185 00001002     511 XFRNMA          GOLONG          NAMEA
                      512 *
    0187 014C         513 PARB20          ST=1?           6               ;SHIFT?
```

```
LOCATION OBJECT CODE LINE     SOURCE LINE

    0188 0003         514                GONC          PARB30
    0189 0130         515                LDI                         ;LOAD FC FOR GTO/IND
    018A 00AE         516                CON           10*16+14
    018B 00AA         517                ACEX          WPT
    018C 00AE         518                ACEX          W
    018D 01BC         519                RCR           11
    018E 02A8         520                REGN=C        10
    018F 030C         521                ST=1?         1             ;OP2 BIT 1?
    0190 0007         522                GOC           INDGTO
    0191 0003         523                GOTO          INDXEQ
                      524 *
    0192 0130         525 PARB30         LDI
    0193 001E         526                CON           1*16+14       ;FC FOR AXEQ
    0194 030C         527                ST=1?         1             ;OP2 BIT 1?
    0195 0003         528                GONC          PARB10        ;XEQ
    0196 0266         529                C=C-1         X             ;CONVERT TO FC FOR AGTO
    0197 028C         530                ST=1?         7             ;GTO   DP KEY?
    0198 0003         531                GONC          PARB10
                      532 *
                      533                GLB           PARB40
                      534 * ENTRY POINT FOR WAND  (3-15-79)
                      535 *
                      536                                            ;GTO .NNN
    0199              537 PARB40
    0199 039C         538                PT=           0             ;RESET INSERT BIT
    019A 0098         539                C=G                         ; IN PTEMP2
    019B 03D8         540                CSTEX
    019C 0044         541                ST=0          4
    019D 03D8         542                CSTEX
    019E 0058         543                G=C
    019F 031C         544                PT=           1
    01A0 0130         545                LDI                         ;FC FOR GTOL
    01A1 0001         546                CON           1
    01A2 00AA         547                ACEX          WPT
    01A3 00AE         548                ACEX          W
    01A4 01BC         549                RCR           11
    01A5 02A8         550                REGN=C        10
    01A6 00001000     551                GOSUB         =CLLCDE
    01A8 0130         552                LDI
    01A9 00D0         553                CON           13*16+0       ;FC FOR GTO
    01AA 00001000     554                GOSUB         =PROMF1
    01AC 03A8         555                SRSABC
    01AD 0130         556                LDI
    01AE 0060         557                CON           140Q          ;" ."
    01AF 03E8         558                SLSABC
    01B0 00001002     559                GOLONG        =PARA60
```

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```
LOCATION OBJECT CODE LINE     SOURCE LINE

                     561 * IND - TAKES CARE OF INDIRECT OPERANDS
                     562 *
   01B2 00001000     563 IND          GOSUB        =ENCP00
   01B4 039C         564 INDXEQ       PT=          0
   01B5 0098         565              C=G
   01B6 03D8         566              CSTEX
   01B7 0148         567              ST=1         6            ;INDIRECT
   01B8 03D8         568              CSTEX
   01B9 0058         569              G=C
   01BA              570 INDGTO
   01BA 00001000     571              GOSUB        =ENLCD
   01BC 00001000     572              GOSUB        =MESSL
   01BE 0009         573              CON          9            ;I
   01BF 000E         574              CON          14           ;N
   01C0 0004         575              CON          4            ;D
   01C1 0220         576              CON          1040Q        ;BLANK
                     577 *
                     578 *
   01C2 00001000     579 IND20        GOSUB        NEXT2
                     580              GLB          IND21        ;ADDED FOR WAND 11/5/79
   01C4              581 IND21
   01C4 0003         582              GOTO         ABTXF3       ;MUST BE SHORT GTO!!
   01C5 004C         583              ST=1?        4            ;A...J?
   01C6 0007         584              GOC          AJ2
   01C7 028C         585              ST=1?        7            ;DP?
   01C8 0007         586              GOC          STK
   01C9 000C         587              ST=1?        3            ;DIGIT?
   01CA 0003         588              GONC         IND30
   01CB 00001000     589              GOSUB        FDIGIT
   01CD 00001000     590 IND30        GOSUB        =BLINK
   01CF 0003         591              GOTO         IND20
```

```
LOCATION OBJECT CODE LINE     SOURCE LINE

                     593 * AJ3 AND AJ2 - TAKE CARE OF A...J KEYS FOR 3 AND 2 DIGIT OPERANDS
                     594 *
01D0                 595 AJ3                                                ;GTO.--- OR FC---
01D0 0130            596                 LDI
01D1 0030            597                 CON             60Q                ;ZERO
01D2 03E8            598                 SLSABC
01D3 0003            599                 GOTO            AJ210
                     600 *
01D4                 601 AJ2                                                ;FC IND-- OR FC--
01D4 0130            602                 LDI
01D5 0030            603                 CON             60Q                ;ZERO
01D6 035E            604 AJ210           A#0?            S
01D7 0007            605                 GOC             AJ220
01D8 022E            606                 C=C+1           W
01D9 03E8            607 AJ220           SLSABC
01DA 033C            608                 RCR             1
01DB 00BE            609                 ACEX            S
01DC 02FC            610                 RCR             13
01DD 03E8            611                 SLSABC
01DE 00001002        612                 GOLONG          NULT_
                     613 *
01E0                 614 MIDDIG
01E0 00BE            615                 ACEX            S
01E1 02FC            616                 RCR             13
01E2 00D0            617                 LC              3
01E3 0056            618                 C=0             XS
01E4 03E8            619                 SLSABC
01E5 00001000        620 MID10           GOSUB           NEXT2
01E7 0003            621                 GOTO            MID20
01E8 000C            622                 ST=1?           3                  ;DIGIT?
01E9 0003            623                 GONC            MID15
01EA 00001000        624                 GOSUB           FDIGIT
01EC 00001000        625 MID15           GOSUB           =BLINK
01EE 0003            626                 GOTO            MID10
                     627 *
01EF                 628 MID20
01EF 03B8            629                 RABCR
01F0 03E0            630                 RTN
                     631 *
01F1 00001002        632 ABTXF3          GOLONG          =ABTSEQ
                     633 *
                     634 * STK - HANDLES STACK REGISTER OPERANDS X,Y,Z,T,L
                     635 *
01F3                 636 STK
01F3 00001000        637 STK03           GOSUB           =MESSL
01F5 0013            638                 CON             23Q                ; S
01F6 0014            639                 CON             24Q                ; T
01F7 0220            640                 CON             1040Q              ;BLANK
01F8 00001000        641                 GOSUB           NEXT1
                     642                 GLB             STK00              ;FOR THE WAND
01FA                 643 STK00
01FA 0003            644                 GOTO            ABTXF3             ;MUST BE SHORT GOTO!!
01FB 0130            645                 LDI
01FC 0020            646                 CON             32                 ;BLANK
01FD 03A8            647                 SRSABC
01FE 03A8            648                 SRSABC
01FF 03A8            649                 SRSABC
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

                     650 *
                     651                GLB             STK04
                     652 * ENTRY POINT FOR WAND (3-16-79)
                     653 *
0200                 654 STK04
0200 00001000        655                GOSUB           =GTACOD         ;GET ALPHACODE[KEYCODE]
0202 02DC            656                PT=             13
0203 0110            657                LC              4               ;SET FOR LASTX
0204 010E            658                A=C             W               ;REG INDEX IN A.S, CHAR IN A.X
0205 0130            659                LDI
0206 004C            660                CON             114Q            ;"L"
0207 0366            661                A#C?            X
0208 0007            662                GOC             STK20
0209 00001000        663 STK05          GOSUB           =MASK           ;PUT CHAR OUT TO LCD
020B 00001000        664                GOSUB           =LEFTJ
020D 00001000        665                GOSUB           =ENCP00
020F 039C            666                PT=             0               ;GET PTEMP2
0210 0098            667                C=G
0211 0358            668                ST=C
0212 02B8            669                C=REGN          10
0213 021C            670                PT=             2
0214 01D0            671                LC              7
0215 014C            672                ST=1?           6               ;INDIRECT?
0216 0003            673                GONC            STK10
0217 021C            674                PT=             2
0218 03D0            675                LC              15
0219                 676 STK10
0219 00AE            677                ACEX            W
021A 037C            678                RCR             12
021B 00A2            679                ACEX            PT
021C 00001002        680                GOLONG          NLT020
                     681 *
021E 00001000        682 STK15          GOSUB           =BLINK
0220 0003            683                GOTO            STK03
                     684 *
0221 0130            685 STK20          LDI
0222 0057            686                CON             87              ;"W"
0223 01BE            687 STK30          A=A-1           S
0224 035E            688                A#0?            S
0225 0003            689                GONC            STK40
0226 0226            690                C=C+1           X
0227 0366            691                A#C?            X
0228 0007            692                GOC             STK30
0229 0003            693                GOTO            STK05
                     694 *
022A 0130            695 STK40          LDI
022B 0054            696                CON             124Q            ;"T"
022C 0366            697                A#C?            X
022D 0003            698                GONC            STK05
022E 0003            699                GOTO            STK15
```

```
LOCATION OBJECT CODE LINE     SOURCE LINE

                     701 * FDIGIT - FINAL DIGIT
                     702 * ENTRY CONDITIONS: A.S=SECOND TO LAST DIGIT, HEX, P SEL,
                     703 *     LCD CHIP ON, STATUS SET PTEMP1 UP
022F                 704 FDIGIT                                          ;SHIFT PROMPTS OFF RIGHT END OF LCD
022F 004E            705                 C=0             W
0230 00BE            706                 ACEX            S
0231 02FC            707                 RCR             13
0232 031C            708                 PT=             1
0233 00D0            709                 LC              3
0234 03E8            710                 SLSABC                          ;SEND DIGIT TO DISPLAY
0235                 711 FDIG10
0235 00001000        712                 GOSUB           NEXT1
0237 0003            713                 GOTO            FDIG30          ;BACKARROW RETURN (SHORT GOTO!!!)
0238 000C            714                 ST=1?           3               ;DIGIT?
0239 0007            715                 GOC             FDIG20          ;YES
023A 00001000        716                 GOSUB           =BLINK
023C 0003            717                 GOTO            FDIG10
023D                 718 FDIG20
023D 004E            719                 C=0             W
023E 00BE            720                 ACEX            S
023F 02FC            721                 RCR             13
0240 00D0            722                 LC              3
0241 03E8            723                 SLSABC                          ;SEND DIGIT TO DISPLAY
0242 0003            724                 GOTO            NULT_
                     725 *
0243                 726 FDIG30
0243 03B8            727                 RABCR                           ;SHIFT DIGIT OFF
0244 03E0            728                 RTN
                     729 *
                     730 *
0245 0130            731 NEXT1           LDI
0246 001F            732                 CON             31
0247 0003            733                 GOTO            NXT1E
0248 0130            734 NEXT2           LDI
0249 001F            735                 CON             31
024A 0003            736                 GOTO            NXT2E
024B 0130            737 NEXT3           LDI
024C 001F            738                 CON             31
024D 03E8            739                 SLSABC
024E 03E8            740 NXT2E           SLSABC
024F 03E8            741 NXT1E           SLSABC
0250 00001000        742 NEXT            GOSUB           =LEFTJ
0252 00001000        743                 GOSUB           =ENCP00
0254 03F8            744                 C=REGN          15              ;SAVE PTEMP2 IN
0255 001C            745                 PT=             3               ; REG 15[4:3]
0256 0098            746                 C=G
0257 03E8            747                 REGN=C          15
0258 03B8            748                 C=REGN          14
0259 033C            749                 RCR             1
025A 0358            750                 ST=C
025B 0088            751                 ST=1            5               ;SET PKSEQ
025C 0308            752                 ST=1            1               ;SET MSGFLG
025D 0398            753                 C=ST
025E 02FC            754                 RCR             13
025F 00001000        755                 GOSUB           =ANN_14
0261 00001000        756                 GOSUB           =RSTKB
0263 00001002        757                 GOLONG          =WKUP10
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

                     758 *
                     759 * NULT_ - NULL TEST FOLLOWING NUMERIC OPERAND
                     760 * ENTRY CONDITIONS: P SEL, LCD ON
 0265                761 NULT_
 0265 02DC           762                 PT=          13          ;INITIALIZE # OF DIGITS COUNTER
 0266 03D0           763                 LC           15
 0267 031C           764                 PT=          1
 0268 010E           765                 A=C          W           ;# OF DIGITS COUNTER IN A.S
 0269 03B8           766 NULT_1          RABCR
 026A 017E           767                 A=A+1        S
 026B 0358           768                 ST=C
 026C 004C           769                 ST=1?        4
 026D 0007           770                 GOC          NULT_1      ;SHIFT UNTIL " " OR " ."
 026E 0006           771                 A=0          X           ;INITIALIZE SUM
 026F 03F8           772 NULT_2          RABCL
 0270 0042           773                 C=0          PT
 0271 0056           774                 C=0          XS
 0272 0146           775                 A=A+C        X
 0273 01BE           776                 A=A-1        S           ;DECREMENT # OF DIGITS
 0274 0007           777                 GOC          NULT_3
 0275 00A6           778                 ACEX         X           ;MULTIPLY BY 10
 0276 01E6           779                 C=C+C        X
 0277 0106           780                 A=C          X
 0278 01E6           781                 C=C+C        X
 0279 01E6           782                 C=C+C        X
 027A 0146           783                 A=A+C        X
                     784                 LEGAL
 027B 0003           785                 GOTO         NULT_2
                     786 *
 027C                787 NULT_3
 027C 039C           788                 PT=          0
 027D 0098           789                 C=G
 027E 0358           790                 ST=C                     ;PUT UP PTEMP2
 027F 014C           791                 ST=1?        6           ;INDIRECT?
 0280 0003           792                 GONC         NULT_4      ;NO
 0281 0130           793                 LDI
 0282 0080           794                 CON          128
 0283 0146           795                 A=A+C        X           ;SET INDIRECT BIT
 0284 0086           796 NULT_4          B=A          X           ;SAVE ARG IN B.X
 0285 00001000       797                 GOSUB        =LEFTJ
 0287 00001000       798                 GOSUB        =ENCP00
 0289 02B8           799                 C=REGN       10          ;GET FC
 028A 010E           800                 A=C          W           ;FC TO A[4...]
 028B 008C           801                 ST=1?        5           ;XROM?
 028C 0007           802                 GOC          NLT020      ;YES. ARG IN B.X ONLY
 028D 00660086       803                 A=B          X           ;COPY ARG TO A.X
 028F 03E6           804 NULT_5          ASL          X           ; & COZY UP TO FC
 0290 0003           805                 GOTO         NLT020      ;FC,ARG IN A[4:1]
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LOCATION OBJECT CODE LINE     SOURCE LINE

 0291                807 NLT000
 0291 00001000       808                 GOSUB       =LEFTJ
 0293 00001000       809                 GOSUB       =ENCP00
 0295 02B8           810                 C=REGN      10
 0296 010E           811                 A=C         W              ;SAVE FC IN A
 0297 0130           812                 LDI
 0298 00C8           813                 CON         200
 0299 02E0           814                 DISOFF
 029A 03C8           815 NLT010          RSTKB
 029B 03CC           816                 CHKKB
 029C 0003           817                 GONC        NLT030
 029D 0266           818                 C=C-1       X
 029E 0003           819                 GONC        NLT010
 029F 0320           820                 DISTOG
 02A0                821 NLT020                                     ;FOR ENTRY HERE,
                     822                                            ;FC, ARG IN A[4:1]
 02A0 00001000       823                 GOSUB       NULTST
 02A2 0003           824                 GOTO        NLT040
 02A3 00001000       825 NLT030          GOSUB       =RST05         ;DEBOUNCE KEY UP
 02A5 00001000       826                 GOSUB       =CLLCDE
 02A7 0320           827                 DISTOG
 02A8 00001000       828                 GOSUB       =ENCP00
                     829                 GLB         NLT040
 02AA                830 NLT040                                     ;KEY IS UP. GO EXECUTE FCN
 02AA 0395           831                 CON         1625Q          ;FIRST GIVE PRINTER A CHANCE
 02AB 01BC           832                 CON         674Q           ;GOSUB PRT5
 02AC 00001000       833                 GOSUB       =RSTSEQ        ;CLEAR SHIFTSET, PKSEQ,
                     834                                            ;MSGFLAG, DATAENTRY,
                     835                                            ;CATALOGFLAG, & PAUSING
                     836                                            ;LEAVES SS0 UP
 02AE 039C           837                 PT=         0
 02AF 0098           838                 C=G
 02B0 03D8           839                 CSTEX                      ;GET PTEMP2
 02B1 004C           840                 ST=1?       4              ;INSERT?
 02B2 0003           841                 GONC        NLT050         ;NO
 02B3 034C           842                 ST=1?       12             ;PRIVATE?
 02B4 0007           843                 GOC         AB10XF         ;YES
 02B5 00AE           844                 ACEX        W
 02B6 00BC           845                 RCR         5
 02B7 00001002       846                 GOLONG      =INSLIN
                     847 *
 02B9 03D8           848 NLT050          CSTEX                      ;BRING BACK SS 0
 02BA 004E           849                 C=0         W
 02BB 005C           850                 PT=         4
 02BC 03D0           851                 LC          15             ;PUT NFRPU (@360)
 02BD 0170           852                 STK=C                      ; ON THE SUBROUTINE STACK
 02BE 00AE           853                 ACEX        W
 02BF 00BC           854                 RCR         5
 02C0 02FE           855                 C#0?        S
 02C1 00001003       856                 GOLC        =XCUTE
 02C3 0066           857                 ABEX        X              ;RETRIEVE 3 DIGIT ARGUMENT
 02C4 00001002       858                 GOLONG      =XCUTB1        ; FROM B.X TO A.X
                     859 *
                     860 * NULTST - NULL TEST
                     861 *
 02C6                862 NULTST                                     ;NULL TEST
 02C6 0130           863                 LDI
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    02C7 0240          864                  CON          576          ;INITIALIZE NULL TIMER
    02C8 01E6          865                  C=C+C        X
    02C9 03C8          866 NULT10           RSTKB
    02CA 03CC          867                  CHKKB                     ;KEY UP YET?
    02CB 00001002      868                  GOLNC        =RST05       ;GO DEBOUNCE
    02CD 0266          869                  C=C-1        X            ;NO. DECREMENT COUNTER
    02CE 0003          870                  GONC         NULT10
    02CF 0104          871                  ST=0         8            ;DON'T PRINT MESSAGE
    02D0 00001000      872                  GOSUB        =MSGA        ;KEY DOWN TOO LONG
    02D2 0000          873                  CON          =MSGNL
    02D3 0130          874                  LDI
    02D4 03E8          875                  CON          1000
    02D5 0266          876 NULT20           C=C-1        X            ;310 MILLISEC DELAY
    02D6 0003          877                  GONC         NULT20       ; SO "NULL" CAN BE SEEN
    02D7 00001002      878 AB10XF           GOLONG       =ABTS10
                       879                  GLB          NAME20
                       880                  GLB          NAMEA
                       881                  GLB          NAME21
                       882                  GLB          NAM40
                       883                  GLB          NAM44
                       884                  GLB          NM44_5
                       885                  GLB          NAME4A
                       886                  GLB          NAME4D
                       887 *
                       888 * PARSE LOGIC FOR ALPHA OPERANDS STARTS HERE
                       889 *
    02D9               890 NAMEA                                      ;ON ENTRY, SS IS SCRATCH
    02D9 00001000      891                  GOSUB        =ENCP00
    02DB 03A5          892                  CON          1645Q        ;GOSUB PRT3
    02DC 01BC          893                  CON          674Q
                       894                  GLB          PR3RT        ;FOR PRINTER
    02DD               895 PR3RT
    02DD 03B8          896                  C=REGN       14
    02DE 03D8          897                  CSTEX
    02DF 0288          898                  ST=1         7            ;SET ALPHAMODE
    02E0 03D8          899                  CSTEX
    02E1 03A8          900                  REGN=C       14
    02E2 004E          901                  C=0          W            ;INITIALIZE ALPHA OPERAND
    02E3 0268          902                  REGN=C       9
    02E4 00001000      903 NAME10           GOSUB        =ENLCD
    02E6 00001000      904 NAME20           GOSUB        NEXT1
    02E8 0003          905                  GOTO         NAME30       ;BACKARROW
    02E9               906 NAME21                                     ;ON ENTRY HERE, PT=1,
                       907                                            ;LCD CHIP ON, SS PTEMP1 UP
    02E9 014C          908                  ST=1?        6            ;SHIFT KEY?
    02EA 00001002      909                  GOLNC        NAM40
    02EC 00001000      910                  GOSUB        =TOGSHF      ;TOGGLE SHIFT KEY
    02EE 0003          911                  GOTO         NAME10
                       912 *
                       913                  GLB          NAME33       ;USED BY CARD RDR LOGIC
                       914                                            ;TO ABORT A PARTIAL
                       915                                            ;KEY SEQUENCE
                       916                                            ;MAY ALSO BE USED BY
                       917                                            ;PRINTER LOGIC
    02EF 00001000      918 NAME33           GOSUB        =LDSSTO
    02F1 0284          919                  ST=0         7            ;CLEAR ALPHAMODE
    02F2 0398          920                  C=ST
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

  02F3 03A8          921                REGN=C          14
  02F4 00001002      922                GOLONG          =ABTSEQ
                     923 *
  02F6               924 NAME30                                         ;ON ENTRY, PT=1, LCD CHIP ON
  02F6 00001000      925                GOSUB           =ENCP00         ;BKARROW HIT
  02F8 0278          926                C=REGN          9
  02F9 02EE          927                C#0?            W               ;ANY CHARS TO DELETE?
  02FA 0003          928                GONC            NAME33          ;NO
  02FB 037C          929                RCR             12              ;YES. DELETE ONE CHAR
  02FC 004A          930                C=0             WPT
  02FD 0268          931                REGN=C          9
  02FE 00001000      932                GOSUB           =OFSHFT
  0300 00001000      933                GOSUB           =ENLCD
  0302 03B8          934                RABCR                           ;SHIFT OFF ONE CHARACTER
  0303 0003          935 NAME31         GOTO            NAME20
                     936 *
  0304 030C          937 NAME34         ST=1?           1               ;OP2 BIT 1?
                     938                                                ;(IS EMPTY OPERAND AN ERROR?)
  0305 0003          939                GONC            NAME42          ;NO
                     940 *
  0306 00001000      941 NAME35         GOSUB           =BLINK
  0308 0003          942                GOTO            NAME10
                     943 *
                     944                GLB             NAME37
                     945 * ENTRY POINT ADD FOR WAND ON 3-13-79
                     946 *
  0309 00001000      947 NAME37         GOSUB           =GTACOD
  030B 0106          948                A=C             X               ;COPY CHARACTER TO A.X
  030C 00001000      949                GOSUB           =OFSHFT
  030E 01B6          950                A=A-1           XS              ;IS IT A CHARACTER?
  030F 0003          951                GONC            NAME35          ;NO
  0310 031C          952                PT=             1
  0311 0130          953                LDI
  0312 007F          954                CON             127             ;LAZY T
  0313 036A          955                A#C?            WPT
  0314 0003          956                GONC            NAME35
  0315 0130          957                LDI
  0316 003A          958                CON             58              ;COLON
  0317 036A          959                A#C?            WPT
  0318 0003          960                GONC            NAME35
  0319 0130          961                LDI
  031A 002E          962                CON             46              ;D.P.
  031B 036A          963                A#C?            WPT
  031C 0003          964                GONC            NAME35
  031D 0130          965                LDI
  031E 002C          966                CON             44              ;COMMA
  031F 036A          967                A#C?            WPT
  0320 0003          968                GONC            NAME35
  0321 0278          969                C=REGN          9
  0322 02EA          970                C#0?            WPT             ;FULL ALREADY?
  0323 0007          971                GOC             NAME35          ;FULL
  0324 00AA          972                ACEX            WPT             ;ADD CHARACTER TO REG 9
  0325 010A          973                A=C             WPT             ;RESTORE CHARACTER TO A.X
  0326 023C          974                RCR             2               ;-
  0327 0268          975                REGN=C          9               ;-
                     976                                                ;ADD CHAR TO DISPLAY
  0328 00EE          977                BCEX            W               ;SAVE OPERAND IN B
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    0329 00001000     978                GOSUB        =ENLCD
    032B 00001000     979                GOSUB        =MASK          ;TRANSLITERATE CHAR AND
                      980                                            ;SEND TO DISPLAY
                      981                                            ;NOTE MASK DECREMENTS B.S
    032D 0003         982                GOTO         NAME31
    032E 00000000     983                FILLTO       1463Q          ;PRESERVE ENTRY TABLE
                      984 *
    0334 00001000     985 NAM40          GOSUB        =ENCP00
    0336 008C         986                ST=1?        5              ;ALPHA KEY?
    0337 0003         987                GONC         NAME37
    0338 031C         988                PT=          1
    0339 0278         989                C=REGN       9
    033A 02EE         990                C#0?         W              ;ANY CHARS IN OPERAND?
    033B 0003         991                GONC         NAME34         ;NO
    033C 00001000     992                GOSUB        =RTJLBL        ;RIGHT JUSTIFY OPERAND
    033E 0268         993 NAME42         REGN=C       9              ;PUT BACK RIGHT-JUSTIFIED
                      994                                            ;OPERAND
    033F 03B8         995                C=REGN       14             ;PUT UP SS 0
    0340 0358         996                ST=C
    0341 0284         997                ST=0         7              ;CLEAR ALPHAMODE
    0342 0398         998                C=ST
    0343 00001000     999                GOSUB        =ANN_14        ;STORE STATUS SETS AND
                     1000                                            ;UPDATE ALPHA ANNUNCIATOR
    0345 02B8        1001                C=REGN       10
    0346 003C        1002                RCR          3
    0347 0106        1003                A=C          X              ;FC TO A.X
    0348 0130        1004                LDI
    0349 000F        1005                CON          0*16+15        ;FC FOR ASN
    034A 036A        1006                A#C?         WPT            ;FC#ASN?
    034B 00001002    1007                GOLNC        =KEYOP         ;THIS IS ASN
    034D 0086        1008                B=A          X              ;SAVE FC IN B.X
    034E 00001000    1009                GOSUB        =ENLCD         ;THIS IS NOT ASN
    0350 00001000    1010                GOSUB        =LEFTJ
    0352 00001000    1011                GOSUB        =ENCP00
    0354 0278        1012                C=REGN       9
    0355 00E0        1013                SELQ
    0356 02DC        1014                PT=          13
    0357 00A0        1015                SELP
    0358 021C        1016                PT=          2
    0359 02F2        1017                C#0?         PQ             ;MORE THAN 1 CHAR IN LABEL?
    035A 00001000    1018                GSUBNC       =ALCL00        ;NO. TEST FOR LOCAL ALPHA LBL
    035C 0066        1019                ABEX         X              ;RETRIEVE FC FROM B
    035D 0130        1020                LDI
    035E 001E        1021                CON          1*16+14        ;FC FOR AXEQ
    035F 031C        1022                PT=          1
    0360 036A        1023                A#C?         WPT            ;FC#AXEQ?
    0261 0007        1024                GOC          NAME46         ;NOT AXEQ
    0362 0278        1025                C=REGN       9
    0363 0158        1026                M=C
    0364 00001000    1027                GOSUB        =ASRCH
    0366 02EE        1028                C#0?         W              ;FOUND?
    0367 0007        1029                GOC          NAME44         ;YES
    0368 03B8        1030                C=REGN       14             ;RESTORE SS 0
    0369 0358        1031                ST=C
    036A 03F8        1032                C=REGN       15             ;RESTORE PTEMP2 TO G
    036B 003C        1033                RCR          3
    036C 039C        1034                PT=          0
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    036D 0058        1035                 G=C
    036E 000C        1036                 ST=1?          3              ;PROGRAM MODE?
    036F 0007        1037                 GOC            NAME46         ;YES
    0370 02B8        1038                 C=REGN         10             ;RESTORE FC TO A
    0371 010E        1039                 A=C            W              ;FOR PRTS
    0372 0395        1040                 CON            1625Q          ;GOSUB PRTS
    0373 01BC        1041                 CON            674Q
    0374 00001000    1042                 GOSUB          =RSTSEQ
    0376 00001002    1043                 GOLONG         =ERRNE
                     1044 *
    0378 024C        1045 NAME44          ST=1?          9              ;MICROCODE FCN?
    0379 0007        1046                 GOC            NAME48         ;YES
                     1047 * USER PROGRAM. PC IN C[3:0].
                     1048 * IF IN ROM THEN S2=1 AND XROM IN C[7:4]
    037A 0158        1049                 M=C                           ;SAVE PC IN M
    037B 007C        1050                 RCR            4
    037C 0070        1051                 N=C                           ;PUT XROM TO N[3:0]
    037D             1052 NAM44
                     1053 * ENTRY CONDITIONS FOR NAM44@:
                     1054 * S2=1 FOR ROM, S2=0 FOR RAM
                     1055 * PC IN M[3:0]
                     1056 * IF ROM, THEN XROM IN N[3:0]
                     1057 * IF RAM, THEN AXEQ ALREADY IN PLACE IN REG 10
    037D 0248        1058                 ST=1           9              ;SAY ADDRESS ALREADY KNOWN
    037E             1059 NM44_5
                     1060 * INSTRUCTIONS BELOW TO CLEAR AND SET S5 MAY NOT BE NECESSARY
                     1061 * BECAUSE NLT020 DOESN'T LOOK AT S5.
    037E 0084        1062                 ST=0           5              ;CLEAR ROM BIT FOR NLT020
    037F 020C        1063                 ST=1?          2              ;ROM?
    0380 0003        1064                 GONC           NAM44A         ;NO
    0381 0088        1065                 ST=1           5              ;SET ROM BIT FOR NLT020
    0382 00B0        1066                 C=N                           ;GET XROM TO C[3:0]
    0383 00001000    1067                 GOSUB          =STORFC
    0385 0044        1068 NAM44A          ST=0           4              ;CLEAR INSERT BIT FOR NLT020
    0386 03B8        1069                 C=REGN         14
    0387 03D8        1070                 CSTEX                         ;PUT UP SS0
    0388 000C        1071                 ST=1?          3              ;PROGRAM MODE?
    0389 0003        1072                 GONC           NAM44B         ;NO
    038A 0358        1073                 ST=C
    038B 0048        1074                 ST=1           4              ;SET INSERT BIT FOR NLT020
    038C 0398        1075                 C=ST
    038D 0358        1076 NAM44B          ST=C                          ;TEMP STATUS UP & IN C
    038E 039C        1077                 PT=            0
    038F 0058        1078                 G=C                           ;TEMP STATUS TO G FOR NLT020
    0390 024C        1079                 ST=1?          9              ;IS ADDRESS KNOWN?
    0391 0003        1080                 GONC           NAME46         ;NO
    0392 00001000    1081                 GOSUB          DSPLN_         ;ENABLE AND CLEAR DISPLAY
                     1082                                              ;IF S4 THEN INC & DSP LINE#
    0394 00001000    1083                 GOSUB          =ENCP00
    0396 0198        1084                 C=M                           ;PUT LABEL ADDR TO
    0397 010E        1085                 A=C            W              ; A[3:0]
    0398 00001000    1086                 GOSUB          =TXTLBL
    039A 02B8        1087 NAME46          C=REGN         10
    039B 010E        1088                 A=C            W              ;FC TO A[4:1]
    039C 0086        1089                 B=A            X              ;IN CASE THIS IS GTO .ALPHA
    039D 00001002    1090                 GOLONG         NLT020
                     1091 *
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LOCATION OBJECT CODE LINE     SOURCE LINE

                     1092 *
039F                 1093 NAME48                                          ;MICROCODE FCN
039F 008C            1094                ST=1?          5                 ;MAINFRAME?
03A0 0003            1095                GONC           NAME4C            ;NO
                     1096                                                 ;YES. FC IS IN C[4:5]
03A1 007C            1097                RCR            4                 ;FC TO C.X
03A2 0056            1098                C=0            XS
03A3 010E            1099                A=C            W                 ;NEW FC TO A.X
03A4 03B8            1100 NAME4A         C=REGN         14
03A5 0358            1101                ST=C                             ;PUT UP SS 0
03A6 00AE            1102                ACEX           W                 ;BRING BACK FC TO C
03A7 0244            1103                ST=0           9                 ;RESTORE S9=0
                     1104                                                 ;(NOT AN AUTO-REASSIGNED FCN)
03A8 00001002        1105                GOLONG         =PARS56
                     1106 *
03AA                 1107 NAME4C
                     1108 * WE COME TO NAME4C FROM ASRCH IN THE AXEQ LOGIC
                     1109 * XADR IS IN C[3:0] AND XROM IS IN C[7:4]
03AA 0158            1110                M=C                              ;SAVE XADR IN M[3:0]
03AB 007C            1111                RCR            4                 ;MOVE XROM TO C[3:0]
03AC                 1112 NAME4D
                     1113 * REPARSE LOGIC FOR MICROCODED XROM FUNCTIONS
                     1114 * ON ENTRY, XADR IS IN M[3:0] AND XROM IS IN C[3:0]
03AC 00001000        1115                GOSUB          =STORFC           ;PUT XROM TO REG 10
03AE 03B8            1116                C=REGN         14                ;GET SS 0
03AF 0358            1117                ST=C
03B0 031C            1118                PT=            1
03B1 0198            1119                C=M                              ;GET XADR
03B2 01BC            1120                RCR            11                ;PUT XADR TO C.M
03B3 0158            1121                M=C                              ;PUT XADR TO M[6:3]
03B4 000C            1122                ST=1?          3                 ;PROGRAM MODE?
03B5 0003            1123                GONC           NAME4F            ;NO
03B6 0330            1124                CXISA
03B7 02E6            1125                C#0?           X                 ;PROGRAMMABLE?
03B8 0003            1126                GONC           NAME4E            ;NO
03B9 00D0            1127                LC             3                 ;SET XROM BIT(5)
                     1128                                                 ;& INSERT BIT(4)
03BA 0003            1129                GOTO           NAME4G
                     1130 * FOR MICROCODE FCNS IN PLUG-IN ROMS, IF C(XADR)=0 THEN WE LOOK
                     1131 * AT C(XADR+1) TO DETERMINE WHETHER THE FCN SHOULD BE EXECUTED ON
                     1132 * KEY DOWN.  IF C(XADR+1)=0 THEN THE FCN IS XKD ELSE THE FCN IS
                     1133 * A NORMAL NON-PROGRAMMABLE FUNCTION.
03BB 023A            1134 NAME4E         C=C+1          M
03BC 0330            1135                CXISA
03BD 02E6            1136                C#0?           X                 ;IS C(XADR+1) NON-ZERO?
03BE 0007            1137                GOC            NAME4F
03BF 01E0            1138                GOTOC                            ;XKD FCN - GO DO IT
                     1139 *
03C0 0090            1140 NAME4F         LC             2                 ;SET XROM BIT(5) ONLY
03C1 0010            1141 NAME4G         LC             0
03C2 0358            1142                ST=C                             ;INITIALIZE PTEMP2
03C3 039C            1143                PT=            0
03C4 0058            1144                G=C                              ; & SAVE IN G
03C5 00001002        1145                GOLONG         =PARS75
                     1146
                     1147 *
                     1148 * DSPLN_ - DISPLAY (LINE#+1)
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

                     1149 * ON ENTRY, LINE NUMBER MUST BE VALID IN REG 15, AND CHIP 0 MUST
                     1150 *     BE ENABLED.
                     1151 * 1. GETS LINE NUMBER FROM REG 15
                     1152 * 2. CLEARS LCD
                     1153 * IF S4 IS CLEAR, THEN RETURNS IMMEDIATELY
                     1154 * 3. INCREMENTS LINE NUMBER (BUT DOESN'T STORE BACK TO REG 15)
                     1155 * 4. IF PRIVATE, REPLACES LINE NUMBER WITH 0
                     1156 * 5. CALLS GENNUM TO PUT LINE NUMBER TO LCD
                     1157 * 6. SHIFTS ON A BLANK FOLLOWING THE LINE NUMBER
                     1158 * ON EXIT, THE DISPLAY CHIP IS ENABLED AND THE PT=0
                     1159 * USES A, B.X, B.S, C, & ONE SUBROUTINE LEVEL
                     1160 *
   03C7 03F8         1161 DSPLN_          C=REGN          15              ;GET LINE NUMBER
   03C8 00E6         1162                 BCEX            X
   03C9 00001000     1163                 GOSUB           =CLLCDE
   03CB 004C         1164                 ST=1?           4
   03CC 03A0         1165                 RTNNC
   03CD 0066         1166                 ABEX            X               ;BRING LINE # TO A.X
   03CE 0166         1167                 A=A+1           X               ;INCREMENT IT
   03CF 034C         1168                 ST=1?           12              ;PRIVATE?
   03D0 0003         1169                 GONC            DSPL10          ;NO
   03D1 0006         1170                 A=0             X               ;YES - ZERO OUT LINE#
   03D2 001E         1171 DSPL10          A=0             S               ;SET UP FOR GENNUM
   03D3 00001000     1172                 GOSUB           =GENNUM
   03D5 0130         1173                 LDI
   03D6 0020         1174                 CON             32
   03D7 03E8         1175                 SLSABC                          ;SHIFT IN A BLANK
   03D8 03E0         1176                 RTN
                     1177 *
                     1178 * GOLONG - LONG BRANCH ROUTINE FOR PLUG IN ROMS
                     1179 * SAME AS GOSUB EXCEPT USES 1 SUBROTINE LEVEL TEMPORARILY.
                     1180 *
                     1181 * GOSUB - SUBROUTINE ROUTINE FOR PORT ADDRESSED PLUG IN ROMS
                     1182 * THIS SUBROUTINE ALLOWS SUBROUTINE CALLS IN PORT ADDRESSED
                     1183 *- PLUG IN ROMS.
                     1184 * THE CALLING SEQUENCE IS:
                     1185 *       GOSUB  GOSUB      MUST BE IN HEX MODE ON ENTRY!!
                     1186 *       DEF    <NAME>
                     1187 * WHERE NAME IS IN THE SAME 1024 WORD ROM AS THE CALLING ROUTINE.
                     1188 *
                     1189 * WARNING!!! - CALLING A SUBROUTINE IN ANOTHER 1024 ROM FROM THE
                     1190 * CURRENT ONE WILL NOT WORK. USE GOSUB[0-3].
                     1191 *
                     1192 * USES ONLY C, NO ADDITIONAL SUBROUTINE LEVELS
                     1193 *
                     1194 * GOLNGH - SAME AS GOLONG EXCEPT SETS HEX MODE ON ENTRY.
                     1195 * GOSUBH - SAME AS GOSUB EXCEPT SETS HEX MODE ON ENTRY.
                     1196 *
                     1197                 GLB             GOLNGH
                     1198                 GLB             GOLONG
                     1199                 GLB             GOSUBH
                     1200                 GLB             GOSUB
   03D9 0260         1201 GOLNGH          SETHEX
   03DA 01B0         1202 GOLONG          C=STK                           ;GET ADDRESS OF CALLING ROUTINE
   03DB 0330         1203                 CXISA                           ;GET DESTINATION ADDRESS
   03DC 0003         1204                 GOTO            GOSUBA          ;GO CREATE THE CORRECT 16 BIT ADDRESS
                     1205
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LOCATION OBJECT CODE LINE     SOURCE LINE

    03DD 0260        1206 GOSUBH          SETHEX
    03DE 01B0        1207 GOSUB           C=STK                          ;GET ADDRESS OF CALLING ROUTINE
    03DF 0330        1208                 CXISA                          ;GET THE DESTINATION ADDRESS
    03E0 023A        1209                 C=C+1          M               ;ADVANCE ADDRESS BEYOND ARGUMENT FOR RETURN.
    03E1 0170        1210                 STK=C                          ;PUT RETURN ADDRESS BACK
    03E2 01EE        1211 GOSUBA          C=C+C          W               ;MOVE OVER BOTH ADDRESSES TWO BITS
    03E3 01EE        1212                 C=C+C          W               ;SO THAT THE DESIRED 10 BIT BOUNDARY
    03E4 03DA        1213                 CSR            M               ;FALLS ON A DIGIT BOUNDARY C[2-3]
    03E5 03DA        1214                 CSR            M               ;COMBINE 10 BITS FROM ARGUMENT
    03E6 03DA        1215                 CSR            M               ;WITH 6 BITS FROM SUBROUTINE STACK
    03E7 01EE        1216                 C=C+C          W               ;TO FORM A 16 BIT ADDRESS
    03E8 01EE        1217                 C=C+C          W               ;AND POSITION PROPERLY FOR GOTOC
    03E9 037C        1218                 RCR            12
    03EA 01E0        1219                 GOTOC                          ;GO TO THE DESIRED ADDRESS.
                     1220 *
                     1221
                     1222                 GLB            GT3DBT
    03EB 00001000    1223 GT3DBT          GOSUB          =GETPC          ;STATUS_3RD BYTE
    03ED 0158        1224                 M=C                            ;-
    03EE 00001000    1225                 GOSUB          =INCAD2         ;-
    03F0 00001000    1226                 GOSUB          =GTBYTA         ;-
    03F2 03D8        1227                 CSTEX                          ;-
    03F3 03E0        1228                 RTN                            ;-
                     1229
                     1230
                     1231                 GLB            XSIGN
                     1232 ***************************************************
                     1233 * THE SIGN FUNCTION RETURNS ONE FOR POSITIVE
                     1234 * NUMBERS AND -1 FOR NEGATIVE NUMBERS AND ZERO FOR
                     1235 * ALPHA DATA.
                     1236 ***************************************************
                     1237
    03F4 035C        1238 XSIGN           PT=            12
    03F5 00F8        1239                 C=REGN         3
    03F6 004A        1240                 C=0            WPT
    03F7 010E        1241                 A=C            W
    03F8 01BE        1242                 A=A-1          S
    03F9 018E        1243                 A=A-1          S
    03FA 0007        1244                 GOC            DONSGN          ;MAKES USE OF OVFL10
                     1245                                                ;AT NFRX TO ZERO OUT
                     1246                                                ;WHOLE WORD BECAUSE
                     1247                                                ;MANTISSA IS ZERO
    03FB 0050        1248                 LC             1
    03FC 00001002    1249 DONSGN          GOLONG         =NFRX
                     1250 *
                     1251 * MUST HAVE AT LEAST 2 WORDS AT THE END OF CN3 FOR CHECKSUM AND
                     1252 * TRAILER.
                     1253 *
                     1254                 FILLTO         1775Q
    03FE 0008        1255 REVLEV          CON            8               ;REV LEVEL= H
    03FF             1256 CKSUM0          BSS            1
                     1257                 END

Errors=    0
```

LINE#	SYMBOL	TYPE	REFERENCES
878	AB10XF	P	843
384	ABTS10	P	6,878
382	ABTSEQ	P	5,342,406,427,632,922
632	ABTXF3	P	582,644
601	AJ2	P	7,344,584
604	AJ210	P	599
607	AJ220	P	605
595	AJ3	P	8,429
	ALCL00	E	1018
	ANNOUT	E	383
	ANN_14	E	755,999
	ASRCH	E	1027
	BLINK	E	348,415,433,456,590,625,682,716,941
1256	CKSUM0	P	
	CLLCDE	E	274,382,551,826,1163
43	CLRSB2	P	41
45	CLRSB3	P	42
77	CLRSBX	P	47
	DATENT	E	225
1249	DONSGN	P	1244
1171	DSPL10	P	1169
1161	DSPLN_	P	4,305,1081
	ENCPOO	E	468,487,563,665,743,798,809,828,891,925,985,1011,1083
	ENLCD	E	122,499,571,903,933,978,1009
	ERRNE	E	1043
711	FDIG10	P	717
718	FDIG20	P	10,410,412,715
726	FDIG30	P	713
704	FDIGIT	P	9,347,589,624
	GENNUM	E	1172
	GETPC	E	1223
1201	GOLNGH	P	1197
1202	GOLONG	P	1198
1207	GOSUB	P	1200
1211	GOSUBA	P	1204
1206	GOSUBH	P	1199
1223	GT3DBT	P	1222
	GTACOD	E	655,947
	GTBYTA	E	1226
	INCAD2	E	1225
563	IND	P	11,353,414
579	IND20	P	591
581	IND21	P	580
590	IND30	P	588
570	INDGTO	P	522
564	INDXEQ	P	523
	INSLIN	E	846
	KEYOP	E	1007
	LDSSTO	E	370,918
	LEFTJ	E	664,742,797,808,1010
	MASK	E	663,979
	MESSL	E	572,637
620	MID10	P	626
625	MID15	P	623
628	MID20	P	621
614	MIDDIG	P	12,432,455
	MSGA	E	872

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LINE#	SYMBOL	TYPE	REFERENCES
	MSGNL	E	873
985	NAM40	P	882,909
1068	NAM44A	P	1064
1076	NAM44B	P	1072
1052	NAM44_	P	883
903	NAME10	P	911,942
904	NAME20	P	879,935
906	NAME21	P	881
924	NAME30	P	905
935	NAME31	P	982
918	NAME33	P	913,928
937	NAME34	P	991
941	NAME35	P	951,956,960,964,968,971
947	NAME37	P	944,987
993	NAME42	P	939
1045	NAME44	P	1029
1087	NAME46	P	1024,1037,1080
1093	NAME48	P	1046
1100	NAME4A	P	885
1107	NAME4C	P	1095
1112	NAME4D	P	886
1134	NAME4E	P	1126
1140	NAME4F	P	1123,1137
1141	NAME4G	P	1129
890	NAMEA	P	420,511,880
151	NEWFCN	P	89
742	NEXT	P	13
731	NEXT1	P	14,403,641,712,904
734	NEXT2	P	15,339,579,620
737	NEXT3	P	16,424,452
	NFRKB	E	389
	NFRX	E	1249
807	NLT000	P	17,318
815	NLT010	P	819
821	NLT020	P	18,680,802,805,1090
825	NLT030	P	817
830	NLT040	P	824,829
848	NLT050	P	841
1059	NM44_5	P	884
866	NULTT0	P	870
876	NULT20	P	877
862	NULTST	P	22,823
761	NULT_	P	19,612,724
766	NULT_1	P	770
772	NULT_2	P	785
787	NULT_3	P	20,482,777
796	NULT_4	P	792
804	NULT_5	P	21,292
741	NXT1E	P	733
740	NXT2E	P	736
	OFSHFT	E	273,304,932,949
72	PAR001	P	74
80	PAR003	P	69,71,73,76
87	PAR005	P	83
339	PAR110	P	349
341	PAR111	P	340
348	PAR112	P	23,355,359,362,500

LINE#	SYMBOL	TYPE	REFERENCES
350	PAR115	P	346
356	PAR130	P	
403	PARA05	P	395,416
405	PARA06	P	404
415	PARA10	P	421
418	PARA45	P	408
423	PARA50	P	398
424	PARA60	P	27,434,460,559
426	PARA61	P	425
433	PARA65	P	463,467
437	PARA70	P	431
448	PARA75	P	445
452	PARA80	P	457
456	PARA90	P	
497	PARB10	P	528,531
502	PARB15	P	498
513	PARB20	P	493
525	PARB30	P	514
537	PARB40	P	533
112	PARS05	P	109
128	PARS10	P	130
132	PARS20	P	138
139	PARS30	P	133
162	PARS50	P	157
206	PARS52	P	165
211	PARS55	P	160
228	PARS56	P	26,372,1105
247	PARS57	P	242,244
268	PARS60	P	202
294	PARS70	P	263
299	PARS75	P	28,1145
223	PARSDE	P	220
53	PARSE	P	24
391	PARSEA	P	336
484	PARSEB	P	25,351
895	PR3RT	P	894
459	PRA100	P	453
462	PRA110	P	443
476	PRA115	P	465
	PROMF1	E	277,554
	PROMF2	E	308
	PUTPCX	E	77
192	RAK05	P	180,184
197	RAK06	P	194
203	RAK10	P	172,189,191
	RAK60	E	168
1255	REVLEV	P	
	ROW940	E	279
	RST05	E	825,868
	RSTKB	E	756
	RSTSEQ	E	386,833,1042
	RTJLBL	E	992
	SEARCH	E	200
636	STK	P	29,357,586
643	STK00	P	642
637	STK03	P	683
654	STK04	P	651

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LINE#	SYMBOL	TYPE	REFERENCES
663	STK05	P	693,698
676	STK10	P	673
682	STK15	P	699
685	STK20	P	662
687	STK30	P	692
695	STK40	P	689
	STORFC	E	1067,1115
	TBITMP	E	166
	TOGSHF	E	910
	TXTLBL	E	1086
	WKUP10	E	757
	XCUTB1	E	858
	XCUTE	E	856
511	XFRNMA	P	475
1238	XSIGN	P	1231

```
LOCATION OBJECT CODE LINE     SOURCE LINE

                      1 "COCONUT"
                      2 * HP41C MAINFRAME MICROCODE ADDRESSES @10000-11777
                      3 * CONTENTS:
                      4 * 1. EXECUTION POINTS FOR MAINFRAME FUNCTIONS (MUST BE IN
                      5 *    @10000-11736)
                      6 *
                      7                GLB             CAT3
                      8                GLB             PLUS
                      9                GLB             MINUS
                     10                GLB             DEC
                     11                GLB             OCT
                     12                GLB             MULTIPLY
                     13                GLB             ADVNCE
                     14                GLB             DIVIDE
                     15                GLB             POWER_OF_TEN
                     16                GLB             ABS
                     17                GLB             ACOS
                     18                GLB             AGTO
                     19                GLB             AOFF
                     20                GLB             AON
                     21                GLB             ARCL
                     22                GLB             ASHF
                     23                GLB             ASIN
                     24                GLB             ASN
                     25                GLB             ASTO
                     26                GLB             ATAN
                     27                GLB             AVIEW
                     28                GLB             AXEQ
                     29                GLB             BEEP
                     30                GLB             BST
                     31                GLB             CAT
                     32                GLB             CF
                     33                GLB             CHS
                     34                GLB             CLA
                     35                GLB             CLDSP
                     36                GLB             CLP
                     37                GLB             CLREG
                     38                GLB             CLSIG
                     39                GLB             CLST
                     40                GLB             CLX
                     41                GLB             COPY
                     42                GLB             COS
                     43                GLB             D_R
                     44                GLB             DEG
                     45                GLB             DEL
                     46                GLB             DELETE
                     47                GLB             DSE
                     48                GLB             END
                     49                GLB             ENG
                     50                GLB             ENTER
                     51                GLB             E_TO_X
                     52                GLB             E_TO_X_MINUS_1
                     53                GLB             FACT
                     54                GLB             FC
                     55                GLB             FC_C
                     56                GLB             FIX
                     57                GLB             FRAC
```

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```
LOCATION OBJECT CODE LINE     SOURCE LINE

                      58                GLB             FS
                      59                GLB             FS_C
                      60                GLB             GRAD
                      61                GLB             GTO
                      62                GLB             GTOL
                      63                GLB             HMS_PLUS
                      64                GLB             HMS_MINUS
                      65                GLB             HMS_H
                      66                GLB             H_HMS
                      67                GLB             INT
                      68                GLB             ISG
                      69                GLB             LASTX
                      70                GLB             LBL
                      71                GLB             LN
                      72                GLB             LN1_PLUS_X
                      73                GLB             LOG
                      74                GLB             MEAN
                      75                GLB             MOD
                      76                GLB             MODE
                      77                GLB             OFF
                      78                GLB             ONE_BY_X
                      79                GLB             P_R
                      80                GLB             PACK
                      81                GLB             PCT
                      82                GLB             PCTCH
                      83                GLB             PI
                      84                GLB             PROMPT
                      85                GLB             PSE
                      86                GLB             R_D
                      87                GLB             R_P
                      88                GLB             RUN_STOP
                      89                GLB             RAD
                      90                GLB             RCL
                      91                GLB             RDN
                      92                GLB             RND
                      93                GLB             RTN
                      94                GLB             ROLLUP
                      95                GLB             SCI
                      96                GLB             SF
                      97                GLB             SHIFT
                      98                GLB             SIGMA_PLUS
                      99                GLB             SIGMA_MINUS
                     100                GLB             SIGN
                     101                GLB             SIGREG
                     102                GLB             SIN
                     103                GLB             SIZE
                     104                GLB             SQRT
                     105                GLB             SST
                     106                GLB             STAYON
                     107                GLB             STDEV
                     108                GLB             STO
                     109                GLB             STO_PLUS
                     110                GLB             STO_MINUS
                     111                GLB             STO_MULTIPLY
                     112                GLB             STO_DIVIDE
                     113                GLB             STOP
                     114                GLB             TAN
```

```
LOCATION OBJECT CODE LINE     SOURCE LINE

                     115                GLB          TONE
                     116                GLB          VIEW
                     117                GLB          X_NE_O
                     118                GLB          X_NE_Y
                     119                GLB          X_LT_O
                     120                GLB          X_LE_O
                     121                GLB          X_LE_Y
                     122                GLB          X_XCHNG
                     123                GLB          X_XCHNG_Y
                     124                GLB          X_LT_Y
                     125                GLB          X_EQ_O
                     126                GLB          X_EQ_Y
                     127                GLB          X_GT_O
                     128                GLB          X_GT_Y
                     129                GLB          XEQ
                     130                GLB          XGOIND
                     131                GLB          X_TO_2
                     132                GLB          Y_TO_X
                     133
                     134 *
                     135 * PKTTAB - PARSE KEY TYPE TABLE
                     136 * MUST START AT 0 IN QUAD 4 (1000=@10000)
                     137 * LOGICAL COLUMN 0
0000 0041            138                CON          65          ;A
0001 0046            139                CON          70          ;F
0002 0100            140                CON          256         ;SHIFT
0003 0000            141                CON          0
0004 0002            142                CON          2           ;-
0005 0001            143                CON          1           ;+
0006 0003            144                CON          3           ;*
0007 0004            145                CON          4           ;/
                     146 * LOGICAL COLUMN 1
0008 0042            147                CON          66          ;B
0009 0047            148                CON          71          ;G
000A 0000            149                CON          0
000B 0000            150                CON          0
000C 0027            151                CON          39          ;7
000D 0024            152                CON          36          ;4
000E 0021            153                CON          33          ;1
000F 0020            154                CON          32          ;0
                     155 * LOGICAL COLUMN 2
0010 0043            156                CON          67          ;C
0011 0048            157                CON          72          ;H
0012 0000            158                CON          0
0013 0000            159                CON          0
0014 0028            160                CON          40          ;8
0015 0025            161                CON          37          ;5
0016 0022            162                CON          34          ;2
0017 0200            163                CON          512         ;DP
                     164 * LOGICAL COLUMN 3
0018 0044            165                CON          68          ;D
0019 0049            166                CON          73          ;I
001A 0000            167                CON          0
001B 0000            168                CON          0
001C 0029            169                CON          41          ;9
001D 0026            170                CON          38          ;6
001E 0023            171                CON          35          ;3
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    001F 0000         172                 CON          0
                      173 * LOGICAL COLUMN 4
    0020 0045         174                 CON          69            ;E
    0021 0040         175                 CON          64            ;J
    0022 0000         176                 CON          0
    0023 000F         177                 CON          15            ;BACKARROW
    0024 0080         178                 CON          128           ;ALPHA
    0025 0000         179                 CON          0
    0026 0000         180                 CON          0
                      181                                            ;OFF KEY IS SPECIAL
    0027 0098         182                 CON          230Q
    0028 001E         183                 CON          36Q
    0029 0019         184                 CON          31Q
    002A 00B0         185 Y_TO_X          C=N
    002B 00001000     186                 GOSUB        =XY_TO_X
    002D 0003         187                 GOTO         NFRXY_
    002E 00AB         188                 CON          253Q
    002F 0013         189                 CON          23Q
    0030 000D         190                 CON          15Q
    0031 0008         191                 CON          10Q
    0032 00B0         192 HMS_PLUS        C=N
    0033 00001000     193                 GOSUB        XTOHRS
    0035 00F0         194                 NCEX
    0036 00B8         195                 C=REGN       2
    0037 00001000     196                 GOSUB        XTOHRS
    0039 010E         197                 A=C          W
    003A 00B0         198                 C=N
    003B 00001000     199                 GOSUB        =AD2_10
    003D 0088         200                 ST=1         5
    003E 00001000     201                 GOSUB        XTOHRS
    0040 0003         202                 GOTO         NFRXY_
    0041 00AD         203                 CON          255Q
    0042 0013         204                 CON          23Q
    0043 000D         205                 CON          15Q
    0044 0008         206                 CON          10Q
    0045 00B0         207 HMS_MINUS       C=N
    0046 02BE         208                 C=-C-1       S
    0047 00F0         209                 CNEX
    0048 0003         210                 GOTO         HMS_PLUS
    0049 00AB         211                 CON          253Q
    004A 00B0         212 PLUS            C=N
    004B 0003         213                 GOTO         ADD210
    004C 0084         214                 CON          204Q
    004D 000F         215                 CON          17Q
    004E 000D         216                 CON          15Q
    004F 00B0         217 MOD             C=N
    0050 00001000     218                 GOSUB        =MOD10
    0052 0003         219                 GOTO         NFRXY_
    0053 00AD         220                 CON          255Q
    0054 00B0         221 MINUS           C=N
    0055 02BE         222                 C=-C-1       S
    0056 0000         223                 NOP
    0057 00001000     224 ADD210          GOSUB        =AD2_10
    0059 00001002     225 NFRXY_          GOLONG       =NFRXY
    005B 00AA         226                 CON          252Q
    005C 00B0         227 MULTIPLY        C=N
    005D 00001000     228                 GOSUB        =MP2_10
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    005F 0003          229                GOTO          NFRXY_
    0060 00A5          230                CON           245Q
    0061 01A6          231 PCT            A=A-1         X
    0062 01A6          232                A=A-1         X
    0063 00B0          233                C=N
    0064 00001000      234 TIMES          GOSUB         =MP2_10
    0066 00001002      235                GOLONG        =NFRX
    0068 00B2          236                CON           262Q
    0069 001E          237                CON           36Q
    006A 0018          238                CON           30Q
    006B 00B0          239 X_TO_2         C=N
    006C 010E          240                A=C           W
    006D 0003          241                GOTO          TIMES
    006E 00AF          242                CON           257Q
    006F 00B0          243 DIVIDE         C=N
    0070 00001000      244                GOSUB         =DV2_10
    0072 0003          245                GOTO          NFRXY_
    0073 0093          246                CON           223Q
    0074 0002          247                CON           2Q
    0075 0001          248                CON           1Q
    0076 00B0          249 ABS            C=N
    0077 005E          250                C=0           S
    0078 03E0          251                RTN
    0079 0093          252                CON           223Q
    007A 000F          253                CON           17Q
    007B 0003          254                CON           3Q
    007C 0001          255                CON           1Q
    007D 00001000      256 ACOS           GOSUB         =TRGSET
    007F 0388          257                ST=1          0
    0080 0308          258 ASIN1          ST=1          1
    0081 0208          259 ATAN1          ST=1          2
    0082 00001002      260                GOLONG        =BRT100
    0084 0000          261                CON           0Q
    0085 0284          262 AGTO           ST=0          7
    0086 00001002      263 XGAXFR         GOLONG        =XGA00
    0088 008C          264                CON           214Q
    0089 0003          265                CON           3Q
    008A 0112          266                CON           422Q
    008B 0201          267                CON           1001Q
    008C 00001002      268 ARCL           GOLONG        =XARCL
    008E 0086          269                CON           206Q
    008F 0008          270                CON           10Q
    0090 0013          271                CON           23Q
    0091 0001          272                CON           1Q
    0092 00001002      273 ASHF           GOLONG        =XASHF
    0094 008E          274                CON           216Q
    0095 0009          275                CON           11Q
    0096 0013          276                CON           23Q
    0097 0001          277                CON           1Q
    0098 00001000      278 ASIN           GOSUB         =TRGSET
    009A 0003          279                GOTO          ASIN1
    009B 008E          280                CON           216Q
    009C 0013          281                CON           23Q
    009D 0101          282                CON           401Q
    009E 00001002      283 ASN            GOLONG        =XASN
    00A0 008F          284                CON           217Q
    00A1 0014          285                CON           24Q
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LOCATION OBJECT CODE LINE     SOURCE LINE

    00A2 0113          286                    CON             423Q
    00A3 0201          287                    CON             1001Q
    00A4 00001002      288 ASTO               GOLONG          =XASTO
    00A6 008E          289                    CON             216Q
    00A7 0001          290                    CON             1Q
    00A8 0014          291                    CON             24Q
    00A9 0001          292                    CON             1Q
    00AA 00001000      293 ATAN               GOSUB           =TRGSET
    00AC 0003          294                    GOTO            ATAN1
    00AD 0097          295                    CON             227Q
    00AE 0005          296                    CON             5Q
    00AF 0009          297                    CON             11Q
    00B0 0016          298                    CON             26Q
    00B1 0001          299                    CON             1Q
    00B2 00001002      300 AVIEW              GOLONG          =XAVIEW
    00B4 0000          301                    CON             0Q
    00B5 0288          302 AXEQ               ST=1            7
    00B6 0003          303                    GOTO            XGAXFR
    00B7 0090          304                    CON             220Q
    00B8 0005          305                    CON             5Q
    00B9 0005          306                    CON             5Q
    00BA 0002          307                    CON             2Q
    00BB 0130          308 BEEP               LDI
    00BC 0007          309                    CON             7
    00BD 00001002      310                    GOLONG          =XBEEP
    00BF 0094          311                    CON             224Q
    00C0 0013          312                    CON             23Q
    00C1 0002          313                    CON             2Q
    00C2 0000          314 BST                NOP                             ;XKD
    00C3 00001002      315                    GOLONG          =XBST
    00C5 0094          316                    CON             224Q
    00C6 0301          317                    CON             1401Q
    00C7 0103          318                    CON             403Q
    00C8 00001002      319 CAT                GOLONG          =XCAT
    00CA 0286          320                    CON             1206Q
    00CB 0203          321                    CON             1003Q
    00CC 00001002      322 CF                 GOLONG          =XCF
    00CE 0081          323                    CON             201Q
    00CF 000C          324                    CON             14Q
    00D0 0003          325                    CON             3Q
    00D1 004E          326 CLA                C=0             W
    00D2 0168          327                    REGN=C          5
    00D3 01A8          328                    REGN=C          6
    00D4 01E8          329                    REGN=C          7
    00D5 0228          330                    REGN=C          8
    00D6 03E0          331 NFRPUL             RTN
    00D7 008F          332                    CON             217Q
    00D8 0014          333                    CON             24Q
    00D9 0213          334                    CON             1023Q
    00DA 0198          335 STO                C=M
    00DB 02F0          336                    DATA=C
    00DC 03E0          337                    RTN
    00DD 0084          338                    CON             204Q
    00DE 000C          339                    CON             14Q
    00DF 0003          340                    CON             3Q
    00E0 00001000      341 CLDSP              GOSUB           =DATOFF         ;CLEAR MSGFLG
                       342 * DATOFF ALSO CLEARS DATAENTRY FLAG, BUT THERE'S NO HARM DONE.
```

```
LOCATION OBJECT CODE LINE     SOURCE LINE

   00E2 00001002      343                GOLONG          =NWGOOS
                      344 * IN KEYBOARD MODE, PUTTING UP A NEW GOOSE ISN'T VERY USEFUL,
                      345 * BUT SINCE THE DEFAULT DISPLAY LOGIC WRITES OVER IT, NO HARM
                      346 * IS DONE.
   00E4 0090          347                CON             220Q
   00E5 000C          348                CON             14Q
   00E6 0103          349                CON             403Q
   00E7 00001002      350 CLP            GOLONG          =CLRPGM
   00E9 0087          351                CON             207Q
   00EA 0012          352                CON             22Q
   00EB 000C          353                CON             14Q
   00EC 0003          354                CON             3Q
   00ED 0108          355 CLREG          ST=1            8
   00EE 00001002      356                GOLONG          =CLR
   00F0 00CE          357                CON             316Q
   00F1 000C          358                CON             14Q
   00F2 0003          359                CON             3Q
   00F3 00001002      360 CLSIG          GOLONG          =XCLSIG
   00F5 0094          361                CON             224Q
   00F6 0013          362                CON             23Q
   00F7 000C          363                CON             14Q
   00F8 0003          364                CON             3Q
   00F9 004E          365 CLST           C=0             W
   00FA 0028          366                REGN=C          0
   00FB 0068          367                REGN=C          1
   00FC 00A8          368                REGN=C          2
   00FD 0003          369                GOTO            XCLX1
   00FE 0098          370                CON             230Q
   00FF 000C          371                CON             14Q
   0100 0003          372                CON             3Q
   0101 004E          373 CLX            C=0             W
                      374                GLB             XCLX1          ;USED BY SIGMA+ AND SIGMA-
   0102 00E8          375 XCLX1          REGN=C          3              ;STORE NEW X
   0103 00001002      376                GOLONG          =NFRSIG
   0105 0099          377                CON             231Q
   0106 0010          378                CON             20Q
   0107 000F          379                CON             17Q
   0108 0103          380                CON             403Q
   0109 00001002      381 COPY           GOLONG          =XCOPY
   010B 0092          382                CON             222Q
   010C 002D          383                CON             55Q
   010D 0004          384                CON             4Q
   010E 00B0          385 D_R            C=N
   010F 00001002      386                GOLONG          =DTOR
   0111 0087          387                CON             207Q
   0112 0005          388                CON             5Q
   0113 0004          389                CON             4Q
   0114 00001002      390 DEG            GOLONG          =XDEG
   0116 0084          391                CON             204Q
   0117 0001          392                CON             1Q
   0118 0012          393                CON             22Q
   0119 0007          394                CON             7Q
   011A 00001002      395 GRAD           GOLONG          =XGRAD
   011C 0084          396                CON             204Q
   011D 0001          397                CON             1Q
   011E 0012          398                CON             22Q
   011F 00001002      399 RAD            GOLONG          =XRAD
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    0121 008C          400                    CON             214Q
    0122 0105          401                    CON             405Q
    0123 0104          402                    CON             404Q
    0124 00001002      403 DEL                GOLONG          =DELNNN
    0126 0000          404                    CON             0Q
    0127 0000          405 DELETE             NOP
    0128 00001002      406                    GOLONG          =XDELET
    012A 0085          407                    CON             205Q
    012B 0113          408                    CON             423Q
    012C 0204          409                    CON             1004Q
    012D 00001002      410 DSE                GOLONG          =XDSE
    012F 0084          411                    CON             204Q
    0130 000E          412                    CON             16Q
    0131 0005          413                    CON             5Q
    0132               414 END
    0132 0087          415                    CON             207Q
    0133 030E          416                    CON             1416Q
    0134 0105          417                    CON             405Q
    0135 0148          418 ENG                ST=1            6
    0136 00001002      419                    GOLONG          =XSCI
    0138 009E          420                    CON             236Q
    0139 0012          421                    CON             22Q
    013A 0005          422                    CON             05Q
    013B 0014          423                    CON             24Q
    013C 000E          424                    CON             16Q
    013D 0005          425                    CON             5Q
    013E 00001000      426 ENTER              GOSUB           =R_SUB
    0140 00B8          427                    C=REGN          2
    0141 00E8          428                    REGN=C          3
    0142 00001002      429                    GOLONG          =NFRENT
    0144 0098          430                    CON             230Q
    0145 001E          431                    CON             36Q
    0146 0005          432                    CON             5Q
    0147 00B0          433 E_TO_X             C=N
    0148 00001002      434                    GOLONG          =EXP10
    014A 0096          435                    CON             226Q
    014B 0004          436                    CON             4Q
    014C 0001          437                    CON             1Q
    014D 0375          438 ADVNCE             CON             1565Q           ;GOSUB PRT9
    014E 01BC          439                    CON             674Q
    014F 03E0          440                    RTN
    0150 0094          441                    CON             224Q
    0151 0003          442                    CON             3Q
    0152 0001          443                    CON             1Q
    0153 0006          444                    CON             6Q
    0154 00B0          445 FACT               C=N
    0155 00001002      446                    GOLONG          =XFT100
    0157 00BF          447                    CON             277Q
    0158 0203          448                    CON             1003Q
    0159 0206          449                    CON             1006Q
    015A 00AE          450 FC                 ACEX            W
    015B 02AE          451                    C=-C-1          W
    015C 00AE          452                    ACEX            W
    015D 0003          453                    GOTO            FS
    015E 00B1          454                    CON             261Q
    015F 002D          455                    CON             55Q
    0160 0018          456                    CON             30Q
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    0161 001E          457                  CON             36Q
    0162 0005          458                  CON             5Q
    0163 0048          459 E_TO_X_MINUS_1   ST=1            4
    0164 00B0          460                  C=N
    0165 00001002      461                  GOLONG          =EXP10
    0167 0083          462                  CON             203Q
    0168 003F          463                  CON             77Q
    0169 0203          464                  CON             1003Q
    016A 0206          465                  CON             1006Q
    016B 00001000      466 FC_C             GOSUB           =XCF
    016D 0003          467                  GOTO            FC
    016E 0098          468                  CON             230Q
    016F 0309          469                  CON             1411Q
    0170 0106          470                  CON             406Q
    0171 0288          471 FIX              ST=1            7
    0172 00001002      472                  GOLONG          =XSCI
    0174 0094          473                  CON             224Q
    0175 000E          474                  CON             16Q
    0176 0009          475                  CON             11Q
    0177 0088          476 INT              ST=1            5
    0178 0003          477                  GOTO            FRAC
    0179 0083          478                  CON             203Q
    017A 0012          479                  CON             22Q
    017B 0006          480                  CON             6Q
    017C 00B0          481 FRAC             C=N
    017D 00001002      482                  GOLONG          =INTFRC
    017F 00BF          483                  CON             277Q
    0180 0213          484                  CON             1023Q
    0181 0206          485                  CON             1006Q
    0182 00001002      486 FS               GOLONG          =XFS
    0184 0083          487                  CON             203Q
    0185 003F          488                  CON             77Q
    0186 0213          489                  CON             1023Q
    0187 0206          490                  CON             1006Q
    0188 00001000      491 FS_C             GOSUB           =XCF
    018A 0003          492                  GOTO            FS
    018B 0000          493                  CON             0
    018C 00001002      494 GTOL             GOLONG          =GTONN
    018E 008F          495                  CON             217Q
    018F 0314          496                  CON             1424Q
    0190 0307          497                  CON             1407Q
    0191               498 GTO                                          ;CAN'T BE FOLLOWED BY 0
    0191 0092          499                  CON             222Q
    0192 0008          500                  CON             10Q
    0193 00B0          501 HMS_H            C=N
    0194 00001002      502                  GOLONG          =XTOHRS
    0196 0093          503                  CON             223Q
    0197 000D          504                  CON             15Q
    0198 0008          505                  CON             10Q
    0199 0088          506 H_HMS            ST=1            5
    019A 0003          507                  GOTO            HMS_H       ;SAVE CODE HERE
    019B 0087          508                  CON             207Q
    019C 0113          509                  CON             423Q
    019D 0209          510                  CON             1011Q
    019E 0384          511 ISG              ST=0            0
    019F 00001002      512                  GOLONG          =XISG
    01A1 008C          513                  CON             214Q
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    01A2 0002          514                 CON             2Q
    01A3 030C          515                 CON             1414Q
    01A4               516 LBL                                             ;CAN'T BE FOLLOWED BY 0
    01A4 008E          517                 CON             216Q
    01A5 000C          518                 CON             14Q
    01A6 00B0          519 LN              C=N
    01A7 00001002      520                 GOLONG          =LN10
    01A9 0087          521                 CON             207Q
    01AA 000F          522                 CON             17Q
    01AB 000C          523                 CON             14Q
    01AC 0088          524 LOG             ST=1            5
    01AD 0003          525                 GOTO            LN                  ;SAVE SPACE HERE
    01AE 0096          526                 CON             226Q
    01AF 0005          527                 CON             5Q
    01B0 0004          528                 CON             4Q
    01B1 0013          529                 CON             023Q
    01B2 00001000      530 STDEV           GOSUB           =SD
    01B4 0003          531                 GOTO            NFRNC_
    01B5 008E          532                 CON             216Q
    01B6 0001          533                 CON             1Q
    01B7 0005          534                 CON             5Q
    01B8 000D          535                 CON             15Q
    01B9 00001000      536 MEAN            GOSUB           =XBAR
    01BB 00001002      537 NFRNC_          GOLONG          =NFRNC
    01BD 0090          538                 CON             220Q
    01BE 002D          539                 CON             55Q
    01BF 0012          540                 CON             22Q
    01C0 00001000      541 R_P             GOSUB           =TRGSET
    01C2 00001000      542                 GOSUB           =TOPOL
    01C4 0003          543                 GOTO            NFRNC_
    01C5 0086          544                 CON             206Q
    01C6 0006          545                 CON             6Q
    01C7 000F          546                 CON             17Q
    01C8 02E0          547 OFF             DISOFF
    01C9 0130          548                 LDI
    01CA 0009          549                 CON             9
    01CB 00001000      550                 GOSUB           =ROMCHK
    01CD 00001000      551                 GOSUB           =MEMCHK
    01CF 00001000      552                 GOSUB           =RSTKB
    01D1 00001002      553                 GOLONG          =DRSY50
    01D3 0098          554                 CON             230Q
    01D4 002F          555                 CON             57Q
    01D5 0031          556                 CON             61Q
    01D6 00B0          557 ONE_BY_X        C=N
    01D7 00001002      558                 GOLONG          =ONE_BY_X10
    01D9 0092          559                 CON             222Q
    01DA 002D          560                 CON             55Q
    01DB 0010          561                 CON             20Q
    01DC 00001000      562 P_R             GOSUB           =TRGSET
    01DE 0308          563                 ST=1            1
    01DF 0208          564                 ST=1            2
    01E0 00001000      565                 GOSUB           =TOREC
    01E2 0003          566                 GOTO            NFRNC_
    01E3 008B          567                 CON             213Q
    01E4 0003          568                 CON             3Q
    01E5 0001          569                 CON             1Q
    01E6 0010          570                 CON             20Q
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    01E7 00001002     571 PACK          GOLONG        =XPACK
    01E9 0088         572               CON           210Q
    01EA 0003         573               CON           3Q
    01EB 0025         574               CON           45Q
    01EC 00BE         575 PCTCH         ACEX          S
    01ED 02BE         576               C=-C-1        S
    01EE 00BE         577               ACEX          S
    01EF 00B0         578               C=N
    01F0 00001000     579               GOSUB         =AD2_10
    01F2 0166         580               A=A+1         X
    01F3 0166         581               A=A+1         X
    01F4 00B8         582               C=REGN        2
    01F5 00001000     583               GOSUB         =DV1_10
    01F7 00001002     584               GOLONG        =NFRX
    01F9 0085         585               CON           205Q
    01FA 0013         586               CON           23Q
    01FB 0010         587               CON           20Q
    01FC 02CC         588 PSE           ST=1?         13            ;RUNNING?
    01FD 0003         589               GONC          PSE10         ;NO
    01FE 0308         590               ST=1          1             ;SET PAUSE FLAG
    01FF 00001000     591               GOSUB         =STOSTO       ;PUT SS 0 BACK
    0201 00001002     592 PSE10         GOLONG        =PSESTP
    0203 0094         593               CON           224Q
    0204 0010         594               CON           20Q
    0205 000D         595               CON           15Q
    0206 000F         596               CON           17Q
    0207 0012         597               CON           22Q
    0208 0010         598               CON           20Q
    0209 00001002     599 PROMPT        GOLONG        =XPRMPT
    020B 0084         600               CON           204Q
    020C 002D         601               CON           55Q
    020D 0012         602               CON           22Q
    020E 00B0         603 R_D           C=N
    020F 00001002     604               GOLONG        =RTOD
    0211 0090         605               CON           220Q
    0212 000F         606               CON           17Q
    0213 0014         607               CON           24Q
    0214 0013         608               CON           23Q
    0215 00001002     609 STOP          GOLONG        =STOPSB
    0217 0000         610               CON           0Q            ;NO PROMPTING
    0218 0000         611 RUN_STOP      NOP                         ;XKD
    0219 00001002     612               GOLONG        =XR_S
    021B 0098         613               CON           230Q
    021C 002B         614               CON           53Q
    021D 0031         615               CON           61Q
    021E 000E         616               CON           16Q
    021F 000C         617               CON           14Q
    0220 00B0         618 LN1_PLUS_X    C=N
    0221 00001002     619               GOLONG        =XLN1_PLUS_X
    0223 0098         620               CON           230Q
    0224 0014         621               CON           24Q
    0225 0013         622               CON           23Q
    0226 0001         623               CON           1Q
    0227 000C         624               CON           14Q
    0228 0138         625 LASTX         C=REGN        4
    0229 00EE         626 LXEX          CBEX          W
    022A 0003         627               GOTO          RCL
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    022B 008C          628                 CON             214Q
    022C 0103          629                 CON             403Q
    022D 0212          630                 CON             1022Q
    022E 018C          631 RCL             ST=1?           11
    022F 00001001      632                 GSUBC           R_SUB
    0231 004E          633 NPRCL           C=0             W
    0232 0270          634                 DADD=C
    0233 00EE          635                 CBEX            W
    0234 00E8          636                 REGN=C          3
    0235 00001002      637 NFRPRL          GOLONG          =NFRPR
    0237 0093          638                 CON             223Q
    0238 0008          639                 CON             8
    0239 0003          640                 CON             3
    023A 00B0          641 CHS             C=N                             ;GET X
    023B 02FA          642                 C#0?            M
    023C 0003          643                 GONC            DONCHS          ;X IS ZERO DO NOTHING
    023D 02BE          644                 C=-C-1          S               ;DO CHS
    023E 00E8          645                 REGN=C          3
    023F 0003          646 DONCHS          GOTO            NFRPRL
    0240 0089          647                 CON             211Q
    0241 0010          648                 CON             20Q
    0242 02A0          649 PI              SETDEC
    0243 00001000      650                 GOSUB           =PI_BY_2
    0245 01EE          651                 C=C+C           W
    0246 023A          652                 C=C+1           M
    0247 0046          653                 C=0             X
    0248 0003          654                 GOTO            LXEX
    0249 00BE          655                 CON             276Q
    024A 013C          656                 CON             474Q
    024B 0218          657                 CON             1030Q
    024C 0198          658 X_XCHNG         C=M
    024D 02F0          659                 DATA=C
    024E 0003          660                 GOTO            NPRCL
    024F 008E          661                 CON             216Q
    0250 0004          662                 CON             4Q
    0251 0012          663                 CON             22Q
    0252 00001002      664 RDN             GOLONG          =XRDN
    0254 0084          665                 CON             204Q
    0255 000E          666                 CON             16Q
    0256 0012          667                 CON             22Q
    0257 00001002      668 RND             GOLONG          =XRND
    0259 008E          669                 CON             216Q
    025A 0014          670                 CON             24Q
    025B 0012          671                 CON             22Q
    025C 00001002      672 RTN             GOLONG          =XRTN
    025E 009E          673                 CON             236Q
    025F 0012          674                 CON             22Q
    0260 00001002      675 ROLLUP          GOLONG          =XROLLUP
    0262 0089          676                 CON             211Q
    0263 0303          677                 CON             1403Q
    0264 0113          678                 CON             423Q
    0265 00001002      679 SCI             GOLONG          =XSCI
    0267 0286          680                 CON             1206Q
    0268 0213          681                 CON             1023Q
    0269 00001002      682 SF              GOLONG          =XSF
    026B 00AB          683                 CON             253Q
    026C 004E          684                 CON             116Q
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LOCATION OBJECT CODE LINE     SOURCE LINE

    026D 00001002     685 SIGMA_PLUS      GOLONG          =SIGMA
    026F 00AD         686                 CON             255Q
    0270 004E         687                 CON             116Q
    0271 0088         688 SIGMA_MINUS     ST=1            5
    0272 0003         689                 GOTO            SIGMA_PLUS      ;SAVE CODE HERE
    0273 0087         690                 CON             207Q
    0274 0005         691                 CON             5Q
    0275 0212         692                 CON             1022Q
    0276 024E         693                 CON             1116Q
    0277 00001002     694 SIGREG          GOLONG          =XSGREG
    0279 0093         695                 CON             223Q
    027A 000F         696                 CON             17Q
    027B 0003         697                 CON             3Q
    027C 00001000     698 COS             GOSUB           =TRGSET
    027E 0003         699                 GOTO            COS1
    027F 008E         700                 CON             216Q
    0280 0001         701                 CON             1Q
    0281 0014         702                 CON             24Q
    0282 00001000     703 TAN             GOSUB           =TRGSET
    0284 0003         704                 GOTO            XTRIG
    0285 008E         705                 CON             216Q
    0286 0009         706                 CON             11Q
    0287 0013         707                 CON             23Q
    0288 00001000     708 SIN             GOSUB           =TRGSET
    028A 0388         709                 ST=1            0
    028B 0308         710 COS1            ST=1            1
    028C 00001002     711 XTRIG           GOLONG          =TRG100
    028E 0085         712                 CON             205Q
    028F 001A         713                 CON             32Q
    0290 0109         714                 CON             411Q
    0291 0113         715                 CON             423Q
    0292 00001002     716 SIZE            GOLONG          =XSIZE
    0294 0094         717                 CON             224Q
    0295 0012         718                 CON             22Q
    0296 0011         719                 CON             21Q
    0297 0013         720                 CON             23Q
    0298 00B0         721 SQRT            C=N
    0299 00001002     722                 GOLONG          =SQR1Q
    029B 0094         723                 CON             224Q
    029C 0013         724                 CON             23Q
    029D 0013         725                 CON             23Q
    029E 0000         726 SST             NOP                             ;XKD
    029F 00001002     727                 GOLONG          =XSST
    02A1 008E         728                 CON             216Q
    02A2 000F         729                 CON             17Q
    02A3 00001002     730 STAYON          GOLONG          =XSTYON
    02A5 00AA         731                 CON             252Q
    02A6 0114         732                 CON             424Q
    02A7 0213         733                 CON             1023Q
    02A8 00001000     734 STO_MULTIPLY    GOSUB           =SEPXY
    02AA 00001000     735                 GOSUB           =MP2_10
    02AC 0003         736                 GOTO            NFRST
    02AD 00AB         737                 CON             253Q
    02AE 0114         738                 CON             424Q
    02AF 0213         739                 CON             1023Q
    02B0 00001000     740 STO_PLUS        GOSUB           =SEPXY
    02B2 00001000     741                 GOSUB           =AD2_10
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LOCATION OBJECT CODE LINE     SOURCE LINE

    02B4 00001002     742 NFRST           GOLONG          =NFRST_PLUS
    02B6 00AD         743                 CON             255Q
    02B7 0114         744                 CON             424Q
    02B8 0213         745                 CON             1023Q
    02B9 0198         746 STO_MINUS       C=M
    02BA 02A0         747                 SETDEC
    02BB 02BE         748                 C=-C-1          S
    02BC 0158         749                 M=C
    02BD 0003         750                 GOTO            STO_PLUS
    02BE 00AF         751                 CON             257Q
    02BF 0114         752                 CON             424Q
    02C0 0213         753                 CON             1023Q
    02C1 00001000     754 STO_DIVIDE      GOSUB           =SEPXY
    02C3 00001000     755                 GOSUB           =DV2_10
    02C5 0003         756                 GOTO            NFRST
    02C6 0098         757                 CON             230Q
    02C7 001E         758                 CON             36Q
    02C8 0030         759                 CON             60Q
    02C9 0031         760                 CON             61Q
    02CA 00001002     761 POWER_OF_TEN    GOLONG          =TEN_TO_X
    02CC 0085         762                 CON             205Q
    02CD 000E         763                 CON             16Q
    02CE 030F         764                 CON             1417Q
    02CF 0114         765                 CON             424Q
    02D0 00001002     766 TONE            GOLONG          =XTONE
    02D2 0097         767                 CON             227Q
    02D3 0005         768                 CON             5Q
    02D4 0109         769                 CON             411Q
    02D5 0216         770                 CON             1026Q
    02D6 00001002     771 VIEW            GOLONG          =XVIEW
    02D8 00BF         772                 CON             277Q
    02D9 0030         773                 CON             60Q
    02DA 004D         774                 CON             115Q
    02DB 0018         775                 CON             30Q
    02DC 00001002     776 X_NE_0          GOLONG          =XX_NE_0
    02DE 00BF         777                 CON             277Q
    02DF 0019         778                 CON             31Q
    02E0 004D         779                 CON             115Q
    02E1 0018         780                 CON             30Q
    02E2 00001002     781 X_NE_Y          GOLONG          =XX_NE_Y
    02E4 00BF         782                 CON             277Q
    02E5 0030         783                 CON             60Q
    02E6 003C         784                 CON             74Q
    02E7 0018         785                 CON             30Q
    02E8 00001002     786 X_LT_0          GOLONG          =XX_LT_0
    02EA 00BF         787                 CON             277Q
    02EB 0030         788                 CON             60Q
    02EC 003D         789                 CON             75Q
    02ED 003C         790                 CON             74Q
    02EE 0018         791                 CON             30Q
    02EF 00001002     792 X_LE_0          GOLONG          =XX_LE_0A
    02F1 00BF         793                 CON             277Q
    02F2 0019         794                 CON             31Q
    02F3 003D         795                 CON             75Q
    02F4 003C         796                 CON             74Q
    02F5 0018         797                 CON             30Q
    02F6 00001002     798 X_LE_Y          GOLONG          =XX_LE_Y
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LOCATION OBJECT CODE LINE     SOURCE LINE

   02F8 0099          799                  CON          231Q
   02F9 003E          800                  CON          76Q
   02FA 003C          801                  CON          74Q
   02FB 0018          802                  CON          30Q
   02FC 00F8          803 X_XCHNG_Y        C=REGN       3
   02FD 00AE          804                  ACEX         W
   02FE 00B8          805                  C=REGN       2
   02FF 00E8          806                  REGN=C       3
   0300 00AE          807                  ACEX         W
   0301 00A8          808                  REGN=C       2
   0302 00001002      809                  GOLONG       =NFRPR
   0304 00BF          810                  CON          277Q
   0305 0019          811                  CON          31Q
   0306 003C          812                  CON          74Q
   0307 0018          813                  CON          30Q
   0308 00001002      814 X_LT_Y           GOLONG       =XX_LT_Y
   030A 00BF          815                  CON          277Q
   030B 0030          816                  CON          60Q
   030C 003D          817                  CON          75Q
   030D 0018          818                  CON          30Q
   030E 00001002      819 X_EQ_0           GOLONG       =XX_EQ_0
   0310 00BF          820                  CON          277Q
   0311 0019          821                  CON          31Q
   0312 003D          822                  CON          75Q
   0313 0018          823                  CON          30Q
   0314 00001002      824 X_EQ_Y           GOLONG       =XX_EQ_Y
   0316 00BF          825                  CON          277Q
   0317 0030          826                  CON          60Q
   0318 003E          827                  CON          76Q
   0319 0018          828                  CON          30Q
   031A 00001002      829 X_GT_0           GOLONG       =XX_GT_0
   031C 00BF          830                  CON          277Q
   031D 0019          831                  CON          31Q
   031E 003E          832                  CON          76Q
   031F 0018          833                  CON          30Q
   0320 00001002      834 X_GT_Y           GOLONG       =XX_GT_Y
   0322 0000          835                  CON          0
   0323 00001002      836 XGOIND           GOLONG       =XGI
   0325 0091          837                  CON          221Q
   0326 0105          838                  CON          0405Q
   0327 0318          839                  CON          1430Q
   0328               840 XEQ                                        ;CAN'T BE FOLLOWED BY 0
   0328 0083          841                  CON          203Q
   0329 0005          842                  CON          5
   032A 0004          843                  CON          4
   032B 0048          844 DEC              ST=1         4
   032C 0003          845                  GOTO         OCT
   032D 0094          846                  CON          224Q
   032E 0003          847                  CON          3
   032F 000F          848                  CON          15
   0330 00B0          849 OCT              C=N
   0331 00001002      850                  GOLONG       =TOOCT
   0333 008E          851                  CON          216Q
   0334 0007          852                  CON          7
   0335 0009          853                  CON          9
   0336 0013          854                  CON          19
   0337 00001002      855 SIGN             GOLONG       =XSIGN
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LOCATION OBJECT CODE LINE     SOURCE LINE

                     856 *
                     857 *
0339 008E            858                 CON          216Q          ;N
033A 000F            859                 CON          15            ;O
033B 0001            860                 CON          1             ;A
033C 0288            861 AON             ST=1         7             ;SET ALPHAMODE
033D 00001000        862 AON10           GOSUB        =STOSTO
033F 00001002        863                 GOLONG       =ANNOUT
                     864 *
                     865 *
0341 0086            866                 CON          206Q          ;F
0342 0006            867                 CON          6             ;F
0343 000F            868                 CON          15            ;O
0344 0001            869                 CON          1             ;A
0345 0284            870 AOFF            ST=0         7             ;CLEAR ALPHAMODE
0346 0003            871                 GOTO         AON10
                     872 *
                     873 *
0347 0000            874                 CON          0Q            ;NO PROMPTING
0348 0000            875 SHIFT           NOP                        ;XKD
0349 00001000        876                 GOSUB        =TGSHF1       ;TOGGLE SHIFT FLAG
034B 0003            877                 GOTO         USCOM1
                     878 *
                     879 *
034C 0000            880                 CON          0Q            ;NO PROMPTING
034D 0000            881 MODE            NOP                        ;XKD
034E 0220            882                 C=KEYS
                     883 *
                     884                 GLB          MODE1         ;FOR WAND ALPHA,PRGM,USER
                     885 * ENTRY POINT ADD FOR WAND ON 3-13-79
                     886 *
034F                 887 MODE1
034F 001C            888                 PT=          3
0350 01E2            889                 C=C+C        PT
0351 01E2            890                 C=C+C        PT
0352 01E2            891                 C=C+C        PT
0353 0003            892                 GONC         ALFPRG
                     893                                            ;USER KEY
0354 03B8            894                 C=REGN       14
0355 017C            895                 RCR          6
0356 03D8            896                 CSTEX                      ;PUT UP SS 3
0357 004C            897                 ST=1?        4             ;USERMODE?
0358 0007            898                 GOC          USEROF        ;YES
0359 0048            899                 ST=1         4             ;SET USERMODE
035A 0003            900                 GOTO         USERC
035B 0044            901 USEROF          ST=0         4             ;CLEAR USERMODE
035C 03D8            902 USERC           CSTEX
035D 013C            903                 RCR          8
035E 0398            904 USCOM           C=ST                       ;MERGE SS 0 WITH OTHER SETS
035F 03A8            905                 REGN=C       14
0360 0244            906 USCOM1          ST=0         9             ;KEYBOARD NOT RESET YET
0361 00001002        907                 GOLONG       =DRSY51       ;REFRESH ANNUNCIATORS ONLY
                     908 *
                     909 *
0363 034D            910 ALFPRG          CON          1515Q         ;GOSUB PRT14
0364 01BC            911                 CON          674Q
                     912                 GLB          PR14RT        ;FOR PRINTER
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LOCATION OBJECT CODE LINE     SOURCE LINE

 0365                913 PR14RT
 0365 02E2           914                 C#0?          PT            ;PRGM KEY?
 0366 0007           915                 GOC           PRGM          ;YES
 0367 00001000       916                 GOSUB         =RSTMS1       ;ALPHA KEY
 0369 028C           917                 ST=1?         7             ;ALPHAMODE
 036A 0003           918                 GONC          ALPHON        ;NO
 036B 0284           919                 ST=0          7             ;CLEAR ALPHAMODE
 036C 0398           920 APCOM           C=ST                        ;MERGE SSO W/ OTHER SETS
 036D 03A8           921                 REGN=C        14            ;PUT STATUS SETS BACK
 036E 0244           922 DOSXFR          ST=0          9             ;KEYBOARD NOT RESET YET
 036F 00001002       923                 GOLONG        =DRSYOS       ;REFRESH MAIN DISPLAY
 0371 0288           924 ALPHON          ST=1          7             ;SET ALPHAMODE
 0372 000C           925                 ST=1?         3             ;PROGRAM MODE?
 0373 0003           926                 GONC          APCOM         ;NO
 0374 0003           927                 GOTO          USCOM         ;YES
                     928 *
                     929 *
 0375 00001000       930 PRGM            GOSUB         =RSTMS1
 0377 0304           931                 ST=0          1             ;CLEAR PAUSEFLAG
 0378 0284           932                 ST=0          7             ;CLEAR ALPHAMODE
 0379 000C           933                 ST=1?         3             ;PRGMMODE?
 037A 0007           934                 GOC           PRGMOF        ;YES
 037B 0008           935                 ST=1          3             ;NO. SET PRGMMODE
 037C 0003           936                 GOTO          APCOM
 037D 0004           937 PRGMOF          ST=0          3             ;CLEAR PRGMMODE
 037E 0398           938                 C=ST
 037F 03A8           939                 REGN=C        14            ;PUT STATUS SETS BACK
 0380 00001000       940                 GOSUB         =DECMPL       ;DECOMPILE
 0382 0003           941                 GOTO          DOSXFR
                     942
                     943
                     944
                     945 ***************************************************
 0383 004E           946 CAT3            C=0           W             ;MOVE # TO A MANT
 0384 00E6           947                 BCEX          X
 0385 01BC           948                 RCR           11
 0386 00AE           949                 ACEX          W
 0387 00001000       950                 GOSUB         =ALPDEF       ;SEL CORECT DEF
 0389 0000           951                 NOP
 038A 004A           952                 CON           PLUS
 038B 0054           953                 CON           MINUS
 038C 005C           954                 CON           MULTIPLY
 038D 006F           955                 CON           DIVIDE
 038E 01D6           956                 CON           ONE_BY_X
 038F 02CA           957                 CON           POWER_OF_TEN
 0390 0076           958                 CON           ABS
 0391 007D           959                 CON           ACOS
 0392 014D           960                 CON           ADVNCE
 0393 0345           961                 CON           AOFF
 0394 033C           962                 CON           AON
 0395 008C           963                 CON           ARCL
 0396 0092           964                 CON           ASHF
 0397 0098           965                 CON           ASIN
 0398 009E           966                 CON           ASN
 0399 00A4           967                 CON           ASTO
 039A 00AA           968                 CON           ATAN
 039B 00B2           969                 CON           AVIEW
```

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```
LOCATION OBJECT CODE LINE     SOURCE LINE

    039C 00BB          970                  CON             BEEP
    039D 00C2          971                  CON             BST
    039E 00C8          972                  CON             CAT
    039F 00CC          973                  CON             CF
    03A0 023A          974                  CON             CHS
    03A1 00D1          975                  CON             CLA
    03A2 00E0          976                  CON             CLDSP
    03A3 00E7          977                  CON             CLP
    03A4 00ED          978                  CON             CLREG
    03A5 00F3          979                  CON             CLSIG
    03A6 00F9          980                  CON             CLST
    03A7 0101          981                  CON             CLX
    03A8 0109          982                  CON             COPY
    03A9 027C          983                  CON             COS
    03AA 010E          984                  CON             D_R
    03AB 032B          985                  CON             DEC
    03AC 0114          986                  CON             DEG
    03AD 0124          987                  CON             DEL
    03AE 012D          988                  CON             DSE
    03AF 0132          989                  CON             END
    03B0 0135          990                  CON             ENG
    03B1 013E          991                  CON             ENTER
    03B2 0147          992                  CON             E_TO_X
    03B3 0163          993                  CON             E_TO_X_MINUS_1
    03B4 0154          994                  CON             FACT
    03B5 015A          995                  CON             FC
    03B6 016B          996                  CON             FC_C
    03B7 0171          997                  CON             FIX
    03B8 017C          998                  CON             FRAC
    03B9 0182          999                  CON             FS
    03BA 0188         1000                  CON             FS_C
    03BB 011A         1001                  CON             GRAD
    03BC 0191         1002                  CON             GTO
    03BD 0199         1003                  CON             H_HMS
    03BE 0032         1004                  CON             HMS_PLUS
    03BF 0045         1005                  CON             HMS_MINUS
    03C0 0193         1006                  CON             HMS_H
    03C1 0177         1007                  CON             INT
    03C2 019E         1008                  CON             ISG
    03C3 0228         1009                  CON             LASTX
    03C4 01A4         1010                  CON             LBL
    03C5 01A6         1011                  CON             LN
    03C6 0220         1012                  CON             LN1_PLUS_X
    03C7 01AC         1013                  CON             LOG
    C3C8 01B9         1014                  CON             MEAN
    03C9 004F         1015                  CON             MOD
    03CA 0330         1016                  CON             OCT
    03CB 01C8         1017                  CON             OFF
    03CC 02A3         1018                  CON             STAYON
    03CD 01DC         1019                  CON             P_R
    03CE 01E7         1020                  CON             PACK
    03CF 0061         1021                  CON             PCT
    03D0 01EC         1022                  CON             PCTCH
    03D1 0242         1023                  CON             PI
    03D2 0209         1024                  CON             PROMPT
    03D3 01FC         1025                  CON             PSE
    03D4 0260         1026                  CON             ROLLUP
```

```
LOCATION OBJECT CODE LINE     SOURCE LINE

   03D5 020E         1027                CON          R_D
   03D6 01C0         1028                CON          R_P
   03D7 011F         1029                CON          RAD
   03D8 022E         1030                CON          RCL
   03D9 0252         1031                CON          RDN
   03DA 0257         1032                CON          RND
   03DB 025C         1033                CON          RTN
   03DC 01B2         1034                CON          STDEV
   03DD 0265         1035                CON          SCI
   03DE 0269         1036                CON          SF
   03DF 026D         1037                CON          SIGMA_PLUS
   03E0 0271         1038                CON          SIGMA_MINUS
   03E1 0277         1039                CON          SIGREG
   03E2 0288         1040                CON          SIN
   03E3 0337         1041                CON          SIGN
   03E4 0292         1042                CON          SIZE
   03E5 0298         1043                CON          SQRT
   03E6 029E         1044                CON          SST
   03E7 02B0         1045                CON          STO_PLUS
   03E8 02B9         1046                CON          STO_MINUS
   03E9 02A8         1047                CON          STO_MULTIPLY
   03EA 02C1         1048                CON          STO_DIVIDE
   03EB 00DA         1049                CON          STO
   03EC 0215         1050                CON          STOP
   03ED 0282         1051                CON          TAN
   03EE 02D0         1052                CON          TONE
   03EF 02D6         1053                CON          VIEW
   03F0 030E         1054                CON          X_EQ_0
   03F1 02DC         1055                CON          X_NE_0
   03F2 02E8         1056                CON          X_LT_0
   03F3 02EF         1057                CON          X_LE_0
   03F4 031A         1058                CON          X_GT_0
   03F5 0314         1059                CON          X_EQ_Y
   03F6 02E2         1060                CON          X_NE_Y
   03F7 0308         1061                CON          X_LT_Y
   03F8 02F6         1062                CON          X_LE_Y
   03F9 0320         1063                CON          X_GT_Y
   03FA 024C         1064                CON          X_XCHNG
   03FB 02FC         1065                CON          X_XCHNG_Y
   03FC 0328         1066                CON          XEQ
   03FD 006B         1067                CON          X_TO_2
   03FE 002A         1068                CON          Y_TO_X
   03FF 0000         1069                CON          0
                     1070
                     1071
                     1072
                     1073 *
                     1074 *
                     1075 *
                     1076 ***********************************************************
                     1077 * NOTE: NO EXECUTION POINT MAY BE LOCATED AFTER @1736 IN THIS
                     1078 * QUAD.  THE SEARCH ALGORITHM USES ENTRIES > @1736 IN THE
                     1079 * MAIN FUNCTION TABLE AS DELIMITERS OF HOLES IN THE TABLE.
                     1080 ***********************************************************
                     1081                FILLTO       1777Q
                     1082                END
```

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LOCATION OBJECT CODE LINE SOURCE LINE

Errors= 0

LINE#	SYMBOL	TYPE	REFERENCES
249	ABS	P	16,958
256	ACOS	P	17,959
	AD2_10	E	199,224,579,741
224	ADD210	P	213
438	ADVNCE	P	13,960
262	AGTO	P	18
910	ALFPRG	P	892
	ALPDEF	E	950
924	ALPHON	P	918
	ANNOUT	E	863
870	AOFF	P	19,961
861	AON	P	20,962
862	AON10	P	871
920	APCOM	P	926,936
268	ARCL	P	21,963
273	ASHF	P	22,964
278	ASIN	P	23,965
258	ASIN1	P	279
283	ASN	P	24,966
288	ASTO	P	25,967
293	ATAN	P	26,968
259	ATAN1	P	294
300	AVIEW	P	27,969
302	AXEQ	P	28
308	BEEP	P	29,970
	BRT100	E	260
314	BST	P	30,971
319	CAT	P	31,972
946	CAT3	P	7
322	CF	P	32,973
641	CHS	P	33,974
326	CLA	P	34,975
341	CLDSP	P	35,976
350	CLP	P	36,977
	CLR	E	356
355	CLREG	P	37,978
	CLRPGM	E	350
360	CLSIG	P	38,979
365	CLST	P	39,980
373	CLX	P	40,981
381	COPY	P	41,982
698	COS	P	42,983
710	COS1	P	699
922	DO5XFR	P	941
	DATOFF	E	341
844	DEC	P	10,985
	DECMPL	E	940
390	DEG	P	44,986
403	DEL	P	45,987
405	DELETE	P	46
	DELNNN	E	403
243	DIVIDE	P	14,955
646	DONCHS	P	643
	DRSY05	E	923
	DRSY50	E	553
	DRSY51	E	907
410	DSE	P	47,988

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LINE#	SYMBOL	TYPE	REFERENCES
	DTOR	E	386
	DV1_10	E	583
	DV2_10	E	244,755
385	D_R	P	43,984
414	END	P	48,989
418	ENG	P	49,990
426	ENTER	P	50,991
	EXP10	E	434,461
433	E_TO_X	P	51,992
459	E_TO_X_MINUS_1	P	52,993
445	FACT	P	53,994
450	FC	P	54,467,995
466	FC_C	P	55,996
471	FIX	P	56,997
481	FRAC	P	57,477,998
486	FS	P	58,453,492,999
491	FS_C	P	59,1000
395	GRAD	P	60,1001
498	GTO	P	61,1002
494	GTOL	P	62
	GTONN	E	494
501	HMS_H	P	65,507,1006
207	HMS_MINUS	P	64,1005
192	HMS_PLUS	P	63,210,1004
506	H_HMS	P	66,1003
476	INT	P	67,1007
	INTFRC	E	482
511	ISG	P	68,1008
625	LASTX	P	69,1009
516	LBL	P	70,1010
519	LN	P	71,525,1011
	LN10	E	520
618	LN1_PLUS_X	P	72,1012
524	LOG	P	73,1013
626	LXEX	P	654
536	MEAN	P	74,1014
	MEMCHK	E	551
221	MINUS	P	9,953
217	MOD	P	75,1015
	MOD10	E	218
881	MODE	P	76
887	MODE1	P	884
	MP2_10	E	228,234,735
227	MULTIPLY	P	12,954
	NFRENT	E	429
	NFRNC	E	537
537	NFRNC_	P	531,543,566
	NFRPR	E	637,809
637	NFRPRL	P	646
331	NFRPUL	P	
	NFRSIG	E	376
742	NFRST	P	736,756
	NFRST_PLUS	E	742
	NFRX	E	235,584
	NFRXY	E	225
225	NFRXY_	P	187,202,219,229,245
633	NPRCL	P	660

LINE#	SYMBOL	TYPE	REFERENCES
	NUGOOS	E	343
849	OCT	P	11,845,1016
547	OFF	P	77,1017
557	ONE_BY_X	P	78,956
	ONE_BY_X10	E	558
571	PACK	P	80,1020
231	PCT	P	81,1021
575	PCTCH	P	82,1022
649	PI	P	83,1023
	PI_BY_2	E	650
212	PLUS	P	8,952
761	POWER_OF_TEN	P	15,957
913	PR14RT	P	912
930	PRGM	P	915
937	PRGMOF	P	934
599	PROMPT	P	84,1024
588	PSE	P	85,1025
592	PSE10	P	589
	PSESTP	E	592
562	P_R	P	79,1019
399	RAD	P	89,1029
631	RCL	P	90,627,1030
664	RDN	P	91,1031
668	RND	P	92,1032
675	ROLLUP	P	94,1026
	ROMCHK	E	550
	RSTKB	E	552
	RSTMS1	E	916,930
672	RTN	P	93,1033
	RTOD	E	604
611	RUN_STOP	P	88
603	R_D	P	86,1027
541	R_P	P	87,1028
	R_SUB	E	426,632
679	SCI	P	95,1035
	SD	E	530
	SEPXY	E	734,740,754
682	SF	P	96,1036
875	SHIFT	P	97
	SIGMA	E	685
688	SIGMA_MINUS	P	99,1038
685	SIGMA_PLUS	P	98,689,1037
855	SIGN	P	100,1041
694	SIGREG	P	101,1039
708	SIN	P	102,1040
716	SIZE	P	103,1042
	SQR10	E	722
721	SQRT	P	104,1043
726	SST	P	105,1044
730	STAYON	P	106,1018
530	STDEV	P	107,1034
335	STO	P	108,1049
609	STOP	P	113,1050
	STOPSB	E	609
	STOSTO	E	591,862
754	STO_DIVIDE	P	112,1048
746	STO_MINUS	P	110,1046

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LINE#	SYMBOL	TYPE	REFERENCES
734	STO_MULTIPLY	P	111,1047
740	STO_PLUS	P	109,750,1045
703	TAN	P	114,1051
	TEN_TO_X	E	761
	TGSHF1	E	876
234	TIMES	P	241
766	TONE	P	115,1052
	TOOCT	E	850
	TOPOL	E	542
	TOREC	E	565
	TRG100	E	711
	TRGSET	E	256,278,293,541,562,698,703,708
904	USCOM	P	927
906	USCOM1	P	877
902	USERC	P	900
901	USEROF	P	898
771	VIEW	P	116,1053
	XARCL	E	268
	XASHF	E	273
	XASN	E	283
	XASTO	E	288
	XAVIEW	E	300
	XBAR	E	536
	XBEEP	E	310
	XBST	E	315
	XCAT	E	319
	XCF	E	322,466,491
	XCLSIG	E	360
375	XCLX1	P	369,374
	XCOPY	E	381
	XDEG	E	390
	XDELET	E	406
	XDSE	E	410
840	XEQ	P	129,1066
	XFS	E	486
	XFT100	E	446
	XGA00	E	263
263	XGAXFR	P	303
	XGI	E	836
836	XGOIND	P	130
	XGRAD	E	395
	XISG	E	512
	XLN1_PLUS_X	E	619
	XPACK	E	571
	XPRMPT	E	599
	XRAD	E	399
	XRDN	E	664
	XRND	E	668
	XROLLUP	E	675
	XRTN	E	672
	XR_S	E	612
	XSCI	E	419,472,679
	XSF	E	682
	XSGREG	E	694
	XSIGN	E	855
	XSIZE	E	716
	XSST	E	727

LINE#	SYMBOL	TYPE	REFERENCES
	XSTYON	E	730
	XTOHRS	E	193,196,201,502
	XTONE	E	766
711	XTRIG	P	704
	XVIEW	E	771
	XX_EQ_O	E	819
	XX_EQ_Y	E	824
	XX_GT_O	E	829
	XX_GT_Y	E	834
	XX_LE_OR	E	792
	XX_LE_Y	E	798
	XX_LT_O	E	786
	XX_LT_Y	E	814
	XX_NE_O	E	776
	XX_NE_Y	E	781
	XY_TO_X	E	186
819	X_EQ_O	P	125,1054
824	X_EQ_Y	P	126,1059
829	X_GT_O	P	127,1058
834	X_GT_Y	P	128,1063
792	X_LE_O	P	120,1057
798	X_LE_Y	P	121,1062
786	X_LT_O	P	119,1056
814	X_LT_Y	P	124,1061
776	X_NE_O	P	117,1055
781	X_NE_Y	P	118,1060
239	X_TO_2	P	131,1067
658	X_XCHNG	P	122,1064
803	X_XCHNG_Y	P	123,1065
185	Y_TO_X	P	132,1068

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```
LOCATION OBJECT CODE LINE     SOURCE LINE

                      1 "COCONUT"
                      2 * HP41C MAINFRAME MICROCODE ADDRESSES @12000-13777
                      3 *
                      4                GLB             FCNTBL
                      5                GLB             ERRAD
                      6                GLB             PCKDUR
                      7                GLB             STFLGS          ;SET MSGFLG & DATAENTRY FLAG
                      8                GLB             XSTYON
                      9                GLB             FIND_NO_1
                     10                GLB             CLR
                     11                GLB             FNDEND
                     12                GLB             CHKADR
                     13                GLB             LOAD3
                     14                GLB             XASHF
                     15                GLB             XBEEP
                     16                GLB             XCLSIG
                     17                GLB             XRAD
                     18                GLB             XGRAD
                     19                GLB             DEGDO
                     20                GLB             XDEG
                     21                GLB             XTONE
                     22                GLB             TONE7
                     23                GLB             TONEB
                     24                GLB             GETLIN
                     25                GLB             FLGANN
                     26                GLB             XSCI
                     27                GLB             XARCL
                     28                GLB             XASTO
                     29                GLB             XDSE
                     30                GLB             XISG
                     31                GLB             XSIZE
                     32                GLB             XSGREG
                     33                GLB             XROLLUP
                     34                GLB             XRDN
                     35                GLB             RDNSUB
                     36                GLB             R_SUB
                     37                GLB             XX_EQ_0
                     38                GLB             XX_NE_0
                     39                GLB             XX_LT_0
                     40                GLB             XX_GT_0
                     41                GLB             XX_LE_0
                     42                GLB             XX_LE_0A
                     43                GLB             XX_EQ_Y
                     44                GLB             XX_NE_Y
                     45                GLB             XX_GT_Y
                     46                GLB             XX_LT_Y
                     47                GLB             XX_LE_Y
                     48                GLB             XCF
                     49                GLB             XSF
                     50                GLB             XFS
                     51                GLB             Y_MINUS_X
                     52                GLB             SEPXY
                     53                GLB             CHK_NO_S
                     54                GLB             CHK_NO_S2
                     55                GLB             SUMCHK
                     56                GLB             SUMCK2
                     57 *
```

```
LOCATION OBJECT CODE LINE     SOURCE LINE

 0000                 58 FCNTBL                                          ;MAIN FUNCTION TABLE
 0000 0000            59                 CON            =CAT             ;00
 0001 0000            60                 CON            =GTOL            ;01
 0002 0000            61                 CON            =DEL             ;02
 0003 0000            62                 CON            =COPY            ;03
 0004 0000            63                 CON            =CLP             ;04
 0005 0000            64                 CON            =RUN_STOP        ;05
 0006 0000            65                 CON            =SIZE            ;06
 0007 0000            66                 CON            =BST             ;07
 0008 0000            67                 CON            =SST             ;08
 0009 0000            68                 CON            =STAYON          ;09
 000A 0000            69                 CON            =PACK            ;0A
 000B 0000            70                 CON            =DELETE          ;0B
 000C 0000            71                 CON            =MODE            ;0C
 000D 03E0            72                 CON            1740Q
 000E 0000            73                 CON            =SHIFT           ;0E
 000F 0000            74                 CON            =ASN             ;0F
 0010 03EC            75                 CON            1754Q            ;DIGIT ENTRY (13)
 0011 03B8            76 XSTYON          C=REGN         14               ;SET THE STAYON FLAG
 0012 023C            77                 RCR            2
 0013 0358            78                 ST=C
 0014 0008            79                 ST=1           3                ;SET STAYON
 0015 0398            80                 C=ST
 0016 037C            81                 RCR            12
 0017 03A8            82                 REGN=C         14
 0018 03E0            83                 RTN
 0019 004E            84 GETLIN          C=0            W
 001A 0270            85                 DADD=C
 001B 03F8            86                 C=REGN         15
 001C 03E0            87                 RTN
                      88                 FILLTO         34Q
 001D 0000            89                 CON            =AGTO
 001E 0000            90                 CON            =AXEQ
 001F 03E0            91                 CON            1740Q
 0020 03FF            92                 CON            1777Q            ;ROWS 2 AND 3
                      93 ***********************************************
                      94 *THIS ROUTINE DOES SUBTRACT FOR COMPARES.
                      95 ***********************************************
 0021 02A0            96 Y_MINUS_X       SETDEC
 0022 00B0            97                 C=N
 0023 02BE            98                 C=-C-1         S
 0024 0000            99                 NOP
 0025 00001000       100                 GOSUB          =AD2_10
 0027 0070           101                 N=C
 0028 03E0           102                 RTN
                     103                 GLB            OVFL10
                     104 *
                     105 * CHECK OVERFLOW/UNDERFLOW
                     106 * C HAS THE NUMBER
                     107 *   RETURN WITH :
                     108 *                PT= 12  OK
                     109 *                PT= 10  OVERFLOW
                     110 *                PT= 11  UNDERFLOW
                     111 *   RETURN IN DEC MODE
 0029 02FA           112 OVFL10         C#0?           M
 002A 0007           113                GOC            OVFL15
 002B 004E           114                C=0            W
```

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```
LOCATION OBJECT CODE LINE     SOURCE LINE

    002C 02A0          115 OVFL15          SETDEC
    002D 035C          116                 PT=             12
    002E 02F6          117                 C#0?            XS
    002F 03A0          118                 RTNNC
    0030 0266          119                 C=C-1           X
    0031 0236          120                 C=C+1           XS
    0032 0276          121                 C=C-1           XS
    0033 0003          122                 GONC            OVFL30
    0034 0226          123                 C=C+1           X
                       124                 LEGAL
    0035 03E0          125 OVFL20          RTN
    0036 01F6          126 OVFL30          C=C+C           XS
    0037 0003          127                 GONC            OVFL40
    0038 004E          128                 C=0             W
    0039 0003          129                 GOTO            OVFL50
    003A 004A          130 OVFL40          C=0             WPT
    003B 026A          131                 C=C-1           WPT
    003C 0056          132                 C=0             XS
    003D 03D4          133                 DECPT
    003E 03D4          134 OVFL50          DECPT
    003F 03E0          135                 RTN
                       136                 FILLTO          77Q
    0040 0000          137                 CON             =PLUS           ;ROW 4
    0041 0000          138                 CON             =MINUS
    0042 0000          139                 CON             =MULTIPLY
    0043 0000          140                 CON             =DIVIDE
    0044 0000          141                 CON             =X_LT_Y
    0045 0000          142                 CON             =X_GT_Y
    0046 0000          143                 CON             =X_LE_Y
    0047 0000          144                 CON             =SIGMA_PLUS
    0048 0000          145                 CON             =SIGMA_MINUS
    0049 0000          146                 CON             =HMS_PLUS
    004A 0000          147                 CON             =HMS_MINUS
    004B 0000          148                 CON             =MOD
    004C 0000          149                 CON             =PCT
    004D 0000          150                 CON             =PCTCH
    004E 0000          151                 CON             =P_R
    004F 0000          152                 CON             =R_P
    0050 0000          153                 CON             =LN             ;ROW 5
    0051 0000          154                 CON             =X_TO_2
    0052 0000          155                 CON             =SQRT
    0053 0000          156                 CON             =Y_TO_X
    0054 0000          157                 CON             =CHS
    0055 0000          158                 CON             =E_TO_X
    0056 0000          159                 CON             =LOG
    0057 0000          160                 CON             =POWER_OF_TEN
    0058 0000          161                 CON             =E_TO_X_MINUS_1
    0059 0000          162                 CON             =SIN
    005A 0000          163                 CON             =COS
    005B 0000          164                 CON             =TAN
    005C 0000          165                 CON             =ASIN
    005D 0000          166                 CON             =ACOS
    005E 0000          167                 CON             =ATAN
    005F 0000          168                 CON             =DEC
    0060 0000          169                 CON             =ONE_BY_X       ;ROW 6
    0061 0000          170                 CON             =ABS
    0062 0000          171                 CON             =FACT
```

```
LOCATION OBJECT CODE LINE     SOURCE LINE

    0063 0000          172                CON          =X_NE_0
    0064 0000          173                CON          =X_GT_0
    0065 0000          174                CON          =LN1_PLUS_X
    0066 0000          175                CON          =X_LT_0
    0067 0000          176                CON          =X_EQ_0
    0068 0000          177                CON          =INT
    0069 0000          178                CON          =FRAC
    006A 0000          179                CON          =D_R
    006B 0000          180                CON          =R_D
    006C 0000          181                CON          =H_HMS
    006D 0000          182                CON          =HMS_H
    006E 0000          183                CON          =RND
    006F 0000          184                CON          =OCT
    0070 0000          185                CON          =CLSIG          ;ROW 7
    0071 0000          186                CON          =X_XCHNG_Y
    0072 0000          187                CON          =PI
    0073 0000          188                CON          =CLST
    0074 0000          189                CON          =ROLLUP
    0075 0000          190                CON          =RDN
    0076 0000          191                CON          =LASTX
    0077 0000          192                CON          =CLX
    0078 0000          193                CON          =X_EQ_Y
    0079 0000          194                CON          =X_NE_Y
    007A 0000          195                CON          =SIGN
    007B 0000          196                CON          =X_LE_0
    007C 0000          197                CON          =MEAN
    007D 0000          198                CON          =STDEV
    007E 0000          199                CON          =AVIEW
    007F 0000          200                CON          =CLDSP
    0080 0000          201                CON          =DEG            ;ROW 8
    0081 0000          202                CON          =RAD
    0082 0000          203                CON          =GRAD
    0083 0000          204                CON          =ENTER
    0084 0000          205                CON          =STOP
    0085 0000          206                CON          =RTN
    0086 0000          207                CON          =BEEP
    0087 0000          208                CON          =CLA
    0088 0000          209                CON          =ASHF
    0089 0000          210                CON          =PSE
    008A 0000          211                CON          =CLREG
    008B 0000          212                CON          =AOFF
    008C 0000          213                CON          =AON
    008D 0000          214                CON          =OFF
    008E 0000          215                CON          =PROMPT
    008F 0000          216                CON          =ADVNCE
    0090 0000          217                CON          =RCL            ;ROW 9
    0091 0000          218                CON          =STO
    0092 0000          219                CON          =STO_PLUS
    0093 0000          220                CON          =STO_MINUS
    0094 0000          221                CON          =STO_MULTIPLY
    0095 0000          222                CON          =STO_DIVIDE
    0096 0000          223                CON          =ISG
    0097 0000          224                CON          =DSE
    0098 0000          225                CON          =VIEW
    0099 0000          226                CON          =SIGREG
    009A 0000          227                CON          =ASTO
    009B 0000          228                CON          =ARCL
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LOCATION OBJECT CODE LINE     SOURCE LINE

    009C 0000          229                 CON             =FIX
    009D 0000          230                 CON             =SCI
    009E 0000          231                 CON             =ENG
    009F 0000          232                 CON             =TONE
    00A0 03E7          233                 CON             1747Q           ;XROM (8)
                       234                 GLB             TSTMAP
                       235 * TSTMAP - TEST BIT MAP
                       236 *- A SUBROUTINE USED TO ELIMINATE DUPLICATE CODE.
                       237 *- TEST BIT MAP FOR A SPECIFIED KEYCODE AND CLEAR
                       238 *- ITS CORRESPONDING BIT IF SET.
                       239 *- IN:  A[1:0]= LOGICAL KEYCODE + 1
                       240 *-      CHIP 0 SELECTED
                       241 *- OUT: CHIP 0 SELECTED
                       242 *- USES: A[13:0], C[13:0], M[13:0]
                       243 *- USES: 1 SUBROUTINE LEVEL
                       244 *
    00A1 00001000      245 TSTMAP          GOSUB           =TBITMA         ;TEST BIT MAP
    00A3 02EE          246                 C#0?            W               ;BIT SET?
    00A4 00001002      247                 GOLNC           =NFRPU          ;NOPE
    00A6 00001002      248                 GOLONG          =SRBMAP         ;RESET BIT MAP
                       249                 FILLTO          247Q
    00A8 0000          250                 CON             =SF
    00A9 0000          251                 CON             =CF
    00AA 0000          252                 CON             =FS_C
    00AB 0000          253                 CON             =FC_C
    00AC 0000          254                 CON             =FS
    00AD 0000          255                 CON             =FC
    00AE 0000          256                 CON             =XGOIND
    00AF 03F0          257                 CON             1760Q
                       258                                                 ;ROW 11
                       259 ***************************************************
                       260 *THIS CODE CLEARS THE SIGMA REGISTERS
                       261 ***************************************************
    00B0 00001000      262 XCLSIG          GOSUB           SUMCHK          ;LEGAL AND GET ADDRESS
                       263                                                 ;SUMCHK RETURNS ADDRESS OF
                       264                                                 ;LAST SIGMA REG IN C.X
    00B2 015C          265                 PT=             6
    00B3 000E          266                 A=0             W
    00B4 00AE          267 CLRNXT          ACEX            W
    00B5 02F0          268                 DATA=C
    00B6 00AE          269                 ACEX            W
    00B7 026E          270                 C=C-1           W
    00B8 0270          271                 DADD=C
    00B9 03D4          272                 DECPT
    00BA 0394          273                 PT=?            0
    00BB 0003          274                 GONC            CLRNXT
    00BC 03E0          275                 RTN
                       276 ***********************************************
                       277 *THE ROLE UP FUNCTION HAPPENS HERE.
                       278 ***********************************************
    00BD 00001000      279 XRDN            GOSUB           RDNSUB
    00BF 0003          280                 GOTO            NFRPRL
                       281                 FILLTO          277Q
    00C0 0000          282                 CON             =END
    00C1 03EC          283                 CON             1754Q
                       284                 GLB             FSTIN
                       285 * FSTIN - FIRST INSTRUCTION
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

                     286 * SETS A[0-3] TO THE ADDRESS IN MM FORMAT OF THE FIRST LOCATION
                     287 *-IN PROGRAM MEMORY MINUS 1 BYTE. (IN PACKED MEMORY THIS IS THE
                     288 *-ADDRESS OF THE FIRST INSTRUCTION.)
                     289 * USES A[0-3],AND C
                     290 * EXPECTS PT=3 IN AND OUT
                     291 *
  00C2 004E          292 FSTIN          C=0          W              ;SET A TO REG0 ADDRESS.
  00C3 0270          293                DADD=C
  00C4 0378          294                C=REGN       13
  00C5 003C          295                RCR          3
  00C6 0106          296                A=C          X
  00C7 0002          297                A=0          PT
  00C8 03E0          298                RTN
                     299 *
                     300                GLB          RTJLBL
                     301 *
                     302 * RTJLBL - RIGHT JUSTIFY ALPHA OPERAND
                     303 * ON ENTRY, C HAS A NON-ZERO ALPHA STRING IN THE FORM
                     304 *      "CBA0000" WHERE THE STRING IS "ABC"
                     305 * RTJLBL MOVES ZEROES TO THE LEFT SIDE: "0000CBA"
                     306 * USES THE PTR AND C ONLY.
                     307 * ON EXIT, PT=1.
                     308 *
  00C9 031C          309 RTJLBL         PT=          1
  00CA 02EA          310 RTJ10          C#0?         WP1
  00CB 0360          311                RTNC
  00CC 023C          312                RCR          2
  00CD 0003          313                GOTO         RTJ10
                     314                FILLTO       315Q
  00CE 0000          315                CON          =X_XCHNG
  00CF 0000          316                CON          =LBL
  00D0 0000          317                CON          =GTO           ;ROW 13
  00D1 03EE          318                CON          1756Q
                     319 ***********************************************
                     320 *THIS ROUTINE CHECKS FOR CHARACTER DATA.
                     321 ***********************************************
  00D2 006E          322 SEPXY          ABEX         W
  00D3 0198          323                C=M
                     324                GLB          CHK_NO_S1
  00D4 00AE          325 CHK_NO_S1      ACEX         W
  00D5 00001000      326                GOSUB        CHK_NO_S
  00D7 00AE          327                ACEX         W
  00D8 02A0          328 CHK_NO_S       SETDEC
  00D9 02FE          329 CHK_NO_S2      C#0?         S
  00DA 03A0          330                RTNNC
  00DB 023E          331                C=C+1        S
  00DC 0003          332                GONC         ERRAD
  00DD 027E          333                C=C-1        S
  00DE 03E0          334                RTN
  00DF 0000          335                FILLTO       337Q
  00E0 0000          336                CON          =XEQ           ;ROW 14
  00E1 0000          337                CON          0              ;END OF MAIN FUNCTION TABLE
  00E2 00001000      338 ERRAD          GOSUB        =ERROR
  00E4 0000          339                CON          =MSGAD
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LOCATION OBJECT CODE LINE     SOURCE LINE

                     341 ***************************************************
                     342 *THIS ROUTINE DOES A ROLL DOWN.
                     343 ***************************************************
 00E5 00001000       344 XROLLUP          GOSUB          R_SUB
 00E7 00001002       345 NFRPRL           GOLONG         =NFRPR
 00E9 00001000       346 RDNSUB           GOSUB          R_SUB
 00EB 00001000       347                  GOSUB          R_SUB
 00ED 004E           348 R_SUB            C=0            W
 00EE 0270           349                  DADD=C
 00EF 0038           350                  C=DATA
 00F0 00AE           351                  ACEX           W
 00F1 0078           352                  C=REGN         1
 00F2 0028           353                  REGN=C         0
 00F3 00B8           354                  C=REGN         2
 00F4 0068           355                  REGN=C         1
 00F5 00F8           356                  C=REGN         3
 00F6 00A8           357                  REGN=C         2
 00F7 00AE           358                  ACEX           W
 00F8 00E8           359                  REGN=C         3
 00F9 03E0           360                  RTN
                     361
                     362
                     363 *
                     364 * LOAD3 - SET REG.C = 33333333333332
                     365 *
 00FA 02A0           366 LOAD3            SETDEC                        ;SET TO DECIMAL MODE
 00FB 004E           367                  C=0            W
 00FC 026E           368                  C=C-1          W              ;GET ALL 9'S IN C
 00FD 0260           369                  SETHEX                        ;PUT BACK TO HEX MODE
 00FE 01EE           370                  C=C+C          W              ;C _ 33333333333332
 00FF 03E0           371                  RTN
                     372
                     373                  FILLTO         377Q
                     374 *
                     375 * DCTAB - DEFAULTCODE TABLE
                     376 * THERE ARE TWO TYPES OF ENTRIES.  ENTRY TYPE IS ENCODED IN
                     377 * BITS 8 AND 9:
                     378 * BITS 9,8 = 00 DATA ENTRY (DIGIT ENTRY AND ALPHA ENTRY KEYS)
                     379 * BITS 9,8 = 01 FUNCTION IN MAIN FCN TABLE
                     380 * FOR FCN ENTRIES, THE INDEX TO THE TABLE IS ENCODED IN BITS 7-0.
                     381 * FOR DATA ENTRY ENTRIES, BITS 7-0 CONTAIN EITHER THE ASCII
                     382 * CHARACTER (ALPHA ENTRY), OR THE FCN CODE FOR THE DIGIT ENTRY FCN.
                     383 * DCTAB MUST START AT @400 IN QUAD 5 (H1500=@12400)
                     384 *
                     385 * LOGICAL COL 0,  UNSHIFTED, NORMAL
 0100 0147           386                  CON            327            ;SIGMA+
 0101 0171           387                  CON            369            ;X<>Y
 0102 010E           388                  CON            0416Q          ;SHIFT
 0103 0183           389                  CON            387            ;ENTER
 0104 0141           390                  CON            321            ;-
 0105 0140           391                  CON            320            ;+
 0106 0142           392                  CON            322            ;*
 0107 0143           393                  CON            323            ;/
                     394 * LOGICAL COL 0,  SHIFTED, NORMAL
 0108 0148           395                  CON            328            ;SIGMA-
 0109 0170           396                  CON            368            ;CLSIGMA
 010A 010E           397                  CON            0416Q          ;SHIFT
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    010B 0100          398                 CON             256             ;CATALOG
    010C 0178          399                 CON             376             ;X=Y?
    010D 0146          400                 CON             326             ;X<=Y?
    010E 0145          401                 CON             325             ;X>Y?
    010F 0167          402                 CON             359             ;X=0?
                       403 * LOGICAL COL 1,  UNSHIFTED, NORMAL
    011C 0160          404                 CON             352             ;1/X
    0111 0175          405                 CON             373             ;RDN
    0112 01E0          406                 CON             480             ;XEQ
    0113 0000          407                 CON             0               ;RIGHT HALF OF ENTER KEY
    0114 0017          408                 CON             23              ;7
    0115 0014          409                 CON             20              ;4
    0116 0011          410                 CON             17              ;1
    0117 0010          411                 CON             16              ;0
                       412 * LOGICAL COL 1,  SHIFTED, NORMAL
    0118 0153          413                 CON             339             ;Y^X
    0119 014C          414                 CON             332             ;%
    011A 010F          415                 CON             417Q            ;ASN
    011B 0000          416                 CON             0               ;RIGHT HALF OF ENTER KEY
    011C 01A8          417                 CON             424             ;SF
    011D 0186          418                 CON             390             ;BEEP
    011E 019C          419                 CON             412             ;FIX
    011F 0172          420                 CON             370             ;PI
                       421 * LOGICAL COL 2,  UNSHIFTED, NORMAL
    0120 0152          422                 CON             338             ;SQRT
    0121 0159          423                 CON             345             ;SIN
    0122 0191          424                 CON             401             ;STO
    0123 001C          425                 CON             28              ;CHS
    0124 0018          426                 CON             24              ;8
    0125 0015          427                 CON             21              ;5
    0126 0012          428                 CON             18              ;2
    0127 001A          429                 CON             26              ;DECIMAL POINT
                       430 * LOGICAL COL 2,  SHIFTED, NORMAL
    0128 0151          431                 CON             337             ;X^2
    0129 015C          432                 CON             348             ;ASIN
    012A 01CF          433                 CON             463             ;LBL
    012B 0196          434                 CON             406             ;ISG
    012C 01A9          435                 CON             425             ;CF
    012D 014E          436                 CON             334             ;P-R
    012E 019D          437                 CON             413             ;SCI
    012F 0176          438                 CON             374             ;LASTX
                       439 * LOGICAL COL 3,  UNSHIFTED, NORMAL
    0130 0156          440                 CON             342             ;LOG
    0131 015A          441                 CON             346             ;COS
    0132 0190          442                 CON             400             ;RCL
    0133 001B          443                 CON             27              ;EEX
    0134 0019          444                 CON             25              ;9
    0135 0016          445                 CON             22              ;6
    0136 0013          446                 CON             19              ;3
    0137 0105          447                 CON             405Q            ;R/S
                       448 * LOGICAL COL 3,  SHIFTED, NORMAL
    0138 0157          449                 CON             343             ;10^X
    0139 015D          450                 CON             349             ;ACOS
    013A 01D0          451                 CON             464             ;GTO
    013B 0185          452                 CON             389             ;RTN
    013C 01AC          453                 CON             428             ;FS?
    013D 014F          454                 CON             335             ;R-P
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LOCATION OBJECT CODE LINE     SOURCE LINE

    013E 019E        455                 CON             414             ;ENG
    013F 0198        456                 CON             408             ;VIEW
                     457 * LOGICAL COL 4,  UNSHIFTED, NORMAL MODE
    0140 0150        458                 CON             336             ;LN
    0141 015B        459                 CON             347             ;TAN
    0142 0108        460                 CON             410Q            ;SST
    0143 0000        461                 CON             0               ;BACKARROW
    0144 010C        462                 CON             414Q            ;MODE (ALPHA)
    0145 010C        463                 CON             414Q            ;MODE (PRGM)
    0146 010C        464                 CON             414Q            ;MODE (USER)
    0147 0000        465                 NOP                             ;OFF KEY IS SPECIAL
                     466 * LOGICAL COL 4,  SHIFTED, NORMAL MODE
    0148 0155        467                 CON             341             ;E^X
    0149 015E        468                 CON             350             ;ARCTAN
    014A 0107        469                 CON             407Q            ;BST
    014B 0177        470                 CON             375             ;CLX
    014C 010C        471                 CON             414Q            ;MODE (ALPHA)
    014D 010C        472                 CON             414Q            ;MODE (PRGM)
    014E 010C        473                 CON             414Q            ;MODE (USER)
    014F 0000        474                 NOP                             ;OFF KEY IS SPECIAL
                     475 *
                     476 * LOGICAL COL 0,  UNSHIFTED, ALPHA MODE
    0150 0041        477                 CON             65              ;A
    0151 0046        478                 CON             70              ;F
    0152 010E        479                 CON             0416Q           ;SHIFT
    0153 004E        480                 CON             78              ;N
    0154 0051        481                 CON             81              ;Q
    0155 0055        482                 CON             85              ;U
    0156 0059        483                 CON             89              ;Y
    0157 003A        484                 CON             58              ;:
                     485 * LOGICAL COL 0,  SHIFTED, ALPHA MODE
    0158 0061        486                 CON             97              ;LOWER CASE A
    0159 007E        487                 CON             126             ;SIGMA
    015A 010E        488                 CON             0416Q           ;SHIFT
    015B 005E        489                 CON             94              ;^
    015C 002D        490                 CON             45              ;-
    015D 002B        491                 CON             43              ;+
    015E 002A        492                 CON             42              ;*
    015F 002F        493                 CON             47              ;/
                     494 * LOGICAL COL 1,  UNSHIFTED, ALPHA MODE
    0160 0042        495                 CON             66              ;B
    0161 0047        496                 CON             71              ;G
    0162 004B        497                 CON             75              ;K
    0163 0000        498                 CON             0               ;RIGHT HALF OF ENTER KEY
    0164 0052        499                 CON             82              ;R
    0165 0056        500                 CON             86              ;V
    0166 005A        501                 CON             90              ;Z
    0167 0020        502                 CON             32              ;SPACE
                     503 * LOGICAL COL 1,  SHIFTED, ALPHA MODE
    0168 0062        504                 CON             98              ;LOWER CASE B
    0169 0025        505                 CON             37              ;%
    016A 007F        506                 CON             127             ;LAZY T (APPEND)
    016B 0000        507                 CON             0               ;RIGHT HALF OF ENTER KEY
    016C 0037        508                 CON             55              ;7
    016D 0034        509                 CON             52              ;4
    016E 0031        510                 CON             49              ;1
    016F 0030        511                 CON             48              ;0
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LOCATION OBJECT CODE LINE     SOURCE LINE

                     512 * LOGICAL COL 2,  UNSHIFTED, ALPHA MODE
0170 0043            513                 CON             67              ;C
0171 0048            514                 CON             72              ;H
0172 004C            515                 CON             76              ;L
0173 004F            516                 CON             79              ;O
0174 0053            517                 CON             83              ;S
0175 0057            518                 CON             87              ;W
0176 003D            519                 CON             61              ;=
0177 002C            520                 CON             44              ;COMMA
                     521 * LOGICAL COL 2,  SHIFTED, ALPHA MODE
0178 0063            522                 CON             99              ;LOWER CASE C
0179 001D            523                 CON             29              ;NOT EQUAL SIGN
017A 019A            524                 CON             410             ;ASTO
017B 000D            525                 CON             13              ;ANGLE SIGN
017C 0038            526                 CON             56              ;8
017D 0035            527                 CON             53              ;5
017E 0032            528                 CON             50              ;2
017F 002E            529                 CON             46              ;DECIMAL POINT
                     530 * LOGICAL COL 3,  UNSHIFTED, ALPHA MODE
0180 0044            531                 CON             68              ;D
0181 0049            532                 CON             73              ;I
0182 004D            533                 CON             77              ;M
0183 0050            534                 CON             80              ;P
0184 0054            535                 CON             84              ;T
0185 0058            536                 CON             88              ;X
0186 003F            537                 CON             63              ;?
0187 0105            538                 CON             405Q            ;R/S
                     539 * LOGICAL COL 3,  SHIFTED, ALPHA MODE
0188 0064            540                 CON             100             ;LOWER CASE D
0189 003C            541                 CON             60              ;<
018A 019B            542                 CON             411             ;ARCL
018B 0024            543                 CON             36              ;$
018C 0039            544                 CON             57              ;9
018D 0036            545                 CON             54              ;6
018E 0033            546                 CON             51              ;3
018F 017E            547                 CON             382             ;AVIEW
                     548 * LOGICAL COL 4,  UNSHIFTED, ALPHA MODE
0190 0045            549                 CON             69              ;E
0191 004A            550                 CON             74              ;J
0192 0108            551                 CON             410Q            ;SST
0193 0000            552                 CON             000             ;BACKARROW
0194 010C            553                 CON             414Q            ;MODE (ALPHA)
0195 010C            554                 CON             414Q            ;MODE(PRGM)
0196 010C            555                 CON             414Q            ;MODE (USER)
0197 0000            556                 NOP                             ;OFF KEY IS SPECIAL
                     557 * LOGICAL COL 4,  SHIFTED, ALPHA MODE
0198 0065            558                 CON             101             ;LOWER CASE E
0199 003E            559                 CON             62              ;>
019A 0207            560                 CON             519             ;BST
019B 0187            561                 CON             391             ;CLA
019C 010C            562                 CON             414Q            ;MODE (ALPHA)
019D 010C            563                 CON             414Q            ;MODE (PRGM)
019E 010C            564                 CON             414Q            ;MODE (USER)
                     565                                                 ;OFF KEY IS SPECIAL
                     566 ***********************************************
                     567 *ISG AND DSE ARE DONE HERE. THE ROUTINE BREAKS
                     568 *THE INPUT IN B INTO ITS THREE PARTS - INT,
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LOCATION OBJECT CODE LINE     SOURCE LINE

                     569 *COMPARE, AND INC. IT ADDS THE INC, STORES THE
                     570 *RESULT AND BRANCHES TO THE COMPARE ROUTINE
                     571 *TO DECIDE WHETHER  TO SKIP OR NOT.
                     572 ***********************************************
 019F 0388           573 XDSE          ST=1          0             ;SET DSE FLAG
 01A0 00EE           574 XISG          BCEX          W             ;GET CONTENT OF RNN
 01A1 00001000       575               GOSUB         CHK_NO_S      ;CHECK FOR ALPHA
 01A3 0003           576               GOTO          NOFRAC
 01A4 03DA           577 ELMFRC        CSR           M             ;CHANGE TO FIX NOTATION
 01A5 0226           578               C=C+1         X
 01A6 02F6           579 NOFRAC        C#0?          XS
 01A7 0007           580               GOC           ELMFRC
 01A8 00001000       581               GOSUB         =SINFR        ;DO INT AND FRC
 01AA 0198           582               C=M                         ;GET INT PART
                     583 * NEXT TWO STATES (?PT=0, GOC OVRDEC) ARE VESTIGIAL FROM WHEN
                     584 * SINFR WORKED FOR 13 DIGIT MANTISSAS IN ANOTHER MACHINE.  THESE
                     585 * TWO STATES CAN BE REMOVED WITHOUT HARM.
 01AB 0394           586               PT=?          0             ;PREVNT CLEAR FOR LARGE VALUES
 01AC 0007           587               GOC           OVRDEC
 01AD 03D4           588               DECPT
 01AE 004A           589 OVRDEC        C=0           WPT           ;CLEAR FRACTIONAL PART
 01AF 00FA           590               BCEX          M             ;JOIN MANTISSA WITH EXP AND SIGN
 01B0 00EE           591               BCEX          W             ;BRING COMPLETE INT TO C
 01B1 0158           592               M=C                         ;SAVE FOR LATER
 01B2 00AE010E       593               C=A           W             ;PUT FRAC IN C
 01B4 02F0           594               DATA=C
 01B5 029C           595               PT=           7             ;SET TO CLR TRAIL DIGITS
 01B6 004A           596               C=0           WPT
 01B7 025C           597               PT=           9             ;PICK OFF INC
 01B8 02EA           598               C#0?          WPT           ;DUMMY ONE FOR ZERO
 01B9 0007           599               GOC           SEPA
 01BA 011C           600               PT=           8
 01BB 0050           601               LC            1
 01BC 025C           602               PT=           9
 01BD 000E           603 SEPA          A=0           W
 01BE 010A           604               A=C           WPT           ;PICK OFF INC
 01BF 004A           605               C=0           WPT           ;LEAVE COMPARE VAL
 01C0 03EE           606               ASL           W
 01C1 03EE           607               ASL           W
 01C2 03EE           608               ASL           W             ;INCREMENT LEFT JUST
 01C3 035C           609               PT=           12            ;POINT TO DIGIT ONE
 01C4 0226           610               C=C+1         X             ;EXP COMPARE
 01C5 0226           611               C=C+1         X
 01C6 0166           612               A=A+1         X             ;EXP INC
 01C7 0342           613               A#0?          PT            ;IS INC EXP OK?
 01C8 0007           614               GOC           TSTEXP        ;YES
 01C9 03FA           615               ASL           M
 01CA 0006           616               A=0           X
 01CB 02E2           617 TSTEXP        C#0?          PT            ;EXP 2 TOO LARGE?
 01CC 0007           618               GOC           ADDIT         ;NO, JUST RIGHT
 01CD 02FC           619               RCR           13            ;SHIFT COMPARE LEFT
 01CE 0046           620               C=0           X             ;EXP=1?
 01CF 0226           621               C=C+1         X
 01D0 02E2           622               C#0?          PT            ;EXP COMP OK NOW?
 01D1 0007           623               GOC           ADDIT         ;YES
 01D2 02FC           624               RCR           13            ;SHIFT LEFT
 01D3 0046           625               C=0           X             ;EXP MUST BE ZERO
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    01D4 038C          626 ADDIT          ST=1?          0              ;DSE OR ISG?
    01D5 0003          627                GONC           ADDEM          ;ISG
    01D6 01BE          628                A=A-1          S              ;MAKE DEC OUT OF INC
    01D7 0070          629 ADDEM          N=C                           ;SAVE FLOATING POINT COMPARE
    01D8 0198          630                C=M                           ;GET INTEGER PART BACK
    01D9 00001000      631                GOSUB          =AD2_10
    01DB 0158          632                M=C                           ;SAVE INT PART OF RESULT
    01DC 010E          633                A=C            W              ;DUP RESULT IN A
    01DD 0038          634                C=DATA                        ;GET FRAC PART BACK
    01DE 00A60106      635                C=A            X              ;DUP EXP
    01E0 03DA          636 MRSHFT         CSR            M              ;SHIFT FRAC INTO POSITION
    01E1 0266          637                C=C-1          X              ;IN POSITION YET/
    01E2 0007          638                GOC            COMBIN         ;YES
    01E3 02FA          639                C#0?           M              ;FRACTION ZERO
    01E4 0007          640                GOC            MRSHFT         ;NO NOT YET
    01E5 0046          641 COMBIN         C=0            X              ;SIGN AND EXP C=0
    01E6 021A          642                C=C+A          M
                       643                LEGAL
    01E7 00001000      644                GOSUB          =SHF40
    01E9 02F0          645                DATA=C                        ;STORE UPDATED COUNTER
    01EA 0288          646                ST=1           7
    01EB 0198          647                C=M
    01EC 00AE          648                ACEX           W
    01ED 038C          649                ST=1?          0              ;DSE??
    01EE 0003          650                GONC           XX_GT_Y
                       651 ************************************************
                       652 *THE COMPARISONS FOLLOW. X VALUES ENTER IN N
                       653 *WHILE Y VALUES ARE IN A.
                       654 ************************************************
    01EF 00001000      655 XX_LT_Y        GOSUB          Y_MINUS_X      ;DO SUBTRACT
    01F1 02A0          656 XX_GT_0        SETDEC
    01F2 00B0          657                C=N
    01F3 02EE          658                C#0?           W
    01F4 0003          659                GONC           SKP
    01F5 023E          660                C=C+1          S
    01F6 0003          661                GONC           NOSKP
    01F7 0003          662                GOTO           SKP
    01F8 00001000      663 XX_GT_Y        GOSUB          Y_MINUS_X
    01FA 028C          664 XX_LT_0        ST=1?          7
    01FB 0007          665                GOC            XX_LE_0
    01FC 02A0          666 XX_LT_0_       SETDEC
    01FD 00B0          667                C=N
    01FE 023E          668                C=C+1          S
    01FF 0003          669                GONC           SKP
    0200 0003          670                GOTO           NOSKP
    0201 00001000      671 XX_LE_Y        GOSUB          =Y_MINUS_X
    0203 02EE          672                C#0?           W
    0204 0003          673                GONC           NOSKP
    0205 0003          674                GOTO           XX_GT_0
    0206 000E          675 XX_EQ_0        A=0            W
    0207 00B0          676                C=N
    0208 0003          677                GOTO           XYY
    0209 00F8          678 XX_LE_0A       C=REGN         3              ;ROW LOGIC DOESN'T CHECK
    020A 00001000      679                GOSUB          CHK_NO_S       ; FOR ALPHA DATA ON X<=0?
    020C 0070          680                N=C
    020D 00B0          681 XX_LE_0        C=N
    020E 02EE          682                C#0?           W
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    020F 0003          683                    GONC            NOSKP
    0210 0003          684                    GOTO            XX_LT_0_
    0211 000E          685 XX_NE_0            A=0             W
    0212 00B0          686                    C=N
    0213 0003          687                    GOTO            XYN
    0214 00B8          688 XX_EQ_Y            C=REGN          2
    0215 00AE          689                    ACEX            W
    0216 00F8          690                    C=REGN          3
    0217 036E          691 XYY                A#C?            W
    0218 0007          692                    GOC             SKP
                       693                    GLB             NOSKP
    0219 02CC          694 NOSKP              ST=1?           13
    021A 0007          695                    GOC             NOSKPO
    021B 004E          696                    C=0             W
    021C 0270          697                    DADD=C
    021D 03B8          698                    C=REGN          14
    021E 03D8          699                    CSTEX
    021F 004C          700                    ST=1?           4
    0220 0007          701                    GOC             NOSKPO
    0221 03D8          702                    CSTEX
    0222 028C          703                    ST=1?           7                ;IS THIS ISG OR DSG
    0223 0007          704                    GOC             NOSKPO
    0224 00001000      705                    GOSUB           =MSG
    0226 0000          706                    CON             =MSGYES
    0227 00001002      707 NOSKPO             GOLONG          =NFRPU           ;CAN'T DO A RTN HERE
                       708 * BECAUSE SOME COMPARISONS HAVE NFRX ON THE STACK INSTEAD OF NFRPU
    0229 00B8          709 XX_NE_Y            C=REGN          2
    022A 00AE          710                    ACEX            W
    022B 00F8          711                    C=REGN          3
    022C 036E          712 XYN                A#C?            W
    022D 0007          713                    GOC             NOSKP
                       714                    GLB             SKP
    022E 0260          715 SKP                SETHEX
    022F 02CC          716                    ST=1?           13
    0230 0003          717                    GONC            SST
    0231 00001000      718 DOSKP              GOSUB           =GETPC
                       719                    GLB             DOSKP
    0233 00001000      720                    GOSUB           =SKPLIN
    0235 00001000      721                    GOSUB           =PUTPCX          ;FORCE RECALC OF LINE NUMBER
    0237 0003          722                    GOTO            NOSKPO
    0238 004E          723 SST_               C=0             W
    0239 0270          724                    DADD=C
    023A 03B8          725                    C=REGN          14
    023B 03D8          726                    CSTEX
    023C 004C          727                    ST=1?           4
    023D 0007          728                    GOC             DOSKP
    023E 03D8          729                    CSTEX
    023F 028C          730                    ST=1?           7                ;ISG DSE?
    0240 0007          731                    GOC             NOSKPO
    0241 00001000      732                    GOSUB           =MSG             ;NO COMP OR FLAGS
    0243 0000          733                    CON             =MSGNO
    0244 0003          734                    GOTO            NOSKPO
                       735 ***************************************************************
                       736 *THE FLAG CONDITIONALS FOLLOW. ENTRY IS WITH R14 IN A AND A
                       737 *MASK IN B. THE MASK CONSISTS OF ALL ZEROS EXCEPT FOR A
                       738 *ONE AT THE LOCATION OF THE SELECTED FLAG
                       739 ***************************************************************
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    0245 00CE         740 XFS             C=B             W               ;GET MASK
    0246 03B0         741                 C=C&A                           ;AND R14 WITH MASK
    0247 02EE         742                 C#0?            W               ;IS ANYTHING LEFT
    0248 0007         743                 GOC             NOSKP           ;YES NO SKP
    0249 0003         744 SKPIT           GOTO            SKP
    024A 00EE         745 XSF             BCEX            W               ;MOVE MASK TO C
    024B 0370         746                 C=C!A                           ;SET MASKED BIT
    024C 0003         747                 GOTO            FLGANN
    024D 00CE         748 XCF             C=B             W
    024E 02AE         749                 C=-C-1          W
    024F 0000         750                 NOP
    0250 03B0         751                 C=C&A
    0251 03A8         752 FLGANN          REGN=C          14
    0252 00AE         753                 ACEX            W
    0253 0158         754                 M=C
    0254 00001000     755                 GOSUB           =ANNOUT
    0256 0198         756                 C=M
    0257 00AE         757                 ACEX            W
    0258 03E0         758                 RTN
                      759 ***************************************************
                      760 *SUM+NN SETS THE ADDRESS OF THE REGISTER USED
                      761 *FOR SIGMA PLUS. IT CHECKS TO SEE IF THE ADDRESS
                      762 *IS IN FACT A LEGAL ADDRESS. THE SUBROUTINE
                      763 *SUMCHK IS CALLED BY THE SIGMA PLUS FUNCTION
                      764 *FOR THIS CHECK.
                      765 ***************************************************
    0259 00B0         766 XSGREG          C=N                             ;ADDRESS OR SUM 1
    025A 00001000     767                 GOSUB           SUMCK2          ;LEGAL?
    025C 00B0         768                 C=N                             ;YES
    025D 00AE         769                 CAEX            W               ;PUT ADDRESS IN SCRATCH
    025E 004E         770                 C=0             W
    025F 0270         771                 DADD=C
    0260 0378         772                 C=REGN          13
    0261 01BC         773                 RCR             11
    0262 0046         774                 C=0             X
    0263 0206         775                 C=C+A           X
    0264 003C         776                 RCR             3
    0265 0368         777                 REGN=C          13
    0266 03E0         778                 RTN
    0267 0378         779 SUMCHK          C=REGN          13              ;GET ADDRESS
    0268 01BC         780                 RCR             11
    0269 00AE         781 SUMCK2          CAEX            W               ;ADD5
    026A 0130         782                 LDI
    026B 0005         783                 CON             5
    026C 0260         784                 SETHEX
    026D 0206         785                 C=C+A           X
                      786                 LEGAL
                      787 ***************************************************
                      788 *CHKADR-CHECKS FOR VALID DATA ADDRESSES.
                      789 * IN: ADDR IN C.X
                      790 * OUT: DATA IN B, ADDR IN C.X, HEXMODE,
                      791 *      DADD=C.X (EXCEPT SOME ERROR EXITS)
                      792 * USES: ACTIVE POINTER, A, S9, DADD, C, B
                      793 * MAY EXIT TO ERRNE
                      794 *
                      795 * NOTE: CONTENTS OF C ARE UNCHANGED
                      796 *
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LOCATION OBJECT CODE LINE     SOURCE LINE

                     797 * CHKAD4 - CHECKS TO SEE IF THE REGISTER IS THERE.
                     798 *   ON ENTRY, DADD=B=ADDRESS OF REGISTER AND C=CONTENTS OF REG
                     799 *   STATUS OF S9 ON ENTRY CONTROLS EXIT IF THE REGISTER ISN'T
                     800 *   THERE: EXITS TO ERRNE IF S9=1 ELSE GOES TO COLD START!
                     801 *   ON EXIT, ADDRESS OF REGISTER IS IN C.X AND CONTENTS ARE IN B
                     802 *   AND HEXMODE AND USES ACTIVE POINTER AND A
                     803 * NOTE - CHKAD4 IS PROBABLY OBSOLETE NOW. IT USED TO BE CALLED BY
                     804 * MEMCHK IN CNO.  DRC 10/20/79
                     805 *
                     806 * NOTE- CHKAD4 IS NOT OBSOLETE!  IT IS CALLED FROM PLUG-INS
                     807 * AND THEY EXPECT THE C-REGISTER TO BE UNCHANGED -- nm 2/21/85
                     808 ***********************************************
026E 00001002        809 CHKADR          GOLONG          =PATCH6
                     810                 GLB             P6RTN
0270 00EE            811 P6RTN           BCEX            W               ;SAVE ADDRESS
0271 0038            812                 C=DATA                          ;GET CURRENT CONTENT
0272 02A0            813                 SETDEC
0273 022E            814                 C=C+1           W               ;LOGIC IN HERE ASSURES
0274 026E            815                 C=C-1           W               ; DATA IS IN A CANONICAL
                     816                                                 ;  FORM
0275 02FE            817                 C#0?            S               ;NON-POSITIVE?
0276 0003            818                 GONC            CKAD3           ;POSITIVE NUMBER
0277 023E            819                 C=C+1           S               ;NEGATIVE NUMBER?
0278 0007            820                 GOC             CKAD2           ;YES
0279 0038            821                 C=DATA                          ;ASSUME AN ALPHA STRING
027A 005E            822                 C=0             S               ;ASSURE A 1 IN DIGIT 13
027B 023E            823                 C=C+1           S
                     824                 LEGAL
027C 0003            825                 GOTO            CKAD4
027D 027E            826 CKAD2           C=C-1           S               ;RESTORE 9 IN SIGN DIGIT
027E 02F6            827 CKAD3           C#0?            XS              ;NEGATIVE EXPONENT?
027F 0003            828                 GONC            CKAD3J          ;NO.
0280 0056            829                 C=0             XS              ;ASSURE EXP SIGN = 9
0281 0276            830                 C=C-1           XS
0282 035C            831 CKAD3J          PT=             12
0283 02E2            832                 C#0?            PT              ;IS MANTISSA NORMALIZED?
0284 0007            833                 GOC             CKAD4           ;YES
0285 004E            834                 C=0             W               ;FORCE WHOLE WORD TO ZERO
                     835                 GLB             CHKAD4
0286                 836 CHKAD4
0286 0260            837 CKAD4           SETHEX
0287 00EE            838                 BCEX            W
0288 010E            839                 A=C             W               ;GET ADR BACK
0289 02F0            840                 DATA=C                          ;WRITE ADR OUT
028A 0038            841                 C=DATA                          ;BRING ADR BACK IN
028B 036E            842                 A#C?            W               ;GET ADR BACK?
028C 0003            843                 GONC            CKAD10          ;YES
                     844                                                 ;REG ISN'T THERE
028D 024C            845                 ST=1?           9
028E 00001003        846                 GOLC            =ERRNE
0290 00001002        847                 GOLONG          =COLDST
0292                 848 CKAD10
0292 00CE            849                 C=B             W               ;PUT DATA BACK
0293 02F0            850                 DATA=C
0294 00AE            851                 ACEX            W               ;ADR BACK TO CX
0295 03E0            852                 RTN
                     853 ***********************************************
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LOCATION OBJECT CODE LINE     SOURCE LINE

    0296 00CE          854 XARCL          C=B            W
    0297 027E          855                C=C-1          S
    0298 02FE          856                C#0?           S              ;NUMERIC DATA?
    0299 0003          857                GONC           REGALP         ;NO, ALPHA DATA
    029A 00001000      858                GOSUB          =AFORMT        ;NUMERIC DATA
    029C 02CC          859 ARCL10         ST=1?          13             ;RUNNING?
    029D 0360          860                RTNC
    029E 03B8          861                C=REGN         14
    029F 0358          862                ST=C
    02A0 004C          863                ST=1?          4              ;SSTFLG?
    02A1 0360          864                RTNC
    02A2 028C          865                ST=1?          7              ;ALPHA MODE?
    02A3 03A0          866                RTNNC                         ;NO
    02A4 0108          867                ST=1           8              ;SAY PROMPT & NO SCROLL
    02A5 00001000      868                GOSUB          =ARGOUT
                       869 *
                       870 * STFLGS - SET MSGFLG & DATAENTRY FLAG
                       871 * ASSUMES CHIP 0 ENABLED.  LEAVES SS 1/2 UP AND REG 14 IN C
                       872 *
    02A7 03B8          873 STFLGS         C=REGN         14
    02A8 033C          874                RCR            1
    02A9 0358          875                ST=C
    02AA 0308          876                ST=1           1              ;SET MSGFLG
    02AB 0148          877                ST=1           6              ;SET DATAENTRY FLAG
    02AC 0398          878                C=ST
    02AD 02FC          879                RCR            13
    02AE 03A8          880 STFL10         REGN=C         14
    02AF 03E0          881                RTN
                       882 *
    02B0 0046          883 REGALP         C=0            X              ;RE-ENABLE CHIP 0
    02B1 0270          884                DADD=C
    02B2 035C          885                PT=            12             ;RELIES ON P ACTIVE
    02B3 00A0          886 ARCL20         SELP
    02B4 03D4          887                DECPT
    02B5 03D4          888                DECPT                         ;MOVE P RIGHT 1 BYTE
    02B6 0354          889                PT=?           12             ;WRAPAROUND?
    02B7 0007          890                GOC            ARCL10         ;YES. DONE
    02B8 00CE          891                C=B            W              ;PUT CHAR TO G FOR APNDNW
    02B9 0058          892                G=C
    02BA 00E0          893                SELQ
    02BB 019C          894                PT=            11
    02BC 02D2          895                B#0?           PQ             ;ANY CHARS FOUND YET?
    02BD 00001001      896                GSUBC          =APNDNW        ;APPEND TO ALPHA REG
                       897 * APNDNW CLOBBERS A, C, AND THE ACTIVE POINTER, WHICH IS Q HERE.
    02BF 0003          898                GOTO           ARCL20
                       899 ***************************************************
                       900 *THIS ROUTINE SETS THE INTERNAL DISPLAY FORMAT
                       901 *STATUS.
                       902 ***************************************************
    02C0 0398          903 XSCI           C=ST                          ;FE00NNNN
    02C1 023C          904                RCR            2              ;XXXXXXXX,FE00NNNN
    02C2 0398          905                C=ST                          ;FE00NNNN,FE00NNNN
    02C3 02FC          906                RCR            13             ;FE00NNNNFE00,NNNN
    02C4 0358          907                ST=C                          ;SAVE NNNNFE00
    02C5 03B8          908                C=REGN         14             ;GET STATUS
    02C6 003C          909                RCR            3              ;MOVE DSP TO POSITION
    02C7 03D8          910                CSTEX                         ;MOVE GRAD RAD TO STATUS
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    02C8 038C          911                 ST=1?           0                   ;IS GRAD SET
    02C9 0003          912                 GONC            S1_                 ;NO THEN RAD
    02CA 022E          913                 C=C+1           W                   ;SET LOW BIT
    02CB 030C          914 S1_             ST=1?           1                   ;RAD?
    02CC 0003          915                 GONC            DSPDN
    02CD 022E          916                 C=C+1           W                   ;SET BIT TWO
    02CE 022E          917                 C=C+1           W
    02CF 01BC          918 DSPDN           RCR             11
    02D0 0003          919                 GOTO            STFL10
                       920 ***************************************************************
                       921 *XBEEP-COCONUT BEEP
                       922 *SETS UP STATUS WITH A TONE NUMBER THEN CALLS TONE AS IF
                       923 *FROM KEYBOAED.
                       924 ***************************************************************
    02D1               925 XBEEP
    02D1 00001000      926                 GOSUB           TONEB
    02D3 0130          927                 LDI                                 ;LOAD A 5
    02D4 0005          928                 CON             5
    02D5 00001000      929                 GOSUB           TONEB
    02D7 0130          930                 LDI                                 ;LOAD A 8
    02D8 0008          931                 CON             8
    02D9 00001000      932                 GOSUB           TONEB
                       933                 GLB             TONE7X
    02DB 0130          934 TONE7X          LDI
    02DC 0007          935                 CON             7
    02DD 0358          936 TONEB           ST=C                                ;FALL INTO TONE
                       937 ***************************************************************
                       938 *XTONE-EXECUTE 41-C TONE FUNCTION
                       939 *
                       940 *  ONE DIGIT(0-9) OPERAND FUNCTION, 0=LOW, 9=HIGH. TONES ARE NOT
                       941 *  MUSCIAL NODES. THE FREQUENCY DIFFERENCE ARE RATHER ARBITRARY.
                       942 *     TONE N     WORD TIMES/CYCLE
                       943 *        9        3
                       944 *        8        4
                       945 *        7        5
                       946 *        6        6
                       947 *        5        8
                       948 *        4       10
                       949 *        3       12
                       950 *        2       14
                       951 *        1       16
                       952 *        0       18
                       953 *  THE DURATION OF EACH TONE IS EQUALLY .25 SECONDS
                       954 *  IF THE AUDIO ENABLE FLAG IS NOT SET, SILENT RETURN.
                       955 *
                       956 * INPUT:  1. S[0:7] = OPERAND (0-9)
                       957 *         2. CHIP 0 ENABLE
                       958 *
                       959 * USES : A, C, S[0:7], F0[0:7]. NO PT.  + 1 SUB LEVEL
                       960 *
                       961 * OUTPUT: 1. HEXMODE
                       962 *         2. F0[0:7] = 0
                       963 *         3. A.X = FFF
                       964 *         4. CHIP 0 ENABLE
                       965 * SPECIAL ENTRIES :
                       966 *
                       967 * TONE7X - GENERATES TONE 7
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LOCATION OBJECT CODE LINE     SOURCE LINE

                      968 *  SAME AS XTONE EXCEPT NO OPERAND IS REQUIRED.
                      969 *
                      970 * TONEB - SAME AS XTONE EXCEPT THE OPERAND IS IN C[0:1]
                      971 *
                      972 ***************************************************************
 02DE 03B8            973 XTONE          C=REGN        14            ;IS BEEP ENABLED
 02DF 02BC            974                RCR           7
 02E0 03D8            975                CSTEX
 02E1 030C            976                ST=1?         1
 02E2 03A0            977                RTNNC                       ;NO NOT ENABLED
 02E3 03C4            978                CLRST                       ;CLEAR FLAG OUT REG
 02E4 02D8            979                FEXSB
 02E5 0358            980                ST=C                        ;SAVE FREQUENCY INPUT IN ST
 02E6 004E            981                C=0           W
 02E7 0130            982                LDI                         ;PUT ALL 1S IN ST
 02E8 00FF            983                CON           15*16+15
 02E9 03D8            984                CSTEX                       ; & GET COUNT BACK
 02EA 01BC            985                RCR           11            ;PLACE COUNT FOR LOOK UP
 02EB 010E            986                A=C           W
 02EC 007C            987                RCR           4             ;SHIFT FREQ INTO DIGIT 13
 02ED 02A0            988                SETDEC
 02EE 02BE            989                C=-C-1        S
 02EF 0260            990                SETHEX
 02F0 00001000        991                GOSUB         PCKDUR        ;PICK .25 S  DURATION
 02F2 005B            992                CON           133Q          ;CONSTANTS MUST BE ODD
 02F3 0065            993                CON           145Q
 02F4 0073            994                CON           163Q
 02F5 0087            995                CON           207Q
 02F6 00A1            996                CON           241Q
 02F7 00C9            997                CON           311Q
 02F8 010B            998                CON           413Q
 02F9 013F            999                CON           477Q
 02FA 018F           1000                CON           617Q
 02FB 0215           1001                CON           1025Q
 02FC 01B0           1002 PCKDUR        C=STK
 02FD 021A           1003                C=C+A         M
 02FE 0330           1004                CXISA
 02FF 00A6           1005                ACEX          X             ;DURATION NOW IN A X
                     1006                                            ;TEST FOR TONE 7,8,9
 0300 027E           1007                C=C-1         S
 0301 0007           1008                GOC           TONE9
 0302 027E           1009                C=C-1         S
 0303 0007           1010                GOC           TONE8
 0304 027E           1011                C=C-1         S
 0305 0007           1012                GOC           TONE7
 0306 011E           1013 DELOOP        A=C           S             ;GET FREQ CNTR
 0307 02D8           1014                FEXSB                       ;TURN ON TONE
 0308 01BE           1015                A=A-1         S             ;FREQ COUNT
 0309 0003           1016                GONC          $-1
 030A 01A6           1017                A=A-1         X             ;COUNT DOWN DURTATION
 030B 0003           1018                GONC          DELOOP
 030C 03E0           1019                RTN
                     1020 *
 030D 02D8           1021 TONE9         FEXSB
 030E 01A6           1022                A=A-1         X
 030F 0003           1023                GONC          $-2
 0310 03E0           1024                RTN
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LOCATION OBJECT CODE LINE     SOURCE LINE

    0311 02D8        1025 TONE8          FEXSB
    0312 0000        1026                NOP
    0313 01A6        1027                A=A-1          X
    0314 0003        1028                GONC           $-3
    0315 03E0        1029                RTN
    0316 02D8        1030 TONE7          FEXSB
    0317 0000        1031                NOP
    0318 0000        1032                NOP
    0319 01A6        1033                A=A-1          X
    031A 0003        1034                GONC           $-4
    031B 03E0        1035                RTN
                     1036 ***************************************************
                     1037 *THIS ROUTINE SETS DEGREES RADIANS OR GRADS.
                     1038 ***************************************************
    031C 00001000    1039 XDEG           GOSUB          DEGDO
    031E 0398        1040 XDEG2          C=ST
    031F 018C        1041                RCR            11
    0320 00001002    1042                GOLONG         =ANN_14
    0322 00001000    1043 XRAD           GOSUB          DEGDO
    0324 0388        1044                ST=1           0
    0325 0003        1045                GOTO           XDEG2
    0326 00001000    1046 XGRAD          GOSUB          DEGDO
    0328 0308        1047                ST=1           1
    0329 0003        1048                GOTO           XDEG2
    032A 03B8        1049 DEGDO          C=REGN         14
    032B 003C        1050                RCR            3
    032C 0358        1051                ST=C
    032D 0384        1052                ST=0           0
    032E 0304        1053                ST=0           1
    032F 03E0        1054                RTN
                     1055 ***************************************************
                     1056 *FNDEND-FIND THE HIGH END OF RAM
                     1057 * ROUTINE STARTS AT REG0 STORING AND RETRIEVING
                     1058 * THE REGISTERS ADDRESS UNTIL THE
                     1059 * RETRIVED VALUE DOEN NOT MATCH THE STORED VALUE.
                     1060 * UPON RETURN  A(0:2) CONTAINS THE ADDRESS OF THE
                     1061 * FIRST NON-EXISTANT REGISTER.
                     1062 *IF FLAG 8 IS SET AND ENTRY IS AT CLEAR THE ROUTINE
                     1063 * ALSO CLEARS ALL DATA REGISTERS.
                     1064 * NOTE: FNDEND RELIES ON THE TESTED REGISTER BEING DIFFERENT FROM
                     1065 * WHAT YOU GET WHEN YOU READ A NONEXISTENT REGISTER - PROBABLY AN
                     1066 * OK ASSUMPTION IF NONEXISTENT REGISTERS GIVE ALL ZEROES OR ALL ONES
                     1067 ***************************************************
    0330 0104        1068 FNDEND         ST=0           8              ;CLEAR CLEAR FLAG
    0331 004E        1069                C=0            W              ;ADDRESS SHIP ZERO
    0332 0270        1070                DADD=C
    0333 0378        1071 CLR            C=REGN         13             ;GET REG 0
    0334 003C        1072                RCR            3
    0335 005A        1073                C=0            M              ;MUST HAVE ZEROS IN TEST
    0336 0270        1074 CLEM           DADD=C                        ;ADDRESS REGISTER
    0337 00AE        1075                ACEX           W              ;SAVE ADR
    0338 0038        1076                C=DATA                        ;SAVE VALUE
    0339 00EE        1077                BCEX           W
    033A 00AE010E    1078                C=A            W              ;DUP ADR
    033C 02F0        1079                DATA=C                        ;SEND ADR OUT
    033D 0038        1080                C=DATA                        ;BRING IT BACK
    033E 036E        1081                A#C?           W              ;HAS IT CHANGED?
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LOCATION OBJECT CODE LINE     SOURCE LINE

    033F 0360        1082                 RTNC                                ;YES SO RTN
    0340 00EE        1083                 BCEX            W                   ;PUT ORIGNAL VAL BACK
    0341 010C        1084                 ST=1?           8                   ;CLEAR REGISTER?
    0342 0003        1085                 GONC            OVRO                ;NO
    0343 004E        1086                 C=0             W
    0344 02F0        1087 OVRO            DATA=C                              ;PUT VAL BACK
    0345 016E        1088                 A=A+1           W                   ;INC ADR
    0346 00AE        1089                 ACEX            W                   ;GET ADR
    0347 0003        1090                 GOTO            CLEM
                     1091 ***********************************************
                     1092 *THIS ROUTINE      KILLS THE FIRST SIX CHARACTERS
                     1093 *IN THE ALPHA REGISTER.
                     1094 ***********************************************
    0348 00001000    1095 XASHF           GOSUB           FIND_NO_1           ;FIND FIRST CHARACTER
    034A 0354        1096                 PT=?            12                  ;7 IN THIS REG
    034B 0003        1097                 GONC            REGG                ;NO REGULAR 6 OR LESS
    034C 021C        1098                 PT=             2                   ;CLEAR TOP SIX AND DONE
    034D 0052        1099 INSHFT          C=0             PQ
    034E 02F0        1100 DONSHF          DATA=C
    034F 03E0        1101                 RTN
    0350 004E        1102 REGG            C=0             W
    0351 02F0        1103                 DATA=C                              ;CLEAR FIRST REG
    0352 00D4        1104                 PT=?            10                  ;DONE SIX
    0353 0360        1105                 RTNC
    0354 00AE        1106                 ACEX            W
    0355 0270        1107                 DADD=C                              ;ADDRESS NEXT REG
    0356 0038        1108                 C=DATA
    0357 03DC        1109                 INCPT                               ;CLEAR REMAINING CHARACTERS
    0358 03DC        1110                 INCPT
    0359 03DC        1111                 INCPT
    035A 03DC        1112                 INCPT
    035B 0003        1113                 GOTO            INSHFT
                     1114 ***********************************************
                     1115 *THIS FUNCTION TAKES THE FIRST SIX NON NULLS
                     1116 *IN THE ALPHA REGISTER AND STORES THEM.
                     1117 ***********************************************
    035C 00001000    1118 XASTO           GOSUB           FIND_NO_1
    035E 0354        1119                 PT=?            12                  ;ALL IN THIS REG?
    035F 0003        1120                 GONC            REG                 ;NO
    0360 023C        1121                 RCR             2                   ;SHIFT RIGHT 2
    0361 02DC        1122 DONSTO          PT=             13
    0362 0050        1123                 LC              1                   ;SET ONE IN 13
    0363 0010        1124                 LC              0                   ; AND CLEAR 12
    0364 00F0        1125                 NCEX                                ;GET DATA ADDRESS BACK
    0365 0270        1126                 DADD=C
    0366 00F0        1127                 NCEX                                ;GET REGISTER CONTENT BACK
    0367 0003        1128                 GOTO            DONSHF
    0368 00D4        1129 REG             PT=?            10                  ;ALL IN THIS REG
    0369 0007        1130                 GOC             DONSTO              ;DONE
    036A 00AE        1131                 ACEX            W                   ;GET ADR OF NEXT REG
    036B 0270        1132                 DADD=C
    036C 0038        1133                 C=DATA                              ;GET NEXT REG
    036D 03DC        1134                 INCPT
    036E 00AA        1135                 ACEX            WPT                 ;COMBINE TWO REG
    036F 03DC        1136 SHFLFT          INCPT                               ;SHIFT THE
    0370 03DC        1137                 INCPT
    0371 037C        1138                 RCR             12
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    0372 0194        1139                 PT=?            11                ;IS THE POINTER IN POSITION
    0373 0003        1140                 GONC            SHFLFT
    0374 0003        1141                 GOTO            DONSTO
                     1142 ************************************************
                     1143 *THIS SUBROUTINE FINDS THE FIRST NON NULL IN
                     1144 *THE ALPHA REGISTER.
                     1145 ***************************************************
                     1146 ******************************************
    0375 0130        1147 FIND_NO_1       LDI                               ;LOAD ADDRESS
    0376 0008        1148                 CON             10Q
    0377 0270        1149                 DADD=C
    0378 00AE        1150                 CAEX            W                 ;PUT ADDRESS IN A
    0379 00E0        1151                 SELQ                              ;SET Q AT 13 FOR TEST AND CLEARS
    037A 02DC        1152                 PT=             13
    037B 00A0        1153                 SELP                              ;SET P AT SIX TO CLEAR GARB
    037C 015C        1154                 PT=             6
    037D 0038        1155                 C=DATA
    037E 0052        1156                 C=0             PQ
    037F 001C        1157                 PT=             3
    0380 01AE        1158 THSIT_          A=A-1           W                 ;DEC ADDRESS
    0381 02EE        1159                 C#0?            W                 ;ANYTHING IN THIS REG
    0382 0007        1160                 GOC             FOUND1            ;IF YES THEN OUT
    0383 00AE010E    1161                 C=A             W                 ;OTHERWISE GET NEXT REG
    0385 0270        1162                 DADD=C
    0386 0038        1163                 C=DATA
    0387 03D4        1164                 DECPT                             ;COUNT DOWN ON LOOP
    0388 0394        1165                 PT=?            0                 ;DONE YET
    0389 0003        1166                 GONC            THSIT_
    038A 035C        1167                 PT=             12
    038B 02F2        1168                 C#0?            PQ                ;IF 7 CHARACTERS IN LAST RTN
    038C 0360        1169                 RTNC
    038D 00DC        1170                 PT=             10                ;OTHERWISE DONE WITH 10
    038E 03E0        1171                 RTN
    038F 039C        1172 FOUND1          PT=             0
    0390 03D4        1173 FNDPT           DECPT
    0391 03D4        1174                 DECPT
    0392 02F2        1175                 C#0?            PQ
    0393 0003        1176                 GONC            FNDPT
    0394 03E0        1177                 RTN                               ;RTN WITH POINTER AT FIRST BYTE
                     1178 ***********************************************************
                     1179 *THE SIZE FUNCTION PLACES RO SUCH THAT COCONUT CONTAINS
                     1180 *THE CORRECT NUMBER OF REGISTERS.
                     1181 *THE NUMBER OF REGSITERS IS DELIVERED IN HEX IN AX
                     1182 * ENTRY SIZSUB USES S9 TO TELL WHETHER TO GO TO PACKE OR RETURN
                     1183 * IF THERE ISN'T ENOUGH ROOM - S9=1 GOES TO PACKE, S9=0 RETURNS
                     1184 * WITH S9=1 IF NOT SUCCESSFUL.
                     1185 ************************************************************
    0395 0248        1186 XSIZE           ST=1            9                 ;EXIT VIA PACKE IF
                     1187                                                   ;UNSUCCESSFUL
                     1188                 GLB             SIZSUB
    0396 00A6        1189                 ACEX            X                 ;GET USER SPEC NUM OF REGS
    0397 0070        1190 SIZSUB          N=C                               ;N CONTAINS THE NUMBER NEEDED
    0398 00001000    1191                 GOSUB           =MEMLFT           ;CALCULATE THE MEM UNUSED
    039A 0158        1192                 M=C                               ;M=UNUSED REGISTERS
    039B 00001000    1193                 GOSUB           =FNDEND           ;FIND THE END OF MEM
                     1194 ***************************************************
                     1195 *MORE OR LESS REGISTERS THAN WE HAVE NOW?
```

```
LOCATION OBJECT CODE LINE     SOURCE LINE

                    1196 ***************************************************
 039D 004E          1197                C=0             W
 039E 0270          1198                DADD=C
 039F 008E          1199                B=A             W               ;MEM END IN B
 03A0 0378          1200                C=REGN          13
 03A1 003C          1201                RCR             3
 03A2 01C6          1202                A=A-C           X
 03A3 00B0          1203                C=N                             ;C=REGISTERS WE NEED
 03A4 01C6          1204                A=A-C           X               ;COMP # 2 SHIFT LEFT POISTIVE
 03A5 0007          1205                GOC             LARGER          ;USER WANTS MORE REGISTERS
                    1206 ***************************************************
                    1207 *CODE BELOW SETS AX=CHAIN HEAD-WHERE WE STOP
                    1208 *                AM=-1 DEC
                    1209 *                BX=FROM ADDRESS-WHERE WE GET DATA
                    1210 *                BM=TO ADDRESS-WHERE WE PUT DATA
                    1211 ***************************************************
 03A6 0108          1212                ST=1            8               ;SET CLEAN UP FLAGO
 03A7 00CE          1213                C=B             W               ;CX=TO
 03A8 00AE          1214                ACEX            W
 03A9 0158          1215                M=C                             ;SAVE SHIFT DISTANCE
 03AA 024E          1216                C=A-C           W               ;CX=FROM
 03AB 003C          1217                RCR             3
 03AC 00E6          1218                BCEX            X               ;C=FRMXXXXXXXXTO
 03AD 01BC          1219                RCR             11
 03AE 00EE          1220                BCEX            W               ;B=TOFRM
 03AF 0378          1221                C=REGN          13              ;GET TEST ADRESS
 03B0 005A          1222                C=0             M
 03B1 027A          1223                C=C-1           M
 03B2 00AE          1224                ACEX            W               ;A=INCTST
 03B3 0003          1225                GOTO            STRTMV
                    1226 ***************************************************
                    1227 *SETS UP AS FOR SMALLER EXCEPT WE STOP AT NOTHINGNESS
                    1228 *AND START AT CHAIN END USING 1 FOR AN INCREMENT.
                    1229 ***************************************************
 03B4 0198          1230 LARGER         C=M                             ;GET UNUSED REG
 03B5 0206          1231                C=C+A           X               ;ADD NEG SHIFT
 03B6 0007          1232                GOC             LARG10          ;MADE IT
 03B7 024C          1233                ST=1?           9               ;EXIT MODE?
 03B8 00001003      1234                GOLC            =PACKE
 03BA 0248          1235                ST=1            9               ;SAY DIDN'T MAKE IT
 03BB 03E0          1236                RTN
                    1237 *
 03BC 0378          1238 LARG10         C=REGN          13              ;A=NEGSHFT C=FROM
 03BD 0206          1239                C=C+A           X               ;C=TO
 03BE 01BC          1240                RCR             11
 03BF 00EE          1241                BCEX            W               ;C=TST B=TOXXX
 03C0 005A          1242                C=0             M
 03C1 023A          1243                C=C+1           M               ;C=INCTST
 03C2 00AE          1244                ACEX            W
 03C3 0158          1245                M=C                             ;SAVE NEG SHIFT
 03C4 0378          1246                C=REGN          13              ;C=FROM
 03C5 00E6          1247                BCEX            X               ;B=TOFRM
 03C6 0003          1248                GOTO            STRTMV
                    1249 ***************************************************
                    1250 *THIS ROUTINE SHIFTS MEMORY EITHER LEFT OR RIGHT
                    1251 *ACCORDING TO THE INPUTS IN A AND B.
                    1252 ***************************************************
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    03C7 01BC        1253 KPMVN          RCR          11          ;C=TOFRM
    03C8 021A        1254                C=C+A        M           ;INC TO
    03C9 00EE        1255                BCEX         W           ;C=DATA B=TOFRM
    03CA 02F0        1256                DATA=C                   ;DATA MOVED
    03CB 00EE        1257 STRTMV         BCEX         W           ;A=INCTST C=TOFRM
    03CC 00AE        1258                ACEX         W           ;C=TOFRM A=INCTST
    03CD 010C        1259                ST=1?        8           ;SMALLER MOVE?
    03CE 0003        1260                GONC         CHKTOP      ;NO
    03CF 0306        1261                A<C?         X           ;IS FRM<TST
    03D0 0003        1262                GONC         GETREG      ;IF NO CONTINUE
    03D1 00AE        1263 B_EQ_0         ACEX         W           ;GET 0 FOR TO
    03D2 002E        1264                B=0          W
    03D3 0003        1265                GOTO         DOTO
    03D4 0366        1266 CHKTOP         A#C?         X           ;ZEROS AFTER MEM END
    03D5 0003        1267                GONC         B_EQ_0
    03D6 00AE        1268 GETREG         ACEX         W           ;A=INCTST C=TOFROM
    03D7 0270        1269                DADD=C                   ;DADD=FROM
    03D8 00FA        1270                BCEX         M           ;SAVE TO PART
    03D9 01BC        1271                RCR          11          ;INC DEC FROM
    03DA 021A        1272                C=C+A        M
    03DB 003C        1273                RCR          3
    03DC 00E6        1274                BCEX         X           ;A=INCTST B=TOFROM
    03DD 0038        1275                C=DATA
    03DE 00EE        1276                BCEX         W
    03DF 003C        1277 DOTO           RCR          3           ;C=FRMXX...XXOTO
    03E0 0270        1278                DADD=C                   ;DADD=TO
    03E1 0366        1279                A#C?         X           ;DONE IF TO=TST
    03E2 0007        1280                GOC          KPMVN       ;NO
    03E3 00EE        1281                BCEX         W           ;CLEAR LAST REGISTER
    03E4 02F0        1282                DATA=C
                     1283 ************************************************
                     1284 *FIX POINTERS AFTER MOVE.
                     1285 ************************************************
    03E5 0198        1286                C=M                      ;GET MOVE DISTANCE
    03E6 00EE        1287                CBEX         W           ;SAVE
    03E7 00001000    1288                GOSUB        =GETPC      ;ENABLE CHIP0
    03E9 00CC        1289                ST=1?        10          ;ROM RAM?
    03EA 0007        1290                GOC          NOTRAM
    03EB 0126        1291                A=A+B        X           ;SHIFT PC
    03EC 006E        1292 NOTRAM         ABEX         W           ;B=PC FOR CLRSB2
    03ED 0378        1293                C=REGN       13
    03EE 0206        1294                C=C+A        X
    03EF 003C        1295                RCR          3
    03F0 0206        1296                C=C+A        X
    03F1 013C        1297                RCR          8
    03F2 0206        1298                C=C+A        X
    03F3 003C        1299                RCR          3
    03F4 0368        1300                REGN=C       13
    03F5 006E        1301                ABEX         W           ;BRING PC BACK TO A[3:0]
    03F6 0244        1302                ST=0         9
    03F7 00001002    1303                GOLONG       =DCRT10
                     1304                GLB          SETSST
                     1305 *
                     1306 * SETSST - SET SINGLE STEP BIT
                     1307 * REQUIRES CHIP 0 ENABLED ON INPUT
                     1308 * DESTROYS C
                     1309 *
```

```
LOCATION OBJECT CODE LINE     SOURCE LINE

    03F9 03B8        1310 SETSST          C=REGN          14
    03FA 0358        1311                 ST=C
    03FB 0048        1312                 ST=1            4               ;SET SST BIT
    03FC 0398        1313                 C=ST
    03FD 03A8        1314                 REGN=C          14
    03FE 03E0        1315                 RTN
                     1316 *
    03FF 0000        1317                 FILLTO          1777Q
                     1318                 END

Errors=    0
```

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LINE#	SYMBOL	TYPE	REFERENCES
	ABS	E	170
	ACOS	E	166
	AD2_10	E	100,631
629	ADDEM	P	627
626	ADDIT	P	618,623
	ADVNCE	E	216
	AFORMT	E	858
	AGTO	E	89
	ANNOUT	E	755
	ANN_14	E	1042
	AOFF	E	212
	AON	E	213
	APNDNW	E	896
	ARCL	E	228
859	ARCL10	P	890
886	ARCL20	P	898
	ARGOUT	E	868
	ASHF	E	209
	ASIN	E	165
	ASN	E	74
	ASTO	E	227
	ATAN	E	167
	AVIEW	E	199
	AXEQ	E	90
	BEEP	E	207
	BST	E	66
1263	B_EQ_0	P	1267
	CAT	E	59
	CF	E	251
836	CHKAD4	P	835
809	CHKADR	P	12
1266	CHKTOP	P	1260
328	CHK_NO_S	P	53,326,575,679
325	CHK_NO_S1	P	324
329	CHK_NO_S2	P	54
	CHS	E	157
848	CKAD10	P	843
826	CKAD2	P	820
827	CKAD3	P	818
831	CKAD3J	P	828
837	CKAD4	P	825,833
	CLA	E	208
	CLDSP	E	200
1074	CLEM	P	1090
	CLP	E	63
1071	CLR	P	10
	CLREG	E	211
267	CLRNXT	P	274
	CLSIG	E	185
	CLST	E	188
	CLX	E	192
	COLDST	E	847
641	COMBIN	P	638
	COPY	E	62
	COS	E	163
	DCRT10	E	1303
	DEC	E	168

LINE#	SYMBOL	TYPE	REFERENCES
	DEG	E	201
1049	DEGDO	P	19,1039,1043,1046
	DEL	E	61
	DELETE	E	70
1013	DELOOP	P	1018
	DIVIDE	E	140
1100	DONSHF	P	1128
1122	DONSTO	P	1130,1141
718	DOSKP	P	719,728
1277	DOTO	P	1265
	DSE	E	224
918	DSPDN	P	915
	D_R	E	179
577	ELMFRC	P	580
	END	E	282
	ENG	E	231
	ENTER	E	204
338	ERRAD	P	5,332
	ERRNE	E	846
	ERROR	E	338
	E_TO_X	E	158
	E_TO_X_MINUS_1	E	161
	FACT	E	171
	FC	E	255
58	FCNTBL	P	4
	FC_C	E	253
1147	FIND_NO_1	P	9,1095,1118
	FIX	E	229
752	FLGANN	P	25,747
1068	FNDEND	P	11,1193
1173	FNDPT	P	1176
1172	FOUND1	P	1160
	FRAC	E	178
	FS	E	254
292	FSTIN	P	284
	FS_C	E	252
84	GETLIN	P	24
	GETPC	E	718,1288
1268	GETREG	P	1262
	GRAD	E	203
	GTO	E	317
	GTOL	E	60
	HMS_H	E	182
	HMS_MINUS	E	147
	HMS_PLUS	E	146
	H_HMS	E	181
1099	INSHFT	P	1113
	INT	E	177
	ISG	E	223
1253	KPMVN	P	1280
1238	LARG10	P	1232
1230	LARGER	P	1205
	LASTX	E	191
	LBL	E	316
	LN	E	153
	LN1_PLUS_X	E	174
366	LOAD3	P	13

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LINE#	SYMBOL	TYPE	REFERENCES
	LOG	E	159
	MEAN	E	197
	MEMLFT	E	1191
	MINUS	E	138
	MOD	E	148
	MODE	E	71
636	MRSHFT	P	640
	MSG	E	705,732
	MSGAD	E	339
	MSGNO	E	733
	MSGYES	E	706
	MULTIPLY	E	139
	NFRPR	E	345
345	NFRPRL	P	280
	NFRPU	E	247,707
579	NOFRAC	P	576
694	NOSKP	P	661,670,673,683,693,713,743
707	NOSKPO	P	695,701,704,722,731,734
1292	NOTRAM	P	1290
	OCT	E	184
	OFF	E	214
	ONE_BY_X	E	169
112	OVFL10	P	103
115	OVFL15	P	113
125	OVFL20	P	
126	OVFL30	P	122
130	OVFL40	P	127
134	OVFL50	P	129
1087	OVRO	P	1085
589	OVRDEC	P	587
811	P6RTN	P	810
	PACK	E	69
	PACKE	E	1234
	PATCH6	E	809
1002	PCKDUR	P	6,991
	PCT	E	149
	PCTCH	E	150
	PI	E	187
	PLUS	E	137
	POWER_OF_TEN	E	160
	PROMPT	E	215
	PSE	E	210
	PUTPCX	E	721
	P_R	E	151
	RAD	E	202
	RCL	E	217
	RDN	E	190
346	RDNSUB	P	35,279
1129	REG	P	1120
883	REGALP	P	857
1102	REGG	P	1097
	RND	E	183
	ROLLUP	E	189
310	RTJ10	P	313
309	RTJLBL	P	300
	RTN	E	206
	RUN_STOP	E	64

LINE#	SYMBOL	TYPE	REFERENCES
	R_D	E	180
	R_P	E	152
348	R_SUB	P	36,344,346,347
914	ST_	P	912
	SCT	E	230
603	SEPA	P	599
322	SEPXY	P	52
1310	SETSST	P	1304
	SF	E	250
	SHF40	E	644
1136	SHFLFT	P	1140
	SHIFT	E	73
	SIGMA_MINUS	E	145
	SIGMA_PLUS	E	144
	SIGN	E	195
	SIGREG	E	226
	SIN	E	162
	SINFR	E	581
	SIZE	E	65
1190	SIZSUB	P	1188
715	SKP	P	659,662,669,692,714,744
744	SKPIT	P	
	SKPLIN	E	720
	SQRT	E	155
	SRBMAP	E	248
	SST	E	67
723	SST	P	717
	STAYON	E	68
	STDEV	E	198
880	STFL10	P	919
873	STFLGS	P	7
	STO	E	218
	STOP	E	205
	STO_DIVIDE	E	222
	STO_MINUS.	E	220
	STO_MULTIPLY	E	221
	STO_PLUS	E	219
1257	STRTMV	P	1225,1248
779	SUMCHK	P	55,262
781	SUMCK2	P	56,767
	TAN	E	164
	TBITMA	E	245
1158	THSIT_	P	1166
	TONE	E	232
1030	TONE7	P	22,1012
934	TONE7X	P	933
1025	TONE8	P	1010
1021	TONE9	P	1008
936	TONEB	P	23,926,929,932
617	TSTEXP	P	614
245	TSTMAP	P	234
	VIEW	E	225
854	XARCL	P	27
1095	XASHF	P	14
1118	XASTO	P	28
925	XBEEP	P	15
748	XCF	P	48

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LINE#	SYMBOL	TYPE	REFERENCES
262	XCLSIG	P	16
1039	XDEG	P	20
1040	XDEG2	P	1045,1048
573	XDSE	P	29
	XEQ	E	336
740	XFS	P	50
	XGOIND	E	256
1046	XGRAD	P	18
574	XISG	P	30
1043	XRAD	P	17
279	XRDN	P	34
344	XROLLUP	P	33
903	XSCI	P	26
745	XSF	P	49
766	XSGREG	P	32
1186	XSIZE	P	31
76	XSTYON	P	8
973	XTONE	P	21
675	XX_EQ_0	P	37
688	XX_EQ_Y	P	43
656	XX_GT_0	P	40,674
663	XX_GT_Y	P	45,650
681	XX_LE_0	P	41,665
678	XX_LE_0A	P	42
671	XX_LE_Y	P	47
664	XX_LT_0	P	39
666	XX_LT_0_	P	684
655	XX_LT_Y	P	46
685	XX_NE_0	P	38
709	XX_NE_Y	P	44
712	XYN	P	687
691	XYY	P	677
	X_EQ_0	E	176
	X_EQ_Y	E	193
	X_GT_0	E	173
	X_GT_Y	E	142
	X_LE_0	E	196
	X_LE_Y	E	143
	X_LT_0	E	175
	X_LT_Y	E	141
	X_NE_0	E	172
	X_NE_Y	E	194
	X_TO_2	E	154
	X_XCHNG	E	315
	X_XCHNG_Y	E	186
96	Y_MINUS_X	P	51,655,663,671
	Y_TO_X	E	156

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LOCATION OBJECT CODE LINE     SOURCE LINE

                  1 "COCONUT"
                  2 ***************************************************
                  3 *   NUT MATH ROM 1                                *
                  4 *   STARTING ADDRESS=@14000                       *
                  5 ***************************************************
                  6 ***************************************************
                  7 *      COMMON MATH ENTRIES                        ***
                  8 *          IF NUMBER IS 2-10,                     ***
                  9 *             THEN FORM IS:                       ***
                 10 *                A HAS 10 DIGIT FORM              ***
                 11 *                C HAS 10 DIGIT FORM              ***
                 12 *          IF NUMBER IS 1-10,                     ***
                 13 *             THEN FORM IS:                       ***
                 14 *                A HAS SIGN AND EXP               ***
                 15 *                B HAS 13 DIGIT MANTISSA          ***
                 16 *                C HAS 10 DIGIT FORM              ***
                 17 *          IF NUMBER IS 2-13,                     ***
                 18 *             THEN FORM IS:                       ***
                 19 *                A AND B AS IN 1-10               ***
                 20 *                M HAS SIGN AND EXP               ***
                 21 *                C HAS 13 DIGIT MANTISSA          ***
                 22 *                                                 ***
                 23 *      ON EXIT, C HAS 10 DIGIT FORM               ***
                 24 *               A AND B HAVE 13 DIGIT FORM        ***
                 25 *                                                 ***
                 26 ***************************************************
                 27                GLB             AD2_10
                 28                GLB             AD1_10
                 29                GLB             AD2_13
                 30                GLB             MP2_10
                 31                GLB             MP1_10
                 32                GLB             MP2_13
                 33                GLB             MPYI50
                 34                GLB             DV2_10
                 35                GLB             DV1_10
                 36                GLB             DV2_13
                 37                GLB             ONE_BY_X10
                 38                GLB             ONE_BY_X13
                 39                GLB             X_BY_YI3
                 40                GLB             DIV120
                 41                GLB             DIV110
                 42                GLB             DIV15
                 43                GLB             ADDONE
                 44                GLB             SUBONE
                 45                GLB             SQR10
                 46                GLB             SQR13
                 47                GLB             ERRO
                 48                GLB             NRM10
                 49                GLB             NRM11
                 50                GLB             NRM12
                 51                GLB             NRM13
                 52                GLB             LN10
                 53                GLB             LNC10
                 54                GLB             XLN1_PLUS_X
                 55                GLB             XY_TO_X
                 56                GLB             SHF10
                 57                GLB             SHF40
```

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```
LOCATION OBJECT CODE LINE     SOURCE LINE

    0000 004E          58 ADDONE          C=0              W
    0001 0003          59                 GOTO             SUBON1
    0002 004E          60 SUBONE          C=0              W
    0003 02BE          61                 C=-C-1           S
    0004 035C          62 SUBON1          PT=              12
    0005 0050          63                 LC               1
    0006 0003          64                 GOTO             AD1_10
    0007 002E          65 AD2_10          B=0              W
    0008 007A          66                 ABEX             M
    0009 01D8          67 AD1_10          MCEX                          ;THESE 2 STATES COULD
    000A 0198          68                 C=M                           ; BE JUST "M=C"
    000B 0046          69                 C=0              X
    000C 003E          70 AD2_13          B=0              S
    000D 005E          71                 C=0              S
    000E 01D8          72                 MCEX
    000F 031C          73                 PT=              1
    0010 03D4          74 ADD10           DECPT
    0011 0176          75                 A=A+1            XS
    0012 0236          76                 C=C+1            XS
    0013 0354          77                 PT=?             12
    0014 0003          78                 GONC             ADD10
    0015 00EE          79                 BCEX             W
    0016 02EE          80                 C#0?             W
    0017 0003          81                 GONC             ADD60
    0018 01D8          82                 MCEX
    0019 006E          83                 ABEX             W
    001A 02EE          84                 C#0?             W
    001B 0003          85                 GONC             ADD60
    001C 0326          86 ADD30           A<B?             X
    001D 0007          87                 GOC              ADD65
    001E 01D8          88 ADD90           MCEX
    001F 006E          89                 ABEX             W
    0020 0326          90                 A<B?             X
    0021 0007          91                 GOC              ADD30
    0022 00AE          92 ADD45           ACEX             W
    0023 01D8          93                 MCEX
    0024 030E          94                 A<C?             W
    0025 0003          95                 GONC             ADD55
    0026 01D8          96                 MCEX
    0027 00AE          97                 ACEX             W
    0028 0003          98                 GOTO             ADD65
    0029 01D8          99 ADD55           MCEX
    002A 00AE         100                 ACEX             W
    002B 01D8         101                 MCEX
    002C 006E         102                 ABEX             W
    002D 019E         103 ADD65           A=A-B            S
    002E 035E         104                 A#0?             S
    002F 0003         105                 GONC             ADD50
    0030 028E         106 ADD40           C=-C             W
    0031 011E         107                 A=C              S
    0032 0326         108                 A<B?             X
    0033 0003         109                 GONC             ADD50
    0034 01D8         110                 MCEX
    0035 02FC         111                 RCR              13
    0036 01D8         112                 MCEX
    0037 006E         113                 ABEX             W
    0038 01A6         114                 A=A-1            X
```

```
LOCATION OBJECT CODE LINE     SOURCE LINE

    0039 006E          115                ABEX          W
    003A 0326          116 ADD50          A<B?          X
    003B 0003          117                GONC          ADD60
    003C 0166          118                A=A+1         X
    003D 03CE          119                CSR           W
    003E 00BE          120                ACEX          S
    003F 011E          121                A=C           S
    0040 03D4          122                DECPT
    0041 02D4          123                PT=?          13
    0042 0003          124                GONC          ADD50
    0043 004E          125                C=0           W
    0044 00AE          126 ADD60          ACEX          W
    0045 0198          127                C=M
    0046 00EE          128                BCEX          W
    0047 012E          129                A=A+B         W
    0048 0276          130                C=C-1         XS
    0049 0276          131                C=C-1         XS
    004A 0276          132                C=C-1         XS
    004B 0000          133                NOP
    004C 0003          134                GOTO          MPY150
    004D 002E          135 MP2_10         B=0           W
    004E 007A          136                ABEX          M
    004F 01D8          137 MP1_10         MCEX
    0050 0198          138                C=M
    0051 0046          139                C=0           X
    0052 003E          140 MP2_13         B=0           S
    0053 005E          141                C=0           S
    0054 01D8          142                MCEX
    0055 0206          143                C=A+C         X
    0056 025E          144                C=A-C         S
    0057 0003          145                GONC          MPY110
    0058 029E          146                C=-C          S
    0059 000E          147 MPY110         A=0           W
    005A 01D8          148                MCEX
    005B 02DC          149                PT=           13
    005C 03DC          150 MPY120         INCPT
    005D 038E          151                ASR           W
    005E 0003          152                GOTO          MPY140
    005F 012E          153 MPY130         A=A+B         W
    0060 0262          154 MPY140         C=C-1         PT
    0061 0003          155                GONC          MPY130
    0062 0354          156                PT=?          12
    0063 0003          157                GONC          MPY120
    0064 0198          158                C=M
    0065 00AE          159 MPY150         ACEX          W          ;***ROUND,SHIFT AND NORMALIZE
    0066 01D8          160                MCEX
    0067 0198          161                C=M
    0068 02FE          162 MPY160         C#0?          S
    0069 0003          163                GONC          SHF40
    006A 0166          164                A=A+1         X
    006B 03CE          165                CSR           W
    006C 00AE          166 SHF40          ACEX          W
    006D 035C          167 SHF10          PT=           12
    006E 034A          168                A#0?          WPT
    006F 0007          169                GOC           SHF20
    0070 00EE          170 NRM10          BCEX          W
    0071 00AE          171 NRM11          ACEX          W
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    0072 035C          172 NRM12          PT=            12
    0073 010E          173                A=C            W
    0074 01E6          174                C=C+C          X
    0075 0003          175                GONC           NRM20
    0076 023A          176                C=C+1          M
    0077 0003          177                GONC           NRM20
    0078 00C6          178                C=B            X
    0079 0226          179                C=C+1          X
    007A 0222          180                C=C+1          PT
    007B 00DE          181 NRM30          C=B            S
    007C 006E          182                ABEX           W
    007D 02FA          183                C#0?           M
    007E 0360          184                RTNC
    007F 004E          185                C=0            W
    0080 001E          186                A=0            S
    0081 03E0          187 NRM40          RTN
    0082 00C6          188 NRM20          C=B            X
    0083 0003          189                GOTO           NRM30
    0084 006E          190 NRM13          ABEX           W
    0085 0003          191                GOTO           NRM11
    0086 0342          192 SHF20          A#0?           PT
    0087 0007          193                GOC            NRM10
    0088 0266          194                C=C-1          X
    0089 03EA          195                ASL            WPT
    008A 0003          196                GOTO           SHF20
    008B 002E          197 ONE_BY_X10     B=0            W
    008C 00FA          198                BCEX           M
    008D 00AE          199                ACEX           W
    008E 004E          200 ONE_BY_X13     C=0            W
    008F 01D8          201                MCEX
    0090 004E          202                C=0            W
    0091 035C          203                PT=            12
    0092 0050          204                LC             1
    0093 00EE          205 X_BY_Y13       BCEX           W
    0094 00AE          206                ACEX           W
    0095 01D8          207                MCEX
    0096 00AE          208                ACEX           W
    0097 0003          209                GOTO           DV2_13
    0098 002E          210 DV2_10         B=0            W
    0099 007A          211                ABEX           M
    009A 01D8          212 DV1_10         MCEX
    009B 0198          213                C=M
    009C 0046          214                C=0            X
    009D 003E          215 DV2_13         B=0            S
    009E 02FA          216                C#0?           M
    009F 0003          217                GONC           ERR0
    00A0 01D8          218 DIV100         MCEX
    00A1 0246          219                C=A-C          X
    00A2 025E          220                C=A-C          S
    00A3 0003          221                GONC           DIV110
    00A4 029E          222                C=-C           S
    00A5 01D8          223 DIV110         MCEX
    00A6 005E          224                C=0            S
    00A7 00AE          225                ACEX           W
    00A8 006E          226                ABEX           W
    00A9 032E          227 DIV15          A<B?           W
    00AA 0003          228                GONC           DIV120
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    00AB 01D8          229                 MCEX
    00AC 03EE          230                 ASL          W
    00AD 0266          231                 C=C-1        X
    00AE 01D8          232                 MCEX
    00AF 035C          233 DIV120          PT=          12
    00B0 004E          234                 C=0          W
    00B1 0003          235                 GOTO         DIV140
    00B2 0222          236 DIV130          C=C+1        PT
    00B3 018E          237 DIV140          A=A-B        W
    00B4 0003          238                 GONC         DIV130
    00B5 012E          239                 A=A+B        W
    00B6 03EE          240                 ASL          W
    00B7 03D4          241                 DECPT
    00B8 02D4          242                 PT=?         13
    00B9 0003          243                 GONC         DIV140
    00BA 00AE          244                 ACEX         W
    00BB 0198          245                 C=M
    00BC 00001002      246                 GOLONG       NRM10
    00BE 002E          247 SQR10           B=0          W            ;***SQUARE ROOT
    00BF 00FA          248                 BCEX         M
    00C0 00AE          249                 ACEX         W
    00C1 035E          250 SQR13           A#0?         S
    00C2 0003          251                 GONC         SQR20
    00C3 00001002      252 ERR0            GOLONG       =ERRDE       ;**ERROR EXIT
    00C5 003E          253 SQR20           B=0          S
    00C6 00CE          254                 C=B          W
    00C7 006E          255                 ABEX         W
    00C8 01EE          256                 C=C+C        W
    00C9 01EE          257                 C=C+C        W
    00CA 020E          258                 C=A+C        W
    00CB 00EE          259                 BCEX         W
    00CC 005A          260                 C=0          M
    00CD 010E          261                 A=C          W
    00CE 01EE          262                 C=C+C        W
    00CF 01E6          263                 C=C+C        X
    00D0 0003          264                 GONC         SQR30
    00D1 02BA          265                 C=-C-1       M
    00D2 014E          266 SQR30           A=A+C        W
    00D3 039C          267                 PT=          0
    00D4 0342          268                 A#0?         PT
    00D5 0007          269                 GOC          SQR50
    00D6 03AE          270                 BSR          W
    00D7 038E          271 SQR50           ASR          W
    00D8 004E          272                 C=0          W
    00D9 006E          273                 ABEX         W
    00DA 02DC          274                 PT=          13
    00DB 0150          275                 LC           5
    00DC 03CE          276                 CSR          W
    00DD 0003          277                 GOTO         SQR100
    00DE 0222          278 SQR60           C=C+1        PT
    00DF 01CE          279 SQR70           A=A-C        W
    00E0 0003          280                 GONC         SQR60
    00E1 014E          281                 A=A+C        W
    00E2 03EE          282                 ASL          W
    00E3 0394          283                 PT=?         0
    00E4 00001003      284                 GOLC         NRM12
    00E6 03D4          285                 DECPT
```

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```
LOCATION OBJECT CODE LINE     SOURCE LINE

    00E7 03CA         286 SQR100          CSR             WPT
    00E8 0003         287                 GOTO            SQR70
                      288                 GLB             XFT100
    00E9 01A6         289 XFT120          A=A-1           X
    00EA 0003         290                 GONC            XFT110
    00EB 0003         291                 GOTO            ERR0
    00EC 02FE         292 XFT100          C#0?            S
    00ED 0007         293                 GOC             ERR0
    00EE 02F6         294                 C#0?            XS
    00EF 0007         295                 GOC             ERR0
    00F0 010E         296                 A=C             W
    00F1 008E         297 XFT110          B=A             W
    00F2 001C         298                 PT=             3
    00F3 03EE         299                 ASL             W
    00F4 038A         300                 ASR             WPT
    00F5 035C         301                 PT=             12
    00F6 034A         302                 A#0?            WPT
    00F7 0007         303                 GOC             XFT120
    00F8 0166         304                 A=A+1           X
                      305                 LEGAL
    00F9 0306         306                 A<C?            X
    00FA 0003         307                 GONC            XFT130
    00FB 0236         308                 C=C+1           XS
    00FC 03E0         309                 RTN
    00FD 004E         310 XFT130          C=0             W
    00FE 0222         311                 C=C+1           PT
    00FF 03CE         312                 CSR             W
    0100 023E         313                 C=C+1           S
    0101 00EE         314                 BCEX            W
    0102 02C2         315 XFT140          B#0?            PT
    0103 0003         316                 GONC            XFT150
    0104 03AA         317                 BSR             WPT
    0105 0226         318                 C=C+1           X
    0106 000E         319 XFT150          A=0             W
    0107 01C2         320                 A=A-C           PT
    0108 0003         321                 GONC            XFT170
    0109 03EE         322                 ASL             W
    010A 012E         323 XFT160          A=A+B           W
    010B 0003         324                 GONC            XFT160
    010C 01DE         325 XFT170          A=A-C           S
    010D 0003         326                 GONC            XFT190
    010E 038A         327                 ASR             WPT
    010F 016E         328                 A=A+1           W
    0110 0226         329                 C=C+1           X
    0111 012E         330 XFT180          A=A+B           W
    0112 0003         331                 GONC            XFT180
    0113 006A         332 XFT190          ABEX            WPT
    0114 0262         333                 C=C-1           PT
    0115 0003         334                 GONC            XFT140
    0116 027E         335                 C=C-1           S
    0117 0003         336                 GONC            XFT140
    0118 03EE         337                 ASL             W
    0119 0086         338                 B=A             X
    011A 005A         339                 C=0             M
    011B 005E         340                 C=0             S
    011C 012A         341                 A=A+B           WPT
    011D 014E         342                 A=A+C           W
```

```
LOCATION OBJECT CODE LINE     SOURCE LINE

    011E 00BA          343                 ACEX            M
    011F 03E0          344                 RTN
                       345 ***************************************************
                       346 *   MATH SCRATCH ROUTINES                         *
                       347 *                                                 *
                       348 *     STSCR STORES S AND 13 DIGIT MANTISSA IN     *
                       349 *           REGN 9 AND EXP IN REGN 10, LEAVING    *
                       350 *           A AND B ALONE                         *
                       351 *     RCSCR RECALLS MATH SCRATCH INTO C AND M,    *
                       352 *           LEAVING A AND B ALONE                 *
                       353 *     EXSCR EXCHANGES A AND B WITH THE MATH       *
                       354 *           SCRATCH REGISTERS, DESTROYING C       *
                       355 ***************************************************
                       356                 GLB             STSCR
                       357                 GLB             RCSCR
                       358                 GLB             EXSCR
                       359                 GLB             RCSCR_
                       360                 GLB             STSCR_
    0120 004E          361 STSCR_          C=0             W
    0121 0270          362                 DADD=C
    0122 009E          363 STSCR           B=A             S
    0123 00CE          364                 C=B             W
    0124 0268          365                 REGN=C          9
    0125 02B8          366                 C=REGN          10
    0126 00A6          367                 ACEX            X
    0127 0106          368                 A=C             X
    0128 02A8          369 STSCR1          REGN=C          10
    0129 03E0          370                 RTN
    012A 007E          371 EXSCR           ABEX            S
    012B 0278          372                 C=REGN          9
    012C 00EE          373                 BCEX            W
    012D 0268          374                 REGN=C          9
    012E 02B8          375                 C=REGN          10
    012F 00A6          376                 ACEX            X
    0130 007E          377                 ABEX            S
    0131 0003          378                 GOTO            STSCR1
    0132 004E          379 RCSCR_          C=0             W
    0133 0270          380                 DADD=C
    0134 0278          381 RCSCR           C=REGN          9
    0135 00FE          382                 BCEX            S
    0136 01D8          383                 MCEX
    0137 02B8          384                 C=REGN          10
    0138 00DE          385                 C=B             S
    0139 01D8          386                 CMEX
    013A 03E0          387                 RTN
                       388                 GLB             INTFRC
                       389                 GLB             SINFR
                       390                 GLB             SINFRA
                       391                 GLB             MOD10
                       392                 GLB             DTOR
                       393                 GLB             RTOD
                       394                 GLB             LD90
                       395                 GLB             PI_BY_2
                       396                 GLB             TRC10
                       397 ***************************************************
                       398 *     IF S5=1, THEN ROUTINE INTFRC FINDS INT      *
                       399 *     IF S5=0, INTFRC FINDS FRACTIONAL PART       *
```

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```
LOCATION OBJECT CODE LINE     SOURCE LINE

                     400 ************************************************
    013B 00001000    401 INTFRC          GOSUB           SINFR
    013D 008C        402                 ST=1?           5
    013E 00001002    403                 GOLNC           SHF10
    0140 0198        404                 C=M
                     405 * NEXT TWO STATES ARE A HOLDOVER FROM A VERSION OF INTFRC WHICH
                     406 * WORKED FOR 13 DIGIT ARITHMETIC.  NOT NECESSARY HERE.
    0141 0394        407                 PT=?            0
    0142 0007        408                 GOC             INT30
    0143 03D4        409                 DECPT
    0144 004A        410                 C=0             WPT
    0145 00001002    411 INT30           GOLONG          NRM12
    0147 002E        412 SINFR           B=0             W
    0148 00FA        413                 BCEX            M
    0149 00AE        414                 ACEX            W
    014A 02DC        415 SINFRA          PT=             13
    014B 00CE        416                 C=B             W
    014C 01D8        417                 CMEX
    014D 006E        418                 ABEX            W
    014E 00CE        419                 C=B             W
    014F 02F6        420                 C#0?            XS
    0150 0360        421                 RTNC
    0151 0226        422                 C=C+1           X
    0152 02E6        423 SINFR1          C#0?            X
    0153 0003        424                 GONC            SINFR2
    0154 0266        425                 C=C-1           X
    0155 03EE        426                 ASL             W
    0156 001E        427                 A=0             S
    0157 03D4        428                 DECPT
    0158 034E        429                 A#0?            W
    0159 0007        430                 GOC             SINFR1
    015A 0266        431 SINFR2          C=C-1           X
    015B 03E0        432                 RTN
    015C 0176        433 MOD10           A=A+1           XS
    015D 02FA        434                 C#0?            M
    015E 0003        435                 GONC            MOD5
    015F 0236        436                 C=C+1           XS
    0160 037E        437                 A#C?            S
    0161 0003        438                 GONC            MOD1
    0162 0048        439                 ST=1            4
    0163             440 MOD1
    0163 0246        441                 C=A-C           X
    0164 0003        442                 GONC            MOD2
    0165 01B6        443 MOD5            A=A-1           XS
    0166 00AE        444                 ACEX            W
    0167 0003        445                 GOTO            MOD4
    0168 002E        446 MOD2            B=0             W
    0169 00F0        447                 CNEX
    016A 00BE        448                 ACEX            S
    016B 00F0        449                 CNEX
    016C 001E        450                 A=0             S
    016D 0006        451                 A=0             X
    016E 00FA        452                 BCEX            M
    016F 018E        453 MOD3            A=A-B           W
    0170 0003        454                 GONC            MOD3
    0171 012E        455                 A=A+B           W
    0172 03EE        456                 ASL             W
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    0173 0266          457                C=C-1          X
    0174 0003          458                GONC           MOD3
    0175 038E          459                ASR            W
    0176 00B0          460                C=N
    0177 00001000      461                GOSUB          SHF10
    0179 004C          462 MOD4           ST=1?          4
    017A 03A0          463                RTNNC
    017B 02FA          464                C#0?           M
    017C 03A0          465                RTNNC
    017D 010E          466                A=C            W
    017E 00F8          467                C=REGN         3
    017F 00001002      468                GOLONG         AD2_10
    0181 000E          469 DTOR           A=C            W
    0182 00001000      470                GOSUB          PI_BY_2
    0184 00EE          471                BCEX           W
    0185 00B0          472                C=N
    0186 00001000      473                GOSUB          MP1_10
    0188 00001000      474                GOSUB          LD90
    018A 00001002      475                GOLONG         DV1_10
    018C 010E          476 RTOD           A=C            W
    018D 00001000      477                GOSUB          LD90
    018F 00001000      478                GOSUB          MP2_10
    0191 00001000      479                GOSUB          PI_BY_2
    0193 00001002      480                GOLONG         DV2_13
    0195 004E          481 LD90           C=0            W
    0196 035C          482                PT=            12
    0197 0226          483                C=C+1          X
    0198 0250          484                LC             9
    0199 03E0          485                RTN
    019A 004E          486 PI_BY_2        C=0            W
    019B 01D8          487                CMEX
    019C 00001000      488                GOSUB          TRC10
    019E 01EE          489                C=C+C          W
    019F 03CE          490                CSR            W
    01A0 03E0          491                RTN
    01A1 035C          492 TRC10          PT=            12
    01A2 004E          493                C=0            W
    01A3 01D0          494                LC             7
    01A4 0210          495                LC             8
    01A5 0150          496                LC             5
    01A6 00D0          497                LC             3
    01A7 0250          498                LC             9
    01A8 0210          499                LC             8
    01A9 0050          500                LC             1
    01AA 0190          501                LC             6
    01AB 00D0          502                LC             3
    01AC 00D0          503                LC             3
    01AD 0250          504                LC             9
    01AE 01D0          505                LC             7
    01AF 0150          506                LC             5
    01B0 035C          507                PT=            12
    01B1 03E0          508                RTN
                       509                GLB            XTOHRS
                       510                GLB            HMSMP
                       511                GLB            HMSDV
                       512 ***********************************************
                       513 *    IF TO H.MMSS, THEN S5=1                  *
```

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```
LOCATION OBJECT CODE LINE     SOURCE LINE

                     514 *    IF TO H.DDDD, THEN S5=0                    *
                     515 ***********************************************
    01B2 02FA        516 XTOHRS          C#0?            M
    01B3 03A0        517                 RTNNC
    01B4 010E        518                 A=C             W
    01B5 008E        519                 B=A             W
    01B6 0226        520                 C=C+1           X
    01B7 0226        521                 C=C+1           X
    01B8 0106        522                 A=C             X
    01B9 035C        523                 PT=             12
    01BA 0146        524                 A=A+C           X
    01BB 0007        525                 GOC             HMS140
    01BC 03D4        526 HMS110          DECPT
    01BD 0394        527                 PT=?            0
    01BE 0003        528                 GONC            HMS130
    01BF 00CE        529 HMS120          C=B             W
    01C0 03E0        530                 RTN
    01C1 0266        531 HMS130          C=C-1           X
    01C2 0003        532                 GONC            HMS110
    01C3 004E        533 HMS140          C=0             W
    01C4 00DA        534                 C=B             M
    01C5 008C        535                 ST=1?           S
    01C6 0003        536                 GONC            HRS100
    01C7 03DC        537                 INCPT
    01C8 02D4        538                 PT=?            13
    01C9 0003        539                 GONC            HMS150
    01CA 00001000    540                 GOSUB           HMSMP
    01CC 0003        541                 GOTO            HMS160
    01CD 03DC        542 HMS150          INCPT
    01CE 00001000    543                 GOSUB           HMSMP
    01D0 03D4        544                 DECPT
    01D1 03D4        545 HMS160          DECPT
                     546                 LEGAL
    01D2 00001000    547                 GOSUB           HMSMP
    01D4 010E        548                 A=C             W
    01D5 00CE        549                 C=B             W
    01D6 00001002    550 HMS170          GOLONG          MPY150
    01D8 000E        551 HRS100          A=0             W
    01D9 00001000    552                 GOSUB           HMSDV
    01DB 03DC        553                 INCPT
    01DC 02D4        554                 PT=?            13
    01DD 0007        555                 GOC             HRS120
    01DE 03DC        556                 INCPT
    01DF 00001000    557 HRS120          GOSUB           HMSDV
    01E1 03EE        558                 ASL             W
    01E2 014E        559                 A=A+C           W
    01E3 00EE        560                 BCEX            W
    01E4 0003        561                 GOTO            HMS170
    01E5 03CA        562 HMSDV           CSR             WPT
    01E6 020A        563                 C=A+C           WPT
    01E7 010A        564 HMSMP           A=C             WPT
    01E8 03CA        565                 CSR             WPT
    01E9 01EA        566                 C=C+C           WPT
    01EA 01EA        567                 C=C+C           WPT
    01EB 024A        568                 C=A-C           WPT
    01EC 008C        569                 ST=1?           S
    01ED 0003        570                 GONC            HMSM20
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LOCATION OBJECT CODE LINE     SOURCE LINE

    01EE 000E          571                 A=0             W
    01EF 0106          572                 A=C             X
    01F0 020E          573                 C=A+C           W
    01F1 0046          574                 C=0             X
    01F2 03E0          575                 RTN
    01F3 014A          576 HMSM20          A=A+C           WPT
    01F4 03CA          577                 CSR             WPT
    01F5 02EA          578                 C#0?            WPT
    01F6 0007          579                 GOC             HMSM20
    01F7 03E0          580                 RTN
                       581                 GLB             EXP710
                       582                 GLB             LN560
                       583                 GLB             PMUL
                       584                 GLB             LNSUB
                       585                 GLB             LNSUB_MINUS
                       586                 GLB             LNC20
                       587                 GLB             LNAP
                       588                 GLB             EXP10
                       589                 GLB             EXP13
                       590                 GLB             TEN_TO_X
                       591                 GLB             LNCTO
                       592                 GLB             EXP500
                       593                 GLB             EXP400
                       594                 GLB             EXP720
    01F8 02BE          595 LNSUB_MINUS     C=-C-1          S
    01F9 006E          596 LNSUB           ABEX            W
    01FA 008E          597                 B=A             W
    01FB 01D8          598                 MCEX
    01FC 0198          599                 C=M
    01FD 038E          600 LNSUB1          ASR             W
    01FE 034E          601                 A#0?            W
    01FF 0007          602                 GOC             LNSUB2
    0200 0198          603                 C=M
    0201 010E          604                 A=C             W
    0202 03E0          605                 RTN
    0203 0226          606 LNSUB2          C=C+1           X
    0204 0003          607                 GONC            LNSUB1
    0205 035C          608                 PT=             12
    0206 0162          609                 A=A+1           PT
    0207 006E          610                 ABEX            W
    0208 00001002      611                 GOLONG          DIV15
    020A 002E          612 EXP10           B=0             W               ;***EXP(X)
    020B 00FA          613                 BCEX            M
    020C 00AE          614                 ACEX            W
    020D 0004          615 EXP13           ST=0            3
    020E 035E          616                 A#0?            S
    020F 0003          617                 GONC            EXP110
    0210 0008          618                 ST=1            3
    0211 001E          619 EXP110          A=0             S
    0212 001A          620                 A=0             M
    0213 006E          621                 ABEX            W
    0214 00CE          622                 C=B             W
    0215 01E6          623                 C=C+C           X
    0216 0003          624                 GONC            EXP200
    0217 00CE          625                 C=B             W
    0218 035E          626                 A#0?            S
    0219 0007          627                 GOC             EXP120
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LOCATION OBJECT CODE LINE     SOURCE LINE

    021A 02DC          628                  PT=            13
    021B 03D4          629 EXP130           DECPT
    021C 0094          630                  PT=?           5
    021D 00001003      631                  GOLC           EXP500
    021F 0226          632                  C=C+1          X
    0220 0003          633                  GONC           EXP130
    0221 00001000      634 EXP400           GOSUB          LNC20
    0223 0003          635                  GOTO           EXP420
    0224 00001000      636 EXP200           GOSUB          LNC10
    0226 015C          637                  PT=            6
    0227 0003          638                  GOTO           EXP220
    0228 006E          639 EXP120           ABEX           W
    0229 0166          640                  A=A+1          X
    022A 03AE          641                  BSR            W
    022B 0003          642                  GOTO           EXP110
    022C 023A          643 EXP210           C=C+1          M
    022D 018E          644 EXP220           A=A-B          W
    022E 0003          645                  GONC           EXP210
    022F 012E          646                  A=A+B          W
    0230 03EE          647                  ASL            W
    0231 0266          648                  C=C-1          X
    0232 0003          649                  GONC           EXP230
    0233 009C          650                  PT=            5
    0234 02E2          651                  C#0?           PT
    0235 0003          652                  GONC           EXP240
    0236 0262          653                  C=C-1          PT
    0237 02E2          654                  C#0?           PT
    0238 0007          655                  GOC            EXP300
    0239 0222          656                  C=C+1          PT
    023A 035C          657 EXP240           PT=            12
    023B 0003          658                  GOTO           EXP430
    023C 00AE          659 EXP230           ACEX           W
    023D 03FA          660                  ASL            M
    023E 00AE          661                  ACEX           W
    023F 02E2          662                  C#0?           PT
    0240 0003          663                  GONC           EXP220
    0241 004E          664 EXP300           C=0            W
    0242 035C          665                  PT=            12
    0243 026A          666                  C=C-1          WPT
    0244 010E          667                  A=C            W
    0245 021C          668                  PT=            2
    0246 0050          669                  LC             1
    0247 000C          670                  ST=1?          3
    0248 0003          671                  GONC           EXP700
    0249 02A6          672                  C=-C-1         X
    024A 006E          673 EXP700           ABEX           W
    024B 010E          674                  A=C            W
    024C 004C          675 EXP710           ST=1?          4
    024D 0003          676                  GONC           EXP720
    024E 00001000      677                  GOSUB          SUBONE
    0250 028C          678 EXP720           ST=1?          7
    0251 0003          679                  GONC           EXP730
    0252 02BE          680                  C=-C-1         S
    0253 011E          681                  A=C            S
    0254 00001002      682 EXP730           GOLONG         NRM13
    0256 0222          683 EXP410           C=C+1          PT
    0257 018E          684 EXP420           A=A-B          W
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LOCATION OBJECT CODE LINE     SOURCE LINE

    0258 0003          685                GONC          EXP410
    0259 012E          686                A=A+B         W
    025A 0154          687                PT=?          6
    025B 0007          688                GOC           EXP510
    025C 03EE          689                ASL           W
    025D 0266          690                C=C-1         X
    025E 03D4          691                DECPT
    025F 00EE          692 EXP430         BCEX          W
    0260 0003          693                GOTO          EXP400
    0261 00EE          694 EXP500         BCEX          W
    0262 004C          695 EXP510         ST=1?         4
    0263 0003          696                GONC          EXP570
    0264 00001000      697                GOSUB         LNAP
    0266 00AE          698                ACEX          W
    0267 006E          699                ABEX          W
    0268 02DC          700 EXP570         PT=           13
    0269 0190          701                LC            6
    026A 009C          702                PT=           5
    026B 02FA          703 EXP550         C#0?          M
    026C 0003          704                GONC          EXP600
    026D 03DC          705                INCPT
    026E 02E2          706 EXP560         C#0?          PT
    026F 0003          707                GONC          EXP520
    0270 0262          708                C=C-1         PT
    0271 008E          709                B=A           W
    0272 01D8          710                MCEX
    0273 0198          711                C=M
    0274 0003          712                GOTO          EXP530
    0275 0226          713 EXP520         C=C+1         X
    0276 038E          714                ASR           W
    0277 027E          715                C=C-1         S
    0278 0003          716                GONC          EXP550
    0279 03CE          717                CSR           W
    027A 03CE          718                CSR           W
    027B 03CE          719                CSR           W
    027C 0162          720                A=A+1         PT
    027D 006E          721                ABEX          W
    027E 010E          722                A=C           W
    027F 000C          723                ST=1?         3
    0280 00001001      724                GSUBC         ONE_BY_X13
    0282 0003          725                GOTO          EXP710
    0283 03AE          726 EXP540         BSR           W
    0284 027E          727 EXP530         C=C-1         S
    0285 0003          728                GONC          EXP540
    0286 012E          729                A=A+B         W
    0287 017E          730                A=A+1         S
    0288 0198          731                C=M
    0289 0003          732                GOTO          EXP560
    028A 01D8          733 LNAP           MCEX
    028B 0198          734                C=M
    028C 008E          735                B=A           W
    028D 00EE          736                BCEX          W
    028E 01EE          737                C=C+C         W
    028F 01EE          738                C=C+C         W
    0290 020E          739                C=A+C         W
    0291 006E          740                ABEX          W
    0292 03CE          741 LNAP1          CSR           W
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LOCATION OBJECT CODE LINE     SOURCE LINE

    0293 02EE          742                  C#0?            W
    0294 0007          743                  GOC             LNAP2
    0295 0198          744                  C=M
    0296 00AE          745                  ACEX            W
    0297 03E0          746                  RTN
    0298 0166          747 LNAP2            A=A+1           X
    0299 0003          748                  GONC            LNAP1
    029A 028E          749                  C=-C            W
    029B 01D8          750                  MCEX
    029C 0226          751                  C=C+1           X
                       752                  LEGAL
    029D 00001002      753                  GOLONG          DIV110
    029F 006E          754 EXP600           ABEX            W
    02A0 005A          755                  C=0             M
    02A1 005E          756                  C=0             S
    02A2 010E          757                  A=C             W
    02A3 000C          758                  ST=1?           3
    02A4 0003          759                  GONC            EXP740
    02A5 00001000      760                  GOSUB           LNSUB_MINUS
    02A7 004C          761 EXP740           ST=1?           4
    02A8 0007          762                  GOC             EXP750
    02A9 00001000      763                  GOSUB           ADDONE
    02AB 00001002      764 EXP750           GOLONG          EXP720
    02AD 00EE          765 LNC10_           BCEX            W
    02AE 035C          766 LNC10            PT=             12
    02AF 0090          767                  LC              2
    02B0 00D0          768                  LC              3
    02B1 0010          769                  LC              0
    02B2 0090          770                  LC              2
    02B3 0150          771                  LC              5
    02B4 0210          772                  LC              8
    02B5 0150          773                  LC              5
    02B6 0010          774                  LC              0
    02B7 0250          775                  LC              9
    02B8 0090          776                  LC              2
    02B9 0250          777                  LC              9
    02BA 0250          778                  LC              9
    02BB 0110          779                  LC              4
    02BC 0003          780                  GOTO            LNCEND
    02BD 004E          781 LNC20            C=0             W
    02BE 0354          782                  PT=?            12
    02BF 0007          783                  GOC             LNC30
    02C0 027A          784                  C=C-1           M
    02C1 0110          785                  LC              4
    02C2 023A          786                  C=C+1           M
    02C3 00D4          787                  PT=?            10
    02C4 0007          788                  GOC             LNC40
    02C5 0254          789                  PT=?            9
    02C6 0007          790                  GOC             LNC50
    02C7 0114          791                  PT=?            8
    02C8 0007          792                  GOC             LNC60
    02C9 0294          793                  PT=?            7
    02CA 0007          794                  GOC             LNC70
    02CB 0154          795                  PT=?            6
    02CC 0007          796                  GOC             LNC80
    02CD 039C          797                  PT=             0
    02CE 00D0          798                  LC              3
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LOCATION OBJECT CODE LINE     SOURCE LINE

    02CF 015C          799                 PT=          6
    02D0 0003          800                 GOTO         LNCEND
    02D1 0190          801 LNC30           LC           6
    02D2 0250          802                 LC           9
    02D3 00D0          803                 LC           3
    02D4 0050          804                 LC           1
    02D5 0110          805                 LC           4
    02D6 01D0          806                 LC           7
    02D7 0050          807                 LC           1
    02D8 0210          808                 LC           8
    02D9 0010          809                 LC           0
    02DA 0150          810                 LC           5
    02DB 0190          811                 LC           6
    02DC 035C          812                 PT=          12
    02DD 00EE          813 LNCEND          BCEX         W
    02DE 03E0          814                 RTN
    02DF 0000          815                 NOP                       ;PRESERVE ENTRY POINT ADDRESSES
    02E0 00D0          816 LNC40           LC           3
    02E1 0050          817                 LC           1
    02E2 0010          818                 LC           0
    02E3 0050          819                 LC           1
    02E4 01D0          820                 LC           7
    02E5 0250          821                 LC           9
    02E6 0210          822                 LC           8
    02E7 0010          823                 LC           0
    02E8 0110          824                 LC           4
    02E9 00D0          825                 LC           3
    02EA 00D0          826                 LC           3
    02EB 019C          827                 PT=          11
    02EC 0003          828                 GOTO         LNCEND
    02ED 011C          829 LNC50           PT=          8
    02EE 00D0          830                 LC           3
    02EF 00D0          831                 LC           3
    02F0 0010          832                 LC           0
    02F1 0210          833                 LC           8
    02F2 0150          834                 LC           5
    02F3 00D0          835                 LC           3
    02F4 0050          836                 LC           1
    02F5 0190          837                 LC           6
    02F6 0210          838                 LC           8
    02F7 00DC          839                 PT=          10
    02F8 0003          840                 GOTO         LNCEND
    02F9 015C          841 LNC60           PT=          6
    02FA 00D0          842                 LC           3
    02FB 00D0          843                 LC           3
    02FC 00D0          844                 LC           3
    02FD 0010          845                 LC           0
    02FE 0210          846                 LC           8
    02FF 00D0          847                 LC           3
    0300 0150          848                 LC           5
    0301 025C          849                 PT=          9
    0302 0003          850                 GOTO         LNCEND
    0303 005C          851 LNC70           PT=          4
    0304 00D0          852                 LC           3
    0305 00D0          853                 LC           3
    0306 00D0          854                 LC           3
    0307 00D0          855                 LC           3
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LOCATION OBJECT CODE LINE     SOURCE LINE

    0308 0050          856                  LC              1
    0309 011C          857                  PT=             8
    030A 0003          858                  GOTO            LNCEND
    030B 021C          859 LNC80            PT=             2
    030C 00D0          860                  LC              3
    030D 00D0          861                  LC              3
    030E 00D0          862                  LC              3
    030F 029C          863                  PT=             7
    0310 0003          864                  GOTO            LNCEND
    0311 002E          865 XY_TO_X          B=0             W
    0312 00FA          866                  BCEX            M
    0313 00AE          867                  ACEX            W
    0314 00001000      868                  GOSUB           STSCR
    0316 00B8          869                  C=REGN          2
    0317 00001000      870                  GOSUB           =CHK_NO_S
    0319 010E          871                  A=C             W
    031A 00F8          872                  C=REGN          3
    031B 035E          873                  A#0?            S
    031C 0003          874                  GONC            YX13
    031D 0006          875                  A=0             X
    031E 00BA          876                  ACEX            M
    031F 02F6          877                  C#0?            XS
    0320 0003          878                  GONC            YX11
    0321 00001002      879 ERR0_            GOLONG          ERR0
    0323 02E6          880 YX12             C#0?            X
    0324 0003          881                  GONC            ERR0_
    0325 0266          882                  C=C-1           X
    0326 03EE          883 YX11             ASL             W
    0327 035A          884                  A#0?            M
    0328 0007          885                  GOC             YX12
    0329 02E6          886                  C#0?            X
    032A 0007          887                  GOC             YX13
    032B 00BE          888                  ACEX            S
    032C 011E          889                  A=C             S
    032D 01FE          890                  C=C+C           S
    032E 01FE          891                  C=C+C           S
    032F 021E          892                  C=A+C           S
    0330 02FE          893                  C#0?            S
    0331 0003          894                  GONC            YX13
    0332 0288          895                  ST=1            7
    0333 00B8          896 YX13             C=REGN          2
    0334 005E          897                  C=0             S
    0335 002E          898 YXTEN            B=0             W
    0336 00FA          899                  BCEX            M
    0337 00AE          900                  ACEX            W
    0338 0308          901 YX31             ST=1            1
    0339 02DA          902                  B#0?            M
    033A 0007          903                  GOC             LN13
    033B 00001000      904                  GOSUB           RCSCR
    033D 02FA          905                  C#0?            M
    033E 0003          906                  GONC            ERR0_
    033F 0198          907                  C=M
    0340 02FE          908                  C#0?            S
    0341 0007          909                  GOC             ERR0_
    0342 002E          910                  B=0             W
    0343 00001002      911                  GOLONG          NRM13
    0345 002E          912 LN10             B=0             W
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LOCATION OBJECT CODE LINE     SOURCE LINE

    0346 00FA          913                  BCEX          M
    0347 00AE          914                  ACEX          W
    0348 003E          915 LN13             B=0           S
    0349 035E          916                  A#0?          S
    034A 0007          917                  GOC           ERRO_
    034B 02DA          918                  B#0?          M
    034C 0003          919                  GONC          ERRO_
    034D 00A6          920                  ACEX          X
    034E 0106          921                  A=C           X
    034F 02E6          922                  C#0?          X
    0350 0003          923                  GONC          LN220
    0351 0146          924                  A=A+C         X
    0352 0003          925                  GONC          LN140
    0353 02A6          926                  C=-C-1        X
    0354 0008          927                  ST=1          3
    0355 000E          928 LN140            A=0           W
    0356 005E          929                  C=0           S
    0357 005A          930                  C=0           M
    0358 035C          931                  PT=           12
    0359 018A          932                  A=A-B         WPT
    035A 0262          933                  C=C-1         PT
    035B 0222          934 LN310            C=C+1         PT
    035C 008E          935 LN300            B=A           W
    035D 01D8          936                  MCEX
    035E 0198          937                  C=M
    035F 0003          938                  GOTO          LN330
    0360 035C          939 LN220            PT=           12
    0361 00CE          940                  C=B           W
    0362 0262          941                  C=C-1         PT
    0363 00AE          942                  ACEX          W
    0364 034E          943                  A#0?          W
    0365 00001002      944                  GOLNC         LN560
    0367 0342          945 LN200            A#0?          PT
    0368 0007          946                  GOC           LN210
    0369 0266          947                  C=C-1         X
    036A 03EE          948                  ASL           W
    036B 0003          949                  GOTO          LN200
    036C 01D8          950 LN210            MCEX
    036D 00001000      951                  GOSUB         DIV15
    036F 0003          952                  GOTO          LN1_PLUS_X6
    0370 00001000      953 LN1_PLUS_X2      GOSUB         ADDONE
    0372 0003          954                  GOTO          LN13
    0373 002E          955 XLN1_PLUS_X      B=0           W
    0374 00FA          956                  BCEX          M
    0375 010E          957                  A=C           W
    0376 00AE          958                  ACEX          W
    0377 010E          959                  A=C           W
    0378 0226          960                  C=C+1         X
    0379 01E6          961                  C=C+C         X
    037A 0003          962                  GONC          LN1_PLUS_X2
    037B 035E          963                  A#0?          S
    037C 0007          964                  GOC           LN1_PLUS_X3
    037D 00AE          965                  ACEX          W
    037E 00001000      966                  GOSUB         LNSUB
    0380 035C          967 LN1_PLUS_X6      PT=           12
    0381 004E          968                  C=0           W
    0382 00A6          969                  ACEX          X
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LOCATION OBJECT CODE LINE     SOURCE LINE

    0383 010E         970                 A=C             W
    0384 006E         971                 ABEX            W
    0385 0003         972                 GOTO            LN1_PLUS_X7
    0386 0008         973 LN1_PLUS_X3     ST=1            3
    0387 0003         974                 GOTO            LN1_PLUS_X6
    0388 0154         975 LN1_PLUS_X8     PT=?            6
    0389 0007         976                 GOC             LN410
    038A 03D4         977                 DECPT
    038B 023E         978                 C=C+1           S
    038C 0226         979 LN1_PLUS_X7     C=C+1           X
    038D 0003         980                 GONC            LN1_PLUS_X8
    038E 0003         981                 GOTO            LN300
    038F 038E         982 LN320           ASR             W
    0390 027E         983 LN330           C=C-1           S
    0391 0003         984                 GONC            LN320
    0392 0198         985                 C=M
    0393 012E         986                 A=A+B           W
    0394 01BE         987                 A=A-1           S
    0395 0003         988                 GONC            LN310
    0396 023E         989                 C=C+1           S
    0397 006E         990                 ABEX            W
    0398 03EE         991                 ASL             W
    0399 03D4         992                 DECPT
    039A 0094         993                 PT=?            5
    039B 0003         994                 GONC            LN300
    039C 00AE         995                 ACEX            W
    039D 008E         996                 B=A             W
    039E 03EA         997                 ASL             WPT
    039F 03EA         998                 ASL             WPT
    03A0 03EA         999                 ASL             WPT
    03A1 00AE        1000                 ACEX            W
    03A2 039C        1001                 PT=             0
    03A3 01D0        1002                 LC              7
    03A4 0286        1003                 C=-C            X
    03A5 02C6        1004                 B#0?            X
    03A6 0003        1005                 GONC            LN420
    03A7 015C        1006                 PT=             6
    03A8 038E        1007 LN460           ASR             W
    03A9 00EE        1008 LN430           BCEX            W
    03AA 00001000    1009 LN431           GOSUB           LNC20
    03AC 00001000    1010                 GOSUB           PMUL
    03AE 02FA        1011                 C#0?            M
    03AF 0003        1012                 GONC            LN530
    03B0 02D4        1013                 PT=?            13
    03B1 0003        1014                 GONC            LN460
    03B2 002E        1015                 B=0             W
    03B3 039C        1016                 PT=             0
    03B4 0082        1017                 B=A             PT
    03B5 012E        1018                 A=A+B           W
    03B6 038E        1019                 ASR             W
    03B7 00001000    1020 LN500           GOSUB           =LNC10_
    03B9 000C        1021                 ST=1?           3
    03BA 0007        1022                 GOC             LN570
    03BB 006E        1023                 ABEX            W
    03BC 018E        1024                 A=A-B           W
    03BD 006E        1025                 ABEX            W
    03BE 012E        1026                 A=A+B           W
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    03BF 006E         1027                ABEX        W
    03C0 001C         1028 LN570          PT=         3
    03C1 00001000     1029 LN520          GOSUB       PMUL
    03C3 02FA         1030                C#0?        M
    03C4 0003         1031                GONC        LN530
    03C5 038E         1032                ASR         W
    03C6 0003         1033                GOTO        LN520
    03C7 00EE         1034 LN410          BCEX        W
    03C8 0003         1035                GOTO        LN400
    03C9 038E         1036 LN540          ASR         W
    03CA 0003         1037                GOTO        LN550
    03CB 035E         1038 LN530          A#0?        S
    03CC 0007         1039                GOC         LN540
    03CD 0266         1040                C=C-1       X
    03CE 005E         1041 LN550          C=0         S
    03CF 000C         1042                ST=1?       3
    03D0 0003         1043                GONC        LN560
    03D1 02BE         1044                C=-C-1      S
    03D2 0000         1045                NOP
    03D3 00001000     1046 LN560          GOSUB       SHF10
    03D5 030C         1047                ST=1?       1
    03D6 0003         1048                GONC        LN580
    03D7 00001000     1049                GOSUB       RCSCR
    03D9 00001000     1050                GOSUB       MP2_13
    03DB 0198         1051 YTOX50         C=M
    03DC 02FE         1052 YTOX60         C#0?        S
    03DD 00001002     1053                GOLNC       EXP13
    03DF 01A6         1054                A=A-1       X
    03E0 00EE         1055                BCEX        W
    03E1 0003         1056                GOTO        YTOX60
    03E2 038E         1057 LN420          ASR         W
    03E3 00001000     1058 LN400          GOSUB       LNAP
    03E5 006E         1059                ABEX        W
    03E6 015C         1060                PT=         6
    03E7 0003         1061                GOTO        LN431
    03E8 012E         1062 PMUL1          A=A+B       W
    03E9 0262         1063 PMUL           C=C-1       PT
    03EA 0003         1064                GONC        PMUL1
    03EB 0042         1065                C=0         PT
    03EC 0226         1066                C=C+1       X
    03ED 03DC         1067                INCPT
    03EE 03E0         1068                RTN
    03EF 008C         1069 LN580          ST=1?       5
    03F0 03A0         1070                RTNNC
    03F1 004E         1071                C=0         W
    03F2 01D8         1072                MCEX
    03F3 00001000     1073                GOSUB       LNC10
    03F5 00EE         1074                BCEX        W
    03F6 00001002     1075                GOLONG      DV2_13
    03F8 000E         1076 TEN_TO_X       A=0         W
    03F9 00001000     1077                GOSUB       LNC10
    03FB 00B0         1078                C=N
    03FC 00001000     1079                GOSUB       MP1_10
    03FE 0003         1080                GOTO        YTOX50
    03FF 0000         1081                FILLTO      1777Q
                      1082                END
```

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LOCATION OBJECT CODE LINE SOURCE LINE

Errors= 0

LINE#	SYMBOL	TYPE	REFERENCES
67	AD1_10	P	28,64
65	AD2_10	P	27,468
70	AD2_13	P	29
74	ADD10	P	78
86	ADD30	P	91
106	ADD40	P	
92	ADD45	P	
116	ADD50	P	105,109,124
99	ADD55	P	95
126	ADD60	P	81,85,117
103	ADD65	P	87,98
88	ADD90	P	
58	ADDONE	P	43,763,953
	CHK_NO_S	E	870
218	DIV100	P	
223	DIV110	P	41,221,753
233	DIV120	P	40,228
236	DIV130	P	238
237	DIV140	P	235,243
227	DIV15	P	42,611,951
469	DTOR	P	392
212	DV1_10	P	35,475
210	DV2_10	P	34
215	DV2_13	P	36,209,480,1075
252	ERRO	P	47,217,291,293,295,879
879	ERRO_	P	881,906,909,917,919
	ERRDE	E	252
612	EXP10	P	588
619	EXP110	P	617,642
639	EXP120	P	627
615	EXP13	P	589,1053
629	EXP130	P	633
636	EXP200	P	624
643	EXP210	P	645
644	EXP220	P	638,663
659	EXP230	P	649
657	EXP240	P	652
664	EXP300	P	655
634	EXP400	P	593,693
683	EXP410	P	685
684	EXP420	P	635
692	EXP430	P	658
694	EXP500	P	592,631
695	EXP510	P	688
713	EXP520	P	707
727	EXP530	P	712
726	EXP540	P	728
703	EXP550	P	716
706	EXP560	P	732
700	EXP570	P	696
754	EXP600	P	704
673	EXP700	P	671
675	EXP710	P	581,725
678	EXP720	P	594,676,764
682	EXP730	P	679
761	EXP740	P	759
764	EXP750	P	762

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LINE#	SYMBOL	TYPE	REFERENCES
371	EXSCR	P	358
526	HMS110	P	532
529	HMS120	P	
531	HMS130	P	528
533	HMS140	P	525
542	HMS150	P	539
545	HMS160	P	541
550	HMS170	P	561
562	HMSDV	P	511,552,557
576	HMSM20	P	570,579
564	HMSMP	P	510,540,543,547
551	HRS100	P	536
557	HRS120	P	555
411	INT30	P	408
401	INTFRC	P	388
481	LD90	P	394,474,477
912	LN10	P	52
915	LN13	P	903,954
928	LN140	P	925
953	LN1_PLUS_X2	P	962
973	LN1_PLUS_X3	P	964
967	LN1_PLUS_X6	P	952,974
979	LN1_PLUS_X7	P	972
975	LN1_PLUS_X8	P	980
945	LN200	P	949
950	LN210	P	946
939	LN220	P	923
935	LN300	P	981,994
934	LN310	P	988
982	LN320	P	984
983	LN330	P	938
1058	LN400	P	1035
1034	LN410	P	976
1057	LN420	P	1005
1008	LN430	P	
1009	LN431	P	1061
1007	LN460	P	1014
1020	LN500	P	
1029	LN520	P	1033
1038	LN530	P	1012,1031
1036	LN540	P	1039
1041	LN550	P	1037
1046	LN560	P	582,944,1043
1028	LN570	P	1022
1069	LN580	P	1048
733	LNAP	P	587,697,1058
741	LNAP1	P	748
747	LNAP2	P	743
766	LNC10	P	591,636,1073,1077
765	LNC10	P	53,1020
781	LNC20	P	586,634,1009
801	LNC30	P	783
816	LNC40	P	788
829	LNC50	P	790
841	LNC60	P	792
851	LNC70	P	794
859	LNC80	P	796

LINE#	SYMBOL	TYPE	REFERENCES
813	LNCEND	P	780,800,828,840,850,858,864
596	LNSUB	P	584,966
600	LNSUB1	P	607
606	LNSUB2	P	602
595	LNSUB_MINUS	P	585,760
440	MOD1	P	438
433	MOD10	P	391
446	MOD2	P	442
453	MOD3	P	454,458
462	MOD4	P	445
443	MOD5	P	435
137	MP1_10	P	31,473,1079
135	MP2_10	P	30,478
140	MP2_13	P	32,1050
147	MPYI10	P	145
150	MPY120	P	157
153	MPY130	P	155
154	MPY140	P	152
159	MPY150	P	33,134,550
162	MPY160	P	
170	NRM10	P	48,193,246
171	NRM11	P	49,191
172	NRM12	P	50,284,411
190	NRM13	P	51,682,911
188	NRM20	P	175,177
181	NRM30	P	189
187	NRM40	P	
197	ONE_BY_X10	P	37
200	ONE_BY_X13	P	38,724
486	PI_BY_2	P	395,470,479
1063	PMUL	P	583,1010,1029
1062	PMUL1	P	1064
381	RCSCR	P	357,904,1049
379	RCSCR_	P	359
476	RTOD	P	393
167	SHF10	P	56,403,461,1046
192	SHF20	P	169,196
166	SHF40	P	57,163
412	SINFR	P	389,401
423	SINFR1	P	430
431	SINFR2	P	424
415	SINFRA	P	390
247	SQR10	P	45
286	SQR100	P	277
250	SQR13	P	46
253	SQR20	P	251
266	SQR30	P	264
271	SQR50	P	269
278	SQR60	P	280
279	SQR70	P	287
363	STSCR	P	356,868
369	STSCR1	P	378
361	STSCR_	P	360
62	SUBONI	P	59
60	SUBONE	P	44,677
1076	TEN_TO_X	P	590
492	TRCIO	P	396,488

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LINE#	SYMBOL	TYPE	REFERENCES
292	XFT100	P	288
297	XFT110	P	290
289	XFT120	P	303
310	XFT130	P	307
315	XFT140	P	334,336
319	XFT150	P	316
323	XFT160	P	324
325	XFT170	P	321
330	XFT180	P	331
332	XFT190	P	326
955	XLN1_PLUS_X	P	54
516	XTOHRS	P	509
865	XY_TO_X	P	55
205	X_BY_Y13	P	39
1051	YTOX50	P	1080
1052	YTOX60	P	1056
883	YX11	P	878
880	YX12	P	885
896	YX13	P	874,887,894
901	YX31	P	
898	YXTEN	P	

```
LOCATION OBJECT CODE LINE     SOURCE LINE

                       1 "COCONUT"
                       2 * ROM ADDRESSES @16000-17777
                       3                 GLB             GTACOD
                       4                 GLB             TOGSHF
                       5                 GLB             TGSHF1
                       6 ***********************************************
                       7 * NUT MESSAGE TABLE & MESSAGE ROUTINE         *
                       8 ***********************************************
                       9                 GLB             MSG
                      10                 GLB             MSGA
                      11                 GLB             MSGE
                      12                 GLB             MSGX
                      13                 GLB             MSGAD
                      14                 GLB             MSGDE
                      15                 GLB             MSGML
                      16                 GLB             MSGNE
                      17                 GLB             MSGNL
                      18                 GLB             MSGNO
                      19                 GLB             MSGOF
                      20                 GLB             MSGPR
                      21                 GLB             MSGRAM
                      22                 GLB             MSGROM
                      23                 GLB             MSGTA
                      24                 GLB             MSGYES
                      25                 GLB             MSGWR
                      26 *
    0000 00000000     27                 FILLTO          2Q                ;PUT SPARE AT BEGINNING
                      28 *
                      29 * PATCH9 - POST-RELEASE FIX TO SIGMA+ AND SIGMA- TO GET OLD X
                      30 * PRESERVED IN LASTX.
                      31 *
                      32                 GLB             PATCH9
    0003 00B0         33 PATCH9          C=N                               ;GET NEW X
    0004 00001002     34                 GOLONG          =XCLX1            ;GO UPDATE X
                      35 *
                      36 * PATCH6 - POST-RELEASE FIX TO CHKADR TO PREVENT WRAPAROUND WHEN
                      37 * PHYSICAL REGISTER ADDRESS CARRIES INTO THE 10TH OR 11TH BITS.
                      38 * WITH THIS PATCH. CHKADR WILL ACCEPT PHYSICAL REGISTER ADDRESSES
                      39 * UP THRU 511 ONLY (9 BITS ONLY).
                      40 *
                      41                 GLB             PATCH6
    0006 0248         42 PATCH6          ST=1            9                 ;REMEMBER ERROR EXIT TO ERRNE
    0007 0016         43                 A=0             XS
    0008 0176         44                 A=A+1           XS
    0009 0316         45                 A<C?            XS                ;511<REG ADDRESS?
    000A 00001003     46                 GOLC            =ERRNE            ;YES - NO SUCH REG
    000C 0270         47                 DADD=C                            ;ADDRESS THE REGISTER
    000D 00001002     48                 GOLONG          =P6RTN
                      49 *
                      50 * MESSAGE TABLE
                      51 *
    000F 0101         52                 CON             401Q              ;A
    0010 000C         53                 CON             14Q               ;L
    0011 0010         54                 CON             20Q               ;P
    0012 0008         55                 CON             10Q               ;H
    0013 0001         56                 CON             01Q               ;A
    0014 0020         57                 CON             40Q
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    0015 0004          58                  CON             04Q             ;D
    0016 0001          59                  CON             01Q             ;A
    0017 0014          60                  CON             24Q             ;T
    0018 0001          61 MSGAD            CON             01Q             ;A
    0019 0104          62                  CON             404Q            ;D
    001A 0001          63                  CON             01Q             ;A
    001B 0014          64                  CON             24Q             ;T
    001C 0001          65                  CON             01Q             ;A
    001D 0020          66                  CON             40Q
    001E 0005          67                  CON             05Q             ;E
    001F 0012          68                  CON             22Q             ;R
    0020 0012          69                  CON             22Q             ;R
    0021 000F          70                  CON             17Q             ;O
    0022 0012          71 MSGDE            CON             22Q             ;R
    0023 010D          72                  CON             415Q            ;M
    0024 0005          73                  CON             05Q             ;E
    0025 000D          74                  CON             15Q             ;M
    0026 000F          75                  CON             17Q             ;O
    0027 0012          76                  CON             22Q             ;R
    0028 0019          77                  CON             31Q             ;Y
    0029 0020          78                  CON             40Q
    002A 000C          79                  CON             14Q             ;L
    002B 000F          80                  CON             17Q             ;O
    002C 0013          81                  CON             23Q             ;S
    002D 0014          82 MSGML            CON             24Q             ;T
    002E 010E          83                  CON             416Q            ;N
    002F 000F          84                  CON             17Q             ;O
    0030 000E          85                  CON             16Q             ;N
    0031 0005          86                  CON             05Q             ;E
    0032 0018          87                  CON             30Q             ;X
    0033 0009          88                  CON             11Q             ;I
    0034 0013          89                  CON             23Q             ;S
    0035 0014          90                  CON             24Q             ;T
    0036 0005          91                  CON             05Q             ;E
    0037 000E          92                  CON             16Q             ;N
    0038 0014          93 MSGNE            CON             24Q             ;T
    0039 010E          94                  CON             416Q            ;N
    003A 0015          95                  CON             25Q             ;U
    003B 000C          96                  CON             14Q             ;L
    003C 000C          97 MSGNL            CON             14Q             ;L
    003D 0110          98                  CON             420Q            ;P
    003E 0012          99                  CON             22Q             ;R
    003F 0009         100                  CON             11Q             ;I
    0040 0016         101                  CON             26Q             ;V
    0041 0001         102                  CON             01Q             ;A
    0042 0014         103                  CON             24Q             ;T
    0043 0005         104 MSGPR            CON             05Q             ;E
    0044 010F         105                  CON             417Q            ;O
    0045 0015         106                  CON             25Q             ;U
    0046 0014         107                  CON             24Q             ;T
    0047 0020         108                  CON             40Q
    0048 000F         109                  CON             17Q             ;O
    0049 0006         110                  CON             06Q             ;F
    004A 0020         111                  CON             40Q
    004B 0012         112                  CON             22Q             ;R
    004C 0001         113                  CON             01Q             ;A
    004D 000E         114                  CON             16Q             ;N
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LOCATION OBJECT CODE LINE     SOURCE LINE

    004E 0007          115                    CON             07Q             ;G
    004F 0005          116 MSGOF              CON             05Q             ;E
    0050 0110          117                    CON             420Q            ;P
    0051 0001          118                    CON             01Q             ;A
    0052 0003          119                    CON             03Q             ;C
    0053 000B          120                    CON             13Q             ;K
    0054 0009          121                    CON             11Q             ;I
    0055 000E          122                    CON             16Q             ;N
    0056 0007          123 MSGWR              CON             07Q             ;G
    0057 0114          124                    CON             424Q            ;T
    0058 0012          125                    CON             22Q             ;R
    0059 0019          126                    CON             31Q             ;Y
    005A 0020          127                    CON             40Q
    005B 0001          128                    CON             01Q             ;A
    005C 0007          129                    CON             07Q             ;G
    005D 0001          130                    CON             01Q             ;A
    005E 0009          131                    CON             11Q             ;I
    005F 000E          132 MSGTA              CON             16Q             ;N
    0060 0119          133                    CON             431Q            ;Y
    0061 0005          134                    CON             5Q              ;E
    0062 0013          135 MSGYES             CON             23Q             ;S
    0063 010E          136                    CON             416Q            ;N
    0064 000F          137 MSGNO              CON             17Q             ;O
    0065 0112          138                    CON             422Q            ;R
    0066 0001          139                    CON             01Q             ;A
    0067 000D          140 MSGRAM             CON             15Q             ;M
    0068 0112          141                    CON             422Q            ;R
    0069 000F          142                    CON             17Q             ;O
    006A 000D          143 MSGROM             CON             15Q             ;M
                       144 *
                       145 * MSG - SEND A MESSAGE TO LCD DISPLAY
                       146 * CALLING MSG WITH S8 SET, MSGFLAG
                       147 * WILL BE SET SO THE DISPLAY WON'T BE REFRESHED BY DISPLAY REFRESH
                       148 * LOGIC. OTHERWISE, THE DISPLAY WILL BE REFRESHED.
                       149 * CALLING SEQUENCE:
                       150 *      GOSUB  MSGA
                       151 *      XDEF   <MSGXXX>
                       152 * MSG - SET S8 AUTOMATICALLY, THEN DROP TO MSGA
                       153 * MSGX -    PLUG-IN ROM CAN CALL MGSX TO DISPLAY MESSAGE IN ROM.
                       154 *          IF S8= 1,  GOSUB PRT6, BLINK LCD, SET MESSAGE FLAG
                       155 *          IF S8= 0,  DON'T PRINT OR SET MESSAGE FLAG
                       156 *      IN: C[6:3]= ADDRESS OF FIRST CHARACTER OF MESSAGE
                       157 *     OUT: IF S8= 1: SST 0 UP, MSG FLAG SET, CHIP 0 ENABLED, C= REG 14
                       158 *          IF S8= 0: CHIP 0 ENABLED
                       159 *    USES: IF S8= 1: A,C,G,N, ST[7:0], ACTIVE PT, 2 ADDITIONAL SUB LEVELS
                       160 *          IF S8= 0: A,C, ACTIVE PT,  1 ADDITIONAL SUB LEVEL
                       161 *   ASSUME:  HEXMODE
                       162 *
                       163 * MESSAGE TABLE FORMAT:
                       164 * EVERY CHAR IN THE MESSAGE COST A 10 BITS WORD TO STORE IT.
                       165 * ENTRY OF EACH MESSAGE POINTING LAST CHAR OF THE MESSAGE. THE
                       166 * MSG ROUTINE WORKS BACKWARD, IT PICK UP LAST CHAR FIRST AND SHIFT
                       167 * IT FROM RIGHT END TO THE DISPLAY, THEN PICK UP NEXT LAST ONE UNTIL
                       168 * DONE WITH THE 1ST CHAR WHICH HAS BIT 8 SET.
                       169 * CHAR IN THE MESSAGE TABLE IS IN LCD FORM.
                       170 *
    006B 0108          171 MSG                ST=1            8
```

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```
LOCATION OBJECT CODE LINE     SOURCE LINE

    006C 01B0          172 MSGA            C=STK·                          ;!!! DOESN'T WORK IN DEC MODE !!!!!!!
    006D 0260          173                 SETHEX
    006E 0330          174                 CXISA
    006F 023A          175                 C=C+1           M
    0070 0170          176                 STK=C                           ;POINT TO P+2
    0071 01BC          177 MSGE            RCR             11
    0072 015C          178                 PT=             6               ;POINT TO MSG ENTRY
    0073 0050          179                 LC              1               ;IN QUAR 7
    0074 0310          180                 LC              12
    0075 010E          181 MSGX            A=C             W
    0076 00001000      182                 GOSUB           =CLLCDE
    0078 00AE          183                 ACEX            W
    0079 0330          184 MSG100          CXISA                           ;LOAD A CHAR
    007A 027A          185                 C=C-1           M               ;POINT TO NEXT CHAR
    007B 0106          186                 A=C             X
    007C 0056          187                 C=0             XS
    007D 03A8          188                 SRSABC
    007E 0356          189                 A#0?            XS              ;IS THIS THE LAST CHAR ?
    007F 0003          190                 GONC            MSG100          ;NO
                       191
                       192                 GLB             MSG105          ;CALLED FROM TIMER ROM
    0080 00001000      193 MSG105          GOSUB           =ENCP00         ;ENABLE CHIP 0
    0082 010C          194                 ST=1?           8
    0083 03A0          195                 RTNNC
    0084 038D          196                 CON             1615Q
    0085 01BC          197                 CON             674Q            ;GOSUB PRT6
                       198 * TO CONSERVE SUBROUTINE LEVELS, THE PRINTER POPS ITS RETURN OFF
                       199 * THE STACK AND DOES A GOLONG BACK TO MSG110
                       200                 GLB             MSG110          ;FOR THE PRINTER
    0086               201 MSG110
    0086 00001002      202                 GOLONG          =MSGDLY         ;DELAY FOR VIEWING MSG
                       203                                                 ;AND SET MSGFLG
                       204 * STATUS SET 0 IS UP FROM MSGDLY
```

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LOCATION OBJECT CODE LINE     SOURCE LINE
                     206                GLB          SIGMA
                     207                GLB          STATCK
                     208                GLB          CHSA
                     209                GLB          BRT140
                     210                GLB          BRT200
                     211                GLB          CHSA1
                     212                GLB          BRT160
                     213                GLB          BRT290
                     214                GLB          TRCS10
                     215                GLB          TOREC
                     216                GLB          ADD1
                     217                GLB          ADD2
                     218                GLB          TRG240
0088 00001000        219 SIGMA          GOSUB        STATCK
008A 00B8            220                C=REGN       2
008B 00F0            221 SIGMA1         CNEX
008C 00B0            222                C=N
008D 010E            223                A=C          W
008E 004C            224                ST=1?        4
008F 0003            225                GONC         SIGMA2
0090 00001000        226                GOSUB        GETX
0092 0003            227                GOTO         SIGMA3
0093 00001000        228 SIGMA2         GOSUB        GETY
0095 00001000        229 SIGMA3         GOSUB        CHSA
0097 00001000        230                GOSUB        ADD2
0099 00B0            231                C=N
009A 010E            232                A=C          W
009B 00001000        233                GOSUB        =MP2_10
009D 00001000        234                GOSUB        CHSA
009F 004C            235                ST=1?        4
00A0 0003            236                GONC         SIGMA4
00A1 00001000        237                GOSUB        GETXSQ
00A3 0003            238                GOTO         SIGMA5
00A4 00001000        239 SIGMA4         GOSUB        GETYSQ
00A6 00001000        240 SIGMA5         GOSUB        ADD1
00A8 0046            241                C=0          X
00A9 0270            242                DADD=C
00AA 00F8            243                C=REGN       3
00AB 004C            244                ST=1?        4
00AC 0007            245                GOC          SIGMA6
00AD 0048            246                ST=1         4
00AE 0003            247                GOTO         SIGMA1
00AF 010E            248 SIGMA6         A=C          W
00B0 00B8            249                C=REGN       2
00B1 00001000        250                GOSUB        =MP2_10
00B3 00001000        251                GOSUB        CHSA
00B5 00001000        252                GOSUB        GETXY
00B7 00001000        253                GOSUB        ADD1
00B9 000E            254                A=0          W
00BA 0162            255                A=A+1        PT
00BB 00001000        256                GSUBNC       CHSA
00BD 00001000        257                GOSUB        GETN
00BF 00001000        258                GOSUB        ADD2
00C1 00F0            259                NCEX
00C2 004E            260                C=0          W
00C3 0270            261                DADD=C
00C4 00F8            262                C=REGN       3            ;GET OLD X
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

   00C5 0128          263                REGN=C          4               ;UPDATE LASTX
   00C6 00001002      264                GOLONG          PATCH9
                      265 ****************************************************
                      266 *THIS SUBROUTINE CHECKS ALL STAT REGISTERS FOR
                      267 *ALPHA DATA. IT STARTS AT THE HIGHEST ADDRESS
                      268 *AND WORKS DOWN THROUGH THE OTHER FIVE REGISTERS.
                      269 ****************************************************
   00C8 00001000      270 STATCK         GOSUB           =SUMCHK         ;CX=ADR N B=N
   00CA 015C          271                PT=             6
   00CB 00EE          272                BCEX            W
   00CC 00001000      273 DOCHK          GOSUB           =CHK_NO_S       ;IS THIS NUMBER?
   00CE 0260          274                SETHEX                          ;YES
   00CF 00EE          275                BCEX            W               ;GET ADR
   00D0 0266          276                C=C-1           X
   00D1 0270          277                DADD=C                          ;ADR REGISTER
   00D2 00EE          278                BCEX            W               ;SAVE ADR
   00D3 0038          279                C=DATA                          ;GET NXT REG
   00D4 03D4          280                DECPT                           ;COUNT DOWN
   00D5 0394          281                PT=?            0
   00D6 0003          282                GONC            DOCHK           ;NO
   00D7 004E          283                C=0             W
   00D8 0270          284                DADD=C
   00D9 0003          285                GOTO            GET1
                      286 ****************************************************
   00DA 008C          287 CHSA           ST=1?           5
   00DB 03A0          288                RTNNC
   00DC 00BE          289 CHSA1          ACEX            S
   00DD 02BE          290                C=-C-1          S
   00DE 00BE          291                ACEX            S
   00DF 03E0          292                RTN
   00E0 00001000      293 ADD1           GOSUB           =AD1_10
   00E2 0003          294                GOTO            STOVF
   00E3 00001000      295 ADD2           GOSUB           =AD2_10
   00E5 00001000      296 STOVF          GOSUB           =OVFL10
   00E7 02F0          297                DATA=C
   00E8 035C          298                PT=             12
   00E9 03E0          299                RTN
                      300                GLB             GETN
                      301                GLB             GETX
                      302                GLB             GETXSQ
                      303                GLB             GETY
                      304                GLB             GETYSQ
                      305                GLB             GETXY
                      306                GLB             XBAR
   00EA 03D4          307 GETN           DECPT
   00EB 03D4          308 GETXY          DECPT
   00EC 03D4          309 GETYSQ         DECPT
   00ED 03D4          310 GETY           DECPT
   00EE 03D4          311 GETXSQ         DECPT
   00EF 0260          312 GETX           SETHEX
   00F0 004E          313                C=0             W
   00F1 0270          314                DADD=C
   00F2 0378          315                C=REGN          13
   00F3 01BC          316                RCR             11
   00F4 0226          317 GETADD         C=C+1           X
   00F5 03DC          318                INCPT
   00F6 02D4          319                PT=?            13
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    00F7 0003          320                GONC          GETADD
    00F8 0266          321                C=C-1         X
    00F9 0270          322                DADD=C
    00FA 0038          323                C=DATA
    00FB 02A0          324 GET1           SETDEC
    00FC 035C          325                PT=           12
    00FD 03E0          326                RTN
    00FE 00001000      327 XBAR           GOSUB         STATCK
    0100 00001000      328                GOSUB         GETY
    0102 00001000      329                GOSUB         XBAR_
    0104 00F0          330                CNEX
    0105 00001000      331                GOSUB         GETX
    0107 010E          332 XBAR_          A=C           W
    0108 00001000      333                GOSUB         GETN
    010A 00EE          334                BCEX          W
    010B 004E          335                C=0           W
    010C 0270          336                DADD=C
    010D 00EE          337                BCEX          W
    010E 00001002      338                GOLONG        =DV2_10
                       339                GLB           XBAR_
                       340                GLB           SD
    0110 0084          341 SD             ST=0          5
    0111 00001000      342                GOSUB         STATCK
    0113 00001000      343                GOSUB         GETYSQ
    0115 010E          344 STDEV1         A=C           W
    0116 00001000      345                GOSUB         GETN
    0118 00001000      346                GOSUB         =MP2_10
    011A 00001000      347                GOSUB         STSCR_
    011C 008C          348                ST=1?         5
    011D 0007          349                GOC           STDEV4
    011E 00001000      350                GOSUB         GETY
    0120 0003          351                GOTO          STDEV5
    0121 00001000      352 STDEV4         GOSUB         GETX
    0123 010E          353 STDEV5         A=C           W
    0124 00001000      354                GOSUB         =MP2_10
    0126 02BE          355                C=-C-1        S
    0127 00BE          356                ACEX          S
    0128 00001000      357                GOSUB         =RCSCR_
    012A 00001000      358                GOSUB         =AD2_13
    012C 00001000      359                GOSUB         GETN
    012E 00001000      360                GOSUB         =DV1_10
    0130 00001000      361                GOSUB         =STSCR_
    0132 00001000      362                GOSUB         GETN
    0134 002E          363                B=0           W
    0135 00FA          364                BCEX          M
    0136 010E          365                A=C           W
    0137 00001000      366                GOSUB         =SUBONE
    0139 00001000      367                GOSUB         =RCSCR_
    013B 00001000      368                GOSUB         =X_BY_∇13
    013D 02FE          369                C#0?          S
    013E 00001003      370                GOLC          =ERROF
    0140 00001000      371                GOSUB         =SQR13
    0142 008C          372                ST=1?         5
    0143 0360          373                RTNC
    0144 00F0          374                CNEX
    0145 0088          375                ST=1          5
    0146 00001000      376                GOSUB         GETXSQ
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LOCATION OBJECT CODE LINE     SOURCE LINE

    0148 0003          377                GOTO        STDEV1
                       378                GLB         BRT100
                       379                GLB         TOPOL
                       380                GLB         TRC30
                       381                GLB         BRTS10
                       382                GLB         TRG430
                       383                GLB         TRG100
    0149 00B0          384 TOPOL          C=N
    014A 02FA          385                C#0?        M
    014B 0003          386                GONC        TOPOL2
    014C 02FE          387                C#0?        S
    014D 0003          388                GONC        TOPOL1
    014E 0288          389                ST=1        7
    014F 0388          390                ST=1        0
    0150 005E          391                C=0         S
    0151 00F0          392 TOPOL1         NCEX
    0152 010E          393                A=C         W
    0153 00001000      394                GOSUB       =MP2_10        ;CALC X^2
    0155 00001000      395                GOSUB       =STSCR
    0157 00B8          396                C=REGN      2
    0158 010E          397                A=C         W
    0159 00001000      398                GOSUB       =MP2_10        ;CALC Y^2
    015B 00001000      399                GOSUB       =RCSCR
    015D 00001000      400                GOSUB       =AD2_13        ;CALC X^2+Y^2
    015F 00001000      401                GOSUB       =SQRT3         ;CALC SQR(X^2+Y^2)
    0161 00F0          402                NCEX
    0162 010E          403                A=C         W
    0163 00B8          404                C=REGN      2
    0164 00AE          405                ACEX        W
    0165 00001000      406                GOSUB       =DV2_10        ;CALC Y/ABS(X)
    0167 02FA          407                C#0?        M
    0168 0007          408                GOC         BRT110
    0169 000E          409                A=0         W
    016A 0003          410                GOTO        BRT110
    016B 038C          411 BRTS10         ST=1?       0
    016C 0007          412                GOC         BRTS20
    016D 0388          413                ST=1        0
    016E 03E0          414                RTN
    016F 0384          415 BRTS20         ST=0        0
    0170 03E0          416                RTN
    0171 00AE          417 TOPOL2         ACEX        W
    0172 0288          418                ST=1        7
    0173 02FE          419                C#0?        S
    0174 0003          420                GONC        TOPOL4
    0175 0148          421                ST=1        6
    0176 005E          422 TOPOL4         C=0         S
    0177 00F0          423                NCEX
    0178 00B0          424                C=N
    0179 02FA          425                C#0?        M
    017A 03A0          426                RTNNC
    017B 000E          427 TOPOL3         A=0         W
    017C 0003          428                GOTO        BRT301
    017D 00001000      429 BRT120         GOSUB       =BRTS10
    017F 0003          430                GOTO        TOPOL3
    0180 002E          431 BRT100         B=0         W
    0181 010E          432                A=C         W
    0182 007A          433                ABEX        M
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LOCATION OBJECT CODE LINE     SOURCE LINE

    0183 02FE          434 BRT110          C#0?            S
    0184 0003          435                 GONC            BRT130
    0185 0148          436                 ST=1            6
    0186 020C          437                 ST=1?           2
    0187 0003          438                 GONC            BRT130
    0188 038C          439                 ST=1?           0
    0189 0003          440                 GONC            BRT130
    018A 0384          441                 ST=0            0
    018B 0288          442                 ST=1            7
    018C 0144          443                 ST=0            6
    018D 035C          444 BRT130          PT=             12
    018E 00A6          445                 ACEX            X
    018F 0106          446                 A=C             X
    0190 01E6          447                 C=C+C           X
    0191 00001003      448                 GOLC            BRT140
    0193 0346          449 BRT150          A#0?            X
    0194 0007          450                 GOC             BRT170
    0195 00CE          451                 C=B             W
    0196 02CE          452                 B#0?            W
    0197 0003          453                 GONC            TOPOL3
    0198 035C          454                 PT=             12
    0199 0262          455                 C=C-1           PT
    019A 02EE          456                 C#0?            W
    019B 0007          457                 GOC             BRT170
    019C 030C          458                 ST=1?           1
    019D 0007          459                 GOC             BRT120
    019E 00001000      460                 GOSUB           =TRC10
    01A0 000E          461                 A=0             W
    01A1 01A6          462                 A=A-1           X
    01A2 00AE          463                 ACEX            W
    01A3 00001002      464                 GOLONG          BRT200
    01A5 030C          465 BRT170          ST=1?           1
    01A6 00001003      466                 GOLC            =ERR0
    01A8 00001000      467 BRT160          GOSUB           ONE_BY_X13
    01AA 00001000      468                 GOSUB           BRTS10
    01AC 006E          469 BRT290          ABEX            W
    01AD 00CE          470                 C=B             W
    01AE 035C          471                 PT=             12
    01AF 005A          472                 C=0             M
    01B0 005E          473                 C=0             S
    01B1 0226          474 BRT300          C=C+1           X
    01B2 02E6          475                 C#0?            X
    01B3 0003          476                 GONC            BRT310
    01B4 023E          477                 C=C+1           S
    01B5 03D4          478                 DECPT
    01B6 0154          479                 PT=?            6
    01B7 0003          480                 GONC            BRT300
    01B8 00EE          481                 BCEX            W
    01B9 00001002      482 BRT301          GOLONG          BRT200
    01BB 01D8          483 BRT310          MCEX
    01BC 004E          484                 C=0             W
    01BD 023E          485                 C=C+1           S
    01BE 03CE          486                 CSR             W
    01BF 0003          487                 GOTO            BRT340
    01C0 00AE          488 BRT320          ACEX            W
    01C1 01D8          489                 MCEX
    01C2 0222          490                 C=C+1           PT
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LOCATION OBJECT CODE LINE     SOURCE LINE

    01C3 011E         491                 A=C             S
    01C4 01D8         492                 MCEX
    01C5 03AE         493 BRT330          BSR             W
    01C6 03AE         494                 BSR             W
    01C7 01BE         495                 A=A-1           S
    01C8 0003         496                 GONC            BRT330
    01C9 001E         497                 A=0             S
    01CA 012E         498                 A=A+B           W
    01CB 00AE         499                 ACEX            W
    01CC 008E         500 BRT340          B=A             W
    01CD 01CE         501                 A=A-C           W
    01CE 0003         502                 GONC            BRT320
    01CF 01D8         503                 MCEX
    01D0 023E         504                 C=C+1           S
    01D1 01D8         505                 MCEX
    01D2 006E         506                 ABEX            W
    01D3 03EE         507                 ASL             W
    01D4 03D4         508                 DECPT
    01D5 0154         509                 PT=?            6
    01D6 0003         510                 GONC            BRT340
    01D7 00EE         511                 BCEX            W
    01D8 00001000     512                 GOSUB           =DIV120
    01DA 006E         513                 ABEX            W
    01DB 01D8         514                 MCEX
    01DC 0046         515                 C=0             X
    01DD 029C         516                 PT=             7
    01DE 00EE         517 BRT350          BCEX            W
    01DF 00001000     518                 GOSUB           TRC30
    01E1 00EE         519                 BCEX            W
    01E2 0003         520                 GOTO            BRT370
    01E3 012E         521 BRT360          A=A+B           W
    01E4 0262         522 BRT370          C=C-1           PT
    01E5 0003         523                 GONC            BRT360
    01E6 038E         524                 ASR             W
    01E7 0042         525                 C=0             PT
    01E8 02FA         526                 C#0?            M
    01E9 0003         527                 GONC            BRT190
    01EA 03DC         528                 INCPT
    01EB 0003         529                 GOTO            BRT350
    01EC 030C         530 BRT140          ST=1?           1
    01ED 0003         531                 GONC            BRT141
    01EE 00001000     532                 GOSUB           =STSCR
    01F0 00001000     533                 GOSUB           =ADDONE
    01F2 00001000     534                 GOSUB           =EXSCR
    01F4 00001000     535                 GOSUB           =SUBONE
    01F6 00001000     536                 GOSUB           =RCSCR
    01F8 00001000     537                 GOSUB           =MP2_13
    01FA 001E         538                 A=0             S
    01FB 00001000     539                 GOSUB           =SQR13
    01FD 00B0         540                 C=N
    01FE 005E         541                 C=0             S
    01FF 01D8         542                 MCEX
    0200 0198         543                 C=M
    0201 0046         544                 C=0             X
    0202 00001000     545                 GOSUB           X_BY_Y13
    0204 00A6         546                 ACEX            X
    0205 0106         547                 A=C             X
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    0206 01E6          548                 C=C+C           X
    0207 00001002      549                 GOLNC           BRT160
    0209 00001002      550 BRT141          GOLONG          BRT290
    020B 03DC          551 BRT180          INCPT
    020C 0266          552 BRT190          C=C-1           X
    020D 0354          553                 PT=?            12
    020E 0003          554                 GONC            BRT180
    020F 005E          555 BRT200          C=0             S
    0210 00001000      556                 GOSUB           =SHF10
    0212 038C          557                 ST=1?           0
    0213 0003          558                 GONC            BRT220
    0214 02BE          559                 C=-C-1          S
    0215 00BE          560                 ACEX            S
    0216 00001000      561                 GOSUB           =PI_BY_2
    0218 00001000      562                 GOSUB           =AD2_13
    021A 028C          563 BRT220          ST=1?           7
    021B 0003          564                 GONC            BRT240
    021C 00001000      565                 GOSUB           =PI_BY_2
    021E 00001000      566                 GOSUB           =AD2_13
    0220 004C          567 BRT240          ST=1?           4
    0221 0007          568                 GOC             BRT250
    0222 00001000      569                 GOSUB           =PI_BY_2
    0224 0166          570                 A=A+1           X
    0225 0166          571                 A=A+1           X
    0226 0000          572                 NOP
    0227 00001000      573                 GOSUB           =DV2_13
    0229 008C          574                 ST=1?           5
    022A 0007          575                 GOC             BRT250
    022B 004E          576                 C=0             W
    022C 035C          577                 PT=             12
    022D 0266          578                 C=C-1           X
    022E 0250          579                 LC              9
    022F 00001000      580                 GOSUB           =MP1_10
    0231 014C          581 BRT250          ST=1?           6
    0232 0003          582                 GONC            BRT260
    0233 02BE          583                 C=-C-1          S
    0234 020C          584 BRT260          ST=1?           2
    0235 0360          585                 RTNC
    0236 00F0          586                 NCEX
    0237 03E0          587                 RTN
    0238 004E          588 TRC30           C=0             W
    0239 026E          589                 C=C-1           W
    023A 005E          590                 C=0             S
    023B 0354          591                 PT=?            12
    023C 0007          592                 GOC             TRC90
    023D 0194          593                 PT=?            11
    023E 0007          594                 GOC             TRC50
    023F 00D4          595                 PT=?            10
    0240 0007          596                 GOC             TRC60
    0241 0254          597                 PT=?            9
    0242 0007          598                 GOC             TRC70
    0243 0114          599                 PT=?            8
    0244 0007          600                 GOC             TRC80
    0245 039C          601                 PT=             0
    0246 01D0          602 TRC35           LC              7
    0247 029C          603 TRC40           PT=             7
    0248 03E0          604                 RTN
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LOCATION OBJECT CODE LINE     SOURCE LINE

    0249 00DC          605 TRC90          PT=          10
    024A 0190          606                LC           6
    024B 0190          607                LC           6
    024C 0210          608                LC           8
    024D 0190          609                LC           6
    024E 0150          610                LC           5
    024F 0090          611                LC           2
    0250 0110          612                LC           4
    0251 0250          613                LC           9
    0252 0050          614                LC           1
    0253 0050          615                LC           1
    0254 0190          616                LC           6
    0255 035C          617 TRC91          PT=          12
    0256 03E0          618                RTN
    0257 0190          619 TRCS10         LC           6
    0258 0394          620                PT=?         0
    0259 0003          621                GONC         TRCS10
    025A 0003          622                GOTO         TRC35
    025B 011C          623 TRC50          PT=          8
    025C 00001000      624                GOSUB        TRCS10
    025E 039C          625                PT=          0
    025F 0150          626                LC           5
    0260 005C          627                PT=          4
    0261 0210          628                LC           8
    0262 019C          629                PT=          11
    0263 03E0          630                RTN
    0264 015C          631 TRC60          PT=          6
    0265 00001000      632                GOSUB        TRCS10
    0267 039C          633                PT=          0
    0268 0250          634                LC           9
    0269 00DC          635                PT=          10
    026A 03E0          636                RTN
    026B 005C          637 TRC70          PT=          4
    026C 00001000      638                GOSUB        TRCS10
    026E 025C          639                PT=          9
    026F 03E0          640                RTN
    0270 021C          641 TRC80          PT=          2
    0271 00001000      642                GOSUB        TRCS10
    0273 011C          643                PT=          8
    0274 03E0          644                RTN
    0275 0208          645 TOREC          ST=1         2
    0276 0308          646                ST=1         1
    0277 00AE          647                ACEX         W
    0278 000E          648 TRG100         A=0          W
    0279 002E          649                B=0          W
    027A 00BA          650                ACEX         M
    027B 02FE          651                C#0?         S
    027C 0003          652                GONC         TRG130
    027D 0288          653                ST=1         7
    027E 030C          654                ST=1?        1
    027F 0003          655                GONC         TRG110
    0280 038C          656                ST=1?        0
    0281 0003          657                GONC         TRG120
    0282 0148          658 TRG110         ST=1         6
    0283 005E          659 TRG120         C=0          S
    0284 00EE          660 TRG130         BCEX         W
    0285 004C          661                ST=1?        4
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LOCATION OBJECT CODE LINE     SOURCE LINE

    0286 00001003     662                 GOLC          TRG240
    0288 008C         663                 ST=1?         5
    0289 0003         664                 GONC          TRG135
    028A 00AE         665                 ACEX          W
    028B 010E         666                 A=C           W
    028C 03CE         667                 CSR           W
    028D 01CE         668                 A=A-C         W
    028E 004E         669 TRG135          C=0           W
    028F 035C         670                 PT=           12
    0290 0110         671                 LC            4
    0291 0150         672                 LC            5
    0292 00EE         673                 BCEX          W
    0293 0266         674                 C=C-1         X
    0294 02F6         675                 C#0?          XS
    0295 0007         676                 GOC           TRG140
    0296 0266         677                 C=C-1         X
    0297 0003         678                 GONC          TRG140
    0298 0226         679                 C=C+1         X
    0299 038E         680                 ASR           W
    029A 00EE         681 TRG140          BCEX          W
    029B 01D8         682 TRG150          MCEX
    029C 0198         683                 C=M
    029D 01EE         684                 C=C+C         W
    029E 01EE         685                 C=C+C         W
    029F 01EE         686                 C=C+C         W
    02A0 03CE         687                 CSR           W
    02A1 00EE         688                 BCEX          W
    02A2 02F6         689                 C#0?          XS
    02A3 0007         690                 GOC           TRG180
    02A4 018E         691 TRG155          A=A-B         W
    02A5 0003         692                 GONC          TRG155
    02A6 012E         693                 A=A+B         W
    02A7 03EE         694                 ASL           W
    02A8 0266         695                 C=C-1         X
    02A9 0003         696                 GONC          TRG155
    02AA 004E         697                 C=0           W
    02AB 00EE         698                 BCEX          W
    02AC 0198         699                 C=M
    02AD 01EE         700                 C=C+C         W
    02AE 004C         701                 ST=1?         4
    02AF 0003         702                 GONC          TRG160
    02B0 038E         703                 ASR           W
    02B1 03CE         704                 CSR           W
    02B2 00EE         705 TRG160          BCEX          W
    02B3 018E         706 TRG170          A=A-B         W
    02B4 0003         707                 GONC          TRG190
    02B5 012E         708                 A=A+B         W
    02B6 00EE         709 TRG180          BCEX          W
    02B7 0198         710                 C=M
    02B8 00EE         711                 BCEX          W
    02B9 004C         712                 ST=1?         4
    02BA 0003         713                 GONC          TRG270
    02BB 02E6         714                 C#0?          X
    02BC 0007         715                 GOC           TRG260
    02BD 03EE         716                 ASL           W
    02BE 0003         717                 GOTO          TRG270
    02BF 038C         718 TRG190          ST=1?         0
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LOCATION OBJECT CODE LINE     SOURCE LINE

    02C0 0007          719                GOC          TRG220
    02C1 0388          720                ST=1         0
    02C2 014C          721 TRG200         ST=1?        6
    02C3 0007          722                GOC          TRG210
    02C4 0148          723                ST=1         6
    02C5 0003          724                GOTO         TRG170
    02C6 0144          725 TRG210         ST=0         6
    02C7 0003          726                GOTO         TRG170
    02C8 0384          727 TRG220         ST=0         0
    02C9 030C          728                ST=1?        1
    02CA 0003          729                GONC         TRG200
    02CB 028C          730                ST=1?        7
    02CC 0003          731                GONC         TRG230
    02CD 0284          732                ST=0         7
    02CE 0003          733                GOTO         TRG170
    02CF 0288          734 TRG230         ST=1         7
    02D0 0003          735                GOTO         TRG170
    02D1 00001000      736 TRG240         GOSUB        =TRC10
    02D3 0003          737                GOTO         TRG150
    02D4 006E          738 TRG250         ABEX         W
    02D5 018E          739                A=A-B        W
    02D6 0000          740                NOP
    02D7 00001000      741                GOSUB        BRTS10
    02D9 0003          742                GOTO         TRG280
    02DA 0226          743 TRG260         C=C+1        X
    02DB 02F6          744 TRG270         C#0?         XS
    02DC 0007          745                GOC          TRG280
    02DD 018E          746                A=A-B        W
    02DE 0003          747                GONC         TRG250
    02DF 012E          748                A=A+B        W
    02E0 0266          749 TRG280         C=C-1        X
    02E1 0000          750                NOP
    02E2 00001000      751                GOSUB        =SHF10
    02E4 004C          752                ST=1?        4
    02E5 0007          753                GOC          TRG300
    02E6 0198          754                C=M
    02E7 01EE          755                C=C+C        W
    02E8 0266          756                C=C-1        X
    02E9 0000          757                NOP
    02EA 00001000      758                GOSUB        =DV1_10
    02EC 00001000      759                GOSUB        =PI_BY_2
    02EE 00001000      760                GOSUB        =MPZ_13
    02F0 01D8          761 TRG300         MCEX
    02F1 00AE          762                ACEX         W
    02F2 010E          763                A=C          W
    02F3 0226          764                C=C+1        X
    02F4 0003          765                GONC         TRG310
    02F5 006E          766                ABEX         W
    02F6 03EE          767                ASL          W
    02F7 0003          768                GOTO         TRG330
    02F8 03D4          769 TRG305         DECPT
    02F9 0154          770                PT=?         6
    02FA 0007          771                GOC          TRG315
    02FB 0226          772 TRG310         C=C+1        X
    02FC 0003          773                GONC         TRG305
    02FD 006E          774                ABEX         W
    02FE 004E          775 TRG330         C=0          W
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    02FF 00EE          776 TRG340          BCEX            W
    0300 00001000      777                 GOSUB           TRC30
    0302 00EE          778                 BCEX            W
    0303 0003          779                 GOTO            TRG800
    0304 023E          780 TRG810          C=C+1           S
    0305 018E          781 TRG800          A=A-B           W
    0306 0003          782                 GONC            TRG810
    0307 012E          783                 A=A+B           W
    0308 03D4          784                 DECPT
    0309 03CE          785                 CSR             W
    030A 03EE          786                 ASL             W
    030B 0154          787                 PT=?            6
    030C 0003          788                 GONC            TRG340
    030D 01D8          789                 MCEX
    030E 038E          790                 ASR             W
    030F 038E          791                 ASR             W
    0310 004E          792                 C=0             W
    0311 035C          793                 PT=             12
    0312 0050          794                 LC              1
    0313 01D8          795                 MCEX
    0314 039C          796                 PT=             0
    0315 0190          797                 LC              6
    0316 0190          798                 LC              6
    0317 0003          799                 GOTO            TRG370
    0318 038A          800 TRG350          ASR             WPT
    0319 038A          801                 ASR             WPT
    031A 01BE          802 TRG360          A=A-1           S
    031B 0003          803                 GONC            TRG350
    031C 001E          804                 A=0             S
    031D 01D8          805                 MCEX
    031E 00AE          806                 ACEX            W
    031F 024E          807                 C=A-C           W
    0320 012E          808                 A=A+B           W
    0321 01D8          809                 MCEX
    0322 008E          810 TRG370          B=A             W
    0323 011E          811                 A=C             S
    0324 0262          812                 C=C-1           PT
    0325 0003          813                 GONC            TRG360
    0326 00AE          814                 ACEX            W
    0327 03FA          815                 ASL             M
    0328 00AE          816                 ACEX            W
    0329 02FA          817                 C#0?            M
    032A 0003          818                 GONC            TRG400
    032B 027E          819                 C=C-1           S
    032C 0266          820                 C=C-1           X
    032D 001E          821                 A=0             S
    032E 038E          822                 ASR             W
    032F 0003          823                 GOTO            TRG370
    0330 0198          824 TRG315          C=M
    0331 020C          825                 ST=1?           2
    0332 0007          826                 GOC             TRG430
    0333 038C          827                 ST=1?           0
    0334 0003          828                 GONC            TRG430
    0335 00001000      829                 GOSUB           =ONE_BY_X13
    0337 0003          830                 GOTO            TRG430
    0338 00B0          831 TOREC1          C=N
    0339 01D8          832                 MCEX
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    033A 0198          833                 C=M
    033B 0046          834                 C=0             X
    033C 00001000      835                 GOSUB           X_BY_Y13
    033E 00F0          836                 NCEX
    033F 00001000      837                 GOSUB           =RCSCR
    0341 00001000      838                 GOSUB           =MP2_13
    0343 038C          839                 ST=1?           0
    0344 0003          840                 GONC            TOREC2
    0345 00F0          841                 NCEX
    0346 028C          842 TOREC2          ST=1?           7
    0347 0003          843                 GONC            TOREC3
    0348 02BE          844                 C=-C-1          S
    0349 00F0          845 TOREC3          NCEX
    034A 0003          846                 GOTO            TRG500
    034B 005E          847 TRG400          C=0             S
    034C 01D8          848                 MCEX
    034D 00AE          849                 ACEX            W
    034E 0198          850                 C=M
    034F 01AE          851                 A=A-1           W
    0350 020C          852                 ST=1?           2
    0351 0007          853                 GOC             TRG415
    0352 038C          854                 ST=1?           0
    0353 0007          855                 GOC             TRG420
    0354 0286          856 TRG415          C=-C            X
    0355 006E          857                 ABEX            W
    0356 02DA          858 TRG420          B#0?            M
    0357 0003          859                 GONC            TRG440
    0358 01D8          860                 MCEX
    0359 00001000      861                 GOSUB           =DIV15
    035B 030C          862 TRG430          ST=1?           1
    035C 0003          863                 GONC            TRG500
    035D 00001000      864                 GOSUB           =STSCR
    035F 00001000      865                 GOSUB           =RCSCR
    0361 00001000      866                 GOSUB           =MP2_13
    0363 00001000      867                 GOSUB           =ADDONE
    0365 00001000      868                 GOSUB           =SQR13
    0367 020C          869                 ST=1?           2
    0368 0007          870                 GOC             TOREC1
    0369 00001000      871                 GOSUB           ONE_BY_X13
    036B 014C          872 TRG500          ST=1?           6
    036C 03A0          873                 RTNNC
    036D 02BE          874                 C=-C-1          S
    036E 03E0          875                 RTN
    036F 004E          876 TRG440          C=0             W
    0370 035C          877                 PT=             12
    0371 026A          878                 C=C-1           WPT
    0372 0056          879                 C=0             XS
    0373 010E          880                 A=C             W
    0374 008E          881                 B=A             W
    0375 030C          882                 ST=1?           1
    0376 03A0          883                 RTNNC
    0377 0003          884                 GOTO            TRG430
    0378 0000          885                 NOP                         ;PRESERVE ENTRY POINT ADDRESSES
                       886                 GLB             TODEC
                       887                 GLB             TOOCT
                       888 ******************************************
                       889 *   IF S4=1, THEN DOING TO DECIMAL       *
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

                     890 *   IF S4=0, THEN DOING TO OCTAL            *
                     891 ******************************************
     0379 00001000   892 TOOCT          GOSUB          =INTFRC
     037B 02FA       893                 C#0?           M
     037C 00001003   894                 GOLC           =ERRO
     037E 00B0       895                 C=N
     037F 004C       896                 ST=1?          4
     0380 0007       897                 GOC            TODEC
     0381 010E       898                 A=C            W
     0382 001E       899                 A=0            S
     0383 004E       900                 C=0            W
     0384 035C       901                 PT=            12
     0385 0266       902                 C=C-1          X
     0386 00D0       903                 LC             3
     0387 00001000   904                 GOSUB          =AD2_10
     0389 004E       905                 C=0            W
     038A 0050       906                 LC             1
     038B 0010       907                 LC             0
     038C 01D0       908                 LC             7
     038D 00D0       909                 LC             3
     038E 01D0       910                 LC             7
     038F 0110       911                 LC             4
     0390 0050       912                 LC             1
     0391 0210       913                 LC             8
     0392 0090       914                 LC             2
     0393 0110       915                 LC             4
     0394 039C       916                 PT=            0
     0395 0250       917                 LC             9
     0396 00001000   918                 GOSUB          =DV1_10
     0398 02F6       919                 C#0?           XS
     0399 00001002   920                 GOLNC          =ERRO
     039B 00E0       921                 SELQ
     039C 011C       922                 PT=            8
     039D 00A0       923                 SELP
     039E 039C       924                 PT=            0
     039F 006E       925                 ABEX           W
     03A0 0003       926                 GOTO           TOOCT2
     03A1 038E       927 TOOCT1          ASR            W
     03A2 0226       928 TOOCT2          C=C+1          X
     03A3 0003       929                 GONC           TOOCT1
     03A4 004E       930                 C=0            W
     03A5 00AE       931                 ACEX           W
     03A6 01EE       932 TOOCT3          C=C+C          W
     03A7 01EE       933                 C=C+C          W
     03A8 01EE       934                 C=C+C          W
     03A9 03EE       935                 ASL            W
     03AA 02FC       936                 RCR            13
     03AB 00A0       937                 SELP
     03AC 00A2       938                 ACEX           PT
     03AD 00E0       939                 SELQ
     03AE 03CE       940                 CSR            W
     03AF 03D4       941                 DECPT
     03B0 0354       942                 PT=?           12
     03B1 0003       943                 GONC           TOOCT3
     03B2 0003       944                 GOTO           TODEC6
     03B3 039C       945 TODEC           PT=            0
     03B4 0042       946                 C=0            PT
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    03B5 02E6          947                    C#0?            X
    03B6 00001003      948                    GOLC            =ERR0
    03B8 00B0          949                    C=N
    03B9 0222          950 TODEC1             C=C+1           PT
    03BA 0007          951                    GOC             TODEC2
    03BB 03DA          952                    CSR             M
    03BC 0003          953                    GOTO            TODEC1
    03BD 00AE          954 TODEC2             ACEX            W
    03BE 01A2          955                    A=A-1           PT
    03BF 004E          956                    C=0             W
    03C0 002E          957                    B=0             W
    03C1 035C          958                    PT=             12
    03C2 0210          959                    LC              8
    03C3 035C          960                    PT=             12
    03C4 00EE          961                    BCEX            W
    03C5 0322          962 TODEC7             A<B?            PT
    03C6 0007          963                    GOC             TODEC4
    03C7 00001002      964                    GOLONG          =ERR0
    03C9 022E          965 TODEC3             C=C+1           W
    03CA 01A2          966 TODEC4             A=A-1           PT
    03CB 0003          967                    GONC            TODEC3
    03CC 01A6          968                    A=A-1           X
    03CD 0007          969                    GOC             TODEC5
    03CE 01EE          970                    C=C+C           W
    03CF 01EE          971                    C=C+C           W
    03D0 01EE          972                    C=C+C           W
    03D1 03FA          973                    ASL             M
    03D2 0003          974                    GOTO            TODEC7
    03D3 00AE          975 TODEC5             ACEX            W
    03D4 00B0          976 TODEC6             C=N
    03D5 004A          977                    C=0             WPT
    03D6 031C          978                    PT=             1
    03D7 0050          979                    LC              1
    03D8 0090          980                    LC              2
    03D9 00001002      981                    GOLONG          =SHF10
                       982 *
                       983 * GTACOD - GET ALPHACODE[KEYCODE]
                       984 * GETS THE ALPHAMODE DEFAULT FUNCTION TABLE ENTRY FOR THE
                       985 * CURRENT KEY.  USED BY NAMEA AND STK SECTIONS OF PARSE.
                       986 * ENTRY CONDITIONS: CHIP 0 ON, LOGICAL KEYCODE IN N[2:1]
                       987 * USES A.X & C.
                       988 * RETURNS ALPHACODE[KEYCODE] IN C.X
                       989 *
    03DB 00B0          990 GTACOD             C=N
    03DC 0106          991                    A=C             X
    03DD 004E          992                    C=0             W
    03DE 0130          993                    LDI
    03DF 0155          994                    CON             525Q            ;H1550\16=@525
    03E0 037C          995                    RCR             12
    03E1 0206          996                    C=A+C           X
    03E2 037C          997                    RCR             12
    03E3 0330          998                    CXISA
    03E4 03E0          999                    RTN
                      1000
                      1001
                      1002
                      1003 *
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

                     1004 * TOGSHF - TOGGLE SHIFT FLAG
                     1005 *
                     1006 * USES C AND 1 SUBROUTINE LEVEL.  LEAVES CHIP 0 ENABLED.
                     1007 *
                     1008 * TGSHF1 - SAME AS TOGSHF EXCEPT REQUIRES CHIP 0 ENABLED ON ENTRY.
                     1009 *
   03E5 00001000     1010 TOGSHF          GOSUB          =ENCP00
   03E7 03B8         1011 TGSHF1          C=REGN         14
   03E8 023C         1012                 RCR            2
   03E9 03D8         1013                 CSTEX                         ;PUT UP SS 1
   03EA 038C         1014                 ST=1?          0              ;SHIFT?
   03EB 0007         1015                 GOC            TOG10          ;YES
   03EC 0388         1016                 ST=1           0              ;NO. SET SHIFT.
   03ED 0003         1017                 GOTO           TOG20
   03EE 0384         1018 TOG10           ST=0           0              ;CLEAR SHIFT
   03EF 03D8         1019 TOG20           CSTEX
   03F0 037C         1020                 RCR            12
   03F1 03A8         1021                 REGN=C         14
   03F2 03E0         1022                 RTN
                     1023                 GLB            APND_
                     1024                 GLB            APNDT0
                     1025                 GLB            APNDDG
   03F3 0130         1026 APND_           LDI
   03F4 002D         1027                 CON            55Q
   03F5 039C         1028 APND10          PT=            0
   03F6 0058         1029 APND15          G=C
   03F7 00A0         1030                 SELP
   03F8 00001002     1031                 GOLONG         =APNDNW
   03FA 0198         1032 APNDDG          C=M
   03FB 03DC         1033                 INCPT
   03FC 00D0         1034                 LC             3
   03FD 0003         1035                 GOTO           APND15
                     1036
                     1037
                     1038 * RESERVE 2 WORDS AT THE END OF CN7 FOR CHIP 1 CHECKSUM AND
                     1039 * TRAILER.
                     1040                 FILLTO         1775Q
   03FE 0006         1041 REVLV1          CON            6              ;REV LEVEL= F
   03FF              1042 CKSUM1          BSS            1
                     1043                 END

Errors=    0
```

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LINE#	SYMBOL	TYPE	REFERENCES
	AD1_10	E	293
	AD2_10	E	295,904
	AD2_13	E	358,400,562,566
293	ADD1	P	216,240,253
295	ADD2	P	217,230,258
	ADDONE	E	533,867
1028	APND10	P	1024
1029	APND15	P	1035
1032	APNDDG	P	1025
	APNDNW	E	1031
1026	APND	P	1023
431	BRT100	P	378
434	BRT110	P	408,410
429	BRT120	P	459
444	BRT130	P	435,438,440
530	BRT140	P	209,448
550	BRT141	P	531
449	BRT150	P	
467	BRT160	P	212,549
465	BRT170	P	450,457
551	BRT180	P	554
552	BRT190	P	527
555	BRT200	P	210,464,482
563	BRT220	P	558
567	BRT240	P	564
581	BRT250	P	568,575
584	BRT260	P	582
469	BRT290	P	213,550
474	BRT300	P	480
482	BRT301	P	428
483	BRT310	P	476
488	BRT320	P	502
493	BRT330	P	496
500	BRT340	P	487,510
517	BRT350	P	529
521	BRT360	P	523
522	BRT370	P	520
411	BRTS10	P	381,429,468,741
415	BRTS20	P	412
	CHK_NO_S	E	273
287	CHSA	P	208,229,234,251,256
289	CHSA1	P	211
1042	CKSUM1	P	
	CLLCDE	E	182
	DIV120	E	512
	DIV15	E	861
273	DOCHK	P	282
	DV1_10	E	360,758,918
	DV2_10	E	338,406
	DV2_13	E	573
	ENCP00	E	193,1010
	ERR0	E	466,894,920,948,964
	ERRNE	E	46
	ERROF	E	370
	EXSCR	E	534
324	GET1	P	285
317	GETADD	P	320

LINE#	SYMBOL	TYPE	REFERENCES
307	GETN	P	257,300,333,345,359,362
312	GETX	P	226,301,331,352
311	GETXSQ	P	237,302,376
308	GETXY	P	252,305
310	GETY	P	228,303,328,350
309	GETYSQ	P	239,304,343
990	GTACOD	P	3
	INTFRC	E	892
	MP1_10	E	580
	MP2_10	E	233,250,346,354,394,398
	MP2_13	E	537,760,838,866
171	MSG	P	9
184	MSG100	P	190
193	MSG105	P	192
201	MSG110	P	200
172	MSGA	P	10
61	MSGAD	P	13
71	MSGDE	P	14
	MSGDLY	E	202
177	MSGE	P	11
82	MSGML	P	15
93	MSGNE	P	16
97	MSGNL	P	17
137	MSGNO	P	18
116	MSGOF	P	19
104	MSGPR	P	20
140	MSGRAM	P	21
143	MSGROM	P	22
132	MSGTA	P	23
123	MSGWR	P	25
181	MSGX	P	12
135	MSGYES	P	24
	ONE_BY_X13	E	467,829,871
	OVFL10	E	296
	P6RTN	E	48
42	PATCH6	P	41
33	PATCH9	P	32,264
	PI_BY_2	E	561,565,569,759
	RCSCR	E	399,536,837,865
	RCSCR_	E	357,367
1041	REVLVI	P	
341	SD	P	340
	SHF10	E	556,751,981
219	SIGMA	P	206
221	SIGMA1	P	247
228	SIGMA2	P	225
229	SIGMA3	P	227
239	SIGMA4	P	236
240	SIGMA5	P	238
248	SIGMA6	P	245
	SQR13	E	371,401,539,868
270	STATCK	P	207,219,327,342
344	STDEV1	P	377
352	STDEV4	P	349
353	STDEV5	P	351
296	STOVF	P	294
	STSCR	E	395,532,864

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LINE#	SYMBOL	TYPE	REFERENCES
	STSCR	E	347,361
	SUBONE	E	366,535
	SUMCHK	E	270
1011	TGSHF1	P	5
945	TODEC	P	886,897
950	TODEC1	P	953
954	TODEC2	P	951
965	TODEC3	P	967
966	TODEC4	P	963
975	TODEC5	P	969
976	TODEC6	P	944
962	TODEC7	P	974
1018	TOG10	P	1015
1019	TOG20	P	1017
1010	TOGSHF	P	4
892	TOOCT	P	887
927	TOOCT1	P	929
928	TOOCT2	P	926
932	TOOCT3	P	943
384	TOPOL	P	379
392	TOPOL1	P	388
417	TOPOL2	P	386
427	TOPOL3	P	430,453
422	TOPOL4	P	420
645	TOREC	P	215
831	TOREC1	P	870
842	TOREC2	P	840
845	TOREC3	P	843
	TRC10	E	460,736
588	TRC30	P	380,518,777
602	TRC35	P	622
603	TRC40	P	
623	TRC50	P	594
631	TRC60	P	596
637	TRC70	P	598
641	TRC80	P	600
605	TRC90	P	592
617	TRC91	P	
619	TRCS10	P	214,621,624,632,638,642
648	TRG100	P	383
658	TRG110	P	655
659	TRG120	P	657
660	TRG130	P	652
669	TRG135	P	664
681	TRG140	P	676,678
682	TRG150	P	737
691	TRG155	P	692,696
705	TRG160	P	702
706	TRG170	P	724,726,733,735
709	TRG180	P	690
718	TRG190	P	707
721	TRG200	P	729
725	TRG210	P	722
727	TRG220	P	719
734	TRG230	P	731
736	TRG240	P	218,662
738	TRG250	P	747

LINE#	SYMBOL	TYPE	REFERENCES
743	TRG260	P	715
744	TRG270	P	713,717
749	TRG280	P	742,745
761	TRG300	P	753
769	TRG305	P	773
772	TRG310	P	765
824	TRG315	P	771
775	TRG330	P	768
776	TRG340	P	788
800	TRG350	P	803
802	TRG360	P	813
810	TRG370	P	799,823
847	TRG400	P	818
856	TRG415	P	853
858	TRG420	P	855
862	TRG430	P	382,826,828,830,884
876	TRG440	P	859
872	TRG500	P	846,863
781	TRG800	P	779
780	TRG810	P	782
327	XBAR	P	306
332	XBAR_	P	329,339
	XCLXT	E	34
	X_BY_Y13	E	368,545,835

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LOCATION OBJECT CODE LINE     SOURCE LINE

                        1 "COCONUT"
                        2 * HP41C MAINFRAME MICROCODE ADDRESSES @20000-21777
                        3 *
                        4                 GLB             GSUBS1
                        5                 GLB             XBST
                        6                 GLB             XSST
                        7                 GLB             XDELET
                        8                 GLB             CLRPGM
                        9                 GLB             UPLINK
                       10                 GLB             GTLINK
                       11                 GLB             GENLNK
                       12                 GLB             GTLNKA
                       13                 GLB             INSSUB
                       14                 GLB             DELNNN
                       15                 GLB             DELLIN
                       16                 GLB             PTLINK
                       17                 GLB             PTLNKA
                       18                 GLB             PTLNKB
                       19                 GLB             PTBYTA
                       20                 GLB             PTBYTP
                       21                 GLB             PUTPC
                       22                 GLB             PUTPCF
                       23                 GLB             PUTPCX
                       24                 GLB             PUTPCA
                       25                 GLB             SKPDEL
                       26
                       27
                       28
                       29
                       30                 GLB             CLRREG
                       31                 GLB             ERR110
                       32                 GLB             ERROR
                       33                 GLB             ERR120
                       34                 GLB             GTFEN1
                       35                 GLB             GTFEND
                       36                 GLB             MOVREG
                       37                 GLB             PACKE
                       38                 GLB             PACKN
                       39                 GLB             PAK200
                       40                 GLB             PAKEND
                       41                 GLB             PAKSPC
                       42                 GLB             PKIOAS
                       43                 GLB             XCOPY
                       44                 GLB             XPACK
                       45 *
                       46 * PACK - PACK MEMORY INCLUDING I/O AREA AND KEY ASSIGNMENT AREA
                       47 *
                       48 * PACKN - NORMAL PACKING SUBROUTINE
                       49 * PACKE - FATAL PACKING, AFTER PACKING WOULD SAY "TRY AGAIN"
                       50 *         EXITS TO ERROR INSTEAD OF RETURNING
                       51 * XPACK - SET PUSHFLAG THEN NORMAL PACKING
                       52 *
                       53 * USED A,B,C,M,N,G STATUS 0-9, THREE LEVEL SUB.
                       54 * DURING PACKING USED M,N AS COUNTER :
                       55 * M(3:0) - NEXT PACKED BYTE ADDR
                       56 * M(7:4) - LAST PACKED END OR ALBL ADDR
                       57 * N(3:0) - LAST PICKING UP BYTE ADDR
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

                      58 *
                      59 * EXITS VIA DECOMPILE ENTRIES DCPL00 OR DCPLRT.
                      60 * EVENTUALLY RETURNS (EXCEPT PACKE) WITH CHIP 0 ENABLED AND
                      61 * STATUS SET 0 UP.
                      62 *
0000                  63 XPACK
0000 0244             64 PACKN        ST=0        9           ;NORMAL PACKING ENTRY
0001 0003             65              GOTO        PACK
0002 0248             66 PACKE        ST=1        9           ;FATAL PACKING ENTRY
0003 00001000         67 PACK         GOSUB       =MSG        ;SAY "PACKING"
0005 0000             68              CON         =MSGWR
0006 00001000         69              GOSUB       =RSTMS0     ;ENABLE CHIP 0 AND CLR MSGFLG
0008 00001000         70              GOSUB       PKIOAS      ;PACK IO BUFFER AREA
000A 004E             71              C=0         W
000B 0158             72              M=C                     ;INDICATE START FROM CHAIN END
000C 0044             73              ST=0        4
000D 0288             74              ST=1        7
000E 00001000         75              GOSUB       GTFEND      ;GET FINAL END
0010 00001000         76              GOSUB       =STBT31     ;RESET PACK BIT
0012 02F0             77              DATA=C
0013 0003             78              GOTO        PAK108
0014 00001000         79 PAK100       GOSUB       UPLINK
0016 008A             80              B=A         WPT
0017 023E             81              C=C+1       S           ;IS THIS AN "END" ?
0018 0003             82              GONC        PAK105      ;YES
0019 02E6             83 PAK102       C#0?        X           ;REACH CHAIN END ?
001A 0007             84              GOC         PAK100      ;NOT YET
001B 0003             85              GOTO        PAK110
001C 00AA010A         86 PAK105       C=A         WPT         ;SAVE 1ST BYTE ADDR OF END IN N
001E 0070             87              N=C
001F 00001000         88              GOSUB       =INCAD2     ;BY PASS THE LINK
0021 027E             89              C=C-1       S
0022 037C             90              RCR         12          ;C(0:1)  THIRD BYTE
0023 00001000         91              GOSUB       =STBT30     ;RESET THE PACK BIT
0025 00001000         92              GOSUB       PTBYTA
0027 00B0             93              C=N                     ;GET ADDR OF END
0028 00AA             94              ACEX        WPT
0029 00001000         95 PAK108       GOSUB       GTLINK
002B 0003             96              GOTO        PAK102
002C 00001000         97 PAK120       GOSUB       =FSTIN      ;GET TOP MEM ADDR -1
002E 004E             98              C=0         W           ;PACKING START FROM TOP
002F 0003             99              GOTO        PAK115
0030 010C            100 PAK110       ST=1?       8           ;DOES 1ST PGM NEEDS PACKING ?
0031 0007            101              GOC         PAK120      ;YES
0032 0198            102              C=M
0033 02EA            103              C#0?        WPT         ;ANY PGM NEEDS PACKING ?
0034 00001002        104              GOLNC       =DCPLRT     ;NONE OF THE PGM NEEDS PACKING
                     105                                      ;EXIT VIA DCPLRT IN DECOMPILE
0036 010A            106              A=C         WPT         ;A(3:0) _ STARTING ADDR
0037 00FC            107              RCR         10          ;C(7:4) _ STARTING ADDR
0038 00001000        108              GOSUB       =INCAD2     ;POINT TO THIRD BYTE OF END
003A 00001000        109 PAK115       GOSUB       =INCADA     ;POINT TO NEXT PACKING ADDR
003C 00AA010A        110              C=A         WPT
003E 0158            111              M=C                     ;SET THE TWO ADDRS IN M
003F 00001000        112              GOSUB       =DECADA     ;BACKUP ONE BYTE
0041 008A            113              B=A         WPT
                     114 * DECIDE WHETHER WE NEED TO ADJUST THE PC WHILE PACKING
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LOCATION OBJECT CODE LINE     SOURCE LINE

    0042 00001000     115                GOSUB      =GETPC
    0044 00CC         116                ST=1?      10          ;ARE WE IN ROM ?
    0045 0007         117                GOC        PAK117      ;YES, DON'T TOUCH PC AT ALL
    0046 0198         118                C=M                    ;C_ADDR TO START PACKING
    0047 0306         119                A<C?       X           ;PC<START ADDR?
    0048 0007         120                GOC        PAK118      ;YES. NEED TO ADJUST PC
    0049 0366         121                A#C?       X           ;PC>START ADDR?
    004A 0007         122                GOC        PAK117      ;YES. DON'T TOUCH PC
    004B 0302         123                A<C?       PT          ;PC<START ADDR?
    004C 0007         124                GOC        PAK118      ;YES. NEED TO ADJUST PC
    004D 0362         125                A#C?       PT          ;PC>START ADDR?
    004E 0003         126                GONC       PAK118      ;NO. MUST ADJUST PC
    004F 000A         127 PAK117         A=0        WPT         ;LEAVE THE PGMPC ALONE
    0050 00AE         128 PAK118         ACEX       W
    0051 00FC         129                RCR        10          ;C(7:4) _ OLD PC
    0052 00CA         130                C=B        WPT
    0053 0070         131                N=C
    0054 0104         132 PAK130         ST=0       8           ;REMEMBER LAST LINE NOT A D.E.
                      133 *
    0055 00B0         134 PAK200         C=N                    ;C(3:0) _ STARTING PICK UP ADDR
    0056 010A         135                A=C        WPT
    0057 008A         136 PAK210         B=A        WPT
    0058 00B0         137                C=N
    0059 00CA         138                C=B        WPT
    005A 0070         139                N=C
    005B 00001000     140                GOSUB      =NXBYTA     ;PICK UP NEXT BYTE
    005D 037C         141                RCR        12          ;CHECK IF IT IS A NULL ?
    005E 02E2         142                C#0?       PT
    005F 0007         143                GOC        PAK220      ;NOT A NULL
    0060 02F6         144                C#0?       XS
    0061 0003         145                GONC       PAK210      ;SKIP A NULL
    0062 0262         146 PAK220         C=C-1      PT          ;IS IT A ROW 0 FC ?
    0063 0007         147                GOC        PAK250      ;YES
    0064 0262         148                C=C-1      PT          ;IS IT A RWO 1 FC ?
    0065 0003         149                GONC       PAK250      ;NO
    0066 01F6         150                C=C+C      XS          ;IS COLUMN # <= 7 ?
    0067 0003         151                GONC       PAK230      ;YES IT IS A D.E.
    0068 01F6         152                C=C+C      XS          ;IS COLUMN # <= 11 ?
    0069 0003         153                GONC       PAK230      ;YES, IT IS A D.E.
    006A 02F6         154                C#0?       XS          ;IS IT A CHS ?
    006B 0007         155                GOC        PAK250      ;NO
    006C 010C         156 PAK230         ST=1?      8           ;PREVIOUS LINE A D.E. ?
    006D 0003         157                GONC       PAK240      ;NO
    006E 0198         158                C=M                    ;LOAD NEXT PACKED ADDR
    006F 010A         159                A=C        WPT
    0070 0046         160                C=0        X
    0071 00001000     161                GOSUB      PTBYTA      ;STORE A NULL BETWEEN D.E.
    0073 00001000     162                GOSUB      =INCADA     ;POINT TO NEXT PACKED ADDR
    0075 0198         163                C=M
    0076 00AA         164                ACEX       WPT
    0077 0158         165                M=C
    0078 0108         166 PAK240         ST=1       8           ;REMEMBER THIS LINE IS D.E.
    0079 0003         167                GOTO       PAK260
    007A 0104         168 PAK250         ST=0       8           ;REMEMBER THIS LINE NOT A D.E.
    007B 00B0         169 PAK260         C=N
    007C 010A         170                A=C        WPT         ;A(3:0) _ POSSIBLE NEW PC
    007D 007C         171                RCR        4           ;C(3:0) _ OLD PC
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LOCATION OBJECT CODE LINE     SOURCE LINE

    007E 0306          172                 A<C?            X                 ;PASS OLD PC ALREADY?
    007F 0007          173                 GOC             PAK280            ;YES, SET NEW PC
    0080 0366          174                 A#C?            X                 ;SAME REG ?
    0081 0007          175                 GOC             PAK265            ;NO, NOT CLOSE TO PC YET
    0082 0302          176                 A<C?            PT                ;PASS PC BYTE ?
    0083 0007          177                 GOC             PAK280            ;YES, SET NEW PC
    0084 0362          178                 A#C?            PT                ;SAME BYTE ?
    0085 0003          179                 GONC            PAK280            ;YES, SET NEW PC
    0086 00001000      180 PAK265          GOSUB           =NXLDEL           ;GET NEXT LINE
    0088 00B0          181                 C=N                               ;C(3:0) _ LAST PICK UP ADDR
    0089 00AA          182                 ACEX            WPT               ;C(3:0) _ END PICK UP ADDR
    008A 0070          183                 N=C                               ;N(3:0) _ END PICK UP ADDR
    008B 00001000      184 PAK270          GOSUB           =NXBYTA           ;PICK UP NEXT BYTE
    008D 00EA          185                 BCEX            WPT               ;SAVE THE BYTE IN B
    008E 0198          186                 C=M                               ;C(3:0) _ NEXT PACKED ADDR
    008F 0270          187                 DADD=C
    0090 031C          188                 PT=             1
    0091 00001000      189                 GOSUB           PTBYTP            ;PACK ONE BYTE
    0093 0198          190                 C=M
    0094 0262          191                 C=C-1           PT
    0095 0003          192                 GONC            PAK275
    0096 0262          193                 C=C-1           PT
    0097 0262          194                 C=C-1           PT
    0098 026E          195                 C=C-1           W
    0099 0262          196 PAK275          C=C-1           PT
    009A 0158          197                 M=C
    009B 00B0          198                 C=N                               ;C(3:0)   END PICKING ADDR
    009C 036A          199                 A#C?            WPT               ;PICKED UP LAST BYTE ALREADY ?
    009D 0007          200                 GOC             PAK270            ;NO
    009E 00001002      201                 GOLONG          =PAK200
    00A0 0046          202 PAK280          C=0             X
    00A1 00FC          203                 RCR             10
    00A2 0070          204                 N=C                               ;SET OLD PC TO VERY SMALL
    00A3 008A          205                 B=A             WPT
    00A4 0198          206                 C=M
    00A5 010A          207                 A=C             WPT               ;GET NEXT PACKING ADDR
    00A6 00001000      208                 GOSUB           =DECADA
    00A8 00001000      209                 GOSUB           PUTPCX            ;SET NEW PC
    00AA 006A          210                 ABEX            WPT
    00AB 0003          211                 GOTO            PAK265
                       212 *
                       213 * PAKEND - THIS IS FINAL PART OF THE PACK ROUTINE. WHEN THE
                       214 *   PACKING REACHED THE FINAL END, IT WOULD BRANCH TO HERE TO
                       215 *   GENERATE A NEW FINAL END INSTEAD OF PACKING IT. THE REASON
                       216 *   IS THAT THE FINAL END HAS TO BE RIGHT JUSTIFIED IN THE REG.
                       217 *
    00AC 0020          218 PAKEND          SPOPND
    00AD 00B0          219                 C=N                               ;LOAD THE .END. ADDR
    00AE 0270          220                 DADD=C
    00AF 0038          221                 C=DATA                            ;LOAD THE .END.
    00B0 039C          222                 PT=             0
    00B1 0058          223                 G=C                               ;SAVE LAST BYTE OF .END. IN G
    00B2 0198          224                 C=M                               ;GET ADDR OF LAST PACKED REG
    00B3 0270          225                 DADD=C                            ;  CHECK IF ENOUGH ROOM IN THIS
    00B4 010E          226                 A=C             W                 ;  REG. FOR A THREE BYTE'S .END.
    00B5 0038          227                 C=DATA
    00B6 008E          228                 B=A             W                 ;SAVE THE ADDR IN B
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LOCATION OBJECT CODE LINE     SOURCE LINE

    00B7 038E          229                    ASR             W               ;A.XS _ LAST BYTE'S POSITION
    00B8 031C          230                    PT=             1               ;CLEAR UNUSED BYTE AT TAIL
    00B9 01B6          231 PKEND1             A=A-1           XS              ;THIS BYTE USED ?
    00BA 0007          232                    GOC             PKEND2          ;YES
    00BB 01B6          233                    A=A-1           XS
    00BC 03DC          234                    INCPT                           ;POINT TO NEXT HIGHER BYTE
    00BD 03DC          235                    INCPT
    00BE 0003          236                    GOTO            PKEND1
    00BF 0102          237 PKEND4             A=C             PT              ;PUT .END. IN LAST PACKED REG
    00C0 0003          238                    GOTO            PKEND3          ; -
    00C1 004A          239 PKEND2             C=0             WPT             ;CLEAR UNUSED BYTES
    00C2 02F0          240                    DATA=C                          ;PUT LAST REG BACK
    00C3 001C          241                    PT=             3               ;CHECK HOW MANY BYTES UNUSED
    00C4 006A          242                    ABEX            WPT             ;GET LAST BYTE'S ADDR
    00C5 0110          243                    LC              4               ;AT LEAST NEED 3 UNUSED BYTES
    00C6 001C          244                    PT=             3
    00C7 0302          245                    A<C?            PT              ;CHECK LAST BYTE POSITION
    00C8 0003          246                    GONC            PKEND4          ;THERE IS ENOUGH ROOM THERE
    00C9 00A6          247                    ACEX            X               ;NOT ENOUGH ROOM IN LAST REG
    00CA 0266          248                    C=C-1           X               ;  FOR A .END., WE HAVE TO PUT IT
    00CB 0270          249                    DADD=C                          ;  TO NEXT REG.
    00CC 010A          250                    A=C             WPT             ;SAVE NEW .END. ADDR IN A
    00CD 004E          251                    C=0             W               ;CLEARN NEXT REG FIRST
    00CE 02F0          252                    DATA=C
    00CF 0198          253 PKEND3             C=M                             ;LET GENLNK PUT THE LINK IN
    00D0 007C          254                    RCR             4               ;C[3:0] _ PREV. END/ALBL ADDR
    00D1 00AA          255                    ACEX            WPT             ;C[3:0] _ NEW .END. ADDR
    00D2 00001000      256                    GOSUB           GENLNK
    00D4 0270          257 PKEND5             DADD=C                          ;PUT LAST BYTE OF .END. IN PLACE
    00D5 0038          258                    C=DATA
    00D6 039C          259                    PT=             0
    00D7 0098          260                    C=G
    00D8 02F0          261                    DATA=C
                       262 *
                       263 * NOW CLEAR ALL REG'S BETWEEN NEW .END. AND OLD .END.
                       264 *
    00D9 0046          265                    C=0             X
    00DA 0270          266                    DADD=C                          ;ENABLE CHIP 0
    00DB 0378          267                    C=REGN          13              ;C.X _ OLD CHAIN HEAD
    00DC 00A6          268                    ACEX            X               ;C.X _ NEW CHAIN HEAD
    00DD 0368          269                    REGN=C          13
    00DE 002E          270                    B=0             W
    00DF 0366          271 PKEND6             A#C?            X               ;ALL DONE ?
    00E0 00001002      272                    GOLNC           =DCPL00         ;YES - DECOMPILE AND EXIT
    00E2 0266          273                    C=C-1           X
    00E3 0270          274                    DADD=C
    00E4 00EE          275                    BCEX            W
    00E5 02F0          276                    DATA=C
    00E6 00EE          277                    BCEX            W
    00E7 0003          278                    GOTO            PKEND6
                       279 *
                       280 * GTFEND - LOAD FINAL END
                       281 *
    00E8 0046          282 GTFEND             C=0             X
    00E9 0270          283                    DADD=C
    00EA 0378          284                    C=REGN          13              ;LOAD CHAIN HEAD
    00EB 001C          285 GTFEN1             PT=             3
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LOCATION OBJECT CODE LINE     SOURCE LINE

    00EC 0110          286                LC              4
    00ED 0270          287                DADD=C
    00EE 001C          288                PT=             3
    00EF 010A          289                A=C             WPT
    00F0 0038          290                C=DATA
    00F1 03E0          291                RTN
                       292 *
                       293 * PAKSPC
                       294 *
                       295 * SPECIAL PACK LOGIC - A SUBBRANCH FROM NEXT LINE ROUTINE
                       296 * PACK CALLS NXLDEL TO FIGURE OUT HOW MANY BYTES IN NEXT LINE,
                       297 * BUT NXLDEL WOULD SEND IT BACK TO HERE IF IT ENCOUNTER AN
                       298 * ALBL OR AN END. THE SPECIAL PACK LOGIC HERE WILL GENERATE A
                       299 * NEW LINK FOR EACH ALBL OR END, BUT NOT FOR THE FINAL END. IT
                       300 * WILL BRANCH AGAIN TO PAKEND, LET HIM TO TAKE CARE OF THE
                       301 * FINAL END.
                       302 *
    00F2 00001000      303 PAKSPC         GOSUB           GTLINK
    00F4 023E          304                C=C+1           S                ;IS IT AN END
    00F5 0007          305                GOC             PKSPC1           ;NO, IS AN ALBL
    00F6 01FE          306                C=C+C           S                ;CHECK FOR FINAL END
    00F7 01FE          307                C=C+C           S
    00F8 01FE          308                C=C+C           S
    00F9 00001003      309                GOLC            =PAKEND          ;IS A FINAL END
    00FB 0198          310 PKSPC1         C=M                              ;C(3:0) _ NEXT PACKING ADDR
    00FC 010A          311                A=C             WPT
    00FD 007C          312                RCR             4                ;C(3:0) _ PREVIOUS END OR ALBL ADDR
    00FE 00AA          313                ACEX            WPT
    00FF 00001000      314                GOSUB           GENLNK
    0101 00FC          315                RCR             10
    0102 00001000      316                GOSUB           =INCAD2
    0104 00AA          317                ACEX            WPT
    0105 0158          318                M=C
    0106 00B0          319 PKSPC3         C=N
    0107 010A          320                A=C             WPT
    0108 00001000      321                GOSUB           =INCAD2
    010A 00AA010A      322                C=A             WPT
    010C 0070          323                N=C
    010D 00001000      324                GOSUB           =NXBYTA
    010F 037C          325                RCR             12
    0110 0222          326                C=C+1           PT
    0111 00001003      327                GOLC            =NXLTX
    0113 03E0          328                RTN
                       329 *
                       330 * PKIOAS - PACK I/O BUFFER AREA & KEY ASSIGNMENT AREA AT BOTTOM
                       331 *         OF PROGRAM MEMORY.
                       332 * ASSUME CHIP 0 ENABLE
                       333 * USED A,B,C,M,N. RETURN WITH CHIP 0 DISABLE
                       334 * 2 SUB LEVELS DEEP
                       335 *
                       336 * FOR FLOWCHART OF PKIOAS, SEE DRC'S LAB NOTEBOOK #00004 P.26
                       337 *
    0114 0378          338 PKIOAS         C=REGN          13               ;LOAD CHAIN HEAD
    0115 00E6          339                BCEX            X                ;SAVE CHAIN HEAD IN B.X
    0116 004E          340                C=0             W
    0117 0130          341                LDI
    0118 00C0          342                CON             12*16+0          ;ADDR OF CHIP 12 REG.0
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LOCATION OBJECT CODE LINE     SOURCE LINE

 0119 0158          343                 M=C                         ;M(2:0) _ CURRENT STACK ADDR
 011A 0070          344                 N=C                         ;N(2:0) _ CURRENT CHECKING ADDR
 011B 0003          345                 GOTO            PKASN3
 011C 0270          346 PKM10           DADD=C                      ;ENABLE CHECKING REG.
 011D 0038          347                 C=DATA                      ;LOAD THE CHECKING REG.
 011E 023E          348                 C=C+1           S           ;IS A KEY ASSIGNMENT REG. ?
 011F 0003          349                 GONC            PKIO10      ;NO, TRY TO PACK I/O AREA
 0120 031C          350                 PT=             1
 0121 02EA          351                 C#0?            WPT         ;KEYCODE IN REG.[1:0] ?
 0122 0007          352                 GOC             PKASN1      ;YES
 0123 017C          353                 RCR             6
 0124 02EA          354                 C#0?            WPT         ;KEYCODE IN REG.[6:7] ?
 0125 0003          355                 GONC            PKASN2      ;NO, PACK THIS REG.
 0126 00001000      356 PKASN1          GOSUB           MOVREG
 0128 0003          357                 GOTO            PKASN3
 0129 00001000      358 PKASN2          GOSUB           CLRREG
 012B 00C6          359 PKASN3          C=B             X           ;LOAD CHAIN HEAD
 012C 0106          360                 A=C             X
 012D 00B0          361                 C=N
 012E 0366          362                 A#C?            X           ;REACHED CHAIN HEAD ?
 012F 0007          363                 GOC             PKM10       ;NOT YET
 0130 03E0          364                 RTN
                    365 * NOTE THERE IS AT LEAST ONE STATE TO BE HAD BY MOVING THE LOGIC
                    366 * AT PKASN3 AHEAD OF PKM10.  THE USE OF B.M INSTEAD OF N11:10 TO
                    367 * STORE THE BUFFER LENGTH IN THE PKIO15 PATH MIGHT RESULT IN
                    368 * SAVING ANOTHER STATE OR TWO.
                    369 *
 0131 027E          370 PKIO10          C=C-1           S           ;RESTORE THE REG.
 0132 02EE          371                 C#0?            W           ;REACHED EMPTY AREA ?
 0133 03A0          372                 RTNNC                       ;YES WE ARE DONE
 0134 00FE          373                 BCEX            S           ;CHECK I O BUFFER
 0135 00DC          374                 PT=             10
 0136 0058          375                 G=C                         ;    G _ BUFFER LENGTH
 0137 00B0          376                 C=N
 0138 0098          377                 C=G                         ;N(11:10) _ BUFFER LENGTH
 0139 0070          378                 N=C
 013A 031C          379                 PT=             1
 013B 00B0          380 PKIO20          C=N
 013C 00FC          381                 RCR             10          ;C.[1:0]  BUFFER LENGTH
 013D 026A          382                 C=C-1           WPT         ;DONE WITH THIS BUFFER ?
 013E 0007          383                 GOC             PKASN3      ;YES
 013F 007C          384                 RCR             4
 0140 0070          385                 N=C                         ;PUT THE UPDATED LENGTH BACK
 0141 00001000      386                 GOSUB           CLRREG
 0143 02DE          387                 B#0?            S           ;IS THIS BUFFER BEING USED?
 0144 00001001      388                 GSUBC           PUTREG      ;YES. PUT REG BACK.
 0146 0003          389                 GOTO            PKIO20
 0147 00000000      390                 FILLTO          524Q        ;PRESERVE ENTRY TABLE
                    391 *
                    392 * CLRREG - CLEAR AN UNUSED REG. IN PROGRAM MEMORY
                    393 *  THIS ROUTINE CALLED BY PKIOAS WHEN CLEAR AN UNUSED REG
                    394 *  IN I/O OR KEY ASSIGNMENT AREA.
                    395 * N[3:0] = CURRENT CHECKING REG'S ADDR ( THE REG TO BE CLEARED)
                    396 *
 0155 00B0          397 CLRREG          C=N                         ;C.X _ CURRENT CHECKING ADDR
 0156 0270          398                 DADD=C
 0157 022E          399                 C=C+1           W           ;POINT TO NEXT CHECKING REG.
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LOCATION OBJECT CODE LINE     SOURCE LINE

    0158 0070         400                 N=C
    0159 0038         401                 C=DATA
    015A 000E         402                 A=0             W
    015B 0003         403                 GOTO            MOVR10
                      404 *
                      405 * MOVREG - MOVE A REG. TO OTHER ADDR
                      406 *  THIS ROUTINE CALLED BY PKIOAS FOR PACKING THOSE UNUSED REG
                      407 * N[3:0] = ADDR OF THE REG TO BE MOVED
                      408 * M[3:0] = DESTINATION ADDR
                      409
                      410 * PUTREG - PUT A REGISTER BACK TO THE DESTINATION ADDRESS, AND
                      411 * INCREMENT THE DESTINATION ADDRESS.
                      412 * USES: A,C
                      413 * IN: A = REG TO BE PUT BACK
                      414 *     M.X = DESTINATION ADDRESS
                      415 * OUT: (A) IS STORED TO DATA REG (M.X)
                      416 *     DADD. = M.X
                      417 *     M.X IS INCREMENTED BY 1.
                      418 *     A IS CLOBBERED.
                      419 * ASSUMES: HEXMODE, NO PERIPHERAL ENABLED.
                      420 *
    015C 00001000     421 MOVREG          GOSUB           CLRREG          ;CLEAR THE CHECKING REG FIRST
                      422                 GLB             PUTREG
    015E 0198         423 PUTREG          C=M
    015F 0270         424                 DADD=C                          ;ENABLE THE DESTINATION REG.
    0160 022E         425                 C=C+1           W               ;POINT TO NEXT DESTINATION REG
    0161 0158         426                 M=C
    0162 00AE         427 MOVR10          ACEX            W
    0163 02F0         428                 DATA=C
    0164 03E0         429                 RTN
                      430 *
                      431 * COPY - COPY A PROGRAM FROM ROM TO RAM
                      432 * ALPHA STRING IS IN REG.9 RIGHT JUSTIFIED. THE ROUTINE WILL
                      433 * SEARCH THE STRING IN ROM AND START COPYING FROM TOP OF
                      434 * THAT PROGRAM. IF REG.9 HAS NULL STRING AND IN ROM MODE, COPY
                      435 * THE CURRENT PGM.
                      436 * USED A,B,C CALL ASRCH, MEMLFT.
                      437 * NORMAL RETURN TO NFRKB. IF NOT ENOUGH MEM TO STORE THE PGM,
                      438 * DO NOTHING, SIMPLY GOTO PACK THE MEM AND SAY TRY AGAIN.
                      439 * DURING THE COPYING:
                      440 * C[6:3] HAS ROM ADDR. B[5:3] HAS RAM ADDR. B[2:0] HAS THE
                      441 * REMAINING # OF REG.'S TO BE COPIED.
    0165 0278         442 XCOPY           C=REGN          9               ;GET ALPHA STRING
    0166 0158         443                 M=C
    0167 02EE         444                 C#0?            W               ;NULLSTRING ?
    0168 0003         445                 GONC            CPY120          ;YES, START FROM PGM HEAD
    0169 00001000     446                 GOSUB           =ASRCH          ;DO THE ALPHA SEARCH
    016B 02EE         447                 C#0?            W               ;FIND IT ?
    016C 00001002     448 CPYNE           GOLNC           =ERRNE
    016E 024C         449 CPY100          ST=1?           9               ;USER CODE ?
    016F 0007         450                 GOC             CPYNE           ;NO, MICRO CODE
    0170 020C         451                 ST=1?           2               ;ROM ?
    0171 0007         452                 GOC             CPY110          ;YES
                      453                 GLB             ERRRAM
    0172 00001000     454 ERRRAM          GOSUB           ERROR
    0174 0000         455                 CON             =MSGRAM         ;SAY RAM
    0175 001C         456 CPY110          PT=             3               ;GET THE PRM HEAD
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    0176 00001000     457                GOSUB        =ROMH05
    0178 0003         458                GOTO         CPY130
    0179 00CC         459 CPY120         ST=1?        10            ;ARE WE IN ROM ?
    017A 0003         460                GONC         ERRRAM        ;NO, WE ARE IN RAM
    017B 00001000     461                GOSUB        =ROMHED       ;GET PGM HEAD
                      462 *
    017D 00AE         463 CPY130         ACEX         W
    017E 01BC         464                RCR          11            ;C.M   PGM HEAD ADDR
    017F 0330         465                CXISA                      ;GET HEADED WORD
    0180 0276         466                C=C-1        XS            ;CHECK PRIVATE
    0181 0276         467                C=C-1        XS
    0182 0276         468                C=C-1        XS
    0183 0007         469                GOC          CPY140        ;NOT PRIVATE
                      470                GLB          ERRPR
    0184 00001000     471 ERRPR          GOSUB        ERROR
    0186 0000         472                CON          =MSGPR
    0187 027A         473 CPY140         C=C-1        M             ;POINT TO P-1
    0188 00FA         474                BCEX         M             ;SAVE ADDR IN B.M
    0189 00001000     475                GOSUB        =MEMLFT       ;HOW MANY REG LEFT ?
    018B 0106         476                A=C          X             ;A.X_ # OF REG LEFT IN MEM
    018C 00DA         477                C=B          M             ;SEE HOW MANY REG REQUIRED
    018D 011A         478                A=C          M
    018E 0330         479                CXISA                      ;LOAD # OF REG REQUIRED
    018F 0306         480                A<C?         X             ;ENOUGH ROOM FOR THIS PRM ?
    0190 00001003     481                GOLC         =PACKE        ;NO, TRY TO PACK MEM
    0192 0266         482                C=C-1        X
    0193 00E6         483                BCEX         X             ;SAVE # OF REG IN B.X
    0194 0046         484                C=0          X
    0195 0270         485                DADD=C
    0196 0378         486                C=REGN       13            ;LOAD CHAIN HEAD
    0197 0270         487                DADD=C
    0198 0266         488                C=C-1        X             ;POINT TO STARTING RAM ADDR
    0199 01BC         489                RCR          11
    019A 00FA         490                BCEX         M             ;SAVE RAM ADDR IN B.M
    019B 0038         491                C=DATA                     ;LOAD FINAL END
    019C 03D8         492                CSTEX
    019D 0084         493                ST=0         5             ;MAKE IT BECOME LOCAT END
    019E 03D8         494                CSTEX
    019F 02F0         495                DATA=C
    01A0 00BA         496                ACEX         M             ;GET ROM ADDR
    01A1 023A         497                C=C+1        M             ;POINT TO HEADER WORD
    01A2 0330         498                CXISA                      ;LOAD # OF BYTES IN 1ST REG
    01A3 031C         499                PT=          1
    01A4 0262         500                C=C-1        PT
    01A5 0102         501                A=C          PT            ;MOVE COUNTER TO C.S
    01A6 037C         502                RCR          12
    01A7 00A2         503                ACEX         PT
    01A8 023C         504                RCR          2
    01A9 000E         505 CPY145         A=0          W             ; PACK 7 ROM WORDS TO 1 REG
    01AA 023A         506 CPY150         C=C+1        M
    01AB 0330         507                CXISA                      ;LOAD A BYTE
    01AC 010A         508                A=C          WPT
    01AD 027E         509                C=C-1        S
    01AE 0007         510                GOC          CPY160        ;DONE WITH ONE REG.
    01AF 03EE         511                ASL          W
    01B0 03EE         512                ASL          W
    01B1 0003         513                GOTO         CPY150
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    01B2 00EE         514 CPY160          BCEX            W
    01B3 003C         515                 RCR             3              ;C.X _ RAM ADDR
    01B4 0270         516                 DADD=C
    01B5 0266         517                 C=C-1           X
    01B6 00EE         518                 BCEX            W
    01B7 00AE         519                 ACEX            W
    01B8 02F0         520                 DATA=C
    01B9 00EE         521                 BCEX            W
    01BA 01BC         522                 RCR             11             ;C.X _ # OF REG REMAINED
    01BB 0266         523                 C=C-1           X
    01BC 0007         524                 GOC             CPY170         ;ALL DONE
    01BD 00EE         525                 BCEX            W
    01BE 00AE         526                 ACEX            W
    01BF 02DC         527                 PT=             13
    01C0 0190         528                 LC              6
    01C1 031C         529                 PT=             1
    01C2 0003         530                 GOTO            CPY145
                      531 *
    01C3 003C         532 CPY170          RCR             3
    01C4 0226         533                 C=C+1           X
    01C5 0106         534                 A=C             X              ;A.X _ NEW CHAIN HEAD ADDR
    01C6 0046         535                 C=0             X
    01C7 0270         536                 DADD=C
    01C8 0378         537                 C=REGN          13
    01C9 00A6         538                 ACEX            X
    01CA 0368         539                 REGN=C          13             ;PUT NEW CHAINHEAD AWAY
    01CB 001C         540                 PT=             3
    01CC 0002         541                 A=0             PT             ;SET PC TO BYTE 0
                      542                                                ;OF OLD CHAINHEAD REGISTER
    01CD 00C4         543                 ST=0            10             ;CLEAR ROMFLAG
    01CE 00001000     544                 GOSUB           PUTPCX
    01D0 00001000     545                 GOSUB           =DECMPL        ;DECOMPILE
    01D2 00001002     546 NFRKBX          GOLONG          =NFRKB
                      547                 GLB             TRGSET
    01D4 03B8         548 TRGSET          C=REGN          14
    01D5 0046         549                 C=0             X
    01D6 023C         550                 RCR             2
    01D7 0358         551                 ST=C
    01D8 0144         552                 ST=0            6
    01D9 0284         553                 ST=0            7
    01DA 00B0         554                 C=N
    01DB 03E0         555                 RTN
                      556 *
                      557 *
                      558 * PATCH1 - POST-RELEASE FIX TO DECAD & DECADA 9/21/78
                      559 * DECAD IS IN QUAD 10.
                      560 *
                      561                 GLB             PATCH1
    01DC 0162         562 PATCH1          A=A+1           PT
    01DD 00001002     563                 GOLNC           =INCADA
    01DF 016E         564                 A=A+1           W
    01E0 03E0         565                 RTN
                      566 *
                      567 * PATCH2 - POST-RELEASE FIX TO CLRPGM FOUND LATER IN QUAD 8.
                      568 * THIS PATCH ALLOWS CLEARING OF PRIVATE PROGRAMS AT THE END OF
                      569 * PROGRAM MEMORY.
                      570 * THE S10=0 IS ANOTHER FIX TO ALLOW CLEARING OF RAM PROGRAMS
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LOCATION OBJECT CODE LINE     SOURCE LINE

                     571 * WHEN THE PROGRAM COUNTER IS POINTING TO ROM.
                     572 *
                     573                 GLB             PATCH2
01E1 00C4            574 PATCH2          ST=0            10              ;CLEAR ROM FLAG
01E2 00001000        575                 GOSUB           =FIXEND         ;GET THE 3RD BYTE OF THE CURRENT END
01E4 00CA            576                 C=B             WPT
01E5 03D8            577                 CSTEX                           ;TURN OFF THE PRIVATE BIT.
01E6 0144            578                 ST=0            6
01E7 03D8            579                 CSTEX
01E8 00001000        580                 GOSUB           =PTBYTM         ;PUT THE 3RD BYTE BACK
01EA 013C            581                 RCR             8               ;SET UP FOR CPGMHD
01EB 010A            582                 A=C             WPT
01EC 00001002        583                 GOLONG          =CPGMHD         ;GO TO THE TOP OF THE PROGRAM AND RETURN
                     584 *
                     585 * PATCH3 - POST-RELEASE FIX TO INSSUB FOUND AT THE END OF QUAD 8
                     586 * THIS FIX PREVENTS DATA ENTRY INTO PRIVATE PROGRAMS.
                     587 *
                     588                 GLB             PATCH3
01EE 00CC            589 PATCH3          ST=1?           10              ;IS THIS A ROM PROGRAM?
01EF 03A0            590                 RTNNC                           ;NO, CONTINUE
01F0 00001000        591                 GOSUB           ERROR           ;YES, ERROR OUT
01F2 0000            592                 CON             =MSGROM
                     593 *
                     594 * PATCH5 - POST-RELEASE FIX TO DEL NNN TO MAKE IT WORK WHEN LINE#=000
                     595 *
                     596                 GLB             PATCH5
01F3 0266            597 PATCH5          C=C-1           X               ;DEC LINE# & TEST FOR 000
01F4 03A0            598                 RTNNC                           ;NOT ZERO - OK
01F5 008C            599                 ST=1?           5               ;IS THIS BACKARROW?
01F6 0007            600                 GOC             NFRKBX          ;YES. DO NOTHING.
01F7 0046            601                 C=0             X               ;MUST BE DEL NNN.
                     602                                                 ;PUT LINE# BACK TO 000
01F8 03E0            603                 RTN
01F9 00000000        604                 FILLTO          777Q
                     605 *
                     606 * UPLINK JUMP TABLE HERE
                     607 *
0200 0038            608 TABUPL          C=DATA                          ;GET THE FIRST BYTE
0201 0003            609                 GOTO            UPLB0           ;SPECIAL CASE
0202 0038            610                 C=DATA
0203 0003            611                 GOTO            UPLB1           ;ANOTHER SPECIAL CASE
0204 0038            612                 C=DATA
0205 0003            613                 GOTO            UPLB2
0206 0038            614                 C=DATA
0207 0003            615                 GOTO            UPLB3
0208 0038            616                 C=DATA
0209 0003            617                 GOTO            UPLB4
020A 0038            618                 C=DATA
020B 0003            619                 GOTO            UPLB5
020C 0038            620 UPLB6           C=DATA
020D 00FC            621 GBA5            RCR             10              ;ROTATE LINK INTO PLACE
020E 03E0            622                 RTN
020F 0000            623                 FILLTO          1017Q
                     624 * GET BYTE JUMP TABLE HERE
0210 0038            625 TBLGBA          C=DATA                          ;7 ENTRY POINTS(0,2,4,...,12)
0211 03E0            626                 RTN
0212 0038            627                 C=DATA
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

  0213 0003          628                    GOTO            GBA1
  0214 0038          629                    C=DATA
  0215 0003          630                    GOTO            GBA2
  0216 0038          631                    C=DATA
  0217 0003          632                    GOTO            GBA3
  0218 0038          633                    C=DATA
  0219 0003          634                    GOTO            GBA4
  021A 0038          635                    C=DATA
  021B 0003          636                    GOTO            GBA5
  021C 0038          637 GBA6               C=DATA
  021D 037C          638 GBA6A              RCR             12
  021E 03E0          639                    RTN
  021F               640 UPLB5
  021F 013C          641 GBA4               RCR             8
  0220 03E0          642                    RTN
  0221               643 UPLB4
  0221 017C          644 GBA3               RCR             6
  0222 03E0          645                    RTN
  0223               646 UPLB3
  0223 007C          647 GBA2               RCR             4
  0224 03E0          648                    RTN
  0225               649 UPLB2
  0225 023C          650 GBA1               RCR             2
  0226 03E0          651                    RTN
  0227 0086          652 UPLB1              B=A             X               ;RETRIEVE REGISTER #
  0228 00EA          653                    BCEX            WPT             ;SAVE LINK (4 DIG), GET ADDRESS IN C
  0229 0266          654                    C=C-1           X
  022A 0270          655                    DADD=C
  022B 0038          656                    C=DATA                          ;GET THE THIRD BYTE
  022C 00CA          657                    C=B             WPT
  022D 03E0          658                    RTN
  022E 0086          659 UPLB0              B=A             X               ;RETRIEVE THE REGISTER #
  022F 00E6          660                    BCEX            X               ;SAVE 2 DIGITS OF LINK, GET ADD IN C
  0230 0266          661                    C=C-1           X
  0231 0270          662                    DADD=C
  0232 0038          663                    C=DATA                          ;GET 2ND AND 3RD BYTES
  0233 00C6          664                    C=B             X
  0234 0003          665                    GOTO            GBA6A           ;PUT ALL 3 BYTES IN PLACE
                     666 * UPLINK - MOVE UP ONE LINK OF THE LABEL CHAIN
                     667 * GIVEN AN ADDRESS OF THE FIRST BYTE OF A LINK IN A[0-3] IN
                     668 *- MM FORMAT, AND THE LINK AT THAT ADDRESS IN C[0-2], RETURNS
                     669 *- THE ADDRESS OF THE NEXT LINK IN A AND THE NEXT LINK IN C IN
                     670 *- THE SAME FORMAT AS INPUT. IN ADDITION, THE BYTE FOLLOWING THE
                     671 *- NEXT LINK IS FOUND IN C[12-13].
                     672 * EXPECTS AND RETURNS PT=3
                     673 * USES A[0-3],B[0-3],AND C.
                     674 * LEAVES DADD#0.
                     675 *
                     676 * GTLINK - GET A LINK. GIVEN THE ADDRESS OF A LINK IN A[0-3]
                     677 *- RETURNS THE LINK IN THE SAME FORM AS UPLINK.
                     678 *
                     679 * GTLNKA - SAME AS GTLINK, BUT EXPECT ADDRESS IN C[0-3]
                     680 *
  0235 0042          681 UPLINK             C=0             PT              ;CREATE THE NEW ADDRESS
  0236 01EA          682                    C=C+C           WPT             ;EXPAND THE LINK
  0237 01EA          683                    C=C+C           WPT
  0238 01EA          684                    C=C+C           WPT
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LOCATION OBJECT CODE LINE     SOURCE LINE

    0239 0222          685                 C=C+1           PT              ;ADD 2 TO BYTE NUMBER WHEN DOUBLED
    023A 01E2          686                 C=C+C           PT              ;PREPARE FOR BASE 14 ADD
    023B 01E6          687                 C=C+C           X
    023C 0007          688                 GOC             ULINK1
    023D 03C6          689                 CSR             X
    023E 0003          690                 GOTO            ULINK2
    023F 03C6          691 ULINK1          CSR             X
    0240 0236          692                 C=C+1           XS
    0241 020A          693 ULINK2          C=A+C           WPT             ;FORM NEW ADDRESS
    0242 0003          694                 GONC            ULINK3
    0243 0226          695                 C=C+1           X
                       696                 LEGAL
    0244 0003          697                 GOTO            GTLNKA          ;ADDRESS READY
    0245 0262          698 ULINK3          C=C-1           PT
    0246 0262          699                 C=C-1           PT              ;THE ADDRESS IS READY
    0247 010A          700 GTLNKA          A=C             WPT             ;SAVE THE ADDRESS
    0248 0270          701                 DADD=C                          ;SELECT THE CORRECT REGISTER
    0249 007C          702                 RCR             4               ;PREPARE FOR 7 WAY TABLE
    024A 0130          703                 LDI
                       704 * TABLE JUMP
    024B 0220          705                 CON             1040Q           ; UPLINK TABLE ADDRESS
    024C 00FC          706                 RCR             10
    024D 01E0          707                 GOTOC                           ;GO GET LINK
                       708 * GTLINK HERE
    024E 00AA          709 GTLINK          ACEX            WPT             ;PUT ADDRESS IN PLACE
    024F 0003          710                 GOTO            GTLNKA          ;GO GET LINK
                       711 *
                       712 * XBST - EXECUTE BACKSTEP
                       713 * MAINLINE CODE TO EXECUTE BACKSTEP FUNCTION
                       714 * ASSUMES STATUS SET 0 UP. PRGM MODE BIT USED
                       715 * USES 3 SUB LEVELS.
                       716 *
    0250 017C          717 XBST            RCR             6               ;CATALOG SET
    0251 03D8          718                 CSTEX
    0252 030C          719                 ST=1?           1
    0253 00001003      720                 GOLC            =BSTCAT
    0255 00001000      721                 GOSUB           SSTBST
    0257 00001000      722                 GOSUB           =BSTEP          ;BACK UP ONE LINE
    0259 00001000      723 XBST1           GOSUB           =DFRST9         ;DISPLAY STEP NUMBER UNTIL KEY UP
    025B 000C          724                 ST=1?           3               ;PROG MODE?
    025C 00001003      725                 GOLC            =DRSY25         ;YES, DON'T PUT UP NEW DISPLAY
    025E 00001002      726                 GOLONG          =NFRKB1         ;DONE!
                       727 *
                       728 * XSST - EXECUTE SINGLE STEP
                       729 * ASSUMES STATUS SET 0 UP. PRGM MODE BIT USED.
                       730 *
    0260 017C          731 XSST            RCR             6               ;CATALOG MODE
    0261 03D8          732                 CSTEX
    0262 030C          733                 ST=1?           1
    0263 00001003      734                 GOLC            =SSTCAT
    0265 00001000      735                 GOSUB           SSTBST
    0267 00001000      736                 GOSUB           =GETPC
    0269 03F8          737                 C=REGN          15              ;ALSO GET THE LINE NUMBER
    026A 000C          738                 ST=1?           3               ;PRGM MODE?
    026B 0003          739                 GONC            XSSTR           ;NO, RUN MODE
    026C 02E6          740                 C#0?            X               ;IF THE LINE NUMBER #0
    026D 00001001      741                 GSUBC           =NXLSST         ;GO TO THE NEXT LINE
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

026F 00001000      742                GOSUB        =GETLIN      ;FIX THE LINE NUMBER
0271 014C          743                ST=1?        6            ;TOP OF PROG?
0272 0003          744                GONC         $+2          ;NO, DO A SIMPLE INCREMENT
0273 0046          745                C=0          X            ;YES, SET LINE # TO 1
0274 0226          746                C=C+1        X
0275 0003          747                GONC         $+2          ;IF NOT VALID, LEAVE ALONE
0276 0266          748                C=C-1        X
0277 03E8          749                REGN=C       15
0278 00001000      750                GOSUB        PUTPC        ;FIX UP PC
027A 0003          751                GOTO         XBST1        ;DONE!
                   752 * RUN MODE SINGLE STEP
027B 02E6          753 XSSTR          C#0?         X            ;LINE 0?
027C 0007          754                GOC          XSSTR1       ;NO,DO NOTHING
027D 0226          755                C=C+1        X            ;YES, MOVE TO LINE 1
027E 03E8          756                REGN=C       15
027F 00001000      757 XSSTR1         GOSUB        =DFKBCK      ;DISPLAY LINE NUMBER
0281 024C          758                ST=1?        9            ;KEYBD RESET YET?
0282 00001000      759                GSUBNC       =NULTST      ;NO
0284 00001000      760                GOSUB        =GETLIN      ;INCREMENT THE LINE NUMBER
0286 0226          761                C=C+1        X
0287 03E8          762                REGN=C       15
0288 00001000      763                GOSUB        =SETSST      ;SET SST BIT
028A 00001002      764                GOLONG       =RUNNK       ;GO DO 1 INSTRUCTION
                   765 *
                   766 * CLRPGM - CLEAR PROGRAM
                   767 * THIS ROUTINE CLEARS THE PROGRAM WHOSE NAME IS FOUND IN REG 9.
                   768 * IF REG 9 = NULL, THEN CLEAR THE PROGRAM WHERE THE PC IS
                   769 *- CURRENTLY POINTING
                   770 * USES A, B[0-3],C,M,N,PT,S[0-7,9],4 SUB LEVELS.
                   771 *
                   772 * SEE DRC'S LAB NOTEBOOK #10422X P.106 FOR FLOWCHART OF CLRPGM
                   773 *
028C 0278          774 CLRPGM         C=REGN       9            ;RETRIEVE THE NAME
028D 0158          775                M=C                       ;SAVE FOR ASRCH
028E 02EE          776                C#0?         W            ;LABEL PRESENT?
028F 0007          777                GOC          CLRP1        ;YES, GO FIND IT
0290 00CC          778                ST=1?        10           ;ROM FLAG?
0291 0007          779                GOC          XCLPX1       ;YES, DO NOTHING
0292 00001000      780                GOSUB        =GETPC       ;NULL STRING HERE,GET CURRENT ADDRESS.
0294 00001000      781 CLRP2          GOSUB        =FLINK       ;FIND THE END OF THE PROGRAM
0296 00001000      782                GOSUB        =PATCH2      ;THIS PATCH CLEARS THE PRIVATE BIT
0298 00001000      783                GOSUB        =PUTPCL      ;STORE IN PC & GET LINE #
029A 0088          784                ST=1         5            ;DELETE THE PROGRAM END
029B 004E          785                C=0          W            ;SET # LINES TO DELETE = FFF
029C 0266          786                C=C-1        X
029D 0248          787                ST=1         9            ;SET UP FOR PACK
029E 0003          788                GOTO         CLRP3        ;GO DELETE THE PROGRAM
029F 00001000      789 CLRP1          GOSUB        =ASRCH       ;GO DO ALPHA SEARCH
02A1 001C          790                PT=          3
02A2 02EE          791                C#0?         W            ;SUCCESS?
02A3 0003          792                GONC         CLPERR       ;NO, ERROR EXIT
02A4 020C          793                ST=1?        2            ;LABEL FOUND IN ROM?
02A5 0003          794                GONC         CLRP2        ;NO, FOUND IN RAM.
02A6 00001002      795 CLPERR         GOLONG       =ERRNE       ;ERROR EXIT
                   796 *
                   797 * DELNNN - DELETE NNN INSTRUCTIONS
                   798 * THIS ROUTINE DELETES NNN LINES OF PROGRAM STARTING WITH
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LOCATION OBJECT CODE LINE     SOURCE LINE

                     799 *- THE ONE POINTED TO BY THE PC.
                     800 * THE NNN ARGUMENT IS FOUND IN A[X].
                     801 * DELNNN WILL NOT DELETE A PROGRAM END STATEMENT.
                     802 * IN ALL OTHER WAYS THIS FUNCTION IS LIKE XDELET FOUND BELOW.
                     803 *
                     804 *
                     805 * XDELET - EXECUTE DELETE LINE
                     806 * DELETES 1 LINE FROM PROGRAM MEMORY STARTING WITH
                     807 *- THE BYTE POINTED TO BY THE PC +1. THE PC IS SET
                     808 *- TO PROPERLY POINT TO THE PRECEEDING LINE.
                     809 * UPDATES LINKS IF A CHAIN ELEMENT IS DELETED.
                     810 * ALSO SETS PACK AND DECOMPILE BITS OF THE
                     811 *- FOLLOWING END.
                     812 * S6 SET TO 1 WHEN AN END IS DELETED
                     813 * NOTE, WILL NOT DELETE THE FINAL END!
                     814 * USES A,B,C,M,N,S[0-9],PT
                     815 *
                     816 * SEE DRC'S LAB NOTEBOOK #10422X P.107 FOR FLOWCHART OF DELNNN AND
                     817 *     XDELET.
                     818 *
02A8 00AE            819 DELNNN          ACEX          W              ;STORE # TO DELETE -1 IN N
02A9 0266            820                 C=C-1         X
02AA 0007            821                 GOC           XDELEX         ;ZERO TO DELETE, DO NOTHING.
02AB 0084            822                 ST=0          5              ;DON'T DELETE AN END.
02AC 000C            823                 ST=1?         3              ;PRGM MODE?
02AD 0003            824                 GONC          XDELEX         ;NO, DON'T DO IT.
02AE 0003            825                 GOTO          XDELA          ;GO DELETE.
02AF 0088            826 XDELET          ST=1          5              ;DELETE ENDS.
02B0 004E            827                 C=0           W              ;DELETE 1 LINE
02B1 0070            828 XDELA           N=C                          ;STORE # OF LINES TO DELETE -1
02B2 034C            829                 ST=1?         12             ;PRIVATE?
02B3 0007            830                 GOC           XDELEX         ;YES - DO NOTHING
02B4 00CC            831 XCLPX1          ST=1?         10             ;ROM FLAG?
02B5 00001003        832                 GOLC          INSSUB         ;YES, DO NOTHING. DISPLAY [ROM].
02B7 00001000        833                 GOSUB         =GETPC         ;GET STARTING ADDRESS OF DELETE
02B9 03F8            834                 C=REGN        15             ;DECREMENT LINE NUMBER IF NON ZERO
02BA 00001000        835                 GOSUB         =PATCH5
02BC 03E8            836                 REGN=C        15
02BD 0244            837                 ST=0          9              ;CLEAR PACK FLAG
02BE 00B0            838                 C=N
02BF 0144            839 CLRP3           ST=0          6              ;CLEAR END FLAG
02C0 0070            840 XDELM1          N=C                          ;STORE # OF LINES LEFT TO DELETE -1
02C1 00001000        841                 GOSUB         DELLIN         ;DELETE 1 LINE
02C3 014C            842                 ST=1?         6              ;TRAVERSED AN END?
02C4 0007            843                 GOC           XDELM2         ;YES. QUIT.
02C5 00B0            844                 C=N                          ;C[X]-1 = # LEFT TO DELETE
02C6 0266            845                 C=C-1         X              ;DONE?
02C7 0003            846                 GONC          XDELM1         ;NO, GO AROUND AGAIN
02C8 00001000        847 XDELM2          GOSUB         =FLINKP        ;FIND THE CURRENT END
02CA 007C            848                 RCR           4              ;SAVE PREVIOUS LINK ADDRESS IN C[3-6]
02CB 00AA            849                 ACEX          WPT
02CC 00FC            850                 RCR           10             ;PUT DECOMPILE BITS IN END
02CD 00001000        851                 GOSUB         =FIXEND
02CF 007C            852                 RCR           4              ;PUT A[0-3]  BACK
02D0 010A            853                 A=C           WPT
02D1 024C            854                 ST=1?         9              ;GO PACK?
02D2 00001003        855                 GOLC          =GTO_5         ;YES.
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LOCATION OBJECT CODE LINE     SOURCE LINE

   02D4 00001000      856                GOSUB          =GETLIN        ;BACK STEP IF NEW LINE NUM. # 0.
   02D6 02E6          857                C#0?           X              ;BACK STEP?
   02D7 0003          858                GONC           XDELEX         ;NO, LINE 0.
   02D8 0198          859                C=M                           ;RETRIEVE THE CURRENT ADDRESS
   02D9 00001000      860                GOSUB          =BSTEPA        ;BACK STEP.
   02DB 00001002      861 XDELEX         GOLONG         =NFRKB         ;ALL DONE!
                      862 *
                      863 * SSTBST - LOGIC COMMON TO SST AND BST
                      864 *
                      865                GLB            SSTBST
   02DD 0345          866 SSTBST         CON            1505Q          ;GOSUB PRT15
   02DE 01BC          867                CON            674Q
                      868                GLB            PR15RT         ;FOR THE PRINTER
   02DF               869 PR15RT
   02DF 00001000      870                GOSUB          =RSTSEQ        ;CLEAR 6 FLAGS
   02E1 00001000      871                GOSUB          =ANNOUT        ;UPDATE ANNUNCIATORS
   02E3 00001000      872                GOSUB          =LINNUM        ;RECONSTRUCT PRIVACY FLAG
   02E5 034C          873                ST=1?          12             ;PRIVACY?
   02E6 0007          874                GOC            XDELEX         ;YES. GOLONG NFRKB
   02E7 03E0          875                RTN
                      876
                      877 * ERROR - ERROR EXIT
                      878 * CALLING SEQUENCE:
                      879 *   GOSUB ERROR
                      880 *   XDEF  <MSGXXX>
                      881 * ERROR ROUTINE PERFORMS :
                      882 * 1. IF ERROR FLAG ALREADY SET, RESET IT, RTN TO NFRKB
                      883 * 2. UNCONDITIONAL RESET DATAENTRY FLAG, AND OTHERS
                      884 * 3. DISPLAY ERROR MESSAGE
                      885 * 4. IF PROGRAM RUNNING, STOP RUNNING AND DO A BACK STEP
                      886 * 5. ALWAYS RETURN TO NFRKB, WON'T RETURN TO CALLING PROGRAM
                      887 *
                      888 *
                      889 * ERR110 - ERROR EXIT SIMPLY DECIDE TO DO A BACK STEP OR NOT BEFORE
                      890 *          RETURNNING TO NFR. REQUIRED STATUS SET 0 LOADING.
                      891 *
                      892                GLB            ERRSUB
   02E8 00001000      893 ERRSUB         GOSUB          =RSTMSO        ;ENABLE CHIP 0 AND
                      894                                              ;CLEAR DATAENTRY FLAG
   02EA 0108          895                ST=1           8              ;TELL MSG TO SET MSGFLAG
   02EB 0260          896                SETHEX
   02EC 02BC          897                RCR            7
   02ED 0358          898                ST=C
   02EE 020C          899                ST=1?          2              ;ERROR FLAG ?
   02EF 03A0          900                RTNNC                         ;NO
   02F0 0204          901                ST=0           2              ;RESET ERROR FLAG
   02F1 0398          902                C=ST
   02F2 02BC          903                RCR            7
   02F3 03A8          904                REGN=C         14
   02F4 0003          905 ERRTN          GOTO           XDELEX
                      906 *
   02F5 00001000      907 ERROR          GOSUB          ERRSUB
   02F7 01B0          908                C=STK
   02F8 0330          909                CXISA
   02F9 00001000      910                GOSUB          =MSGE
   02FB 02CC          911 ERR110         ST=1?          13             ;RUNNING ?
   02FC 0007          912                GOC            ERR120         ;YES
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LOCATION OBJECT CODE LINE     SOURCE LINE

    02FD 004C          913                 ST=1?          4              ;SST ?
    02FE 0003          914                 GONC           ERR130         ;NO
    02FF 00001000      915 ERR120          GOSUB          =BSTEP
    0301               916 ERR130
    0301 00001000      917                 GOSUB          =STOPS         ;CLEAR PAUSEFLAG & RUNNING
    0303 00001000      918                 GOSUB          =LINNUM        ;GUARANTEE VALID LINE NUMBER
                       919                                               ;FOR PARSE IN PRGM MODE
    0305 0003          920                 GOTO           ERRTN
                       921 *
                       922 *
                       923 * DELLIN - DELETE LINE FROM PROGRAM MEMORY
                       924 * THIS ROUTINE DELETES A LINE OF CODE STARTING WITH THE
                       925 *- NEXT BYTE AFTER THE ONE SPECIFIED BY A[0-3] IN MM FORMAT.
                       926 * WILL NOT DELETE THE FINAL END.
                       927 * RETURNS S6=1 IF END DELETED.
                       928 * IF A CHAIN ELEMENT IS DELETED, THE PREVIOUS LINK IS UPDATED
                       929 *- TO INCLUDE THE DELETED LINK.
                       930 * USES A[0-3],B,C,M,3 SUBROUTINE LEVELS
                       931 *
                       932 * NOTE !!! THIS ROUTINE CANNOT BE CALLED FROM A SUBROUTINE
                       933 *
    0306 00AA          934 DELLIN          ACEX           WPT            ;SAVE STARTING ADDRESS
    0307 010A          935                 A=C            WPT
    0308 0158          936                 M=C
    0309 0048          937                 ST=1           4
    030A 0288          938                 ST=1           7
    030B 00001000      939                 GOSUB          =NXLDEL        ;FIND THE ENDING ADDRESS
    030D 0198          940                 C=M                           ;RETRIEVE THE STARTING ADDRESS
    030E 00AA          941                 ACEX           WPT            ;AND SAVE THE ENDING ADDRESS
    030F 0158          942                 M=C
    0310 0003          943                 GOTO           DELLN1         ;ZERO OUT APPROPRIATE BYTES
    0311 004E          944 DELLN2          C=0            W              ;ZERO 1 BYTE
    0312 00001000      945                 GOSUB          =INCADA        ;MOVE THERE
    0314 00001000      946                 GOSUB          PTBYTA         ;PUT ZERO'S IN
    0316 0198          947 DELLN1          C=M                           ;RETRIEVE THE ENDING ADDRESS
    0317 036A          948                 A#C?           WPT            ;DONE?
    0318 0007          949                 GOC            DELLN2         ;NO, DELETE SOME MORE
    0319 03E0          950                 RTN                           ;ALL DONE
                       951
                       952 *
                       953 * PTLINK - PUT LINK
                       954 * PUTS C[0-3] INTO PROGRAM MEMORY AT THE ADDRESS POINTED TO
                       955 *- A[0-3] IN MM FORMAT.
                       956 * PT=3 EXPECTED AND RETURNED
                       957 * USES B[0-3]
                       958 * THIS ROUTINE MIXED IN WITH PTBYTA
                       959 *
    031A 00AA          960 PTLINK          ACEX           WPT            ;SAVE BYTES TO STORE
    031B 008A          961 PTLNKA          B=A            WPT            ;IN B
    031C 0270          962                 DADD=C                        ;WAKE UP THE RIGHT REGISTER
    031D 010A          963                 A=C            WPT            ;RESTORE A
    031E 007C          964                 RCR            4              ;PREPARE FOR BRANCH TABLE (7)
    031F 0130          965                 LDI
                       966 * TABLE JUMP
    0320 0283          967                 CON            1203Q          ; PUT LINK TABLE ADDRESS
    0321 00FC          968 PTLNKB          RCR            10             ;PUT ADDRESS IN POSITION
    0322 01E0          969                 GOTOC                         ;7 WAY BRANCH
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LOCATION OBJECT CODE LINE     SOURCE LINE

                      970 *
                      971 * PTBYTA - PUT BYTE
                      972 * PUT THE BYTE IN C[0-1] INTO RAM AT THE ADDRESS
                      973 *- POINTED TO BY A[0-3] IN MM FORMAT.
                      974 * PT=3 OUT.
                      975 * USES B[0-1]
                      976 *
  0323 00AE           977 PTBYTA          ACEX            W               ;SAVE BYTE TO STORE IN B
  0324 031C           978                 PT=             1               ;SET UP FOR 1 BYTE STORE
  0325 008A           979                 B=A             WPT             ;SAVE BYTE
  0326 0270           980                 DADD=C                          ;WAKE UP THE RIGHT REG.
  0327 010E           981                 A=C             W               ;RESTORE A
  0328 007C           982 PTBYTP          RCR             4               ;PREPARE FOR TABLE JUMP
  0329 0130           983                 LDI
                      984 * TABLE JUMP
  032A 0280           985                 CON             1200Q           ; PUT BYTE TABLE ADDRESS
  032B 0003           986                 GOTO            PTLNKB
                      987 *
                      988 * PUTPC - PUT AWAY THE PROGRAM COUNTER
                      989 * PLACES A[0-3] IN MM FORMAT INTO THE PC AFTER CONVERTING
                      990 *- TO PC FORMAT BY SHIFTING A[3] RIGHT 1 BIT IF S10=0
                      991 * PT=3 ASSUMED AND RETURNED
                      992 *
                      993 * PUTPCF - SAME AS PUTPC, BUT SETS LINE# TO FFF
                      994 *
                      995 * PUTPCX - SAME AS PUTPCF EXCEPT IF RUNNING LINE# NOT SET TO FFF
                      996 *
                      997 * PUTPCD - SAME AS PUTPC EXCEPT CALLS DECAD BEFORE GOING TO PUTPC
                      998 * CONSEQUENTLY USES 1 SUBROUTINE LEVEL
                      999 *
                     1000                 GLB             PUTPCD
  032C 00001000      1001 PUTPCD          GOSUB           =DECAD
  032E 0003          1002                 GOTO            PUTPC
                     1003 *
  032F 02CC          1004 PUTPCX          ST=1?           13              ;RUNNING?
  0330 0007          1005                 GOC             PUTPC           ;YES, DON'T SET LINE# TO FFF
  0331 004E          1006 PUTPCF          C=0             W               ;SET LINE# TO FFF
  0332 0270          1007                 DADD=C
  0333 03F8          1008                 C=REGN          15
  0334 0046          1009                 C=0             X
  0335 0266          1010                 C=C-1           X
  0336 03E8          1011                 REGN=C          15
  0337 0046          1012 PUTPC           C=0             X
  0338 0270          1013                 DADD=C
  0339 0338          1014 PUTPCA          C=REGN          12              ;GET PC
  033A 00AA          1015                 ACEX            WPT
  033B 010A          1016                 A=C             WPT             ;NEW PC IN PLACE
  033C 00CC          1017                 ST=1?           10              ;ROM ADDRESS?
  033D 0007          1018                 GOC             PUTPC3          ;YES,NO SHIFT
  033E 01E2          1019                 C=C+C           PT              ;SHIFT 1 BIT RIGHT
  033F 0003          1020                 GONC            PUTPC1
  0340 0222          1021                 C=C+1           PT
  0341 01E2          1022 PUTPC1          C=C+C           PT
  0342 0003          1023                 GONC            PUTPC2
  0343 0222          1024                 C=C+1           PT
  0344 01E2          1025 PUTPC2          C=C+C           PT
  0345 0003          1026                 GONC            PUTPC3
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LOCATION OBJECT CODE LINE     SOURCE LINE

    0346 0222        1027                 C=C+1          PT
    0347 0328        1028 PUTPC3          REGN=C         12            ;PUT PC BACK
    0348 03E0        1029                 RTN
                     1030 * SPECIAL DELETE AND PACK LOGIC HERE
    0349 004C        1031 SKPDEL          ST=1?          4             ;DELETE LOGIC?
    034A 00001002    1032                 GOLNC          =PAKSPC       ;PACK LOGIC GOES HERE
    034C 00001000    1033 SKPDL           GOSUB          =INCADA       ;MOVE INSIDE LINK
    034E 00001000    1034                 GOSUB          =FLINKA       ;FIND VARIOUS LINKS
    0350 00AA        1035                 ACEX           WPT
    0351 010A        1036                 A=C            WPT           ;RESTORE ADDRESS BEFORE LINK
    0352 00001000    1037                 GOSUB          =DECADA
    0354 00AA        1038                 ACEX           WPT
    0355 0158        1039                 M=C                          ;SAVE CURRENT AND PREVIOUS LINK ADDRESSES
    0356 00001000    1040                 GOSUB          GTLINK        ;GET THE CURRENT LINK
    0358 023E        1041                 C=C+1          S             ;END?
    0359 0007        1042                 GOC            SKPD7         ;NO, ALPHA LABEL.
    035A 0148        1043                 ST=1           6             ;END, REMEMBER IT.
    035B 008C        1044                 ST=1?          5             ;TRAVERSE THE END? (DELET)
    035C 0003        1045                 GONC           SKPD4         ;NO, (DEL NNN)
    035D 027E        1046                 C=C-1          S             ;FINAL END?
    035E 01FE        1047                 C=C+C          S
    035F 01FE        1048                 C=C+C          S
    0360 01FE        1049                 C=C+C          S
    0361 0003        1050                 GONC           SKPD1         ;NO, TRAVERSE THE END
    0362 01B0        1051 SKPD4           C=STK                        ;THIS IS A SPECIAL CASE EXIT OUT
    0363 03E0        1052                 RTN                          ;OF DELLIN!!! WATCH OUT!!!
    0364 0198        1053 SKPD7           C=M                          ;SAVE M IN B
    0365 00EE        1054                 BCEX           W
    0366 00001000    1055                 GOSUB          =INCAD2       ;CHECK BYTE AFTER TEXT CHAR.
    0368 00001000    1056                 GOSUB          =NXBYTA       ;GET KEYCODE
    036A 031C        1057                 PT=            1
    036B 026A        1058                 C=C-1          WPT           ;SUBTRACT 1
    036C 0007        1059                 GOC            SKPD6         ;DO NOTHING IF 0 KEYCODE
    036D 0106        1060                 A=C            X             ;POSITION FOR BITMAP SUBS.
    036E 03E6        1061                 ASL            X
    036F 004E        1062                 C=0            W
    0370 0270        1063                 DADD=C
    0371 00001000    1064                 GOSUB          =TBITMP       ; CLEAR BIT
    0373 00001000    1065                 GOSUB          =SRBMAP
    0375 00CE        1066 SKPD6           C=B            W             ;RESTORE B TO M
    0376 0158        1067                 M=C
    0377 001C        1068                 PT=            3
    0378 010A        1069                 A=C            WPT
    0379 00001000    1070                 GOSUB          =INCADA       ;GET ADDRESS OF LINK IN A[0-3]
    037B 00001000    1071                 GOSUB          GTLINK        ;GET THE LINK
    037D 00FC        1072 SKPD1           RCR            10            ;SAVE THE CURRENT LINK
    037E 00EE        1073                 BCEX           W             ;FIX PREVIOUS LINK
    037F 0198        1074                 C=M                          ;GET ADDRESS OF PREVIOUS LINK
    0380 007C        1075                 RCR            4             ;POSITION FOR GTLINK
    0381 00001000    1076                 GOSUB          =GTLNKA       ;GET IT
    0383 00EE        1077                 BCEX           W             ;PLACE THE FIRST LINK IN A[0-3]
    0384 007C        1078                 RCR            4
    0385 00EE        1079                 BCEX           W
    0386 006A        1080                 ABEX           WPT
    0387 0346        1081                 A#0?           X             ;END OF CHAIN SPECIAL CASE
    0388 0007        1082                 GOC            $+2           ;NOT HERE
    0389 0046        1083                 C=0            X             ;PUT END OF CHAIN 1 LINK DOWN
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

   038A 0236         1084                 C=C+1          XS              ;BASE 14 ADD
   038B 0236         1085                 C=C+1          XS
   038C 0206         1086                 C=A+C          X               ;CREATE NEW LONGER LINK
   038D 0007         1087                 GOC            SKPD2
   038E 0276         1088                 C=C-1          XS
   038F 0276         1089                 C=C-1          XS
   0390 0003         1090                 GONC           SKPD3
   0391 0226         1091 SKPD2           C=C+1          X               ;NEW LINK READY
   0392 006A         1092 SKPD3           ABEX           WPT             ;PUT THE NEW LINK BACK
   0393 00001000     1093                 GOSUB          =PTLINK
   0395 0198         1094                 C=M
   0396 010A         1095                 A=C            WPT             ;GET ADDRESS OF BYTE BEFORE LINK
   0397 0284         1096                 ST=0           7               ;TRAVERSE THE LINK THIS TIME
   0398 00001002     1097                 GOLONG         =NXLDEL         ;AROUND WE GO AGAIN.
                     1098
                     1099 *
                     1100 * GENLNK - GENERATE LINK
                     1101 * GIVEN 2 ADDRESSES IN A[0-3](LARGER) AND C[0-3](SMALLER),
                     1102 *- CREATES THE NECESSARY LINK TO GO UP THE CHAIN FROM C TO A.
                     1103 *- THIS LINK IS STORED IN THE C ADDRESS IN MEMORY.
                     1104 * ASSUMES AND RETURNES PT=3.
                     1105 * USES A[0-3],B[0-3],M, AND 1 SUB LEVEL. C SAVED.
                     1106 * FOR THE SPECIAL CASE OF A=0[0-3], 0 IS STORED AS THE LINK.
                     1107 *
   039A 0158         1108 GENLNK          M=C
   039B 034A         1109                 A#0?           WPT             ;TOP OF CHAIN?
   039C 0007         1110                 GOC            $+2             ;NO
   039D 004A         1111                 C=0            WPT             ;YES, CREATE A ZERO LINK.
   039E 024A         1112                 C=A-C          WPT             ;CREATE LINK
   039F 0003         1113                 GONC           GENLK1
   03A0 0266         1114                 C=C-1          X               ;FIX UP ADDRESS
   03A1 0262         1115                 C=C-1          PT
   03A2 0262         1116                 C=C-1          PT              ;IN THE BORROW CASE
   03A3 01E6         1117 GENLK1          C=C+C          X               ;MAKE COMPACT LINK
   03A4 01E6         1118                 C=C+C          X
   03A5 01E6         1119                 C=C+C          X
   03A6 01E6         1120                 C=C+C          X
   03A7 0003         1121                 GONC           $+2
   03A8 0222         1122                 C=C+1          PT
   03A9 03CA         1123                 CSR            WPT
   03AA 0310         1124                 LC             12              ;CREATE LINK CHAR.
   03AB 001C         1125                 PT=            3               ;PUT POINTER BACK
   03AC 010A         1126                 A=C            WPT             ;STORE LINK
   03AD 0198         1127                 C=M
   03AE 00001000     1128                 GOSUB          =PTLNKA
   03B0 0198         1129                 C=M                            ;FIX UP
   03B1 03E0         1130                 RTN                            ;DONE
                     1131 *
                     1132 * INSSUB - INSERT SUBROUTINE
                     1133 * THIS SUBROUTINE SETS UP THE CALCULATOR FOR AN INSERT.
                     1134 * IF THE LINE NUMBER # 0 OR THE CURRENT LINE # END, THEN
                     1135 *- THE PC IN ADVANCED PAST THE CURENT LINE, S9 IS SET TO 1,
                     1136 *- AND THE LINE # IS INCREMENTED BY 1.
                     1137 * C[13-10] IS SAVED IN A[13-10].
                     1138 * USES A[0-3],B[0-3],C,S[0-7,9].
                     1139 *
   03B2 00001000     1140 INSSUB          GOSUB          =PATCH3         ;THIS PATCH CHECKS PRIVACY FOR DATA ENTRY.
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LOCATION OBJECT CODE LINE     SOURCE LINE

    03B4 034C        1141                ST=1?          12             ;IS THIS A PRIVATE PROGRAM?
    03B5 00001003    1142                GOLC           =ERRPR         ;YES, SAY PRIVATE.
    03B7 00AE        1143 INSUBA         ACEX           W              ;SAVE C IN A
    03B8 00001000    1144                GOSUB          =GETPC
    03BA 0244        1145                ST=0           9              ;DISABLE BACKSTEP IN INBYT ERROR
    03BB 03F8        1146                C=REGN         15             ;GET LINE NUMBER
    03BC 02E6        1147                C#0?           X              ;NON ZERO LINE NUMBER?
    03BD 0003        1148                GONC           INSUB1         ;NO, DON'T SKPLIN, BUT INC LINNUM.
    03BE 00001000    1149                GOSUB          =SKPLIN        ;SKIP A LINE
    03C0 014C        1150                ST=1?          6              ;HIT AN END?
    03C1 0007        1151                GOC            INSUB2         ;YES, DON'T INCREMENT LINNUM.
    03C2 0248        1152                ST=1           9              ;ENABLE BACKSTEP ON ERROR.
    03C3 00001000    1153 INSUB1         GOSUB          =GETLIN        ;INCREMENT LINE NUMBER
    03C5 0226        1154                C=C+1          X
    03C6 03E8        1155                REGN=C         15             ;STORE AWAY AGAIN
    03C7 00001002    1156 INSUB2         GOLONG         PUTPC          ;PUT ADDRESS AWAY AND RETURN
                     1157
                     1158
                     1159
                     1160
                     1161
                     1162
                     1163
                     1164 *
                     1165 * GOSUB0,GOSUB1,GOSUB2,GOSUB3 - GOSUB LONG WITHIN A 4K ROM TO AN
                     1166 *- ADDRESS WITHIN A SPECIFIED 1K ROM.
                     1167 * THESE ROUTINES ARE THE SAME AS GOSUB EXCEPT INSTEAD OF ASSUMING THAT
                     1168 *- THE DESTINATION ADDRESS IS WITHIN THE CURRENT 1024 WORD ROM, THE
                     1169 *- DESTINATION ROM IS SPECIFIED BY THE CALL. I.E. TO GOSUB TO A
                     1170 *- SUBROUTINE IN ROM1 OF A 4 ROM CHIP, ONE WOULD USE:
                     1171 *    GOSUB  GOSUB1
                     1172 *    XDEF   <NAME>
                     1173 *
                     1174 * WARNING!!! IF YOU SPECIFY THE WRONG ROM, THE CALL WILL GO TO THE
                     1175 *- ADDRESS YOU SPECIFY RATHER THAN THE CORRECT ONE.  THIS IS A PAINFUL
                     1176 *- ERROR TO FIND SINCE IT RESULTS IN JUMPS TO THE MIDDLE OF NOWHERE.
                     1177 *
                     1178 * USES C PLUS 1 ADDITIONAL SUBROUTINE LEVEL TEMPORARILY.
                     1179 *
                     1180 * GOL0,GOL1,GOL2,GOL3 - GOLONG TO ANYWHERE IN A 4K ROM.
                     1181 * SAME AS GOLONG EXCEPT DESTINATION 1K ROM SPECIFIED AS IN GOSUB[0-3]
                     1182 * USES C PLUS 1 SUBROUTINE LEVEL TEMPORARILY.
                     1183 *
                     1184 * INTERNAL SUBROUTINE FOR GOSUB[0-3] AND GOL[0-3]
                     1185 *
                     1186                GLB            GOL0
                     1187                GLB            GOSUB0
                     1188                GLB            GOL1
                     1189                GLB            GOSUB1
                     1190                GLB            GOL2
                     1191                GLB            GOSUB2
                     1192                GLB            GOL3
                     1193                GLB            GOSUB3
    03C9 0330        1194 GSUBS1         CXISA                         ;GET 10 LSB OF ADDRESS PLUS 00
    03CA 03DA        1195                CSR            M              ;PREPARE TO CONCATINATE 12 BITS TO
    03CB 03DA        1196                CSR            M              ;TOP 4 BITS OF GOSUB ADDRESS
    03CC 03DA        1197                CSR            M
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LOCATION OBJECT CODE LINE     SOURCE LINE

   03CD 01EE         1198                C=C+C          W              ;ALIGN SO THAT A MANTISSA INCREMENT
   03CE 01EE         1199                C=C+C          W              ;WILL CHANGE BIT 10 OF THE FINAL ADDRESS
   03CF 03E0         1200                RTN
   03D0 01B0         1201 GOL0           C=STK                         ;GET CALLING ADDRESS
   03D1 0003         1202                GOTO           GSB0A          ;GO TO IT (IN ROM 0)
   03D2 01B0         1203 GOSUB0         C=STK                         ;GET CALLING ADDRESS
   03D3 023A         1204                C=C+1          M              ;INCREMENT PAST ARGUMENT
   03D4 0170         1205                STK=C                         ;PUT BACK FOR SUBROUTINE RETURN
   03D5 027A         1206                C=C-1          M              ;DECREMENT TO GET ARGUMENT
                     1207                LEGAL
   03D6 00001000     1208 GSB0A          GOSUB          =GSUBS1        ;PREPARE ADDRESS
   03D8 0003         1209                GOTO           GSBQ0          ;FINISH UP
   03D9 01B0         1210 GOL1           C=STK
   03DA 0003         1211                GOTO           GSB1A
   03DB 01B0         1212 GOSUB1         C=STK
   03DC 023A         1213                C=C+1          M
   03DD 0170         1214                STK=C
   03DE 027A         1215                C=C-1          M
                     1216                LEGAL
   03DF 00001000     1217 GSB1A          GOSUB          =GSUBS1
   03E1 0003         1218                GOTO           GSBQ1
   03E2 01B0         1219 GOL2           C=STK
   03E3 0003         1220                GOTO           GSB2A
   03E4 01B0         1221 GOSUB2         C=STK
   03E5 023A         1222                C=C+1          M
   03E6 0170         1223                STK=C
   03E7 027A         1224                C=C-1          M
                     1225                LEGAL
   03E8 00001000     1226 GSB2A          GOSUB          =GSUBS1
   03EA 0003         1227                GOTO           GSBQ2
   03EB 01B0         1228 GOL3           C=STK
   03EC 0003         1229                GOTO           GSB3A
   03ED 01B0         1230 GOSUB3         C=STK
   03EE 023A         1231                C=C+1          M
   03EF 0170         1232                STK=C
   03F0 027A         1233                C=C-1          M
                     1234                LEGAL
   03F1 00001000     1235 GSB3A          GOSUB          =GSUBS1
   03F3 023A         1236 GSBQ3          C=C+1          M              ;SELECT ROM 3 OF CHIP
   03F4 023A         1237 GSBQ2          C=C+1          M              ;SELECT ROM 2 OF CHIP
   03F5 023A         1238 GSBQ1          C=C+1          M              ;SELECT ROM 1 OF CHIP
   03F6 037C         1239 GSBQ0          RCR            12             ;MOVE ADDRESS ALMOST INTO PLACE
   03F7 01EE         1240                C=C+C          W              ;ALIGN DESTINATION ADDRESS ON
   03F8 01EE         1241                C=C+C          W              ;DIGIT BOUNDARIES.
   03F9 01E0         1242                GOTOC                         ;GO!
                     1243 *
                     1244 * GSB000,GSB256,GSB512,GSB768 - FAST ABSOLUTE GOSUB
                     1245 * THESE FOUR ENTRY POINTS TO THE SAME ROUTINE PROVIDE A MEANS
                     1246 *- FOR FAST 2 WORD GOSUBS IN PORT ADDRESSED MICROCODED PLUG-IN
                     1247 *- ROMS. THE SUBROUTINE CALLED MUST HAVE ITS FIRST WORD LOCATED
                     1248 *- ON A LOCAL 256(DEC) BOUNDARY AND THE GOSUBS REFERENCING THE
                     1249 *- SUBROUTINE MUST BE LOCATED WITHIN THAT 256 WORD BLOCK.
                     1250 * I.E. A SUBROUTINE COULD BE LOCATED STARTING AT LOCATION 512
                     1251 *- (1000 OCT) IN SOME ROM AND BE CALLED WITH A SINGLE 2 WORD
                     1252 *- GOSUB [ GOSUB GSB256 ] AMYWHERE BETWEEN LOCATIONS 512 AND 767.
                     1253 *
                     1254 * BEWARE!!! - THIS ROUTINE IS DUMB. IF YOU CALL GSB256 FROM LOCATION
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

                     1255 *- 700 IT WILL NOT GO TO 256 BUT TO 512 AS THE LABELS ARE FOR
                     1256 *- PROGRAMMING CONVENIENCE ONLY. BE CAREFUL WHEN YOU USE THESE ROUTINES.
                     1257 *
                     1258 * USES ONLY C[2-6] PLUS 1 SUBROUTINE LEVEL TEMPORARILY.
                     1259 *
                     1260                GLB             GSB000
                     1261                GLB             GSB256
                     1262                GLB             GSB512
                     1263                GLB             GSB768
    03FA             1264 GSB000
    03FA             1265 GSB256
    03FA             1266 GSB512
    03FA 01B0        1267 GSB768         C=STK                           ;GET THE ADDRESS
    03FB 0170        1268                STK=C                           ;RESTORE THE RETURN ADDRESS
    03FC 023C        1269                RCR             2               ;ZERO THE LAST 8 BITS
    03FD 0046        1270                C=0             X
    03FE 037C        1271                RCR             12              ;RESTORE ADDRESS TO GOTOC SPOT
    03FF 01E0        1272                GOTOC                           ;GO DO IT
                     1273                FILLTO          1777Q
                     1274                END

Errors=    0
```

LINE#	SYMBOL	TYPE	REFERENCES
	ANNOUT	E	871
	ASRCH	E	446,789
	BSTCAT	E	720
	BSTEP	E	722,915
	BSTEPA	E	860
795	CLPERR	P	792
789	CLRP1	P	777
781	CLRP2	P	794
839	CLRP3	P	788
774	CLRPGM	P	8
397	CLRREG	P	30,358,386,421
	CPGMHD	E	583
449	CPY100	P	
456	CPY110	P	452
459	CPY120	P	445
463	CPY130	P	458
473	CPY140	P	469
505	CPY145	P	530
506	CPY150	P	513
514	CPY160	P	510
532	CPY170	P	524
448	CPYNE	P	450
	DCPL00	E	272
	DCPLRT	E	104
	DECAD	E	1001
	DECADA	E	112,208,1037
	DECMPL	E	545
934	DELLIN	P	15,841
947	DELLN1	P	943
944	DELLN2	P	949
819	DELNNN	P	14
	DFKBCK	E	757
	DFRST9	E	723
	DRSY25	E	725
911	ERR110	P	31
915	ERR120	P	33,912
916	ERR130	P	914
	ERRNE	E	448,795
907	ERROR	P	32,454,471,591
471	ERRPR	P	470,1142
454	ERRRAM	P	453,460
893	ERRSUB	P	892,907
905	ERRTN	P	920
	FIXEND	E	575,851
	FLINK	E	781
	FLINKA	E	1034
	FLINKP	E	847
	FSTIN	E	97
650	GBA1	P	628
647	GBA2	P	630
644	GBA3	P	632
641	GBA4	P	634
621	GBA5	P	636
637	GBA6	P	
638	GBA6A	P	665
1117	GENLK1	P	1113
1108	GENLNK	P	11,256,314

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LINE#	SYMBOL	TYPE	REFERENCES
	GETLIN	E	742,760,856,1153
	GETPC	E	115,736,780,833,1144
1201	GOL0	P	1186
1210	GOL1	P	1188
1219	GOL2	P	1190
1228	GOL3	P	1192
1203	GOSUB0	P	1187
1212	GOSUB1	P	1189
1221	GOSUB2	P	1191
1230	GOSUB3	P	1193
1264	GSB000	P	1260
1208	GSB0A	P	1202
1217	GSB1A	P	1211
1265	GSB256	P	1261
1226	GSB2A	P	1220
1235	GSB3A	P	1229
1266	GSB512	P	1262
1267	GSB768	P	1263
1239	GSBQ0	P	1209
1238	GSBQ1	P	1218
1237	GSBQ2	P	1227
1236	GSBQ3	P	
1194	GSUBS1	P	4,1208,1217,1226,1235
285	GTFEN1	P	34
282	GTFEND	P	35,75
709	GTLINK	P	10,95,303,1040,1071
700	GTLNKA	P	12,697,710,1076
	GTO_5	E	855
	INCAD2	E	88,108,316,321,1055
	INCADA	E	109,162,563,945,1033,1070
1140	INSSUB	P	13,832
1153	INSUB1	P	1148
1156	INSUB2	P	1151
1143	INSUBA	P	
	LINNUM	E	872,918
	MEMLFT	E	475
427	MOVR10	P	403
421	MOVREG	P	36,356
	MSG	E	67
	MSGE	E	910
	MSGPR	E	472
	MSGRAM	E	455
	MSGROM	E	592
	MSGWR	E	68
	NFRKB	E	546,861
	NFRKB1	E	726
546	NFRKBX	P	600
	NULTST	E	759
	NXBYTA	E	140,184,324,1056
	NXLDEL	E	180,939,1097
	NXLSST	E	741
	NXLTX	E	327
67	PACK	P	65
66	PACKE	P	37,481
64	PACKN	P	38
79	PAK100	P	84
83	PAK102	P	96

LINE#	SYMBOL	TYPE	REFERENCES
86	PAK105	P	82
95	PAK108	P	78
100	PAK110	P	85
109	PAK115	P	99
127	PAK117	P	117,122
128	PAK118	P	120,124,126
97	PAK120	P	101
132	PAK130	P	
134	PAK200	P	39,201
136	PAK210	P	145
146	PAK220	P	143
156	PAK230	P	151,153
166	PAK240	P	157
168	PAK250	P	147,149,155
169	PAK260	P	167
180	PAK265	P	175,211
184	PAK270	P	200
196	PAK275	P	192
202	PAK280	P	173,177,179
218	PAKEND	P	40,309
303	PAKSPC	P	41,1032
562	PATCH1	P	561
574	PATCH2	P	573,782
589	PATCH3	P	588,1140
597	PATCH5	P	596,835
356	PKASN1	P	352
358	PKASN2	P	355
359	PKASN3	P	345,357,383
231	PKEND1	P	236
239	PKEND2	P	232
253	PKEND3	P	238
237	PKEND4	P	246
257	PKEND5	P	
271	PKEND6	P	278
370	PKIO10	P	349
380	PKIO20	P	389
338	PKIOAS	P	42,70
346	PKM10	P	363
310	PKSPC1	P	305
319	PKSPC3	P	
869	PR15RT	P	868
977	PTBYTA	P	19,92,161,946
	PTBYTM	E	580
982	PTBYTP	P	20,189
960	PTLINK	P	16,1093
961	PTLNKA	P	17,1128
968	PTLNKB	P	18,986
1012	PUTPC	P	21,750,1002,1005,1156
1022	PUTPC1	P	1020
1025	PUTPC2	P	1023
1028	PUTPC3	P	1018,1026
1014	PUTPCA	P	24
1001	PUTPCD	P	1000
1006	PUTPCF	P	22
	PUTPCL	E	783
1004	PUTPCX	P	23,209,544
423	PUTREG	P	388,422

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LINE#	SYMBOL	TYPE	REFERENCES
	ROMH05	E	457
	ROMHED	E	461
	RSTMSO	E	69,893
	RSTSEQ	E	870
	RUNNK	E	764
	SETSST	E	763
1072	SKPD1	P	1050
1091	SKPD2	P	1087
1092	SKPD3	P	1090
1051	SKPD4	P	1045
1066	SKPD6	P	1059
1053	SKPD7	P	1042
1031	SKPDEL	P	25
1033	SKPDL	P	
	SKPLIN	E	1149
	SRBMAP	E	1065
866	SSTBST	P	721,735,865
	SSTCAT	E	734
	STBT30	E	91
	STBT31	E	76
	STOPS	E	917
608	TABUPL	P	
	TBITMP	E	1064
625	TBLGBA	P	
548	TRGSET	P	547
691	ULINK1	P	688
693	ULINK2	P	690
698	ULINK3	P	694
659	UPLB0	P	609
652	UPLB1	P	611
649	UPLB2	P	613
646	UPLB3	P	615
643	UPLB4	P	617
640	UPLB5	P	619
620	UPLB6	P	
681	UPLINK	P	9,79
717	XBST	P	5
723	XBST1	P	751
831	XCLPX1	P	779
442	XCOPY	P	43
828	XDELA	P	825
826	XDELET	P	7
861	XDELEX	P	821,824,830,858,874,905
840	XDELM1	P	846
847	XDELM2	P	843
63	XPACK	P	44
731	XSST	P	6
753	XSSTR	P	739
757	XSSTR1	P	754

```
LOCATION OBJECT CODE LINE     SOURCE LINE

                      1 "COCONUT"
                      2 * HP41C MAINFRAME MICROCODE ADDRESSES @22000-23777
                      3 *
                      4                GLB             SAR021
                      5                GLB             SAR022
                      6 *
                      7                GLB             SERR
                      8                GLB             SEARCH
                      9                GLB             ASRCH
                     10                GLB             SNROM
                     11                GLB             DOSRCH
                     12                GLB             XGNN10
                     13                GLB             XGNN12
                     14                GLB             XEQC01
                     15                GLB             GTSRCH
                     16                GLB             SNR12
                     17                GLB             SNR10
                     18                GLB             SGT019
                     19                GLB             SAROM
                     20                GLB             XRTN
                     21                GLB             RTN30
                     22                GLB             XGI
                     23                GLB             ROW0
                     24                GLB             ROW11
                     25                GLB             ROW12
                     26                GLB             XXEQ
                     27                GLB             XGTO
                     28
                     29
                     30
                     31
0000 0066            32 SNROM          ABEX            X              ;A[1:0] LBL
0001 01BC            33                RCR             11             ;SET ADDR TO NXT WORD
0002 031C            34 SNR09          PT=             1              ;-
0003 023A            35 SNR010         C=C+1           M              ;-
0004 0330            36 SNR012         CXISA                          ;GET ROM WORD
0005 0276            37                C=C-1           XS             ;1ST BYTE?
0006 02F6            38                C#0?            XS             ;1ST BYTE?
0007 0007            39                GOC             SNR010         ;NOPE
0008 02E2            40                C#0?            PT             ;ROW0?
0009 0007            41                GOC             SNR020         ;NOPE
000A 02EA            42                C#0?            WPT            ;NULL?
000B 0003            43                GONC            SNR010         ;YES
000C 0266            44                C=C-1           X              ;LBL LBL-1
000D 036A            45                A#C?            WPT            ;CORRECT SHORT LBL?
000E 0007            46                GOC             SNR010         ;NOPE
000F 0003            47                GOTO            SNR040         ;RETURN
                     48
0010 0222            49 SNR020         C=C+1           PT             ;ROW 12?
0011 0222            50                C=C+1           PT             ;-
0012 0222            51                C=C+1           PT             ;-
0013 0222            52                C=C+1           PT             ;-
0014 0003            53                GONC            SNR010         ;NOPE
0015 039C            54                PT=             0              ;LONG LBL?
0016 0222            55                C=C+1           PT             ;-
0017 0007            56                GOC             SNR030         ;YES
0018 0222            57                C=C+1           PT             ;CHAIN?
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    0019 0007          58                GOC             SNR09           ;NOPE
    001A 023A          59                C=C+1           M               ;GET 3RD BYTE
    001B 023A          60                C=C+1           M               ;-
    001C 0330          61                CXISA                           ;-
    001D 031C          62                PT=             1               ;ALBL?
    001E 0222          63                C=C+1           PT              ;-
    001F 0007          64                GOC             SNR010          ;YES
    0020 004E          65                C=0             W               ;-
    0021 024C          66                ST=1?           9               ;2ND END?
    0022 0007          67                GOC             SNR050
    0023 0248          68                ST=1            9               ;1ST END FOUND
    0024 008E          69                B=A             W               ;SAVE LBL
    0025 00001000      70                GOSUB           =ROMHED         ;GET BEGIN ADDR
    0027 006E          71                ABEX            W               ;PUT BACK LBL
    0028 01BC          72                RCR             11              ;-
    0029 0003          73                GOTO            SNR09           ;CONTINUE SEARCH
                       74
    002A 023A          75 SNR030         C=C+1           M               ;CORRECT LONG LBL?
    002B 0330          76                CXISA                           ;-
    002C 0366          77                A#C?            X               ;-
    002D 0007          78                GOC             SNR09           ;NOPE
    002E 027A          79                C=C-1           M               ;POSITION ADDRESS
    002F 027A          80 SNR040         C=C-1           M               ;-
    0030 003C          81                RCR             3               ;C[3:0]_ROM ADDRESS
    0031 001C          82 SNR050         PT=             3
    0032 03E0          83                RTN             .               ;-
                       84
                       85
                       86
                       87
                       88
                       89 *  SEARCH - SEARCH FOR NUMERIC LABEL
                       90 *- SEARCH THE CURRENT PROGRAM FOR THE DESIGNATED
                       91 *- LONG OR SHORT NUMERIC LABEL. (SEARCH'S IN ROM
                       92 *- OR RAM)
                       93 *- IN:  A.X=NUMERIC LABEL (IF PC IS IN RAM, A[2] MAY BE NON-ZERO)
                       94 *-      PT= 3
                       95 *- OUT: C=0 IMPLIES THE LABEL WAS NOT FOUND
                       96 *          OTHERWISE
                       97 *-      C[3:0]= LABEL ADDRESS (ADDRESS OF BYTE BEFORE LABEL)
                       98 *-      PT= 3
                       99 *-      CHIP 0 SELECTED
                      100 *- USES: STATUS BITS 9,6,0, G, A[13:0], C[13:0],B[3:0]
                      101 *        S6=1 IMPLIES PROGRAM COUNTER IS AT THE FIRST BYTE
                      102 *            OF A THREE BYTE INSTRUCTION ON INPUT.  THIS
                      103 *            ONLY OCCURS WHEN EXECUTING LONG GTONN AND XEQNN
                      104 *            OUT OF PROGRAM MEMORY.
                      105 *        S6=0 IMPLIES PROGRAM COUNTER IS AT A STANDARD POSITION
                      106 *            (I.E. AT THE BYTE BEFORE THE FIRST BYTE OF A LINE).
                      107 *- USES: 2 SUBROUTINE LEVELS
                      108
                      109
                      110
                      111               GLB             SEARC1
    0033 0144         112 SEARCH        ST=0            6
    0034 0244         113 SEARC1        ST=0            9               ;1ST END NOT FOUND
    0035 0086         114               B=A             X               ;SAVE A
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    0036 00001000     115                GOSUB      =GETPC       ;GET ADDR
    0038 00CC         116                ST=1?      10           ;ROM?
    0039 0007         117                GOC        SNROM        ;YES
    003A 00C6         118                C=B        X            ;G_LBL
    003B 01BC         119                RCR        11           ;-
    003C 0058         120                G=C                     ;-
    003D 014C         121                ST=1?      6            ;-
    003E 0003         122                GONC       SNR12
    003F 00001000     123 SNR10          GOSUB      =INCAD2
    0041 00001000     124 SNR12          GOSUB      =NXBYTA      ;GET A BYTE
    0043 037C         125                RCR        12           ;SET PTR
    0044 0282         126                C=-C       PT           ;1 BYTE FC?
    0045 01E2         127                C=C+C      PT           ;-
    0046 0007         128                GOC        SNR12        ;YES
    0047 01E2         129                C=C+C      PT           ;2 BYTE FC?
    0048 0007         130                GOC        SNR70        ;YES
    0049 01E2         131                C=C+C      PT           ;3 BYTE FC?
    004A 0007         132                GOC        SNR10        ;YES
    004B 01E2         133                C=C+C      PT           ;ROW 0?
    004C 0003         134                GONC       SNR50        ;YES
    004D 00001000     135                GOSUB      =NXLTX       ;ITS A TEXT FC
    004F 0003         136                GOTO       SNR12        ;-
                      137
    0050 02F6         138 SNR50          C#0?       XS           ;NULL?
    0051 0003         139                GONC       SNR12        ;YES
    0052 0384         140                ST=0       0            ;-
    0053 0276         141                C=C-1      XS           ;LBL_LBL-1
    0054 023C         142                RCR        2            ;-
    0055 00AE         143 SNR55          ACEX       W            ;C[6:3]_RAM ADDRESS
    0056 01BC         144                RCR        11           ;-
    0057 039C         145                PT=        0            ;C[1:0]_LBL
    0058 0098         146                C=G                     ;-
    0059 0116         147                A=C        XS           ;-
    005A 001C         148                PT=        3            ;-
    005B 0366         149                A#C?       X            ;CORRECT LBL?
    005C 0007         150                GOC        SNR60        ;NOPE
    005D 003C         151                RCR        3            ;YES, PNT AT PREV STEP.
    005E 010E         152                A=C        W            ;-
    005F 00001000     153                GOSUB      =DECADA      ;DEC RAM ADDR
    0061 038C         154                ST=1?      0            ;LNG LBL?
    0062 00001001     155                GSUBC      =DECADA      ;YES, DEC RAM ADDR AGAIN
    0064 004E         156                C=0        W            ;RE-ENABLE CHIP 0
    0065 0270         157                DADD=C
    0066 00AA         158                ACEX       WPT          ;C[3:0]_LBL ADDR
    0067 03E0         159                RTN                     ;RETURN FROM SEARCH
                      160
    0068 003C         161 SNR60          RCR        3            ;A[3:0]_RAM ADDR
    0069 010E         162                A=C        W            ;-
    006A 0003         163                GOTO       SNR12        ;-
                      164
    006B 00001000     165 SNR65          GOSUB      =INCADA      ;INC RAM ADDR
    006D 0003         166                GOTO       SNR12        ;-
                      167
    006E 02E2         168 SNR70          C#0?       PT           ;ROW 12?
    006F 0007         169                GOC        SNR65        ;NOPE
    0070 0236         170                C=C+1      XS           ;LONG LBL?
    0071 0007         171                GOC        SNR80        ;YES
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

 0072 0236          172                C=C+1          XS             ;X<>?
 0073 0007          173                GOC            SNR65          ;YES
 0074 00001000      174                GOSUB          =GTLINK        ;C[13]_3RD BYT OF CHAIN
 0076 023E          175                C=C+1          S              ;ALBL?
 0077 0007          176                GOC            SNR65          ;YES
 0078 024C          177                ST=1?          9              ;2ND END?
 0079 0007          178                GOC            SNR72          ;YES
 007A 00001000      179                GOSUB          =CPGMHD        ;GOTO PGM HEAD
 007C 0248          180                ST=1           9              ;1ST END FOUND
 007D 0003          181                GOTO           SNR12
 007E               182 SNR72
                    183 * SEARCH GIVES UP HERE
 007E 014C          184                ST=1?          6              ;PGM CTR IN ODD PLACE?
 007F 0003          185                GONC           SNR73          ;NO
 0080 00001000      186                GOSUB          =GETPC         ;YES
 0082 00001000      187                GOSUB          =INCAD2        ;SET IT TO END OF 3 BYTE FC
 0084 00001000      188                GOSUB          =PUTPC
 0086 004E          189 SNR73          C=0            W              ;NOT FOUND
 0087 0270          190                DADD=C                        ;RE-ENABLE CHIP 0
 0088 03E0          191                RTN                           ;-
                    192
 0089 00001000      193 SNR80          GOSUB          =NXBYTA        ;GET 2ND BYT OF LNG LBL
 008B 0388          194                ST=1           0              ;LNG LBL
 008C 0003          195                GOTO           SNR55          ;CORRECT LNG LBL?
                    196
                    197
                    198
                    199
                    200
                    201                GLB            XGA00
                    202 *
                    203 * XGA - XEQ/GTO ALPHA
                    204 *- PLACE THE PROGRAM COUNTER AT THE SPECIFIED ALPHA
                    205 *- STRING LABEL ADDRESS.  IN THE CASE OF A XEQ, THE
                    206 *- RETURN STACK IS PUSHED THROUGH A TRANSFER TO "XEQC"
                    207 *- IN:  S7= 1/0 IMPLIES XEQ/GTO FUNCTION
                    208 *-      S9= 1 IMPLIES AN ALPHA SEARCH HAS BEEN
                    209 *-            PREVIOUSLY PERFORMED
                    210 *-      M[3:0]=ADDRESS OR M=ALPHA STRING
                    211 *
 008D 00001000      212 XGA00          GOSUB          SAVRC          ;SAVE RETURN ADDRESS
 008F 0198          213                C=M                           ;C=ALBL OR ADDRESS
 0090 02CC          214                ST=1?          13             ;RUNNING?
 0091 0007          215                GOC            XGI52          ;YES
 0092 004C          216                ST=1?          4              ;SST?
 0093 0007          217                GOC            XGI52          ;YES
                    218 * MUST BE FROM KEYBOARD
 0094 024C          219                ST=1?          9              ;ALREADY FOUND?
 0095 0003          220                GONC           XGI52          ;NO. (AGTO FROM KEYBOARD)
 0096 0003          221                GOTO           XGI54          ;MUST BE AXEQ OF USER LABEL
                    222 *
                    223 * XGI - XEQ/GTO INDIRECT
                    224 *- PLACE THE PROGRAM COUNTER AT THE NUMERIC OR
                    225 *- ALPHA LABEL FOUND IN THE SPECIFIED REGISTER.
                    226 *- IN THE CASE OF AN XEQ, THE SUBROUTINE RETURN
                    227 *- STACK IS PUSHED THROUGH A TRANSFER TO "XEQC".
                    228 *- IN:  STATUS= 2ND BYTE OF FUNCTION CODE
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LOCATION OBJECT CODE LINE     SOURCE LINE

                     229 *-       STATUS BIT 7 = 0/1 IMPLIES GTO/XEQ FUNCTION
                     230 *- OUT: GTO- CHIP 0 SELECTED
                     231 *-       XEQ- PT= 3
                     232 *-            C[3:0]= LABEL ADDRESS
                     233 *-            CHIP 0 SELECTED
                     234 *- USES: A,B,C,M,N,G,STATUS BITS, STATUS BITS 8 & 9
                     235 *-       REG 9, REG 10 DIGITS 0,1
                     236 *- USES: 4 SUBROUTINE LEVELS
                     237
                     238
                     239
                     240
0097 035C            241 XGI30          PT=          12          ;TEST FOR NULL LBL
0098 0042            242                C=0          PT          ;-
0099 02EE            243                C#0?         W           ;-
009A 0003            244                GONC         SERRXF      ;YES
009B 010E            245                A=C          W           ;FORMAT
009C 004E            246                C=0          W           ;-
009D 0270            247                DADD=C
009E 031C            248                PT=          1           ;-
009F 034A            249 XGI40          A#0?         WPT         ;- (END OF STRING?)
00A0 0003            250                GONC         XGI50       ;-  (YES)
00A1 00AA            251                ACEX         WPT         ;-
00A2 037C            252                RCR          12          ;-
00A3 038E            253                ASR          W           ;-
00A4 038E            254                ASR          W           ;-
00A5 0003            255                GOTO         XGI40       ;-
00A6 023C            256 XGI50          RCR          2           ;-
00A7 0158            257                M=C                      ;-
00A8 0268            258 XGI52          REGN=C       9
00A9 00001000        259                GOSUB        ASRCH       ;SEARCH FOR ALPHA LBL
00AB 02EE            260                C#0?         W           ;FOUND?
00AC 0003            261                GONC         SERRXF      ;NO
00AD 020C            262                ST=1?        2           ;ROM?
00AE 0007            263                GOC          XGI55       ;YES
00AF 00C4            264 XGI54          ST=0         10          ;NO.  MUST BE RAM
00B0 0003            265                GOTO         XGI60
00B1 024C            266 XGI55          ST=1?        9           ;MICROCODE?
00B2 0003            267                GONC         XGI57       ;NO. MUST BE USER LANG
00B3 008C            268                ST=1?        5           ;MAINFRAME?
00B4 0007            269                GOC          SERR        ;YES. ERROR
00B5 0158            270                M=C                      ;SAVE ADDRESS IN M
00B6 02B8            271                C=REGN       10          ;RETRIEVE RTN ADDR
00B7 02E6            272                C#0?         X           ;XEQ?
00B8 0003            273                GONC         SERR        ;NO. AGTO ILLEGAL FOR
                     274                                         ;MICROCODE
00B9 03B8            275                C=REGN       14          ;RESTORE SS0
00BA 0358            276                ST=C                     ;
00BB 0198            277                C=M                      ;C[3:0]=XADR
00BC 01BC            278                RCR          11          ;C[6:3]=XADR
00BD 0330            279                CXISA                    ;GET WORD AT XADR
00BE 02E6            280                C#0?         X           ;PROGRAMMABLE FCN?
00BF 0003            281 SERRXF         GONC         SERR        ;NO. ERROR
00C0 01E0            282                GOTOC
                     283 *
                     284                GLB          XGI57
                     285 * XROM ENTERS AT XGI57
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LOCATION OBJECT CODE LINE     SOURCE LINE

                     286 * ON ENTRY, ADDRESS OF FIRST BYTE OF DESTINATION LABEL IS IN C[3:0],
                     287 * AND RETURN ADDRESS IS IN R10[3:0] ALREADY PACKED FOR PUSH ONTO
                     288 * SUBROUTINE STACK
00C1 00C8            289 XGI57          ST=1          10            ;ROM USER LANGUAGE
00C2 001C            290 XGI60          PT=           3             ;-
00C3 010A            291                A=C           WPT           ;-
00C4 00001000        292                GOSUB         =DECAD        ;-
00C6 0003            293                GOTO          XGI07         ;-
                     294
00C7 00001000        295 XGI            GOSUB         SAVRC         ;SAVE RETURN ADDRESSS
00C9 0284            296                ST=0          7             ;CLEAR S7 FOR ADRFCH
00CA 00001000        297                GOSUB         =ADRFCH       ;C[13:0]_REG CONTENTS
00CC 027E            298                C=C-1         S
00CD 02FE            299                C#0?          S             ;VALID # LABEL?
00CE 0003            300                GONC          XGI30         ;NOPE
00CF 00001000        301                GOSUB         =BCDBIN       ;CNVRT BCD TO BINARY
00D1 0106            302                A=C           X             ;VALID LABEL?
00D2 0130            303                LDI                         ;-
00D3 0064            304                CON           100           ;-
00D4 0306            305                A<C?          X             ;-
00D5 0003            306                GONC          SERR          ;NOPE, # TOO BIG
00D6 00001000        307                GOSUB         DOSRC1        ;SEARCH FOR LBL
00D8 001C            308 XGI05          PT=           3             ;-
00D9 010A            309                A=C           WPT           ;A[3:0]_LBL ADDR
                     310 *
                     311 *  XGI07  -  ENTRY POINT TO DO XEQ [RAM ADDRESS]
                     312 *            ADDED FOR WAND.2/13/80 JAVB.
                     313 *    ON INPUT
                     314 *       CHIP 0 ENABLED
                     315 *       REG10 HAS PACKED RETURN ADDRESS (SEE SAVRTN)
                     316 *       A[3:0] HAS RAM ADDRESS
                     317 *       PT = 3
                     318 *    NEVER RETURNS TO CALLING PROGRAM
                     319 *
                     320                GLB           XGI07
00DA 02B8            321 XGI07          C=REGN        10            ;RETRIEVE RTN ADDR
00DB 02E6            322                C#0?          X             ;XEQ?
00DC 0003            323                GONC          XGNN10        ;NO. GTO
00DD 008A            324                B=A           WPT           ;LBL ADDR TO B[3:0]
00DE 0003            325                GOTO          XEQC01
                     326
                     327
                     328
                     329
00DF 006A            330 GTSRCH         ABEX          WPT           ;A[1:0]_CORRESPONDING SHORT LBL
00E0 0386            331                ASR           X             ;-
00E1 0386            332                ASR           X             ;-
00E2 01A6            333                A=A-1         X             ;-
                     334                GLB           DOSRC1
00E3 0144            335 DOSRC1         ST=0          6             ;PGM CTR IS IN A STD PLACE
00E4 00001000        336 DOSRCH         GOSUB         =SEARC1       ;SEARCH FOR NUMERIC LABEL
00E6 02EE            337                C#0?          W             ;FOUND?
00E7 0360            338                RTNC                        ;YES
00E8 00001002        339 SERR           GOLONG        =ERRNE        ;REPORT ERROR
                     340                                            ;"NON-EXISTENT"
                     341
                     342
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LOCATION OBJECT CODE LINE     SOURCE LINE

                     343
                     344 *  XEQC01 - XEQ COMMON LOGIC
                     345 *- IF IN KEYBOARD MODE, THE SUBROUTINE RETURN STACK
                     346 *- IS CLEARED, & THE PROGRAM IS SET TO RUNNING,
                     347 *- OTHERWISE THE SUBROUTINE STACK IS PUSHED AND THE
                     348 *- PROGRAM COUNTER IS SET TO THE DESIGNATED LABEL
                     349 *- ADDRESS
                     350 *- IN:  B[3:0]= LABEL ADDRESS
                     351 *-       PT= 3
                     352 *        REG 10 [3:0] = RETURN ADDRESS ALREADY PACKED
                     353 *- OUT: CHIP 0 SELECTED
                     354 *- USES: B[3:0], C[13:0], A[13:0]
                     355 *- USES: 1 SUBROUTINE LEVEL
                     356 *
                     357 * XEQ20 - SAME AS XEQC01 EXCEPT DOESN'T CHECK FOR KEYBOARD MODE
                     358 *
                     359
                     360
                     361
00EA 0046            362 XEQC01          C=0             X               ;SELECT CHIP 0
00EB 0270            363                 DADD=C                          ;-
00EC 02CC            364                 ST=1?           13              ;RUNNING?
00ED 0007            365                 GOC             XEQ20           ;YES
00EE 03B8            366                 C=REGN          14              ;SSTFLAG?
00EF 0358            367                 ST=C                            ;-
00F0 004C            368                 ST=1?           4               ;-
00F1 0003            369                 GONC            XEQ50           ;NOPE
00F2 02B8            370 XEQ20           C=REGN          10              ;GET RETURN ADDRESS
00F3 010A            371                 A=C             WPT             ;PUT RTN ADDR TO A[3:0]
00F4 0338            372                 C=REGN          12
00F5 00AA            373                 ACEX            WPT
00F6 00FC            374                 RCR             10              ;PUSH STACK
00F7 010E            375                 A=C             W               ;-
00F8 02F8            376                 C=REGN          11              ;-
00F9 00FC            377                 RCR             10              ;-
00FA 00AA            378                 ACEX            WPT             ;-
00FB 02E8            379                 REGN=C          11              ;-
00FC 00AE            380                 ACEX            W               ;-
00FD 00001000        381                 GOSUB           =CLRSB3         ;FINISH PUSH
00FF 0003            382                 GOTO            XGNN12
                     383
0100 00EA            384 XEQ49           BCEX            WPT             ;KEYBOARD PATH
0101 00001000        385 XEQ50           GOSUB           =CLRSB2         ;CLEAR RTN STACK
0103 00001002        386                 GOLONG          =RUN
                     387
                     388
                     389
                     390 * XGNN - XEQ/GTO NUMERIC  (LONG FORM GTO)
                     391 *- PLACE THE PROGRAM COUNTER AT THE SPECIFIED NUMERIC
                     392 *- LABEL ADDRESS, COMPILING A DISPLACEMENT TO BE
                     393 *- STORED WITH THE FUNCTION UPON THE FIRST ENCOUNTER
                     394 *- OF THAT FUNCTION. (FOLLOWING A DECOMPILE)  IN THE
                     395 *- CASE OF AN XEQ, THE RETURN STACK IS PUSHED THROUGH
                     396 *- A TRANSFER TO "XEQC".
                     397 *- IN: S1= 0/1 IMPLIES GTO/XEQ FUNCTION
                     398 *-     S9=1 IMPLIES A NUMERIC SEARCH HAS BEEN
                     399 *-        PREVIOUSLY PERFORMED
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LOCATION OBJECT CODE LINE     SOURCE LINE

                     400 *-      C[1:0]= NUMERIC LABEL
                     401 *- OUT: GTO- CHIP 0 SELECTED
                     402 *-      XEQ- C[3:0]= LABEL ADDRESS
                     403 *-           PT= 3
                     404 *-           CHIP 0 SELECTED
                     405 *- USES: STATUS BITS 0,1,6,8,9, A[13:0], B[13:0], C[13:0],
                     406 *-       M[13:0], G
                     407 *- USES: 4 SUBROUTINE LEVELS
                     408
                     409
                     410
                     411
  0105 0304          412 XGTO          ST=0          1            ;GTO NN
  0106 02CC          413 XGNN          ST=1?         13           ;RUNNING?
  0107 0007          414               GOC           XGNN02       ;YES
  0108 004C          415               ST=1?         4            ;SSTFLAG?
  0109 0007          416               GOC           XGNN02       ;YES
  010A 0106          417               A=C           X            ;A[1:0]_# LBL
  010B 0198          418               C=M
  010C 024C          419               ST=1?         9
  010D 00001000      420               GSUBNC        DOSRC1
  010F 030C          421               ST=1?         1            ;XEQ?
  0110 0007          422               GOC           XEQ49
  0111 010A          423               A=C           WPT
  0112 00001000      424 XGNN10        GOSUB         =PUTPCX      ;-
  0114 00001002      425 XGNN12        GOLONG        =NFRPU       ;-
  0116 00CC          426 XGNN02        ST=1?         10           ;ROM?
  0117 0003          427               GONC          XGNN20       ;NOPE
  0118 010A          428               A=C           WPT          ;-
  0119 0002          429               A=0           PT           ;-
  011A 0338          430               C=REGN        12           ;NO, A[2:0]_FULL REL ADDR.
  011B 01BC          431               RCR           11           ;-
  011C 023A          432               C=C+1         M            ;-
  011D 0330          433               CXISA                      ;-
  011E 00A6          434               ACEX          X            ;-
  011F 00B6          435               ACEX          XS           ;-
  0120 023A          436               C=C+1         M            ;DETERMINE SIGN
  0121 0330          437               CXISA                      ;-
  0122 02FC          438               RCR           13           ;-
  0123 01E6          439               C=C+C         X            ;-
  0124 0007          440               GOC           XGNN15       ;ADD
  0125 0338          441               C=REGN        12           ;PGMCTR_PGMCTR-REL ADDR.
  0126 00AA          442               ACEX          WPT          ;-
  0127 01CA          443               A=A-C         WPT          ;-
  0128 030C          444 XGNN05        ST=1?         1            ;XEQ?
  0129 0003          445 XGNN06        GONC          XGNN10       ;NOPE
  012A 008A          446               B=A           WPT          ;B[3:0]_LBL ADDRESS
  012B 0003          447               GOTO          XEQ20
                     448
  012C 0338          449 XGNN15        C=REGN        12           ;PGMCTR_PGMCTR+REL ADDR.
  012D 014A          450               A=A+C         WPT          ;-
                     451               LEGAL
  012E 0003          452               GOTO          XGNN05       ;-
                     453 *
                     454
  012F 0308          455 XXEQ          ST=1          1            ;XEQ
  0130 00EE          456               BCEX          W            ;SAVE FC & 2ND BYTE IN B
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    0131 00001000     457                GOSUB        =GETPC       ;CALC RETURN ADDRESS
    0133 00001000     458                GOSUB        =INCAD       ;INCREMENT OVER 2ND AND
    0135 00001000     459                GOSUB        =INCAD       ; 3RD BYTES OF XEQ NN
    0137 00AA010A     460                C=A          WPT          ;COPY ADDR TO C[3:0]
    0139 00001000     461                GOSUB        SAVR10       ;REQ ADDR IN BOTH A AND C
                      462                                           ;SAVES RTN ADDR IN R10
    013B 00EE         463                BCEX         W            ;RESTORE C
    013C 0003         464                GOTO         XGNN
                      465
                      466
    013D 010C         467 XGNN20         ST=1?        8            ;FULL REL ADDR?
    013E 0003         468                GONC         XGNN25       ;YES
    013F 00EA         469                BCEX         WPT          ;NO, C[2:0]_FULL REL ADDR
    0140 00001000     470                GOSUB        =GETPCA      ;-
    0142 00001000     471                GOSUB        =NXBYTA      ;-
    0144 00D6         472                C=B          XS           ;-
    0145 02E6         473 XGNN25         C#0?         X            ;COMPILE?
    0146 0003         474                GONC         XGNN65       ;YES
    0147 0042         475                C=0          PT           ;UNPACK REL ADDR &
    0148 01EA         476                C=C+C        WPT          ;-   INC BYTE BY 2
    0149 01EA         477                C=C+C        WPT          ;-
    014A 01EA         478                C=C+C        WPT          ;-
    014B 0222         479                C=C+1        PT           ;-
    014C 01E2         480                C=C+C        PT           ;-
    014D 01E6         481                C=C+C        X            ;-
    014E 0007         482                GOC          XGNN50       ;-
    014F 03C6         483                CSR          X            ;-
    0150 00EA         484 XGNN30         BCEX         WPT          ;B[3:0]_REL ADDR  (MM)
    0151 00001000     485                GOSUB        =GT3DBT      ;GET 3RD BYTE
    0153 01D8         486                MCEX                      ;M_ORG STATUS, C_PGMCTR
    0154 006A         487                ABEX         WPT          ;A[3:0]_REL ADDR
    0155 028C         488                ST=1?        7            ;SUBTRACT?
    0156 0003         489                GONC         XGNN60       ;YES
    0157 0146         490                A=A+C        X            ;-
    0158 0142         491                A=A+C        PT           ;A[3:0]_LBL ADDR
    0159 0003         492                GONC         XGNN55       ;-
    015A 0166         493                A=A+1        X            ;-
    015B 0198         494 XGNN35         C=M                       ;RESTORE ORG STATUS
    015C 0358         495                ST=C                      ;-
                      496                GLB          XGNN40
    015D 0046         497 XGNN40         C=0          X            ;RE-ENABLE CHIP 0
    015E 0270         498                DADD=C
    015F 0003         499                GOTO         XGNN05
                      500
    0160 03C6         501 XGNN50         CSR          X            ;-
    0161 0236         502                C=C+1        XS           ;-
                      503                LEGAL
    0162 0003         504                GOTO         XGNN30       ;-
                      505
    0163 01A2         506 XGNN55         A=A-1        PT           ;BYTE_BYTE-2
    0164 01A2         507                A=A-1        PT           ;-
                      508                LEGAL
    0165 0003         509                GOTO         XGNN35       ;-
                      510
    0166 00AA         511 XGNN60         ACEX         WPT          ;A[3:0]_PGMCTR-REL ADDR
    0167 0262         512                C=C-1        PT           ;-
    0168 0262         513                C=C-1        PT           ;-
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LOCATION OBJECT CODE LINE     SOURCE LINE

                     514                LEGAL
0169 00001000        515                GOSUB        =CALDSP      ;CALCULATE DISPLACEMENT
016B 0003            516                GOTO         XGNN35       ;-
                     517
                     518
016C 0108            519 XGNN65         ST=1         8            ;-
016D 00001000        520                GOSUB        =GT3DBT      ;GET 3RD BYTE
016F 0284            521                ST=0         7            ;DECOMPILE DOESN'T CLEAR
                     522                                           ;BIT 7 OF THE THIRD BYTE
0170 03D8            523                CSTEX                      ;-
0171 0106            524                A=C          X            ;-
0172 0148            525                ST=1         6            ;PGM PTR IS AT 1ST BYTE
                     526                                           ;OF 3 BYTE FC
0173 00001000        527                GOSUB        =DOSRCH      ;SEARCH RAM FOR LBL
0175 010A            528                A=C          WPT          ;CALCULATE DISPLACEMENT
0176 01D8            529                MCEX                      ;-  (M_LBL ADDRESS)
0177 0366            530                A#C?         X            ;-
0178 0007            531                GOC          XGNN70       ;-
0179 0302            532                A<C?         PT           ;-
017A 0003            533                GONC         XGNN80       ;-
017B 0003            534                GOTO         XGNN75       ;-
017C 0306            535 XGNN70         A<C?         X            ;-
017D 0003            536                GONC         $+3          ;-
017E 0104            537 XGNN75         ST=0         8            ;-
017F 00AA            538                ACEX         WPT          ;-
0180 0246            539 XGNN80         C=A-C        X            ;-  (#REGS)
0181 0242            540                C=A-C        PT           ;-  (#BYTES)
0182 0003            541                GONC         $+4          ;-  (NO CARRY)
0183 0266            542                C=C-1        X            ;-  (REG_REG-1)
0184 0262            543                C=C-1        PT           ;-  (BYTE_BYTE-2)
0185 0262            544                C=C-1        PT           ;-
0186 01E6            545                C=C+C        X            ;PACK DISPLACEMENT
0187 01E6            546                C=C+C        X            ;-
0188 01E6            547                C=C+C        X            ;-
0189 01E6            548                C=C+C        X            ;-
018A 0003            549                GONC         $+2          ;-
018B 0222            550                C=C+1        PT           ;-
018C 03CA            551                CSR          WPT          ;-
018D 00E6            552                BCEX         X            ;REL ADDR_DISPLACEMENT
018E 00001000        553                GOSUB        =GETPC       ;-
0190 00001000        554                GOSUB        =GTBYTA      ;-
0192 037C            555                RCR          12           ;-
0193 00C6            556                C=B          X            ;-
0194 023C            557                RCR          2            ;-
0195 00FA            558                BCEX         M            ;-
0196 00FE            559                BCEX         S            ;-
0197 00001000        560                GOSUB        =PTBYTA      ;-
0199 00001000        561                GOSUB        =INCADA      ;-
019B 00CE            562                C=B          W            ;-
019C 037C            563                RCR          12           ;-
019D 00001000        564                GOSUB        =PTBYTA      ;-
019F 00001000        565                GOSUB        =NXBYTA      ;SET BIT 8 OF LABEL BYTE
01A1 03D8            566                CSTEX                      ;-
01A2 0284            567                ST=0         7            ;-
01A3 010C            568                ST=1?        8            ;-
01A4 0003            569                GONC         $+2          ;-
01A5 0288            570                ST=1         7            ;-
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LOCATION OBJECT CODE LINE     SOURCE LINE

    01A6 03D8          571                 CSTEX                          ;-
    01A7 00001000      572                 GOSUB          =PTBYTA         ;-
    01A9 0198          573                 C=M1                           ;A[3:0]_LBL ADDRESS
    01AA 010A          574                 A=C            WPT             ;-
    01AB 00001002      575                 GOLONG         =XGNN40         ;-
                       576
                       577 * GT3DBT MOVED TO CNO
                       578
                       579
    01AD 00001000      580 ROW11           GOSUB          =INCGT2         ;GET 2ND BYTE
    01AF 0356          581                 A#0?           XS              ;SHORT GTO?
    01B0 03A0          582                 RTNNC                          ;NOPE
    01B1 008A          583                 B=A            WPT             ;-
    01B2 0016          584                 A=0            XS              ;-
    01B3 00CC          585                 ST=1?          10              ;ROM?
    01B4 0003          586                 GONC           SGT025          ;NOPE
    01B5 0346          587                 A#0?           X               ;NEED SEARCH?
    01B6 0003          588                 GONC           SGT015          ;YES
    01B7 0002          589                 A=0            PT              ;-
    01B8 00A6          590                 ACEX           X               ;STATUS_BYTE2
    01B9 0358          591                 ST=C                           ;-
    01BA 028C          592                 ST=1?          7               ;SUBTRACT?
    01BB 0003          593                 GONC           SGT010          ;YES
    01BC 0284          594                 ST=0           7               ;PGMCTR_PGMCTR+ REL ADDR
    01BD 0398          595                 C=ST                           ;-
    01BE 0106          596                 A=C            X               ;-
    01BF 0338          597                 C=REGN         12              ;-
    01C0 014A          598                 A=A+C          WPT             ;-
                       599                 LEGAL
    01C1 0003          600                 GOTO           SGT020          ;-
                       601
    01C2 0106          602 SGT010          A=C            X               ;PGMCTR_PGMCTR-REL ADDR
    01C3 0338          603                 C=REGN         12              ;-
    01C4 00AA          604                 ACEX           WPT             ;-
    01C5 01CA          605                 A=A-C          WPT             ;-
                       606                 LEGAL
    01C6 0003          607                 GOTO           SGT020          ;-
                       608
    01C7 00001000      609 SGT015          GOSUB          =GTSRCH         ;SEARCH FOR NUMERIC SHORT LBL
    01C9 010A          610 SGT019          A=C            WPT             ;PGMCTR_LBL ADDRESS
    01CA 00001002      611 SGT020          GOLONG         =XGNN10         ;-
                       612
                       613
    01CC 0346          614 SGT025          A#0?           X               ;NEED COMPILE?
    01CD 0003          615                 GONC           SGT040          ;YES
    01CE 03EA          616                 ASL            WPT             ;UNPACK REL ADDR(EXCEPT FOR +- BIT)
    01CF 03EA          617                 ASL            WPT             ;-
    01D0 0386          618                 ASR            X               ;-
    01D1 0386          619                 ASR            X               ;-
    01D2 0338          620                 C=REGN         12              ;A[3:0]_PGMCTR
    01D3 01E2          621                 C=C+C          PT              ;-
    01D4 00AA          622                 ACEX           WPT             ;C[3:0]_REL ADDR
    01D5 01E2          623                 C=C+C          PT              ;ADD?
    01D6 0007          624                 GOC            SGT030          ;YES
    01D7 00001000      625                 GOSUB          =CALDSP         ;CALCULATE DISPLACEMENT
    01D9 0003          626                 GOTO           SGT020          ;-
                       627
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LOCATION OBJECT CODE LINE     SOURCE LINE

    01DA 0146          628 SGT030          A=A+C          X              ;-
    01DB 0222          629                 C=C+1          PT             ;PGMCTR_PGMCTR+REL ADDR
    01DC 0222          630                 C=C+1          PT             ;-
    01DD 0142          631                 A=A+C          PT             ;-
    01DE 0003          632                 GONC           SGT035         ;-
    01DF 0166          633                 A=A+1          X              ;-
                       634                 LEGAL
    01E0 0003          635                 GOTO           SGT020         ;-
                       636
    01E1 01A2          637 SGT035          A=A-1          PT             ;-
    01E2 01A2          638                 A=A-1          PT             ;-
                       639                 LEGAL
    01E3 0003          640                 GOTO           SGT020         ;-
                       641
    01E4 0104          642 SGT040          ST=0           8              ;-
    01E5 00001000      643                 GOSUB          =GTSRCH        ;SEARCH
    01E7 0158          644                 M=C            ;-
    01E8 00001000      645                 GOSUB          =GETPC         ;A[3:0]_PGMCTR
    01EA 0070          646                 N=C            ;-
    01EB 0198          647                 C=M            ;C[3:0]_LBL ADDR
    01EC 0366          648                 A#C?           X              ;-
    01ED 0007          649                 GOC            SGT045         ;-
    01EE 0302          650                 A<C?           PT             ;-
    01EF 0003          651                 GONC           SGT055         ;-
    01F0 0003          652                 GOTO           SGT050         ;-
    01F1 0306          653 SGT045          A<C?           X              ;CALCULATE DISPLACEMENT
    01F2 0003          654                 GONC           $+3            ;-
    01F3 0108          655 SGT050          ST=1           8              ;-
    01F4 00AA          656                 ACEX           WPT            ;-
    01F5 00001000      657 SGT055          GOSUB          =CALDSP        ;CALCULATE DISPLACEMENT
    01F7 0356          658                 A#0?           XS             ;>=MAX?
    01F8 0007          659                 GOC            SGT060         ;YES
    01F9 03E6          660                 ASL            X              ;PACK REL ADDR
    01FA 0356          661                 A#0?           XS             ;>=MAX?
    01FB 0007          662                 GOC            SGT060         ;YES
    01FC 03E6          663                 ASL            X              ;-
    01FD 038A          664                 ASR            WPT            ;-
    01FE 00B0          665                 C=N            ;-
    01FF 00AA          666                 ACEX           WPT            ;-
    0200 010C          667                 ST=1?          8              ;-
    0201 0003          668                 GONC           $+2            ;-
    0202 0222          669                 C=C+1          PT             ;-
    0203 01EA          670                 C=C+C          WPT            ;-
    0204 01EA          671                 C=C+C          WPT            ;-
    0205 01EA          672                 C=C+C          WPT            ;-
    0206 01E6          673                 C=C+C          X              ;-
    0207 023C          674                 RCR            2              ;-
    0208 00001000      675                 GOSUB          =PTBYTA        ;-
    020A 0198          676 SGT060          C=M            ;PGMCTR_LBL ADDR
    020B 00001002      677                 GOLONG         =SGT019        ;-
                       678
                       679 * CALDSP MOVED TO CNO
                       680
                       681
    020D 021C          682 SAROM           PT=            2              ;PT_1 & A[13]_6
    020E 0190          683                 LC             6              ;-
    020F 003C          684                 RCR            3              ;-
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    0210 011E          685                 A=C             S               ;-
    0211 0198          686                 C=M                             ;-
    0212 00EE          687 SAR002          BCEX            W               ;CONVERT ASCII CHAR TO LCD
    0213 006A          688                 ABEX            WPT             ;-
    0214 00001000      689                 GOSUB           =MASK           ;-
    0216 0000          690                 NOP
    0217 031C          691                 PT=             1               ;-
    0218 02F6          692                 C#0?            XS              ;SPECIAL CHARACTER?
    0219 0003          693                 GONC            $+3             ;NOP
    021A 0110          694                 LC              4               ;ADJUST SPECIAL CHARACTER
    021B 031C          695                 PT=             1               ;-
    021C 00EE          696                 BCEX            W               ;PLACE LCD CHAR IN STRING
    021D 00EA          697                 BCEX            WPT             ;-
    021E 023C          698                 RCR             2               ;-
    021F 02EA          699                 C#0?            WPT             ;DONE?
    0220 0003          700                 GONC            SAR004          ;YES
    0221 01BE          701                 A=A-1           S               ;7 CHARS?
    0222 0007          702                 GOC             SAR006          ;YES
    0223 0003          703                 GOTO            SAR002          ;NXT CHAR
    0224 023C          704 SAR004          RCR             2               ;RIGHT JUSTIFY
    0225 02EA          705                 C#0?            WPT             ;-
    0226 0003          706                 GONC            $-2             ;-
    0227 0158          707 SAR006          M=C                             ;M LCD CHAR STRING
    0228 0084          708                 ST=0            5               ;MAINFRAME TBL 3RD
    0229 015C          709                 PT=             6               ;B[M]_C[M]_56K
    022A 004E          710                 C=0             W               ;-
    022B 0270          711                 DADD=C                          ;-  (SEL CHIP 0)
    022C 0150          712                 LC              5               ;-
    022D 00FA          713 SAR011          BCEX            M               ;-
    022E 00DA          714 SAR010          C=B             M               ;TABLE THERE?
    022F 039C          715                 PT=             0               ;- (G_ROM ID)
    0230 0330          716                 CXISA                           ;!!!!!!!SHOULD BE CXISA!!!!!!
    0231 0058          717                 G=C                             ;-
    0232 023A          718                 C=C+1           M               ;-
    0233 0330          719                 CXISA                           ;!!!!!SHOULD BE CXISA!!!!!!
    0234 02E6          720                 C#0?            X               ;-
    0235 0007          721                 GOC             SAR020          ;YES
    0236 015C          722 SAR015          PT=             6               ;ADJUST ADDR
    0237 00DA          723                 C=B             M               ;-
    0238 0222          724                 C=C+1           PT              ;-
    0239 0003          725                 GONC            SAR011          ;-
    023A 0050          726                 LC              1               ;LOAD MAIN ADDR - 1 (11777 OCT)
    023B 00D0          727                 LC              3
    023C 03D0          728                 LC              15
    023D 03D0          729                 LC              15
    023E 0088          730                 ST=1            5               ;SEARCH MAINFRAME TBL NOW
    023F 031C          731 SAR020          PT=             1               ;C[6:3]_LBL ADDR
    0240 023A          732 SAR021          C=C+1           M               ;-
    0241 0330          733 SAR022          CXISA                           ;-
    0242 008C          734                 ST=1?           5               ;MAINFRAME SEARCH?
    0243 0007          735                 GOC             SAR042          ;YES
    0244 00E6          736                 BCEX            X               ;-
    0245 023A          737                 C=C+1           M               ;-
    0246 0330          738                 CXISA                           ;-
    0247 02C6          739                 B#0?            X               ;- (END OF TABLE?)
    0248 0007          740                 GOC             SAR025          ;-
    0249 02E6          741                 C#0?            X               ;-
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LOCATION OBJECT CODE LINE     SOURCE LINE

    024A 0003          742                GONC        SAR015      ;-  (YES)
    024B 00E6          743 SAR025         BCEX        X           ;-
    024C 010E          744                A=C         W           ;-
    024D 00BC          745                RCR         5           ;-
    024E 0142          746                A=A+C       PT          ;-
    024F 027C          747                RCR         9
    0250 00A6          748                ACEX        X
    0251 037C          749                RCR         12
    0252 00CA          750                C=B         WPT         ;-
    0253 0070          751                N=C                     ;SAVE LBL ADDR IN N
    0254 01BC          752                RCR         11          ;-
    0255 00A6          753                ACEX        X           ;-
    0256 01F6          754                C=C+C       XS          ;-
    0257 01F6          755                C=C+C       XS          ;-
    0258 01F6          756                C=C+C       XS          ;-
    0259 0003          757                GONC        SAR045      ;-
    025A 023A          758                C=C+1       M           ;C[13]_# LBL CHARS
    025B 023A          759                C=C+1       M           ;-
    025C 010E          760                A=C         W           ;-
    025D 0330          761                CXISA                   ;-
    025E 033C          762                RCR         1           ;-
    025F 011E          763                A=C         S           ;-
    0260 0278          764                C=REGN      9           ;-  (A[13:0]_ALPHA CHARS)
    0261 00AE          765                ACEX        W           ;-
    0262 027E          766                C=C-1       S           ;-
    0263 023A          767                C=C+1       M           ;-
    0264 023A          768 SAR030         C=C+1       M           ;C[1:0]_1 LBL CHAR
    0265 0330          769                CXISA                   ;EQUAL?
    0266 036A          770                A#C?        WPT         ;-
    0267 0007          771                GOC         SAR040      ;NO
    0268 027E          772                C=C-1       S           ;DEC LBL COUNT
    0269 038E          773                ASR         W           ;SHIFT A TO NXT CHAR
    026A 038E          774                ASR         W           ;-
    026B 02FE          775                C#0?        S           ;END OF LBL?
    026C 0007          776                GOC         SAR035      ;NOPE
    026D 034A          777                A#0?        WPT         ;END OF CHRS?
    026E 0007          778                GOC         SAR040      ;NOPE
    026F 0244          779                ST=0        9           ;USER_TRUE
    0270 0003          780                GOTO        SAR055      ;-
    0271 034A          781 SAR035         A#0?        WPT         ;END OF CHRS?
    0272 0007          782                GOC         SAR030      ;NOPE, TST NXT CHAR
    0273 00BC          783 SAR040         RCR         5           ;GET NXT TBL ENTRY
    0274 0003          784                GOTO        SAR021      ;-
                       785
    0275 001C          786 SAR042         PT=         3           ;SET PTR
    0276 0106          787                A=C         X           ;A[2:0]_LBL ADDR
    0277 0346          788                A#0?        X           ;END OF MAINFRAME TBL?
    0278 0007          789                GOC         $+3         ;NOPE
    0279 004E          790                C=0         W           ;RETURN W/ERROR
    027A 03E0          791                RTN                     ;-
    027B 0130          792                LDI                     ;HOLE?
    027C 03DF          793                CON         1737Q       ;-
    027D 0306          794                A<C?        X           ;-
    027E 0007          795                GOC         SAR043      ;NOPE
    027F 01C6          796                A=A-C       X           ;SUBTRACT OFFSET
    0280 003C          797                RCR         3           ;TBL ADDR_ TBL ADDR+DISPLACEMENT
    0281 0002          798                A=0         PT          ;-
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LOCATION OBJECT CODE LINE     SOURCE LINE

    0282 020A          799                 C=A+C          WPT            ;-
    0283 01BC          800                 RCR            11             ;-
    0284 00001002      801                 GOLONG         =SAR022        ;CHECK NEXT TBL ENTRY
    0286 00A6          802 SAR043          ACEX           X              ;-
    0287 02FC          803                 RCR            13             ;N_LBL ADDR
    0288 03CA          804                 CSR            WPT            ;-
    0289 0222          805                 C=C+1          PT             ;-
    028A 031C          806                 PT=            1              ;-
    028B 0070          807                 N=C                           ;-
    028C 01BC          808                 RCR            11             ;TEST FOR ALBL MATCH
    028D 010E          809 SAR045          A=C            W              ;A_ALPHA STRING
    028E 0198          810                 C=M                           ;-
    028F 00AE          811                 ACEX           W              ;-
    0290 027A          812 SAR047          C=C-1          M              ;GET NXT CHAR
    0291 0330          813                 CXISA                         ;-
    0292 02EA          814                 C#0?           WPT            ;IS THERE A PROMPT STRING?
    0293 0003          815                 GONC           SAR048         ;NO
    0294 0104          816                 ST=0           8              ;S8_END BIT
    0295 03D8          817                 CSTEX                         ;-
    0296 028C          818                 ST=1?          7              ;-
    0297 0003          819                 GONC           $+3            ;-
    0298 0284          820                 ST=0           7              ;-
    0299 0108          821                 ST=1           8              ;-
    029A 03D8          822                 CSTEX                         ;-
    029B 036A          823                 A#C?           WPT            ;EQUAL?
    029C 0007          824                 GOC            SAR048         ;NOPE
    029D 038E          825                 ASR            W              ;-
    029E 038E          826                 ASR            W              ;-
    029F 010C          827                 ST=1?          8              ;END OF LBL?
    02A0 0007          828                 GOC            SAR050         ;YES
    02A1 034A          829                 A#0?           WPT            ;END OF CHARS?
    02A2 0007          830                 GOC            SAR047         ;NOPE
    02A3 007C          831 SAR048          RCR            4              ;GET NXT ENTRY
    02A4 008C          832                 ST=1?          5              ;REALIGN OLD ADDR
    02A5 0007          833                 GOC            $+2            ;-
    02A6 033C          834                 RCR            1              ;-
    02A7 00001002      835                 GOLONG         =SAR021        ;-
    02A9 034A          836 SAR050          A#0?           WPT            ;END OF CHARS?
    02AA 0007          837                 GOC            SAR048         ;NOPE
    02AB 0248          838                 ST=1           9              ;UCODE_TRUE
    02AC 00B0          839 SAR055          C=N                           ;C[3:0]_ADDR & F.C.
                       840 * NEXT TWO INSTRUCTIONS (PT=7,LC 0) MAY NOT BE NECESSARY.
    02AD 029C          841                 PT=            7              ;-
    02AE 0010          842                 LC             0              ;-
    02AF 008C          843                 ST=1?          5              ;XROM?
    02B0 0007          844                 GOC            SAR060         ;NOPE
    02B1 010E          845                 A=C            W              ;C[7:4]_XROM F.C.
    02B2 023C          846                 RCR            2              ;CONSTRUCT TABLE INDEX PART
    02B3 027A          847                 C=C-1          M              ;-
    02B4 027A          848                 C=C-1          M              ;-
    02B5 01FA          849                 C=C+C          M              ;-
    02B6 01FA          850                 C=C+C          M              ;-
    02B7 01FA          851                 C=C+C          M              ;-
    02B8 03DA          852                 CSR            M              ;-
    02B9 01FA          853                 C=C+C          M              ;CONSTRUCT ROM ID PART
    02BA 01FA          854                 C=C+C          M              ;-
    02BB 009C          855                 PT=            5              ;-
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LOCATION OBJECT CODE LINE     SOURCE LINE

    02BC 0098          856                 C=G                          ;-
    02BD 01FA          857                 C=C+C          M             ;-
    02BE 01FA          858                 C=C+C          M             ;-
    02BF 029C          859                 PT=            7             ;CONSTRUCT XROM FC PART
    02C0 0290          860                 LC             10            ;-
    02C1 001C          861                 PT=            3             ;-
    02C2 00AA          862                 ACEX           WPT           ;C[3:0]_ROM ADDR & C[5:4]_F.C.
    02C3 0208          863 SAR060          ST=1           2             ;-
    02C4 03E0          864                 RTN                          ;RETURN
                       865
                       866
                       867
                       868 *  ASRCH - ALPHA SEARCH
                       869 *- LOCATE THE ADDRESS OF AN ALPHA STRING.  THE ALPHA
                       870 *- STRING MAY APPLY TO AN ALPHA LABEL IN RAM OR A
                       871 *- FUNCTION IN THE MAIN FRAME OR PLUG-IN ROMS. IF THE
                       872 *- FUNCTION IS LOCATED IN A PLUG-IN ROM, RETURN THE
                       873 *- XROM FUNCTION CODE.  IF THE FUNCTION IS LOCATED IN
                       874 *- THE MAINFRAME, RETURN ITS FUNCTION CODE.  IF THE
                       875 *- FUNCTION IS LOCATED IN RAM, RETURN THE ALPHA LABEL
                       876 *- ADDRESS.
                       877 *-
                       878 *- IN:  M[13:0] AND REG 9[13:0] = ALPHA LABEL (2 COPIES)
                       879 *-
                       880 *- OUT: C[3:0]= ADDRESS (IF USER LANG, THIS IS ADDRESS OF FIRST
                       881 *                       BYTE OF LABEL)
                       882 *-      C[7:4]= FUNCTION CODE
                       883 *-      S2=1/0 IMPLIES ROM/RAM ADDRESS
                       884 *-      C=0 IMPLIES NOT FOUND
                       885 *-      S9=1/0 IMPLIES MICROCODE/USER CODE
                       886 *-      S5=1 IMPLIES A MAINFRAME FUNCTION
                       887 *       CHIP 0 ENABLED
                       888 *-
                       889 *- USES: M,A,B,C,G,N,STATUS,PTR P,REG 9
                       890 *-       STATUS BITS 2,3,5,8,9
                       891 *- USES: 2 SUBROUTINE LEVELS
                       892
                       893
    02C5 0378          894 ASRCH           C=REGN         13            ;A[3:0]_END ADDR  (RAM 1ST)
    02C6 001C          895                 PT=            3             ;-
    02C7 0110          896                 LC             4             ;C[2:0]_END LINK
    02C8 001C          897                 PT=            3             ;-
    02C9 010A          898                 A=C            WPT           ;-
    02CA 0270          899                 DADD=C                       ;-
    02CB 0038          900                 C=DATA                       ;-
    02CC 023C          901                 RCR            2             ;-
    02CD 02E6          902 SARA10          C#0?           X             ;END?
    02CE 00001002      903                 GOLNC          =SAROM        ;YES
    02D0 00001000      904                 GOSUB          =UPLINK       ;GET NXT LINK ADDR
    02D2 023E          905                 C=C+1          S             ;ALBL?
    02D3 0003          906                 GONC           SARA10        ;NOPE
    02D4 027C          907 SARA20          RCR            9             ;G_# ALPHA LBL CHARS
    02D5 0262          908                 C=C-1          PT            ;-
    02D6 0058          909                 G=C                          ;-
    02D7 008A          910                 B=A            WPT           ;A[7:0]_LBL ADDR & CHAR ADDR
    02D8 00CA          911                 C=B            WPT           ;-
    02D9 00FC          912                 RCR            10            ;-
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LOCATION OBJECT CODE LINE     SOURCE LINE

   02DA 00CA          913                 C=B             WPT             ;-
   02DB 010E          914                 A=C             W               ;GET 1ST CHAR
   02DC 00001000      915                 GOSUB           =INCAD2         ;-
   02DE 00001000      916                 GOSUB           =INCADA         ;-
   02E0 0198          917                 C=M                             ;B[13:0]_ALPHA STRING
   02E1 00EE          918                 BCEX            W               ;-
   02E2 006E          919                 ABEX            W               ;-
   02E3 006E          920 SARA30          ABEX            W               ;GET NXT BYT
   02E4 001C          921                 PT=             3               ;-
   02E5 00001000      922                 GOSUB           =NXBYTA         ;-
   02E7 006E          923                 ABEX            W               ;-
   02E8 031C          924                 PT=             1               ;-
   02E9 036A          925                 A#C?            WPT             ;EQUAL?
   02EA 0007          926                 GOC             SARA40          ;NOPE
   02EB 038E          927                 ASR             W               ;SHIFT TO NXTCHAR
   02EC 038E          928                 ASR             W               ;-
   02ED 0098          929                 C=G                             ;DEC COUNT LBL CHARS
   02EE 0262          930                 C=C-1           PT              ;-
   02EF 0058          931                 G=C                             ;-
   02F0 02E2          932                 C#0?            PT              ;END LBL CHARS?
   02F1 0003          933                 GONC            SARA50          ;YES
   02F2 034A          934                 A#0?            WPT             ;END STR CHARS?
   02F3 0007          935                 GOC             SARA30          ;NOPE
   02F4 001C          936 SARA40          PT=             3               ;GET NXT LINK
   02F5 00CE          937                 C=B             W               ;-
   02F6 007C          938                 RCR             4               ;-
   02F7 010A          939                 A=C             WPT             ;-
   02F8 00BC          940                 RCR             5               ;-
   02F9 0003          941                 GOTO            SARA10          ;-
   02FA 034A          942 SARA50          A#0?            WPT             ;END STR CHARS?
   02FB 0007          943                 GOC             SARA40          ;NOPE
   02FC 0046          944                 C=0             X               ;ENABLE CHIP 0
   02FD 0270          945                 DADD=C                          ;-
   02FE 00CE          946                 C=B             W               ;C[3:0]_ADDR
   02FF 007C          947                 RCR             4               ;-
   0300 0204          948                 ST=0            2               ;RAM
   0301 0244          949                 ST=0            9               ;USERCODE_TRUE
   0302 03E0          950                 RTN                             ;RETURN
                      951 *
                      952 *  RTN - RETURN
                      953 *- POPS THE SUBROUTINE RETURN STACK IF RUNNING,
                      954 *- OTHERWISE, IT PLACES THE PROGRAM COUNTER AT THE
                      955 *- BEGINNING OF THE CURRENT PROGRAM
                      956 *- IN:  CHIP 0 SELECTED
                      957 *- OUT:
                      958 *- USES: STATUS BITS 13 & 12, C[13:0], A[13:0],
                      959 *-       B[3:0], M[13:0]
                      960 *- USES: 2 SUBROUTINE LEVELS
                      961
                      962
   0303 0244          963 XRTN            ST=0            9               ;REMEMBER THIS IS RTN
   0304 001C          964                 PT=             3               ;-
   0305 02CC          965 RTN00           ST=1?           13              ;RUNNING?
   0306 0007          966                 GOC             RTN10           ;YES
   0307 004C          967                 ST=1?           4               ;SSTFLAG?
   0308 0003          968                 GONC            RTN30           ;NOPE
   0309 02F8          969 RTN10           C=REGN          11              ;POP RTN STK
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LOCATION OBJECT CODE LINE     SOURCE LINE

    030A 010E         970                 A=C             W               ;-
    030B 0338         971                 C=REGN          12              ;-
    030C 00AA         972                 ACEX            WPT             ;-
    030D 007C         973                 RCR             4               ;-
    030E 02EA         974                 C#0?            WPT             ;-  (POP ZERO?)
    030F 0003         975                 GONC            RTN21           ;-  (YES)
    0310 00C8         976                 ST=1            10              ;ASSUME NEW PC IS IN ROM
    0311 02E2         977                 C#0?            PT              ;-  (NEED UNPACK?)
    0312 0007         978                 GOC             RTN15           ;-  (NOPE)
    0313 00C4         979                 ST=0            10              ;NEW PC IS IN RAM
    0314 01EA         980                 C=C+C           WPT             ;- (UNPACK)
    0315 01EA         981                 C=C+C           WPT             ;-
    0316 01EA         982                 C=C+C           WPT             ;-
    0317 01E6         983                 C=C+C           X               ;-
    0318 0007         984                 GOC             RTN25           ;-
    0319 03C6         985                 CSR             X               ;-
    031A 0328         986 RTN15           REGN=C          12              ;-
    031B 00AE         987                 ACEX            W               ;-
    031C 004A         988                 C=0             WPT             ;-
    031D 007C         989                 RCR             4               ;-
    031E 02E8         990                 REGN=C          11              ;-
    031F 03F8         991                 C=REGN          15              ;LINE_FFF
    0320 0046         992                 C=0             X               ;-
    0321 0266         993                 C=C-1           X               ;-
    0322 03E8         994                 REGN=C          15              ;-
    0323 00001002     995                 GOLONG          =CHKRPC
                      996
    0325 03C6         997 RTN25           CSR             X               ;-
    0326 0236         998                 C=C+1           XS              ;-
                      999                 LEGAL
    0327 0003        1000                 GOTO            RTN15           ;-
                     1001 *
                     1002 *  XEND - EXECUTE END
                     1003 *  WHEN EXECUTING FROM THE KEYBOARD, OR WHEN RUNNING AND
                     1004 *- IF THE SUBROUTINE STACK IS EMPTY, THEN THE
                     1005 *- PROGRAM COUNTER IS PLACED AT THE CURRENT
                     1006 *- PROGRAM HEAD, OTHERWISE, A RETURN FUNCTION
                     1007 *- IS PERFORMED
                     1008 *- IN:
                     1009 *- OUT:
                     1010 *- USES: C[13:0], A[3:0], B[4:0]
                     1011 *- USES: 2 SUBROUTINE LEVELS
                     1012
                     1013
                     1014                 GLB             XEND
    0328             1015 XEND
                     1016                                         ;ROW LOGIC MAY LEAVE
                     1017                                         ;SOME CHIP OTHER THAN
                     1018                                         ;0 ENABLED.
    0328 004E        1019                 C=0             W       ;SELECT CHIP 0
    0329 0270        1020                 DADD=C                  ;-
    032A 0248        1021                 ST=1            9       ;REMEMBER THIS IS END
    032B 0003        1022                 GOTO            RTN00
                     1023
    032C 02C4        1024 RTN21           ST=0            13      ;CLEAR RUNNING FLAG
    032D 024C        1025                 ST=1?           9       ;IS THIS END?
    032E 03A0        1026                 RTNNC                   ;NO. MUST BE RTN
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LOCATION OBJECT CODE LINE     SOURCE LINE

    032F 03F8        1027 RTN30          C=REGN          15              ;LINE #_0
    0330 0046        1028                C=0             X               ;-
    0331 03E8        1029                REGN=C          15              ;-
    0332 00CC        1030                ST=1?           10              ;ROM?
    0333 0007        1031                GOC             RTN35           ;YES
    0334 00001000    1032                GOSUB           =FLINKP         ;GET END ADDRESS
    0336 013C        1033                RCR             8               ;-
    0337 010A        1034                A=C             WPT             ;-
    0338 00001000    1035                GOSUB           =CPGMHD         ;C[3:0]_HEAD ADDRESS
    033A 0244        1036 RTN33          ST=0            9               ;TELL DCRT10 TO RTN
    033B 00001002    1037                GOLONG          =DCRT10         ;GO CLEAR SUBROUTINE STACK
                     1038
    033D 00001000    1039 RTN35          GOSUB           =ROMHED         ;A[3:0]_CPGMHD
    033F 0003        1040                GOTO            RTN33           ;-
                     1041
                     1042
                     1043
                     1044
                     1045
                     1046 *-  ROW12 - ROW TWELVE LOGIC
                     1047 *- DISTINGUISHES LONG NUMERIC LABELS, X<> FUNCTION,
                     1048 *- END FUNCTION, AND ALPHA LABELS
                     1049 *-
                     1050 *- IN:  C[3:2]= FUNCTION CODE
                     1051 *-       CHIP 0 SELECTED
                     1052 *- USES: M[13:0], C[13:0], AND A[13:0]
                     1053 *- USES: 1 SUBROUTINE LEVEL
                     1054
                     1055 * NOTE PARSE GENERATES CD FOR THE FC OF "ALBL".  LOGIC AT ROW12A
                     1056 * IS FOR KEYBOARD EXECUTION ONLY.
                     1057
    0340 0236        1058 ROW12A         C=C+1           XS              ;ALBL F.C.?
    0341 0007        1059                GOC             ALBL            ;YES, ALPHA LABEL
    0342 0003        1060 XENDA          GOTO            XEND            ;NO, MUST BE END
                     1061
    0343 0158        1062 ROW12          M=C                             ;SAVE F.C.
    0344 0236        1063                C=C+1           XS              ;LONG LBL?
    0345 0007        1064                GOC             LBL             ;YES
    0346 0236        1065                C=C+1           XS              ;-
    0347 00001003    1066                GOLC            =XNNROW         ;-
    0349 02CC        1067                ST=1?           13              ;RUNNING?
    034A 0007        1068                GOC             RW10            ;YES
    034B 004C        1069                ST=1?           4               ;SSTFLAG?
    034C 0003        1070                GONC            ROW12A          ;NOPE
    034D 00001000    1071 RW10           GOSUB           =GETPCA         ;ALBL?
    034F 00001000    1072                GOSUB           =INCAD          ;-
    0351 00001000    1073                GOSUB           =NXTBYT         ;-
    0353 023C        1074                RCR             2               ;-
    0354 023E        1075                C=C+1           S               ;-
    0355 0003        1076                GONC            XENDA           ;GOTO END
                     1077
                     1078 * ALBL - ALPHA LABEL
                     1079 *- INCREMENT THE PROGRAM COUNTER PAST THE ALPHA LABEL,
                     1080 *  AND DROP INTO SLBL
                     1081 *- IN:  M[3:2]= ALPHA LABEL FUNCTION CODE
                     1082 *- OUT: CHIP 0 SELECTED
                     1083 *- USES: C[13:0], A[13:0], STATUS BITS 1 & 2, B[13:0]
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

                     1084 *-        M[13:0]
                     1085 *- USES: 2 SUBROUTINE LEVELS
                     1086
   0356 0198         1087 ALBL            C=M                          ;RECOVER F.C.
   0357 010E         1088                 A=C            W             ;-
   0358 0046         1089                 C=0            X             ;-
   0359 0270         1090                 DADD=C                       ;-
   035A 00001000     1091                 GOSUB          =GTAINC       ;ADVANCE PGMCTR
   035C 0003         1092                 GOTO           SLBL
                     1093 *
                     1094 *  LBL/SLBL - (NUMERIC) LABEL/SHORT LABEL
                     1095 *- INCREMENTS THE PROGRAM COUNTER PAST A NUMERIC
                     1096 *- LABEL, AND ROTATES THE GOOSE RIGHT ONE POSITION
                     1097 *-
                     1098 *- USES: 1 SUBROUTINE LEVEL
                     1099
                     1100
   035D 00001000     1101 LBL             GOSUB          =INCGT2       ;INC PGMCTR
   035F 008C         1102 SLBL            ST=1?          5             ;DISPLAY GOT SOMETHING?
                     1103                                              ;(MSGFLG?)
   0360 0360         1104                 RTNC                         ;YES
   0361 00001000     1105                 GOSUB          =ENLCD
   0363 03B8         1106                 RABCR                        ;ROTATE GOOSE
   0364 00001002     1107                 GOLONG         =ENCP00
                     1108
                     1109 *  ROW0 - ROW ZERO LOGIC
                     1110 *- DISTINGUISHES NULLS FROM SHORT LABELS
                     1111 *- SKIPS ALL NULLS
                     1112 *- IN:  C[3:]= FUNCTION CODE
                     1113 *-      PT= 3
                     1114 *- OUT: PT= 3
                     1115 *- USES: C[2]
                     1116
                     1117
                     1118
   0366 0276         1119 ROW0            C=C-1          XS            ;-
   0367 0003         1120                 GONC           SLBL          ;SHORT LBL
   0368 00001002     1121 NULL            GOLONG         =RUNING       ;SKIP ALL NULLS
                     1122
                     1123
                     1124
                     1125                 GLB            ASN20
                     1126                 GLB            XASN
                     1127
                     1128
                     1129
                     1130 *  ASN - ASSIGN FUNCTION TO KEYCODE
                     1131 *- THIS CODE PERFORMS AN ASSIGNMENT FUNCTION AND ALSO
                     1132 *- CLEARS ASSIGNMENTS.  ROM FUNCTIONS ARE ASSIGNED
                     1133 *- BY PLACING THE FUNCTION CODE & KEYCODE IN AN
                     1134 *- ASSIGNMENT TABLE.  RAM FUNCTIONS ARE ASSIGNED BY
                     1135 *- PLACING THE KEYCODE IN THE CORRESPONDING ALPHA
                     1136 *- LABEL.  THE ASSIGNMENT BIT MAP IS MAINTAINED AND
                     1137 *- ASN TABLE REGISTERS ARE CREATED BY THIS CODE ALSO.
                     1138 *- IN:  A[1:0]= KEYCODE TO BE ASSIGNED/CLEARED
                     1139 *-      REG 9 = ALPHA STRING/ZERO
                     1140 *- OUT:
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

                     1141 *- USES: A,B,C,M,N,G,REG 9,REG 10,STATUS BITS 3,8,9,2,5
                     1142 *- USES: 3 SUBROUTINE LEVELS
                     1143
                     1144
036A 0278            1145 XASN          C=REGN        9          ;REMOVE ASSIGNMENT?
036B 0158            1146               M=C                      ;-
036C 02EE            1147               C#0?          W          ;-
036D 00001002        1148               GOLNC         ASN20      ;YES
036F 02B8            1149               C=REGN        10         ;SAVE KEYCODE IN REG 10
0370 00AA            1150               ACEX          WPT        ;-
0371 02A8            1151               REGN=C        10         ;-
0372 00001000        1152               GOSUB         ASRCH      ;C[3:0]_ALBL ADDR
0374 02EE            1153               C#0?          W          ;ERROR?
0375 00001002        1154               GOLNC         =SERR      ;YES
0377 0268            1155               REGN=C        9          ;REG 9_ALBL ADDR & F.C.
0378 02B8            1156               C=REGN        10         ;A[2:1]_K.C.
0379 0106            1157               A=C           X          ;-
037A 00001000        1158               GOSUB         =TBITMA    ;TEST BIT MAP
037C 02EE            1159               C#0?          W          ;BIT SET?
037D 0003            1160               GONC          XASN02     ;NO
037E 02B8            1161               C=REGN        10         ;CLEAR KEYCODE ENTRY
037F 010E            1162               A=C           W          ;-
0380 0308            1163               ST=1          1          ;-
0381 00001000        1164               GOSUB         =GCPKC     ;-
0383 0003            1165               GOTO          $+3
0384 00001000        1166 XASN02        GOSUB         =SRBMAP    ;SET BIT
0386 02B8            1167               C=REGN        10         ;A[3:2]_K.C.  A[1:0]_0
0387 0106            1168               A=C           X          ;-
0388 03EE            1169               ASL           W          ;-
0389 03EE            1170               ASL           W          ;-
038A 0278            1171               C=REGN        9          ;B[3:0]_F.C.
038B 007C            1172               RCR           4          ;-
038C 00EE            1173               BCEX          W          ;-
038D 020C            1174               ST=1?         2          ;PLACE IN RAM?
038E 0007            1175               GOC           XASN05     ;NOPE
038F 0278            1176               C=REGN        9          ;C[3:0]_ALBL ADDRESS
0390 00AE            1177               ACEX          W          ;YES
0391 023C            1178               RCR           2          ;-
0392 00EE            1179               BCEX          W          ;SAVE K.C.
0393 001C            1180               PT=           3          ;-
0394 00001000        1181               GOSUB         =INCAD2    ;-
0396 00001000        1182               GOSUB         =INCADA    ;-
0398 00001000        1183               GOSUB         =GTBYT     ;GET KEYCODE BYTE
039A 006E            1184               ABEX          W          ;TEST FOR ASSIGN SAME KEY
039B 031C            1185               PT=           1          ;-
039C 036A            1186               A#C?          WPT        ;-
039D 03A0            1187               RTNNC                    ;KEYS EQUAL
039E 006E            1188               ABEX          W          ;PLACE KEY CODE
039F 001C            1189               PT=           3          ;-
03A0 0158            1190               M=C                      ;-
03A1 00EE            1191               BCEX          W          ;-
03A2 00001000        1192               GOSUB         =PTBYTA    ;-
03A4 031C            1193               PT=           1          ;TEST TO UPDATE BIT MAP
03A5 0198            1194               C=M                      ;-
03A6 02EA            1195               C#0?          WPT        ;-
03A7 03A0            1196               RTNNC                    ;NOT NEEDED
03A8 00AE            1197               ACEX          W          ;-
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    03A9 0046        1198                 C=0            X              ;-
    03AA 0270        1199                 DADD=C                        ;-
    03AB 00001002    1200                 GOLONG         =TSTMAP        ;UPDATE BIT MAP
    03AD 00001000    1201 XASN05          GOSUB          =GCPKC         ;PLACE K.C. & F.C.
    03AF 000C        1202                 ST=1?          3              ;DONE?
    03B0 0360        1203                 RTNC                          ;YES
    03B1 004E        1204                 C=0            W              ;CONSTRUCT REGISTER TO INSERT
    03B2 00CA        1205                 C=B            WPT            ;-
    03B3 00FC        1206                 RCR            10             ;-
    03B4 00AA        1207                 ACEX           WPT            ;-
    03B5 023C        1208                 RCR            2              ;-
    03B6 027E        1209                 C=C-1          S              ;-
    03B7 00EE        1210                 BCEX           W              ;B REG TO INSERT
    03B8 00001000    1211                 GOSUB          =AVAILA        ;ANY ROOM?
    03BA 02EE        1212                 C#0?           W              ;-
    03BB 0007        1213                 GOC            ASN15          ;YES
    03BC 0270        1214                 DADD=C                        ;ENABLE CHIP 0
    03BD 006E        1215                 ABEX           W
    03BE 00001000    1216                 GOSUB          =TSTMAP        ;CLEAR BIT IN BIT MAP
    03C0 00001002    1217                 GOLONG         =PACKE
                     1218
                     1219                 GLB            ASN15          ;ENTRY POINT MADE FOR CARD READER
                     1220 *
    03C2 0270        1221 ASN15           DADD=C                        ;SELECT REGISTER
    03C3 0158        1222                 M=C                           ;SAVE ADDR
    03C4 0038        1223                 C=DATA                        ;SWITCH REG CONTENTS
    03C5 00EE        1224                 BCEX           W              ;-
    03C6 02F0        1225                 DATA=C                        ;-
    03C7 0198        1226                 C=M                           ;INCREMENT ADDR
    03C8 0226        1227                 C=C+1          X              ;-
    03C9 0306        1228                 A<C?           X              ;END?
    03CA 0003        1229                 GONC           ASN15          ;-
    03CB 03E0        1230                 RTN                           ;RETURN
    03CC 008E        1231 ASN20           B=A            W              ;SAVE F.C. & K.C.
    03CD 00001000    1232                 GOSUB          =TSTMAP        ;UPDATE BIT MAP
    03CF 006E        1233                 ABEX           W              ;A[1:0]_K.C.
    03D0 0308        1234                 ST=1           1              ;-
    03D1 00001002    1235                 GOLONG         =GCPKC         ;CLEAR K.C.
                     1236 *
                     1237 * SAVRTN - SAVE RETURN ADDRESS IN REG 10 [3:0]
                     1238 * SAVRC - SAVE RETURN CONDITIONED ON S7
                     1239 * SAVR10 - SAVE THE ADDRESS IN THE A AND C REGISTERS [3:0]
                     1240 *     SAVR10 REQUIRES PT=3 ON ENTRY
                     1241 *
                     1242                 GLB            SAVRTN
                     1243                 GLB            SAVRC
                     1244                 GLB            SAVR10
    03D3 00001000    1245 SAVRTN          GOSUB          =GETPC         ;RTNS PC IN BOTH A AND C
    03D5 00CC        1246 SAVR10          ST=1?          10             ;ROMFLAG?
    03D6 0007        1247                 GOC            SAVR20         ;YES
    03D7 0046        1248                 C=0            X              ;PACK RAM ADDRESS INTO 3 DIGITS
    03D8 03CA        1249                 CSR            WPT
    03D9 0146        1250                 A=A+C          X
    03DA 0002        1251                 A=0            PT
    03DB 02B8        1252 SAVR20          C=REGN         10
    03DC 00AA        1253                 ACEX           WPT
    03DD 02A8        1254                 REGN=C         10
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LOCATION OBJECT CODE LINE     SOURCE LINE

   03DE 03E0         1255                 RTN
                     1256 *
   03DF 028C         1257 SAVRC           ST=1?          7              ;XEQ?
   03E0 0007         1258                 GOC            SAVRTN         ;YES
   03E1 0006         1259                 A=0            X              ;SAVE X000 TO
   03E2 001C         1260                 PT=            3              ; REMEMBER THIS IS
   03E3 0003         1261                 GOTO           SAVR20         ;  GTO
                     1262 *
                     1263 *
                     1264 *
                     1265                 GLB            IORUN
   03E4 0130         1266 IORUN           LDI
   03E5 000B         1267                 CON            11             ;MAIN RUNNING LOOP
                     1268                                               ;FALL INTO ROMCHK HERE
                     1269 *
                     1270 * ROMCHK - PLUG-IN ROM CHECK SUBROUTINE
                     1271 * LOOKS AT LOCATIONS AT THE END OF ROM CHIPS 5-F
                     1272 * IF THE LOCATION IS NON-ZERO, THEN DOES A GOTOC TO THAT LOCATION
                     1273 * LOCATIONS TO BE CHECKED ARE SPECIFIED IN C.X ON ENTRY:
                     1274 *       PAUSE LOOP (-FF4) ... C.X=12 NOTE - MUST RETURN IN A MULTIPLE
                     1275 *          OF 80 STATES AND ADJUST PAUSETIMER ACCORDINGLY
                     1276 *       MAIN RUNNING LOOP (-FF5) ... C.X=11
                     1277 *       WAKE UP FROM DEEP SLEEP WITH NO KEY DOWN (-FF6) ... C.X=10
                     1278 *       OFF LOCATION (-FF7) ... C.X=9
                     1279 *       I/O SERVICE (-FF8) ... C.X=8
                     1280 *       WAKEUP FROM DEEP SLEEP (-FF9) ... C.X=7
                     1281 *       COLD START (-FFA) ... C.X=6
                     1282 *
                     1283 * FOR ENTRY: HEX MODE, P SELECTED, SSO UP, CHIP 0 SELECTED
                     1284 * PLUG-IN ROMS MUST PRESERVE C[10:3] AND RETURN TO RMCK10 WITH
                     1285 *     HEX MODE, P SELECTED, STATUS SET 0 UP, AND CHIP 0 SELECTED.
                     1286 *     PLUG-IN ROMS MAY RETURN TO RMCK15 (SAVING ONE WORD TIME) IF
                     1287 *     ALL OF THE ABOVE CONDITIONS ARE SATISFIED AND IN ADDITION
                     1288 *     PTR P=6.
                     1289 * ALL SUBROUTINE LEVELS ARE AVAILABLE EXCEPT IN I/O SERVICE ENTRY.
                     1290 * IF PKSEQ IS SET THEN I/O SERVICE ROUTINES MUST EITHER PRESERVE
                     1291 * THREE SUBROUTINE RETURNS ON THE SUBROUTINE STACK OR ELSE TERMINATE
                     1292 * THE PARTIAL KEY SEQUENCE.
                     1293 *
                     1294                 GLB            ROMCHK
   03E6 0106         1295 ROMCHK          A=C            X              ;SAVE ADDR IN A.X
   03E7 0204         1296                 ST=0           2              ;CLEAR IOFLG
   03E8 03B8         1297                 C=REGN         14
   03E9 0398         1298                 C=ST
   03EA 03A8         1299                 REGN=C         14             ;STORE SSO
   03EB 00A6         1300                 ACEX           X              ;RESTORE ADDR
                     1301                 GLB            RMCK05         ;PAUSE LOOP ENTERS HERE
   03EC              1302 RMCK05
   03EC 033C         1303                 RCR            1
   03ED 01B0         1304                 C=STK
   03EE 02FC         1305                 RCR            13
   03EF 001C         1306                 PT=            3
   03F0 0110         1307                 LC             4
   03F1 0286         1308                 C=-C           X
   03F2 01BC         1309                 RCR            11
                     1310 * C NOW HAS ROMCHK'S RETURN ADDRESS IN DIGITS 10:7 AND THE TARGET
                     1311 * ADDRESS IN THE PLUG-IN ROMS IN DIGITS 6:3 (NOTE CHIP # IS 4 AT
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LOCATION OBJECT CODE LINE     SOURCE LINE

                     1312 * PRESENT, BUT WILL BE INCREMENTED TO 5, THE LOWEST POSSIBLE
                     1313 * PLUG-IN ADDRESS).
                     1314                 GLB            RMCK10
    03F3 015C        1315 RMCK10          PT=            6
                     1316                 GLB            RMCK15
    03F4 0222        1317 RMCK15          C=C+1          PT
    03F5 0003        1318                 GONC           RMCK20
    03F6 007C        1319                 RCR            4
    03F7 01E0        1320                 GOTOC                         ;RETURN TO CALLING PGM
    03F8 0330        1321 RMCK20          CXISA
    03F9 02E6        1322                 C#0?           X
    03FA 0003        1323                 GONC           RMCK15
    03FB 01E0        1324                 GOTOC
    03FC 00000000    1325                 FILLTO         1777Q
                     1326                 END

Errors=    0
```

LINE#	SYMBOL	TYPE	REFERENCES
	ADRFCH	E	297
1087	ALBL	P	1059
1221	ASN15	P	1213,1219,1229
1231	ASN20	P	1125,1148
894	ASRCH	P	9,259,1152
	AVAILA	E	1211
	BCDBIN	E	301
	CALDSP	E	515,625,657
	CHKRPC	E	995
	CLRSB2	E	385
	CLRSB3	E	381
	CPGMHD	E	179,1035
	DCRT10	E	1037
	DECAD	E	292
	DECADA	E	153,155
335	DOSRC1	P	307,334,420
336	DOSRCH	P	11,527
	ENCP00	E	1107
	ENLCD	E	1105
	ERRNE	E	339
	FLINKP	E	1032
	GCPKC	E	1164,1201,1235
	GETPC	E	115,186,457,553,645,1245
	GETPCA	E	470,1071
	GT3DBT	E	485,520
	GTAINC	E	1091
	GTBYT	E	1183
	GTBYTA	E	554
	GTLINK	E	174
330	GTSRCH	P	15,609,643
	INCAD	E	458,459,1072
	INCAD2	E	123,187,915,1181
	INCADA	E	165,561,916,1182
	INCGT2	E	580,1101
1266	IORUN	P	1265
1101	LBL	P	1064
	MASK	E	689
	NFRPU	E	425
1121	NULL	P	
	NXBYTA	E	124,193,471,565,922
	NXLTX	E	135
	NXTBYT	E	1073
	PACKE	E	1217
	PTBYTA	E	560,564,572,675,1192
	PUTPC	E	188
	PUTPCX	E	424
1302	RMCK05	P	1301
1315	RMCK10	P	1314
1317	RMCK15	P	1316,1323
1321	RMCK20	P	1318
1295	ROMCHK	P	1294
	ROMHED	E	70,1039
1119	ROW0	P	23
580	ROW11	P	24
1062	ROW12	P	25
1058	ROW12A	P	1070
965	RTN00	P	1022

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LINE#	SYMBOL	TYPE	REFERENCES
969	RTN10	P	966
986	RTN15	P	978,1000
1024	RTN21	P	975
997	RTN25	P	984
1027	RTN30	P	21,968
1036	RTN33	P	1040
1039	RTN35	P	1031
	RUN	E	386
	RUNING	E	1121
1071	RW10	P	1068
902	SARA10	P	906,941
907	SARA20	P	
920	SARA30	P	935
936	SARA40	P	926,943
942	SARA50	P	933
687	SAR002	P	703
704	SAR004	P	700
707	SAR006	P	702
714	SAR010	P	
713	SAR011	P	725
722	SAR015	P	742
731	SAR020	P	721
732	SAR021	P	4,784,835
733	SAR022	P	5,801
743	SAR025	P	740
768	SAR030	P	782
781	SAR035	P	776
783	SAR040	P	771,778
786	SAR042	P	735
802	SAR043	P	795
809	SAR045	P	757
812	SAR047	P	830
831	SAR048	P	815,824,837
836	SAR050	P	828
839	SAR055	P	780
863	SAR060	P	844
682	SAROM	P	19,903
1246	SAVR10	P	461,1244
1252	SAVR20	P	1247,1261
1257	SAVRC	P	212,295,1243
1245	SAVRTN	P	1242,1258
113	SEARC1	P	111,336
112	SEARCH	P	8
339	SERR	P	7,269,273,281,306,1154
281	SERRXF	P	244,261
602	SGT010	P	593
609	SGT015	P	588
610	SGT019	P	18,677
611	SGT020	P	600,607,626,635,640
614	SGT025	P	586
628	SGT030	P	624
637	SGT035	P	632
642	SGT040	P	615
653	SGT045	P	649
655	SGT050	P	652
657	SGT055	P	651
676	SGT060	P	659,662

LINE#	SYMBOL	TYPE	REFERENCES
1102	SLBL	P	1092,1120
123	SNR10	P	17,132
124	SNR12	P	16,122,128,136,139,163,166,181
138	SNR50	P	134
143	SNR55	P	195
161	SNR60	P	150
165	SNR65	P	169,173,176
168	SNR70	P	130
182	SNR72	P	178
189	SNR73	P	185
193	SNR80	P	171
35	SNR010	P	39,43,46,53,64
36	SNR012	P	
49	SNR020	P	41
75	SNR030	P	56
80	SNR040	P	47
82	SNR050	P	67
34	SNR09	P	58,73,78
32	SNROM	P	10,117
	SRBMAP	E	1166
	TBITMA	E	1158
	TSTMAP	E	1200,1216,1232
	UPLINK	E	904
1145	XASN	P	1126
1166	XASN02	P	1160
1201	XASN05	P	1175
1015	XEND	P	1014,1060
1060	XENDA	P	1076
370	XEQ20	P	365,447
384	XEQ49	P	422
385	XEQ50	P	369
362	XEQC01	P	14,325
212	XGA00	P	201
295	XGI	P	22
308	XGI05	P	
321	XGI07	P	293,320
241	XGI30	P	300
249	XGI40	P	255
256	XGI50	P	250
258	XGI52	P	215,217,220
264	XGI54	P	221
266	XGI55	P	263
289	XGI57	P	267,284
290	XGI60	P	265
413	XGNN	P	464
426	XGNN02	P	414,416
444	XGNN05	P	452,499
445	XGNN06	P	
424	XGNN10	P	12,323,445,611
425	XGNN12	P	13,382
449	XGNN15	P	440
467	XGNN20	P	427
473	XGNN25	P	468
484	XGNN30	P	504
494	XGNN35	P	509,516
497	XGNN40	P	496,575
501	XGNN50	P	482

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LINE#	SYMBOL	TYPE	REFERENCES
506	XGNN55	P	492
511	XGNN60	P	489
519	XGNN65	P	474
535	XGNN70	P	531
537	XGNN75	P	534
539	XGNN80	P	533
412	XGTO	P	27
	XNNROW	E	1066
963	XRTN	P	20
455	XXEQ	P	26

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LOCATION OBJECT CODE LINE     SOURCE LINE

                      1 "COCONUT"
                      2 * HP41C MAINFRAME MICROCODE ADDRESSES @24000-25777
                      3 *
                      4                    GLB              AVAIL
                      5                    GLB              AVAILA
                      6                    GLB              BSTEP
                      7                    GLB              BSTE2
                      8                    GLB              BKROM2
                      9                    GLB              BSTE
                     10                    GLB              BSTEPA
                     11                    GLB              DECAD
                     12                    GLB              DECADA
                     13                    GLB              FIXEND
                     14                    GLB              FLINK
                     15                    GLB              GETPC
                     16                    GLB              INCAD
                     17                    GLB              INCADA
                     18                    GLB              LINNM1
                     19                    GLB              LINN1A
                     20                    GLB              LINNUM
                     21                    GLB              NXLDEL
                     22                    GLB              NXLSST
                     23                    GLB              FLINKA
                     24                    GLB              FLINKM
                     25                    GLB              FLINKP
                     26                    GLB              GTBYT
                     27                    GLB              GTBYTO
                     28                    GLB              GETPCA
                     29                    GLB              GTBYTA
                     30                    GLB              GTONN
                     31                    GLB              GTO 5
                     32                    GLB              IN3B
                     33                    GLB              INBYT
                     34                    GLB              INBYTC
                     35                    GLB              INBYTP
                     36                    GLB              INBYTO
                     37                    GLB              INBYT1
                     38                    GLB              INCAD2
                     39                    GLB              INCADP
                     40                    GLB              INEX
                     41                    GLB              INLIN
                     42                    GLB              INSLIN
                     43                    GLB              INLIN2
                     44                    GLB              INSTR
                     45                    GLB              INTXC
                     46                    GLB              NROOM3
                     47                    GLB              NXBYTA
                     48                    GLB              NXBYT3
                     49                    GLB              NXL1B
                     50                    GLB              NXL3B2
                     51                    GLB              NXLCHN
                     52                    GLB              NXLIN
                     53                    GLB              NXLINA
                     54                    GLB              NXLIN3
                     55                    GLB              NXLTX
                     56                    GLB              PTBYTM
                     57                    GLB              PUTPCL
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

                      58                  GLB             SKPLIN
                      59 * PUT BYTE BRANCH TABLE
0000 0038             60 TBLPBA           C=DATA                          ;7 ENTRY POINTS(0,2,4,...,12)
0001 0003             61                  GOTO            PBA0            ;BYTE 0
0002 0038             62                  C=DATA
0003 0003             63                  GOTO            PBA1            ;BYTE 1
0004 0038             64                  C=DATA
0005 0003             65                  GOTO            PBA2
0006 0038             66                  C=DATA
0007 0003             67                  GOTO            PBA3
0008 0038             68                  C=DATA
0009 0003             69                  GOTO            PBA4
000A 0038             70                  C=DATA
000B 0003             71                  GOTO            PBA5
000C 0038             72 PBA6             C=DATA                          ;BYTE 6
000D 037C             73                  RCR             12              ;ROTATE PROPER BYTE INTO POSITION
000E 00CA             74                  C=B             WPT             ;STORE 1 (OR 2) BYTE(S)
000F 023C             75                  RCR             2               ;RESTORE BYTE(S) TO PROPER POSITION
0010 0003             76                  GOTO            PBAEND          ;CLEAN UP
0011 00FC             77 PBA5             RCR             10
0012 00CA             78                  C=B             WPT
0013 007C             79                  RCR             4
0014 0003             80                  GOTO            PBAEND
0015 013C             81 PBA4             RCR             8
0016 00CA             82                  C=B             WPT
0017 017C             83                  RCR             6
0018 0003             84                  GOTO            PBAEND
0019 017C             85 PBA3             RCR             6
001A 00CA             86                  C=B             WPT
001B 013C             87                  RCR             8
001C 0003             88                  GOTO            PBAEND
001D 007C             89 PBA2             RCR             4
001E 00CA             90                  C=B             WPT
001F 00FC             91                  RCR             10
0020 0003             92                  GOTO            PBAEND
0021 023C             93 PBA1             RCR             2
0022 00CA             94                  C=B             WPT
0023 037C             95                  RCR             12
0024 0003             96                  GOTO            PBAEND
0025 00CA             97 PBA0             C=B             WPT             ;NO ROTATION NEEDED HERE
0026 02F0             98 PBAEND           DATA=C                          ;RESTORE REGISTER IN MEMORY
0027 001C             99                  PT=             3               ;RESTORE POINTER
0028 03E0            100                  RTN                             ;DONE!
0029 023C            101 INB1             RCR             2
002A 00EA            102                  BCEX            WPT
002B 037C            103                  RCR             12
002C 0003            104                  GOTO            INBEXA
                     105 *
                     106                  GLB             ERRDE
002D 00001000        107 ERRDE            GOSUB           =ERROR
002F 0000            108                  CON             =MSGDE
                     109                  FILLTO          57Q
                     110 * PUT LINK BRANCH TABLE
0030 0038            111 TBLPTL           C=DATA                          ;7 ENTRY POINTS(0,2,4,...,12)
0031 0003            112                  GOTO            PTL0            ;SPECIAL CASE ON BOUNDARY
0032 0038            113                  C=DATA
0033 0003            114                  GOTO            PBA0
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    0034 0038        115                 C=DATA
    0035 0003        116                 GOTO          PBA1
    0036 0038        117                 C=DATA
    0037 0003        118                 GOTO          PBA2
    0038 0038        119                 C=DATA
    0039 0003        120                 GOTO          PBA3
    003A 0038        121                 C=DATA
    003B 0003        122                 GOTO          PBA4
    003C 0038        123                 C=DATA
    003D 0003        124                 GOTO          PBA5
    003E 0003        125 PBA6A           GOTO          PBA6
    003F 0000        126                 FILLTO        77Q
                     127 * INSERT BYTE BRANCH TABLE
    0040 0038        128 TBLINB          C=DATA                      ;INSERT BYTE BRANCH TABLE
    0041 0003        129                 GOTO          INB0          ;ON 16 WORD BOUNDARY
    0042 0038        130                 C=DATA
    0043 0003        131                 GOTO          INB1
    0044 0038        132                 C=DATA
    0045 0003        133                 GOTO          INB2
    0046 0038        134                 C=DATA
    0047 0003        135                 GOTO          INB3
    0048 0038        136                 C=DATA
    0049 0003        137                 GOTO          INB4
    004A 0038        138                 C=DATA
    004B 0003        139                 GOTO          INB5
    004C 0038        140 INB6            C=DATA                      ;GET REGISTER TO INSERT INTO.
    004D 037C        141                 RCR           12            ;POSITION BYTE OF.INTEREST IN C[0-1]
    004E 00EA        142                 BCEX          WPT           ;EXCHANGE BYTE WITH BYTE IN REGISTER
    004F 023C        143                 RCR           2             ;PUT BYTE BACK INTO RIGHT POSITION IN REG.
    0050 0003        144 INBEXA          GOTO          INBEX         ;FINISH UP
    0051 037C        145 PTL0            RCR           12            ;PUT FIRST BYTE IN
    0052 00C2        146                 C=B           PT
    0053 00D6        147                 C=B           XS
    0054 023C        148                 RCR           2
    0055 02F0        149                 DATA=C
    0056 00AA        150                 ACEX          WPT           ;PUT IN SECOND BYTE
    0057 010A        151                 A=C           WPT           ;IN THE NEXT REGISTER
    0058 026E        152                 C=C-1         W
    0059 0270        153                 DADD=C
    005A 031C        154                 PT=           1
    005B 0003        155                 GOTO          PBA6A
    005C 00FC        156 INB5            RCR           10
    005D 00EA        157                 BCEX          WPT
    005E 007C        158                 RCR           4
    005F 0003        159                 GOTO          INBEX
    0060 013C        160 INB4            RCR           8
    0061 00EA        161                 BCEX          WPT
    0062 017C        162                 RCR           6
    0063 0003        163                 GOTO          INBEX
    0064 017C        164 INB3            RCR           6
    0065 00EA        165                 BCEX          WPT
    0066 013C        166                 RCR           8
    0067 0003        167                 GOTO          INBEX
    0068 007C        168 INB2            RCR           4
    0069 00EA        169                 BCEX          WPT
    006A 00FC        170                 RCR           10
    006B 0003        171                 GOTO          INBEX
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LOCATION OBJECT CODE LINE     SOURCE LINE

    006C 00EA          172 INB0          BCEX          WPT
    006D 02CA          173 INBEX         B#0?          WPT
    006E 0007          174               GOC           INLIN
    006F 02F0          175               DATA=C                      ;PUT REGISTER BACK
    0070 0198          176               C=M                         ;INCREMENT CT BY 1
    0071 023E          177               C=C+1         S
    0072 00AE          178               ACEX          W             ;RESTORE REGISTERS
    0073 0046          179               C=0           X             ;WAKE UP CHIP 0
    0074 0270          180               DADD=C
    0075 03E0          181               RTN                         ;DONE
    0076 00001000      182 INLIN         GOSUB         AVAIL         ;CHECK IF EMPTY REG. AVAILABLE
    0078 02EE          183 NROOM         C#0?          W             ;EMPTY REGISTER?
    0079 0003          184               GONC          NOROOM        ;NO, ERROR EXIT
                       185 * INSERT ASSURED HERE.
    007A 00001000      186               GOSUB         FLINKM        ;FIND LINKS TO FIX UP CHAIN
    007C 00001000      187               GOSUB         FIXEND        ;FIX UP END
    007E 007C          188               RCR           4             ;FIX UP FOLLOWING LINK
    007F 00001000      189               GOSUB         =GTLNKA       ;GET LINK
    0081 02E6          190               C#0?          X             ;TOP ELEMENT OF CHAIN?
    0082 0003          191               GONC          $+2           ;YES, DO NOTHING
    0083 022E          192               C=C+1         W             ;ADD 1 TO REGISTER COUNT
                       193               LEGAL
    0084 00001000      194               GOSUB         =PTLINK       ;PUT LINK BACK
    0086 0198          195               C=M
    0087 010A          196               A=C           WPT
    0088 033C          197               RCR           1             ;PUT BYTE # IN C[XS]
    0089 031C          198               PT=           1             ;SET PT TO TOP DIGIT OF THE BYTE SPECIFIED BY
    008A 0003          199               GOTO          INL1          ;C[XS].
    008B 0276          200 INL2          C=C-1         XS
    008C 03DC          201               INCPT
    008D 03DC          202               INCPT
    008E 0276          203 INL1          C=C-1         XS
    008F 0003          204               GONC          INL2
    0090 004E          205               C=0           W             ;FIX UP CHAINHEAD
    0091 0270          206               DADD=C
    0092 0378          207               C=REGN        13
    0093 026E          208               C=C-1         W
    0094 0368          209               REGN=C        13            ;PUT BACK
    0095 022E          210 INL3          C=C+1         W             ;MOVE REGISTERS DOWN
    0096 0270          211               DADD=C
    0097 00E6          212               BCEX          X
    0098 0038          213               C=DATA
    0099 00E6          214               BCEX          X
    009A 0266          215               C=C-1         X
    009B 0270          216               DADD=C
    009C 00E6          217               BCEX          X
    009D 02F0          218               DATA=C
    009E 00E6          219               BCEX          X
    009F 0226          220               C=C+1         X
    00A0 0366          221               A#C?          X             ;FINISHED?
    00A1 0007          222               GOC           INL3          ;NO, MOVE ANOTHER LINE.
    00A2 00E6          223               BCEX          X             ;CLEAN UP
    00A3 00AE          224               ACEX          W
    00A4 02F0          225               DATA=C                      ;STORE A TEMPORARILY
    00A5 004E          226               C=0           W             ;CREATE NULL REGISTER
    00A6 00AA          227               ACEX          WPT           ;PLACE NULLS IN BEGINNING OF REGISTER
    00A7 00AE          228               ACEX          W
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

   00A8 0038          229                 C=DATA                          ;RETRIEVE OLD A
   00A9 00AE          230                 ACEX            W
   00AA 02F0          231                 DATA=C                          ;STORE LAST PART OF REGISTER
   00AB 0198          232                 C=M
   00AC 0270          233                 DADD=C
   00AD 0038          234                 C=DATA
   00AE 004A          235                 C=0             WPT             ; STORE LAST PART OF REGISTER WITH 1 OR
   00AF 02F0          236                 DATA=C                          ;MORE NULLS
   00B0 0198          237                 C=M                             ;GO BACK AND FINISH THE INSERT
   00B1 00001002      238                 GOLONG          INBYT1
   00B3 0198          239 NOROOM          C=M                             ;NO ROOM - ERROR EXIT
   00B4 010A          240                 A=C             WPT             ;ZERO PREVIOUSLY INSERTED STEPS
   00B5 0003          241                 GOTO            NROOM2
   00B6 00001000      242 NROOM1          GOSUB           DECADA
   00B8 0046          243                 C=0             X
   00B9 00001000      244                 GOSUB           PTBYTM
   00BB 027E          245                 C=C-1           S               ;DONE?
   00BC 0158          246                 M=C
   00BD 02FE          247 NROOM2          C#0?            S
   00BE 0007          248                 GOC             NROOM1          ;NO, ZERO OUT SOME MORE BYTES.
   00BF 024C          249                 ST=1?           9               ;SET RUNNING TO ASSURE BACK STEP
   00C0 0003          250                 GONC            $+2             ;IF S9=1
   00C1 02C8          251                 ST=1            13
   00C2 00001002      252 NROOM3          GOLONG          =PACKE
                      253 *
                      254 * AVAIL - FIND AN AVAILABLE REGISTER
                      255 * THIS SUBROUTINE PLACES CHAINHEAD-1 IN A[X] AND LOOKS
                      256 *- TO SEE IF CHAINHEAD-1 IS AVAINABLE FOR USE IN INSERTING
                      257 *- OR IN ASSIGNING. C[X] IS RETURNED AS 0 IF THERE IS NO ROOM.
                      258 *- IF THERE IS ROOM, C[X] IS RETURNED AS DECIMAL 192.
                      259 *- NOTHING IS ASSUMED AND PT IS RETURNED AS 3
                      260 * AVAILA - SAME AS AVAIL EXCEPT PT.NOT SET AND REG 0 ASSUMMED
                      261 *- SELECTED.
                      262 *
   00C4 004E          263 AVAIL           C=0             W
   00C5 001C          264                 PT=             3
   00C6 0270          265                 DADD=C
   00C7 0378          266 AVAILA          C=REGN          13              ;GET CHAINHEAD ADDRESS
   00C8 026E          267                 C=C-1           W
   00C9 0270          268                 DADD=C                          ;SELECT CHAINHEAD-1 REGISTER
   00CA 0106          269                 A=C             X               ;SAVE ADDRESS IN A
   00CB 0038          270                 C=DATA                          ;GET THE REGISTER
   00CC 02EE          271                 C#0?            W               ;NON ZERO REGISTER?
   00CD 0007          272                 GOC             AVAIL1          ;YES, ERROR EXIT
   00CE 0130          273                 LDI
   00CF 00C0          274                 CON             192             ;REGISTER EXISTENT?
   00D0 0306          275                 A<C?            X
   00D1 03A0          276                 RTNNC                           ;YES, SUCCESS EXIT
   00D2 004E          277 AVAIL1          C=0             W               ;FAILURE EXIT
   00D3 03E0          278                 RTN
                      279 *
                      280 * BSTEP - BACK STEP
                      281 * WHEN CALLED, ASSUMES THE PROGRAM COUNTER IS POINTING
                      282 *- AT AN UNKNOWN LINE. THIS ROUTINE MOVES THE
                      283 *- PROGRAM COUNTER TO POINT AT THE BYTE JUST PRECEEDINT THE UNKNOWN
                      284 *- LINE.
                      285 * WORKS IN ROM OR RAM
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LOCATION OBJECT CODE LINE     SOURCE LINE

                     286 * WILL BACK STEP PAST BEGINNING OF MEMORY TO END
                     287 *- IF LINE NUMBER = 1 OR 0.
                     288 * ASSUMES NOTHING
                     289 * USES A,B[0-3],C,M,N,S[0-7],3 SUB LEVELS
                     290 *
                     291 * BACK AROUND TO END CASE OF BACK STEP
   00D4 00CC         292 BSTEP2          ST=1?          10          ;ROM FLAG?
   00D5 0007         293                 GOC            BSTEP3      ;YES, DO BACK STEP IN ROM
   00D6 00001000     294                 GOSUB          FLINKP      ;FIND THE END OF THE PROGRAM
   00D8 013C         295                 RCR            8
   00D9 010A         296                 A=C            WPT
                     297                                            ;MOVE BACK ONE BYTE
   00DA 00001000     298                 GOSUB          =PUTPCD     ;PUT PC THERE
   00DC 00001002     299                 GOLONG         LINNM1      ;CALCULATE NEW LINE NUMBER AND RTN
   00DE 00001000     300 BSTEP           GOSUB          LINNUM      ;GET THE LINENUMBER
   00E0 0266         301                 C=C-1          X           ;0?
   00E1 0007         302                 GOC            BSTEP2      ;YES, GO TO END.
   00E2 02E6         303                 C#0?           X           ;1?
   00E3 0003         304                 GONC           BSTEP2      ;YES, GO TO END.
   00E4 03E8         305                 REGN=C         15          ;NO, FIX LINE NUMBER
   00E5 00001000     306 BSTEP3          GOSUB          GETPC       ;GET PROGRAM COUNTER
   00E7 00CC         307                 ST=1?          10          ;ROM FLAG
   00E8 0007         308                 GOC            BKROM       ;ROM-
   00E9 00001000     309                 GOSUB          FLINK       ;RAM
   00EB 01D8         310 BSTEPA          CMEX                       ;SAVE ADDRESES IN M
   00EC 034A         311                 A#0?           WPT         ;TOP OF MEMORY?
   00ED 0007         312                 GOC            BST1        ;NO
   00EE 00001000     313                 GOSUB          =FSTIN      ;YES - MOVE TO BEFORE FIRST INSTRUCTION
   00F0 0003         314                 GOTO           BST2
   00F1 00001000     315 BST1            GOSUB          DECADA      ;MOVE TO ADDRESS BEFORE LINK
   00F3 00001000     316 BST2            GOSUB          GTBYTA      ;GET BYTE
   00F5 037C         317                 RCR            12
   00F6 03C4         318                 CLRST                      ;SET UP FOR NXLIN
   00F7 0048         319                 ST=1           4
   00F8 0003         320                 GOTO           BSTML2      ;GO FIND THE END OF THE CURRENT LINE
                     321 * REVISED BACK STEP MAIN LOOP
   00F9 00FC         322 BSTML           RCR            10          ;SAVE PREVIOUS 2 ADDRESSES
   00FA 00CA         323                 C=B            WPT
   00FB 00AE         324                 ACEX           W
   00FC 01D8         325                 CMEX                       ;GET REGISTER BACK
   00FD 00001000     326                 GOSUB          NXLIN       ;MOVE UP ONE LINE
   00FF 01D8         327 BSTML2          CMEX
   0100 008A         328                 B=A            WPT
   0101 00AE         329                 ACEX           W
   0102 0306         330                 A<C?           X           ;MORE?
   0103 0007         331                 GOC            BSTML       ;YES!
   0104 0366         332                 A#C?           X           ;SAME REG?
   0105 0007         333                 GOC            BSTML1      ;NO, DONE
   0106 0302         334                 A<C?           PT          ;MORE?
   0107 0007         335                 GOC            BSTML       ;YES
   0108 036A         336                 A#C?           WPT         ;DONE?
   0109 0003         337                 GONC           BSTML       ;NO, DON'T QUIT ON EQUAL
   010A 013C         338 BSTML1          RCR            8           ;DONE-GET OLD ADDRESS
   010B 00001002     339 BSTE            GOLONG         BSTE2       ;PUT IN PC
                     340 * ROM BACK STEP HERE
   010D 01BC         341 BKROM           RCR            11          ; PUT PC IN PLACE
   010E 0108         342                 ST=1           8           ;SET GTONN BIT
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    010F 0330          343 BKROM1          CXISA                           ;GET BYTE
    0110 027A          344                 C=C-1          M                ;MOVE TO PREVIOUS BYTE
    0111 0276          345                 C=C-1          XS               ;STARTING BYTE?
    0112 0007          346                 GOC            BKROM1           ;NO
    0113 003C          347                 RCR            3                ;PUT IN PLACE
    0114 027E          348                 C=C-1          S                ;BEGIN?
    0115 00001002      349                 GOLNC          BKROM2           ;YES, GOTO LINE FFF OF PROG
    0117 0003          350                 GOTO           BSTE             ;NO, DONE!
                       351 *
                       352 * FIXEND - FIX END
                       353 *-SETS DECOMPILE AND PACK BITS IN AN END SPECIFIED
                       354 *-BY C[8-11]
                       355 *-PT=3 IN AND OUT
                       356 *-USES 1 SUB LEVEL
                       357 * USES A[0-3],B[0-3],M
                       358 *
    0118 0158          359 FIXEND          M=C                             ;SAVE ADDRESSES
    0119 013C          360                 RCR            8                ;GET END ADDRESS
    011A 010A          361                 A=C            WPT
    011B 00001000      362                 GOSUB          INCAD2           ;GET END BYTE
    011D 00001000      363                 GOSUB          GTBYTA
    011F 039C          364                 PT=            0                ;PUT DECOMPILE AND PACK BITS IN END
    0120 03D0          365                 LC             15
    0121 00001000      366 PTBYTM          GOSUB          =PTBYTA
    0123 0198          367                 C=M                             ;RESTORE ADDRESS
    0124 03E0          368                 RTN
                       369 *
                       370 * FLINK - FIND LINKS
                       371 * GIVEN AN ADDRESS IN MM FORM IN C[0-3]
                       372 * RETURNS THE FOLLOWING IN MM FORM:
                       373 *
                       374 * FLINKP - SAME AS FLINK EXCEPT USES THE PC AS THE INPUT ADDRESS
                       375 *
                       376 * FLINKA - SAME AS FLINK EXCEPT INPUT ADDRESS IN A[0-3].
                       377 *
                       378 * A[0-3]- THE ADDRESS OF THE LINK PRECEEDING (HIGHER REG #)
                       379 *-THE INPUT ADDRESS.
                       380 * C[0-3]- THE INPUT ADRESS
                       381 * C[4-7]- THE ADDRESS OF THE NEXT LINK FOLLOWING THE INPUT
                       382 *- ADDRESS
                       383 * C[8-11]- THE ADDRESS OF THE FIRST END FOLLOWING THE INPUT
                       384 *- ADDRESS
                       385 * M[0-2] AND M[13] - THE LINK PRECEEDING THE INPUT ADDRESS
                       386 * NOTE- IF NO LINK PRECEEDES THE INPUT ADDRESS [TOP OF MEMORY]
                       387 *- THEN A[0-3] AND M SET TO 0
                       388 * USES A[0-3],B[0-3],C[0-11],M,1 SUB LEVEL
                       389 * PT=3 ON RETURN
    0125 00001000      390 FLINKP          GOSUB          GETPC            ;GET PROGRAM COUNTER
    0127 00AA          391 FLINKA          ACEX           WPT              ; MOVE ADDRESS TO C
    0128 01D8          392 FLINK           CMEX
    0129 00001000      393 FLINKM          GOSUB          =GTFEND          ;GET THE FINAL END
    012B 023C          394                 RCR            2                ;PUT IN PLACE
    012C 0003          395                 GOTO           FLINK2
    012D 00001000      396 FLINK1          GOSUB          =UPLINK          ;MOVE UP 1 LINK
    012F 01D8          397 FLINK2          CMEX                            ;RETRIEVE ADDRESSES
    0130 0306          398                 A<C?           X                ;SEE IF DONE
    0131 0007          399                 GOC            FLINK3           ;NO WAY - TRY AGAIN
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LOCATION OBJECT CODE LINE     SOURCE LINE

  0132 0366          400                A#C?          X             ;CHECK FOR SAME REGISTER CASE
  0133 0360          401                RTNC                        ;DONE!
  0134 0302          402                A<C?          PT            ;CHECK BYTE
  0135 0007          403                GOC           FLINK3        ;TRY AGAIN
  0136 0362          404                A#C?          PT            ;ON LINK?
  0137 0360          405                RTNC                        ;ALL DONE IF NOT EQUAL
  0138 007C          406 FLINK3         RCR           4             ;GO UP ANOTHER LINK
  0139 008A          407                B=A           WPT           ;PUT ADDRESS IN FOLLOWING LINK SPOT
  013A 00CA          408                C=B           WPT
  013B 00FC          409                RCR           10
  013C 01D8          410                CMEX                        ;CHECK FOR END
  013D 023E          411                C=C+1         S
  013E 0007          412                GOC           FLINK5        ;CARRY IF ALPHA LABEL
  013F 01D8          413                CMEX                        ;PUT ADDRESS IN FOLLOWING END SPOT
  0140 013C          414                RCR           8
  0141 00CA          415                C=B           WPT
  0142 017C          416                RCR           6
  0143 01D8          417                CMEX
  0144 0344          418                ST=0          12            ;CLEAR PRIVACY STATUS BIT
  0145 027E          419                C=C-1         S             ;RESTORE END BYTE
  0146 01FE          420                C=C+C         S             ;CHECK PRIVATE BIT FOR THIS PROGRAM
  0147 01FE          421                C=C+C         S             ;IS IT 1
  0148 0003          422                GONC          $+2           ;NO, LEAVE PRIVACY RESET
  0149 0348          423                ST=1          12            ;YES, SET PRIVACY STATUS
  014A 02E6          424 FLINK5         C#0?          X             ;CHECK FOR END OF CHAIN
  014B 0007          425                GOC           FLINK1        ;NON ZERO - TRY AGAIN
  014C 000A          426                A=0           WPT           ;FIX UP END OF CHAIN EXIT
  014D 004E          427                C=0           W
  014E 01D8          428                CMEX
  014F 03E0          429                RTN
                     430 *
                     431 * GETPC - RETRIEVES THE PC AFTER SELECTING CHIP 0 AND CREATES
                     432 *- THE MM ADDRESS FORM BY DOUBLING THE BYTE NUMBER IF THE
                     433 *- S10=0. THE RESULTING MM ADDRESS IS
                     434 *- STORED IN A[0-3]
                     435 * GETPCA - SAME AS GETPC EXCEPT CHIP 0 ASSUMED SELECTED.
                     436 * SETS PT=3
                     437 * USES A[0-3],AND C
                     438 *
  0150 004E          439 GETPC          C=0           W
  0151 0270          440                DADD=C
  0152 0338          441 GETPCA         C=REGN        12
  0153 001C          442                PT=           3
  0154 00CC          443                ST=1?         10
  0155 0007          444                GOC           $+2
  0156 01E2          445                C=C+C         PT
  0157 010A          446                A=C           WPT
  0158 03E0          447                RTN
                     448 *
                     449 * GTONN - GOTO LINE NNN OF THE CURRENT PROGRAM
                     450 * REPLACES THE PROGRAM COUNTER WITH THE ADDRESS OF
                     451 *- THE LINE SPECIFIED BY A[0-2]
                     452 * FFF IN A[0-2] MEANS GTO..
                     453 * USES A,B[0-3]C,N,M,P,Q,S[0-7]
                     454 *
  0159 001C          455 GTONN          PT=           3             ;RSTORE POINTER TO MM PLACE
  015A 00AE          456                ACEX          W             ;PUT LINE# IN C
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LOCATION OBJECT CODE LINE     SOURCE LINE

    015B 02E6          457                 C#0?          X             ;GOTO 0?
    015C 00001002      458                 GOLNC         =RTN30        ;YES, EXECUTE KEYBOARD RETURN
    015E 005A          459                 C=0           M             ;CLEAN UP THE REGISTER
    015F 0226          460                 C=C+1         X             ;GTO..?
    0160 0007          461                 GOC           GTO__         ;YES.
    0161 0226          462                 C=C+1         X             ;GTO. ALPHA?
    0162 0003          463                 GONC          GTONN2        ;NOPE, GO ON
    0163 0130          464                 LDI                         ;CREATE GOTO ALPHA FUNCTION CODE
    0164 001D          465                 CON           1*16+13
    0165 037C          466                 RCR           12            ; PUT IN PLACE
    0166 0244          467                 ST=0          9             ;CLEAR ALPHA SEARCH BIT
    0167 00001002      468                 GOLONG        =XROW1        ;GO TO THE LABEL
    0169 0266          469 GTONN2          C=C-1         X
    016A 0266          470                 C=C-1         X             ;RESTORE LINE NUMBER
    016B 00FC          471                 RCR           10            ;PUT IN PLACE
    016C 0108          472                 ST=1          8             ;SET GTONN BIT
    016D 00001000      473                 GOSUB         LINN1A        ;GO DO IT
    016F 00001002      474                 GOLONG        =NFRC         ;RETURN
    0171 0378          475 GTO__           C=REGN        13            ;GET CHAINHEAD ADDRESS
    0172 0110          476                 LC            4
    0173 001C          477                 PT=           3             ;SAVE FOR LATER
    0174 010A          478                 A=C           WPT
    0175 0070          479                 N=C
    0176 00001000      480                 GOSUB         =GTLINK       ;IS THE PREVIOUS LINK AN END?
    0178 02E6          481                 C#0?          X             ;IS IT THE TOP OF MEMORY?
    0179 0007          482                 GOC           GTO_4         ;NO, SEE IF PREVIOUS LINK IS AN END
    017A 00001000      483                 GOSUB         =FSTIN        ;GO TO THE TOP OF MEMORY
    017C 0003          484                 GOTO          GTO_2         ;SEE IF .END. IS THE FIRST INST.
    017D 00001000      485 GTO_4           GOSUB         =UPLINK       ;GET THE LINK
    017F 023E          486                 C=C+1         S             ;IS IT AN ALPHA LABEL?
    0180 0007          487                 GOC           GTO_1         ;YES, PUT AN END IN.
    0181 00001000      488                 GOSUB         INCAD2        ;GO TO THE NEXT INSTRUCTION
    0183 00001000      489 GTO_2           GOSUB         NXBYTA        ;FIND THE ADDRESS OF THE NEXT LINE
    0185 037C          490                 RCR           12            ;NULL?
    0186 02E2          491                 C#0?          PT
    0187 0007          492                 GOC           GTO_2A
    0188 02F6          493                 C#0?          XS
    0189 0003          494                 GONC          GTO_2         ;YES, NULL, KEEP LOOKING
    018A 00B0          495 GTO_2A          C=N                         ;COMPARE ADDRESSES
    018B 036A          496                 A#C?          WPT           ;SAME AS THE FINAL END?
    018C 0003          497                 GONC          GTO_3         ;YES, NO INSERT NEEDED.
                       498 * CREATE NEW FINAL END HERE
    018D 00001000      499 GTO_1           GOSUB         AVAIL
    018F 02EE          500                 C#0?          W             ;IS THERE ROOM?
    0190 00001002      501                 GOLNC         =PACKE        ;NO, GO PACK!
    0192 009C          502                 PT=           5             ;MAKE NEW FINAL END
    0193 0310          503                 LC            12
    0194 001C          504                 PT=           3
    0195 0130          505                 LDI
    0196 0120          506                 CON           440Q          ;LINK= 1 REG.
    0197 02F0          507                 DATA=C
    0198 00B0          508                 C=N                         ;FIX OLD END
    0199 0270          509                 DADD=C
    019A 0266          510                 C=C-1         X             ;CONSTRUCT ADDR OF NEW
    019B 010A          511                 A=C           WPT           ; FINAL END AND SAVE IN
                       512 * A[3:0] FOR THE PUTPCD CALL LATER ON
                       513 * NOTE C[3] HERE IS 4, THE MM BYTE COUNT FOR THE
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LOCATION OBJECT CODE LINE     SOURCE LINE

                     514 * FIRST BYTE OF THE END.  N[3:0] WAS SET UP BACK AT GTO..
019C 0038            515                 C=DATA                          ;GET OLD FINAL END
019D 03D8            516                 CSTEX                           ;TURN OFF FINAL END STATUS BIT
019E 0084            517                 ST=0            5
019F 0208            518                 ST=1            2               ;TURN OF PACK BIT
01A0 03D8            519                 CSTEX
01A1 02F0            520                 DATA=C                          ;RETURN
01A2 004E            521                 C=0             W               ;FIX CHAINHEAD
01A3 0270            522                 DADD=C
01A4 0378            523                 C=REGN          13
01A5 0266            524                 C=C-1           X
01A6 0368            525                 REGN=C          13
01A7 00C4            526 GTO_3           ST=0            10              ;TURN OFF THE ROM FLAG
                     527                                                 ;FIX PC
01A8 00001000        528                 GOSUB           =PUTPCD
01AA 00001000        529 GTO_5           GOSUB           =PACKN          ;PACK MEMORY
01AC 00001000        530                 GOSUB           =RTN30          ;MAKE A ZERO LINE NUMBER
01AE 00001002        531                 GOLONG          =NFRPU          ;CAN'T USE A RTN HERE.
                     532 * THE GOLONG NFRPU IS NECESSARY HERE INSTEAD OF A SIMPLE
                     533 * RETURN BECAUSE WE GET HERE FROM CLP VIA DELLIN AND DELLIN
                     534 * USES UP ALL THE SUBROUTINE LEVELS, PUSHING THE NFRPU OFF
                     535 * THE TOP OF THE STACK.
                     536 *
                     537 * GTBYT - GET BYTE
                     538 * GENERALIZED ROUTINE FOR GETTING A BYTE OUT OF ROM OR RAM.
                     539 * GETS THE BYTE POINTED TO BY A[0-3] IN MM ADDRESS FORM AND
                     540 * PLACES IT IN C[0-1]
                     541 * GTBYTA - SAME AS GTB ' EXCEPT RAM ADDRESS`S ONLY WORK.
                     542 * USES A[0-3],AND C
                     543 *
01B0 00CC            544 GTBYT           ST=1?           10              ;ROM FLAG?
01B1 0003            545                 GONC            GTBYTA          ;NO, GET RAM BYTE
01B2 00AE            546 GTBYTO          ACEX            W               ;YES, GET ROM BYTE
01B3 010E            547                 A=C             W
01B4 01BC            548                 RCR             11
01B5 0330            549                 CXISA
01B6 03E0            550                 RTN                             ;DONE
                     551 *
                     552 * NXBYTA - GET THE NEXT BYTE
                     553 * INCREMENTS A[0-3] IN MM FORMAT AND RETURNS THE BYTE
                     554 *- POINTED TO BY THIS ADDRESS IN C[0-1].
                     555 * ASSUMES PT=3 ON ENTRY
                     556 * RAM ONLY!
                     557 * USES 1 SUB LEVEL
                     558 *
                     559 * NXBYT3 - GET THE NEXT 3RD BYTE
                     560 * SAME AS NXBYTA EXCEPT INCREMENTS THE ADDRESS 3 BYTES INSTEAD
                     561 *- OF 1 BEFORE GETTING THE BYTE
                     562 *
01B7 00001000        563 NXBYT3          GOSUB           INCAD2
01B9 00001000        564 NXBYTA          GOSUB           INCADA
                     565 * GET A BYTE FROM RAM HERE
01BB 00AA            566 GTBYTA          ACEX            WPT             ;GET BYTE OUT OF RAM
01BC 010A            567                 A=C             WPT             ;SET  UP TABLE ADDRESS
01BD 0270            568                 DADD=C
01BE 007C            569                 RCR             4
01BF 0130            570                 LDI                             ;TABLE ON 16 WORD BOUNDARY
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LOCATION OBJECT CODE LINE     SOURCE LINE

                     571 * TABLE JUMP
01C0 0221            572                 CON          10410          ;TABLE -GET BYTE
01C1 00FC            573                 RCR          10
01C2 01E0            574                 GOTOC                       ;7 WAY BRANCH
                     575                 GLB          CALDSP
01C3 01C6            576 CALDSP          A=A-C        X              ;A[3;0]_PGMCTR-REL ADDR
01C4 01C2            577                 A=A-C        PT             ;-
01C5 03A0            578                 RTNNC
01C6 0003            579                 GOTO         INC2
                     580 *
                     581 * INCAD - INCREMENT ADDRESS
                     582 * INCREMENTS ROM OR RAM(MM FORM) ADDRESS IN A[0-3] IN PLACE.
                     583 * INCADA - SAME AS INCAD EXCEPT ASSUMES PT=3 AND ONLY RAM ADDRESSES.
                     584 * INCADP - SAME AS INCADA EXCEPT SET PT=3 ON ENTRY
                     585 * INCAD2 - INCREMENT ADDRESS BY TWO BYTES
                     586 * SAME AS 2 CALLS TO INCADA EXCEPT FASTER.
                     587 *
                     588 * DECAD - DECADA  DECREMENT ADDRESS
                     589 *-DECADA - ASSUMES ADDRESS IS A RAM ADDRESS
                     590 *-DECAD - RAM OR ROM
                     591 *-ADDRESS EXPECTED IN A[0-3] IN MM FORMAT
                     592 *-PT EXPECTED AT 3 FOR DECADA, ALWAYS RETURNED AT 3
01C7 001C            593 DECAD           PT=          3
01C8 00CC            594                 ST=1?        10             ;ROM FLAG?
01C9 0007            595                 GOC          DECADB
01CA 0162            596 DECADA          A=A+1        PT
01CB 0162            597                 A=A+1        PT
01CC 0162            598                 A=A+1        PT
                     599                 LEGAL
01CD 00001002        600                 GOLONG       =PATCH1        ;@740 IN QUAD 8
01CF 00CC            601 INCAD           ST=1?        10             ;ROM FLAG?
01D0 0007            602                 GOC          INCADB         ;YES, ROM INCREMENT.
01D1 001C            603 INCADP          PT=          3              ;NO,RAM ADDRESS TO INCREMENT
01D2 0003            604                 GOTO         INCADA
01D3 01A2            605 INCAD2          A=A-1        PT             ;BYTE 0?
01D4 0007            606                 GOC          INC21          ;YES, GO TO NEXT REG,BYTE 5
01D5 01A2            607                 A=A-1        PT             ;FINISH THE FIRST INCREMENT
01D6 01A2            608 INCADA          A=A-1        PT             ;BYTE=0?
01D7 0007            609                 GOC          INC1           ;YES, GO TO NEXT REG, BYTE 6
01D8 01A2            610                 A=A-1        PT             ;NO, FINISH MOVING TO NEXT BYTE
01D9 03E0            611                 RTN                         ;DONE
01DA 01A2            612 INC21           A=A-1        PT             ;2 INC CASE, BTYE 5 DESIRED
01DB 01A2            613                 A=A-1        PT
01DC 01A2            614 INC1            A=A-1        PT             ;SET C[PT] TO 12 (BYTE 6)
01DD 01A2            615 INC2            A=A-1        PT
01DE 01A2            616                 A=A-1        PT
01DF 01AE            617 DECADB          A=A-1        W              ;DECREMENT REGISTER BY 1
01E0 03E0            618                 RTN                         ;DONE
01E1 016E            619 INCADB          A=A+1        W              ;ROM INCREMENT
01E2 03E0            620                 RTN                         ;DONE
                     621 *
                     622 * INBYTO - INSERT A ZERO BYTE INTO MEMORY
                     623 * CONDITIONS THE SAME AS INBYT EXCEPT THAT G NEED NOT BE
                     624 *- SPECIFIED.
                     625 *
                     626 * INBYTC - SPECIAL INBYT ENTRY WHERE THE BYTE TO BE INSERTED IS
                     627 *- FOUND IN C[0-1].
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LOCATION OBJECT CODE LINE     SOURCE LINE

                     628 *
                     629 * INBYTP - SAME AS INBYTP EXCEPT THAT THE PT POINTS TO THE
                     630 *- LAST DIGIT OF THE BYTE IN C TO BE INSERTED.
                     631 *
  01E3 0046          632 INBYT0          C=0             X
  01E4 039C          633 INBYTC          PT=             0
  01E5 0058          634 INBYTP          G=C
                     635 *
                     636 * INBYT - INSERT BYTE INTO PROGRAM MEMORY
                     637 *- INCREMENT A[0-3] IN MM FORMAT AND INSERT THE BYTE IN G INTO
                     638 *- PROGRAM MEMORY AT THAT LOCATION. MAKE SPACE OF NECCESSARY
                     639 *- BY INCREASING PROG LENGTH BY 1 REGISTER. FIX UP CHAINHEAD,
                     640 *- CURRENT PROGRAM HEAD AND CLOSEST LINK. ALSO INCREMENT CT
                     641 *- IN A[13]. CT IS USED TO KEEP TRACK OF THE NUMBER OF
                     642 *- SUCCESSFUL INSERTS IN A LINE IN CASE OF RUNNING OUT OF ROOM.
                     643 * DOES NOT RETURN IF NO ROOM. THE PREVIOUS [CT] BYTES SET TO 0
                     644 *- IF S9=1 THEN BACK STEP FORCED IN ERROR CASE.
                     645 * ASSUMES NOTHING.
                     646 * RETURNS CHIP 0 SELECTED AND PT=1
                     647 * USES A[0-11],B[0-3],C[0-3],M,G,PT,S9,AND 2 SUB LEVELS
                     648 *
                     649 * NOTE- INBYTO MUST BE LOCATED RIGHT ABOVE HERE.
                     650 *
  01E6 00001000      651 INBYT           GOSUB           =INCADP         ;MOVE TO RIGHT BYTE
  01E8 00AE          652                 ACEX            W               ;SAVE ADDRESS
  01E9 0158          653                 M=C
  01EA 0270          654 INBYT1          DADD=C                          ;WAKE UP THE RIGHT REGISTER
  01EB 007C          655                 RCR             4               ;DO 7 WAY BRANCH JUST LINE GTBYTA
  01EC 039C          656                 PT=             0
  01ED 0098          657                 C=G                             ;PUT BYTE TO INSERT INTO B[0-1]
  01EE 00E6          658                 BCEX            X
  01EF 031C          659                 PT=             1               ;SET POINTER TO INSERT 2 DIGITS(1 BYTE)
  01F0 0130          660                 LDI
                     661 * TABLE JUMP
  01F1 0284          662                 CON             1204Q
  01F2 00FC          663                 RCR             10
  01F3 01E0          664                 GOTOC
                     665 *
                     666 * INSLIN - INSERT LINE
                     667 * THIS ROUTINE INSERTS A LINE AFTER THE CURRENT LINE POINTED TO
                     668 *- BY THE PC. DOES NOT SKIP CURRENT LINE IF THE LINE IS AN END OR
                     669 *- THE LINE NUMBER IS 0.
                     670 * LEAVES THE PC POINTING TO THE NEW LINE AND INCREMENTS THE LINE
                     671 *- NUMBER BY 1. IF NO ROOM, THE ENTIRE INSERT IS IGNORED.
                     672 * DIGIT OR TEST ENTRY NOT HANDLED BY THIS ROUTINE.
                     673 * THE LINE TO BE INSERTED HAS ITS FIRST BYTE IN C[13-12],THE
                     674 *- SECOND BYTE, IF NEEDED, IS IN C[11-10]. ALPHA OPERANDS ARE
                     675 *- IN REGISTER 9
                     676 * USES A,B,C,M,G,S[0-9]
                     677 *
  01F4 00001000      678 INSLIN          GOSUB           =INSSUB         ;INTITIALIZE
  01F6 008E          679 INLIN2          B=A             W               ;SAVE BYTES FOR LATER
  01F7 00CE          680                 C=B             W               ;GET FIRST BYTE READY FOR INSERT
  01F8 035C          681                 PT=             12
  01F9 0058          682                 G=C
  01FA 001E          683                 A=0             S               ;INITIALIZE CT TO 0
  01FB 00001000      684                 GOSUB           =INBYT          ;INSERT 1 BYTE
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LOCATION OBJECT CODE LINE     SOURCE LINE

  01FD 029E          685                 C=-C            S              ;DECODE NUMBER OF BYTES TO INSERT
  01FE 01FE          686                 C=C+C           S              ;1 BYTE?
  01FF 0003          687                 GONC            IN2B           ;NO, MORE DECODE
  0200 023E          688                 C=C+1           S              ;LINE 1?
  0201 023E          689                 C=C+1           S
  0202 0003          690                 GONC            INEXA          ;NO, DONE!
                     691 * ALPHA OPERANDS HERE
  0203 00001000      692                 GOSUB           INTXC          ;PREPARE TEXT CHARACTER
  0205 00001000      693                 GOSUB           =INBYTC        ;INSERT TEXT CHAR.
  0207 00001000      694                 GOSUB           INSTR          ;OUTPUT TEXT STRING
  0209 0003          695                 GOTO            INEXA          ;DONE!
  020A 01FE          696 IN2B            C=C+C           S              ;2 BYTE?
  020B 00001002      697                 GOLNC           IN3B           ;NO, MORE DECODE
  020D 02FE          698                 C#0?            S              ;ROW 12?(NO ROW 11 CODES)
  020E 0007          699                 GOC             IN2BA          ;NO, ROWS 9-10
  020F 035C          700                 PT=             12             ;CHECK FOR LBL NN
  0210 0222          701                 C=C+1           PT             ;LBL NN?
  0211 0003          702                 GONC            IN2BB          ;NO, MORE DECODE
  0212 00FC          703                 RCR             10             ;YES, CHECK FOR SHORT FORM
  0213 0226          704                 C=C+1           X              ; NOTE-FF IS ILLEGAL ADDRESS
  0214 031C          705                 PT=             1              ;15 CARRIED TO 10?
  0215 02E2          706                 C#0?            PT             ;OR >15?
  0216 0007          707                 GOC             INN2B          ;YES, LONG FORM, NORMAL 2 BYTE
                     708                 GLB             INSHRT
  0217 00001000      709 INSHRT          GOSUB           =PTBYTA        ;SHORT FORM
  0219 0003          710 INEXA           GOTO            INEX           ;DONE!
  021A 0222          711 IN2BB           C=C+1           PT             ;C<>REG?
  021B 0007          712                 GOC             INN2B          ;YES, NORMAL 2 BYTE
                     713 * LINKS OF THE CHAIN INSERTED HERE
  021C 0104          714                 ST=0            8              ;CLEAR END BIT
  021D 0222          715                 C=C+1           PT             ;END?
  021E 0007          716                 GOC             $+2            ;NO, ALPHA LABEL
  021F 0108          717                 ST=1            8              ;SET END BIT
  0220 00001000      718                 GOSUB           =INBYTO        ;PUT IN BYTE FOR LINK
  0222 0130          719                 LDI                            ;PUT OF IN EXP FIELD
  0223 000F          720                 CON             15
  0224 010C          721                 ST=1?           8              ;END?
  0225 0003          722                 GONC            INLNK1         ;NO, ALPHA LABEL
  0226 00001000      723                 GOSUB           =INBYTC        ;OUTPUT OF (END BYTE)
  0228 0003          724                 GOTO            INLNK2         ;GO FIX LINKS
  0229 00001000      725 INLNK1          GOSUB           INTXC          ;MAKE TEXT CHARACTER
  022B 0226          726                 C=C+1           X              ;COUNT BYTE FOR KEYCODE
                     727                 LEGAL
  022C 00001000      728                 GOSUB           =INBYTC        ;INSERT TEXT COUNT
  022E 00001000      729                 GOSUB           =INBYTO        ;INSERT ZERO BYTE FOR KEYCODE
  0230 00001000      730                 GOSUB           INSTR          ;INSERT STRING
  0232 00001000      731 INLNK2          GOSUB           GETPC          ;FIX LINKS
  0234 00001000      732                 GOSUB           INCADA         ;POINT TO FIRST BYTE OF NEW LINK
  0236 00001000      733                 GOSUB           =FLINKA        ;FIND LINKS
  0238 00001000      734                 GOSUB           =GENLNK        ;FIX CURRENT LINK
  023A 007C          735                 RCR             4
  023B 00001000      736                 GOSUB           =GENLNK        ;FIX PREVIOUS LINK
  023D 010C          737                 ST=1?           8              ;IF END,FIX PREVIOUS END
  023E 0003          738                 GONC            INEX           ;NO, DONE
  023F 00FC          739                 RCR             10             ;YES, PUT DECOMPILE BITS
  0240 00001000      740                 GOSUB           FIXEND         ;IN PREVIOUS END
  0242 010A          741                 A=C             WPT            ;MOVE PC TO END OF "END"
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LOCATION OBJECT CODE LINE     SOURCE LINE

    0243 00001000     742                 GOSUB       INCAD2
    0245 00001000     743                 GOSUB       =PUTPC
    0247 03F8         744                 C=REGN      15          ;SET LINE # TO 000
    0248 0046         745                 C=0         X
    0249 03E8         746                 REGN=C      15
    024A 00001002     747 INEX            GOLONG      =NFRC       ;DONE
    024C 01FE         748 IN2BA           C=C+C       S           ;SEPARATE ROWS 9 AND 10
    024D 02FE         749                 C#0?        S
    024E 0007         750                 GOC         IN2R9       ;ROW 9, MORE TO DO
    024F 00CE         751 INN2B           C=B         W           ;ROW 10, NORMAL 2 BYTE
    0250 00DC         752                 PT=         10
    0251 00001000     753                 GOSUB       =INBYTP     ;INSERT SECOND BYTE
    0253 0003         754                 GOTO        INEX        ;DONE
                      755 * ROW 9 HERE
    0254 035C         756 IN2R9           PT=         12
    0255 0262         757                 C=C-1       PT          ;RCL?
    0256 0003         758                 GONC        IN2STO      ;NO,CHECK FOR STORE
    0257 019C         759                 PT=         11          ;YES, CHECK FOR SHORT FORM
    0258 02E2         760                 C#0?        PT          ;<16?
    0259 0007         761                 GOC         INN2B       ;NO,LONG FORM.
    025A 0090         762                 LC          2           ;YES, MAKE SHORT FORM
    025B 00FC         763 INRCLS          RCR         10
    025C 00001002     764 INSHR2          GOLONG      =INSHRT     ;INSERT IT
    025E 0262         765 IN2STO          C=C-1       PT          ; STO?
    025F 0003         766                 GONC        INN2B       ;NO, STANDARD 2 BYTE
    0260 019C         767                 PT=         11          ;SHORT FORM?
    0261 02E2         768                 C#0?        PT
    0262 0007         769                 GOC         INN2B       ;NO, LONG FORM
    0263 00D0         770                 LC          3
    0264 0003         771                 GOTO        INRCLS      ;SHORT FORM
                      772 * 3 BYTE FUNCTIONS HERE
    0265 00001000     773 IN3B            GOSUB       =INBYTO     ;PUT OUT SECOND BYTE FOR COMPILE
    0267 01FE         774                 C=C+C       S           ;XEQ OR GTO?
    0268 02FE         775                 C#0?        S
    0269 0003         776                 GONC        INN2B       ;XEQ-INSERT NORMAL ADDRESS
    026A 00FC         777                 RCR         10          ;CHECK FOR SHORT FORM
    026B 0226         778                 C=C+1       X           ; NOTE-FF IS ILLEGAL
    026C 031C         779                 PT=         1
    026D 02E2         780                 C#0?        PT          ;SHORT FORM?
    026E 0007         781                 GOC         INN2B       ;NO, INSERT NORMAL ADDRESS
    026F 02D0         782                 LC          11          ;YES, SHORT FORM
    0270 00001000     783                 GOSUB       =DECAD      ;OVERWRITE FIRST BYTE
    0272 0003         784                 GOTO        INSHR2
                      785 *
                      786 * INSTR - INSERT STRING
                      787 * GIVEN REG A IN THE PROPER FORMAT FOR INBYT, INSERTS A
                      788 *- LABEL STRING FROM REG 9 INTO PROGRAM MEMORY
                      789 * USES THE SAME REGISTERS AS INBYT AND IN ADDITION ALL
                      790 *- OF C.
                      791 * USES 3 SUB LEVELS. RETURNS PT=1
                      792 *
    0273 0278         793 INSTR           C=REGN      9           ;GET THE REST OF THE STRING
    0274 02EE         794 INSTR1          C#0?        W           ;ALL DONE?
    0275 03A0         795                 RTNNC                   ;YES, GO BACK.
    0276 00001000     796                 GOSUB       =INBYTC     ;NO, INSERT ANOTHER CHAR.
    0278 0278         797                 C=REGN      9           ;SHIFT OUT INSERTED CHAR.
    0279 03CE         798                 CSR         W
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LOCATION OBJECT CODE LINE     SOURCE LINE

    027A 03CE          799                CSR            W
    027B 0268          800                REGN=C         9
    027C 0003          801                GOTO           INSTR1          ;GO AROUND AGAIN
                       802 *
                       803 * INTXC - PREPARE TEST CHARACTER FOR INSERT
                       804 * PLACES A TEXT CHARACTER OF THE PROPER SIZE IN C[0-1]
                       805 * WHICH IS NEEDED TO PRECEED THE TEXT STRING IN REG 9.
                       806 * USES ONLY C[X] AND M.
                       807 *
    027D 0130          808 INTXC          LDI                            ;CREATE TEXT CHARACTER
    027E 00F0          809                CON            15*16+0
    027F 00AE          810                ACEX           W               ;PLACE TEXT CHAR IN A
    0280 0158          811                M=C                            ;SAVE A FOR LATER
    0281 0278          812                C=REGN         9               ;GET TEXT CHAR
    0282 0003          813                GOTO           INTXC2
    0283 0166          814 INTXC1         A=A+1          X               ;ADD 1 TO TEXT CHAR
    0284 03CE          815                CSR            W               ;MOVE TO NEXT CHAR.
    0285 03CE          816                CSR            W
    0286 02EE          817 INTXC2         C#0?           W               ;ALL DONE?
    0287 0007          818                GOC            INTXC1          ;NO, COUNT SOME MORE.
    0288 0198          819                C=M                            ;DONE, PUT THINGS BACK
    0289 00AE          820                ACEX           W               ;RESTORE A
    028A 03E0          821                RTN                            ;DONE
                       822 *
                       823 * LINNUM - LINE NUMBER
                       824 * WHEN CALLED EITHER RECALLS THE BINARY LINE NUMBER
                       825 *- OF THE CURRENT LINE FROM REGISTER 15 OR ELSE COMPUTES IT
                       826 *- IF THE LINE NUMBER STORED IS INVALID. IN ALL CASES THE
                       827 *- CORRECT LINE NUMBER IS RETURNED IN C[0-2]. IF COMPUTED,
                       828 *- THE PROPER LINE NUMBER IS STORED.
                       829 * ASSUMES CHIP 0 SELECTED ON INPUT.
                       830 * WORKS IN ROM OR RAM.
                       831 * USES 2 SUBROUTINE LEVELS.
                       832 * USES A,C,M,N,P,Q,B[0-3],S[0-8]. RETURNS P SELECTED IF LINE NUMBER
                       833 *- IS COMPUTED.
    028B 03F8          834 LINNUM         C=REGN         15              ;GET LINE NUMBER
    028C 0226          835                C=C+1          X               ;VALID?
    028D 0007          836                GOC            LINNM1          ; NO, GO COMPUTE IT.
    028E 0266          837                C=C-1          X               ;RESTORE THE CORRECT NUMBER
    028F 03E0          838                RTN
    0290 0104          839 LINNM1         ST=0           8               ;CLEAR GTONN BIT
    0291 004E          840 BKROM2         C=0            W
    0292 026E          841                C=C-1          W               ;SET TARGET LINE# = FFF
    0293 00A0          842 LINN1A         SELP                           ;COMPUTE LINE NUMBER IN RAM
    0294 005C          843                PT=            4               ;SET UP POINTERS FOR LATER
    0295 00E0          844                SELQ
    0296 0070          845                N=C                            ;STORE TARGET LINE#
    0297 00CC          846                ST=1?          10              ;ROM FLAG?
    0298 0007          847                GOC            LINROM          ;YES, COMPUTE LINE# IN ROM
    0299 00001000      848                GOSUB          FLINKP          ;FIND THE PREVIOUS LINK
    029B 010C          849                ST=1?          8               ;GTONN?
    029C 0003          850                GONC           $+2             ;NO, USE PC ADDRESS
    029D 013C          851                RCR            8               ;YES, USE END ADDRESS AS TARGET
    029E 0052          852                C=0            PQ              ;PREPARE FOR LINE NUMBER IN PQ FIELD
    029F 01D8          853                CMEX
    02A0 034A          854                A#0?           WPT             ;TOP OF MEMORY?
    02A1 0003          855                GONC           LINNM5          ;YES, GO TO FIRST INST.
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LOCATION OBJECT CODE LINE     SOURCE LINE

 02A2 0003          856                    GOTO          LINNM2        ; GO FIND IT
 02A3 00001000      857 LINNM3             GOSUB         =UPLINK       ;FIND PREVIOUS END
 02A5 023E          858 LINNM2             C=C+1         S             ;END?
 02A6 0003          859                    GONC          LINNM4        ;YES, MOVE TO FINAL BYTE
 02A7 02E6          860                    C#0?          X             ;TOP OF MEMORY?
 02A8 0007          861                    GOC           LINNM3        ;NO, CONTINUE
 02A9 00001000      862 LINNM5             GOSUB         =FSTIN        ;YES, POSITION JUST BEFORE 1ST INST.
 02AB 0003          863                    GOTO          LINNM6        ;GO COUNT LINES.
 02AC 00001000      864 LINNM4             GOSUB         INCADA        ;END! SET UP FOR COUNTING LOOP.
 02AE 00001000      865                    GOSUB         NXBYTA        ;POSITION TO LAST BYTE OF END
 02B0 037C          866                    RCR           12
 02B1 03C4          867 LINNM6             CLRST                       ;SET UP FOR NXLIN
 02B2 0048          868                    ST=1          4
 02B3 008A          869                    B=A           WPT           ;SAVE COUNTING ADDRESS IN B
 02B4 01D8          870                    CMEX                        ;STORE MEM REG IN C
 02B5 010E          871                    A=C           W             ;GET TARGET ADDRESS AND LINE CT TO A
 02B6 00B0          872                    C=N                         ;RETRIEVE THE TARGET LINE NUMBER
 02B7 00CA          873                    C=B           WPT           ;MERGE WITH THE COUNTING ADDRESS
                    874 * MAIN COUNTING LOOP
 02B8 0070          875 LINML              N=C                         ;SAVE THE CURRENT ADDRESS
 02B9 00AE          876                    ACEX          W
 02BA 01D8          877                    CMEX                        ;SAVE ADDRESS, GET STEPS
 02BB 00001000      878 LINML1             GOSUB         NXLIN         ;MOVE TO THE NEXT LINE
 02BD 01D8          879                    CMEX                        ;GET ADDRESS
 02BE 0232          880                    C=C+1         PQ            ;ADD 1 TO LINE COUNT
 02BF 00AE          881                    ACEX          W             ;TEST FOR DONE
 02C0 0372          882                    A#C?          PQ            ;REACHED LINE NN
 02C1 0003          883                    GONC          LINML2        ;YES, GTONN EXIT.
 02C2 0306          884                    A<C?          X             ;MORE?
 02C3 0007          885                    GOC           LINML         ;YES.
 02C4 0366          886                    A#C?          X             ;SAME REGISTER?
 02C5 0007          887                    GOC           LINML2        ;NO, DONE!
 02C6 0302          888                    A<C?          PT            ;MORE?
 02C7 0007          889                    GOC           LINML         ;YES
 02C8 0362          890                    A#C?          PT            ;MORE? - DON'T STOP ON EQUAL.
 02C9 0003          891                    GONC          LINML         ;YES
 02CA 00AE          892 LINML2             ACEX          W             ;SAVE NUMBER IN C
 02CB 0003          893                    GOTO          LINEND        ;ALL DONE!
                    894 * CALCULATE LINE NUMBER IN ROM
 02CC 00001000      895 LINROM             GOSUB         =ROMHED       ;A[0-3]=ADDRESS OF BEGIN
 02CE 004E          896                    C=0           W             ;PREPARE A ZERO MANTISSA
 02CF 00AA          897                    ACEX          WPT           ;C=COUNTING REG, A[0-3]=0
 02D0 0158          898                    M=C                         ;SAVE COUNTERS IN M
 02D1 01AA          899                    A=A-1         WPT           ;SET A[0-3]=FFFF
 02D2 010C          900                    ST=1?         8             ;GTONN?
 02D3 00001000      901                    GSUBNC        GETPC         ;NO,GET ENDING ADDRESS
 02D5 00B0          902                    C=N                         ;GET ENDING LINE#
 02D6 00AA          903                    ACEX          WPT           ;FORM TARGET STRING
 02D7 01D8          904                    CMEX                        ;GET READY FOR LOOP
 02D8 010E          905                    A=C           W             ;PUT COUNTING ADDRESS'S IN A
 02D9 0144          906                    ST=0          6             ;CLEAR END BIT
 02DA 0003          907                    GOTO          LINRM4
 02DB 00001000      908 LINRM2             GOSUB         SKPLIN        ;MOVE TO THE NEXT LINE
 02DD 014C          909                    ST=1?         6             ;HIT AN END?
 02DE 0007          910                    GOC           LINRM3        ;YES, DONE!
 02DF 0172          911 LINRM4             A=A+1         PQ            ;NO, ADD 1 TO LINE #
 02E0 0198          912                    C=M                         ;GET TARGETS
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LOCATION OBJECT CODE LINE     SOURCE LINE

    02E1 0312          913                 A<C?            PQ              ;REACHED THE LINE#?
    02E2 0003          914                 GONC            LINRM3          ;YES, DONE!
    02E3 030A          915                 A<C?            WPT             ;REACHED THE ADDRESS?
    02E4 0007          916                 GOC             LINRM2          ;NO, TRY AGAIN.
    02E5 00AE          917 LINRM3          ACEX            W               ;DONE!
    02E6 0070          918                 N=C                             ;SAVE THE ADDRESS IN N
    02E7 007C          919 LINEND          RCR             4               ;PUT THE NEW LINE# IN A[X]
    02E8 0106          920                 A=C             X
    02E9 00001000      921                 GOSUB           =GETLIN         ;PLACE NUMBER IN REGISTER 15
    02EB 00A0          922                 SELP                            ;SELECT P FOR RETURN
    02EC 001C          923                 PT=             3
    02ED 034C          924                 ST=1?           12              ;PRIVATE PROGRAM?
    02EE 0360          925                 RTNC                            ;YES, RETURN FFF.
    02EF 00A6          926                 ACEX            X               ;PUT LINE NUMBER IN PLACE
    02F0 03E8          927                 REGN=C          15              ;PUT BACK
    02F1 00B0          928                 C=N
    02F2 010A          929 BSTE2           A=C             WPT
    02F3 00001000      930 PUTPCL          GOSUB           =PUTPC          ;PUT THE NEW ADDRESS IN THE PC
    02F5 03F8          931                 C=REGN          15              ;GET THE LINE NUMBER
    02F6 03E0          932                 RTN
                       933 *
                       934 * NXLIN - MOVE TO THE NEXT LINE
                       935 * SPECIAL RAM PROGRAM MEMORY TRAVERSAL SUBROUTINE
                       936 * GIVEN THE ADDRESS OF THE LAST BYTE OF A LINE IN MM FORMAT IN
                       937 *- A[0-3], AND ALSO IN C THE REGISTER POINTED TO BY A[0-2]
                       938 *- ROTATED SO THAT THE BYTE POINTED TO BY A[3] IS IN C[3-2].
                       939 * THE ROUTINE RETURNS A & C IN THE SAME FORMAT AS THEY WERE
                       940 *- INPUT BUT REFERRING TO THE NEXT LINE IN PROGRAM MEMORY.
                       941 * NOTE- IF THE BYTE NUMBER=0 THEN C[3-2] IS CORRECT, BUT THE
                       942 *- REST OF C MAY BE FROM A DIFFERENT REGISTER ON RETURN. ON
                       943 *- INPUT, C NEED NOT BE SPECIFIED.
                       944 * TRAILING NULLS ARE TREATED AS PART OF THE CURRENT PROGRAM STEP.
                       945 * USES B[0-3].
                       946 * PT=3 IN AND OUT
                       947 *
                       948 *
                       949 * SKPLIN -SKIP A LINE
                       950 * GIVEN THE ADDRESS OF THE LAST BYTE OF A PROGRAM LINE
                       951 *- IN A[0-3] IN MM FORMAT, RETURNS THE ADDRES OF THE
                       952 *- LAST BYTE OF THE NEXT LINE IN A[0-3].
                       953 * NULLS FOLLOWING THE CURRENT LINE ARE PROPERLY SKIPPED
                       954 * THE ROUTINE DOES NOTHING IF THE LINE TO BE SKIPPED IS
                       955 *- AND END.
                       956 *
                       957 * NXLSST - SAME AS SLPLIN, BUT THIS ENTRY WILL SKIP ENDS
                       958 *- BY GOING TO STEP 1 OF THE CURRENT PROGRAM.
                       959 *
                       960 * S6 SET TO 1 WHEN ENCOUTERING AN END.
                       961 * USES A[0-3],B[0-3],C,S0-7,1 SUB LEVEL
                       962 *
                       963 * NXLDEL - A SPECIAL ENTRY POINT INTO NXLIN HAS BEEN
                       964 *- CREATED FOR DELETE OPERATIONS. THIS ENTRY POINT
                       965 *- EXPECTS S7=1 AND GOES ON TO THE NORMAL RAM LINE SKIPPING
                       966 *- LOGIC. IF A CHAIN ELEMENT IS TO BE SKIPPED, SPECIAL
                       967 *- DELETE LOGIC IS EMPLOYED:
                       968 * THE PREVIOUS LINK IS ELARGED TO BRIDGE THE GAP
                       969 * IF AN END IS TO BE DELETED, SET S5=0. OTHERWISE ALL ENDS
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LOCATION OBJECT CODE LINE     SOURCE LINE

                     970 *- ARE TREATED AS THE FINAL END.
                     971 * IF THE FINAL END, RETURN WITH THE SAME ADDRESS AS INPUT.
                     972 *
02F7 03C4            973 NXLSST          CLRST                           ;SINGLE STEP ENTRY
02F8 0003            974                 GOTO            NXLSS1
02F9 03C4            975 SKPLIN          CLRST
02FA 0088            976                 ST=1            5               ;SET BIT TO BACK UP ON END
02FB 00CC            977 NXLSS1          ST=1?           10              ;ROM TO SKIP?
02FC 0007            978                 GOC             SKPROM          ;YES GO DO IT
02FD 00001000        979 NXLDEL          GOSUB           NXBYTA          ;DELETE ENTRY
02FF 0003            980                 GOTO            NXLINA
                     981 * ROM SKIP LINE HERE
0300 00AA            982 SKPROM          ACEX            WPT
0301 01BC            983                 RCR             11
0302 023A            984 SKPR10          C=C+1           M
0303 0330            985                 CXISA
0304 02F6            986                 C#0?            XS              ;1ST BYTE OF NEW FC?
0305 0003            987                 GONC            SKPR10          ;NO. SKIP THIS NULL.
0306 023A            988 SKPR20          C=C+1           M               ;SKIP THIS BYTE
0307 0330            989                 CXISA
0308 0276            990                 C=C-1           XS              ;CONTINUATION BYTE?
0309 0007            991                 GOC             SKPR20          ;YES
030A 027A            992 SKPR30          C=C-1           M               ;MUST BE 3RD BYTE OF END
                     993                                                 ;OR 1ST BYTE OF 2ND NEW FC
                     994                                                 ;BACK UP ONE BYTE
030B 0276            995                 C=C-1           XS              ;WAS IT 1ST BYTE OF 2ND FC?
030C 00001003        996                 GOLC            =ROMH35         ;YES
030E 0148            997                 ST=1            6               ;MARK THE END
030F 008C            998                 ST=1?           5               ;STOP AT END?
0310 00001002        999                 GOLNC           =ROMHED         ;NO. GO TO TOP
0312 027A           1000                 C=C-1           M               ;BACK UP 2ND BYTE
                    1001                 LEGAL
0313 0003           1002                 GOTO            SKPR30          ;GO BACK UP 1 MORE & EXIT
                    1003 * NXLIN RAM TRAVERSAL LOGIC HERE
0314 01A2           1004 NXLIN           A=A-1           PT              ;MOVE TO THE NEXT BYTE
0315 0003           1005                 GONC            NXLIN1
0316 00AA           1006                 ACEX            WPT             ;GET THE NEXT REGISTER
0317 0262           1007                 C=C-1           PT              ;SET BYTE NO. TO 6
0318 0262           1008                 C=C-1           PT
0319 0266           1009                 C=C-1           X               ;MOVE TO THE NEXT REGISTER
031A 0270           1010                 DADD=C                          ;GET IT
031B 010A           1011                 A=C             WPT             ;SAVE THE NEW ADDRESS
031C 0038           1012                 C=DATA
031D 037C           1013                 RCR             12              ;MOVE BYTE 6 INTO BYTE 0 POSITION
031E 01A2           1014 NXLIN1          A=A-1           PT              ;FINISH CHANGING THE BYTE NO.
031F 037C           1015 NXLINA          RCR             12              ;MOVE NEW BYTE INTO POSITION
0320 0282           1016                 C=-C            PT              ;START DECODE
0321 01E2           1017                 C=C+C           PT              ;1BYTE?
0322 0003           1018                 GONC            NXLIN2          ;NO, MORE DECODE
0323 0222           1019 NXL1B           C=C+1           PT              ;1 BYTE INST. HERE
0324 0222           1020                 C=C+1           PT              ;ROW 1?
0325 03A0           1021                 RTNNC                           ;NO, ALL DONE!
0326 01F6           1022                 C=C+C           XS              ;DIG 0-7?
0327 0003           1023                 GONC            NXLDE           ;YES
0328 01F6           1024                 C=C+C           XS              ;DIG 8-9, . ,EEX
0329 0003           1025                 GONC            NXLDE           ;YES
032A 02F6           1026                 C#0?            XS              ;GTO ALPHA,XEQ ALPHA?
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LOCATION OBJECT CODE LINE     SOURCE LINE

    032B 0007        1027                 GOC          NXLIN        ;YES, GET TEXT
                     1028 * DIGIT ENTRY HERE
    032C 00EA        1029 NXLDE           BCEX         WPT          ;SAVE THE CURRENT BYTE IN B
    032D 00CA        1030                 C=B          WPT          ;RESTORE C
    032E 00001000    1031                 GOSUB        NXL3B2       ;GET THE NEXT BYTE
    0330 0282        1032                 C=-C         PT           ;SEARCH FOR NON DIGIT ENTRY CODE
    0331 01E2        1033                 C=C+C        PT           ;1 BYTE FN?
    0332 0003        1034                 GONC         NXLDE2       ;NO, BACK UP 1 BYTE
    0333 0222        1035                 C=C+1        PT
    0334 0222        1036                 C=C+1        PT           ;ROW 1?
    0335 0003        1037                 GONC         NXLDE2       ;NO,BACK UP
    0336 01F6        1038                 C=C+C        XS           ;DIG 0-7?
    0337 0003        1039                 GONC         NXLDE        ;YES, KEEP GOING
    0338 01F6        1040                 C=C+C        XS           ;DIG 8-9, . ,EEX?
    0339 0003        1041                 GONC         NXLDE        ;YES, KEEP GOING
    033A 02F6        1042                 C#0?         XS           ;CHS?
    033B 0003        1043                 GONC         NXLDE        ;YES, KEEP GOING
    033C 00001000    1044 NXLDE2          GOSUB        DECADA       ;BACK UP ONE BYTE
    033E 023C        1045                 RCR          2            ;RESTORE THE REGISTER
    033F 00CA        1046 NXLTX1          C=B          WPT          ;RETRIEVE OLD BYTE
    0340 03E0        1047                 RTN                       ;DONE!
                     1048 * 2 BYTE INSTRUCTIONS HERE
    0341 01E2        1049 NXLIN2          C=C+C        PT           ;2 BYTE?
    0342 0003        1050                 GONC         NXLIN3       ;NOPE, MORE DECODE
    0343 02E2        1051                 C#0?         PT           ;ROW 12?
    0344 0007        1052                 GOC          NXL3B2       ;NO, INCREMENT 1 BYTE
    0345 0236        1053                 C=C+1        XS           ;LBL NN?
    0346 0007        1054                 GOC          NXL3B2       ;YES, SIMPLE INCREMENT
    0347 0236        1055                 C=C+1        XS           ;X<>NN?
    0348 0007        1056                 GOC          NXL3B2       ;YES
    0349 028C        1057 NXLCHN          ST=1?        7            ;DELETE?
    034A 00001003    1058                 GOLC         =SKPDEL      ;YES,SPECIAL LOGIC
    034C 00001000    1059                 GOSUB        NXL3B2       ;GET THE THIRD BYTE
    034E 00001000    1060                 GOSUB        NXL3B2
    0350 0222        1061                 C=C+1        PT           ;ALPHA LABEL?
    0351 0007        1062                 GOC          NXLTX        ;YES, GO DO THE TEXT
    0352 0148        1063                 ST=1         6            ;NO, END - MARK IT
    0353 004C        1064                 ST=1?        4            ;NORMAL CASE?
    0354 0360        1065                 RTNC                      ;YES, DONE!
    0355 00001000    1066                 GOSUB        DECADA       ;RESTORE ADDRESS OF 1ST BYTE OF LINK.
    0357 00001000    1067                 GOSUB        DECADA
    0359 008C        1068                 ST=1?        5            ;SKPLIN?
    035A 0007        1069                 GOC          NXLDE2       ;YES, BACK UP
    035B 00001000    1070                 GOSUB        =GTLINK      ;NO, SINGLE STEP
    035D 00001002    1071                 GOLONG       =CPGMHD      ;GO TO THE TOP OF THE PROGRAM
                     1072 * 3 BYTE INSTRUCTIONS HERE
    035F 01E2        1073 NXLIN3          C=C+C        PT           ;3 BYTE?
    0360 0003        1074                 GONC         NXLIN4       ;NO,MORE DECODE
    0361 00001000    1075                 GOSUB        NXL3B2       ;INCREMENT THE FIRST BYTE
    0363 01A2        1076 NXL3B2          A=A-1        PT           ;INCREMENT 1 BYTE
    0364 0003        1077                 GONC         NXL2B1
    0365 00AA        1078                 ACEX         WPT
    0366 0310        1079                 LC           12
    0367 001C        1080                 PT=          3
    0368 0266        1081                 C=C-1        X
    0369 0270        1082                 DADD=C
    036A 010A        1083                 A=C          WPT
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LOCATION OBJECT CODE LINE     SOURCE LINE

    036B 0038        1084                 C=DATA
    036C 00FC        1085                 RCR            10
    036D 03E0        1086                 RTN
    036E 01A2        1087 NXL2B1          A=A-1          PT
    036F 037C        1088                 RCR            12
    0370 03E0        1089                 RTN
                     1090 * TEXT AND ROW 0 HERE
    0371 01E2        1091 NXLIN4          C=C+C          PT              ;TEXT?
    0372 0007        1092                 GOC            NXLTX           ;YES, GO TRAVERSE IT.
                     1093 * ROW 0 HERE
    0373 02F6        1094 NXLR0           C#0?           XS              ;SHORT LABELS?
    0374 0360        1095                 RTNC                           ;YES, ALL DONE!
    0375 00001002    1096                 GOLONG         NXLIN           ;SKIP OVER NULLS
                     1097 * TEXT HERE
    0377 0276        1098 NXLTX           C=C-1          XS
    0378 0360        1099                 RTNC                           ;EXIT FOR FUNCTION CODE F0
    0379 00EA        1100 NXLTX2          BCEX           WPT             ;SAVE BYTE COUNT IN B
    037A 00001000    1101                 GOSUB          NXL3B2          ;MOVE TO THE NEXT CHAR.
    037C 00EA        1102                 BCEX           WPT             ;RETRIEVE REMAINING CHAR COUNT.
    037D 0276        1103                 C=C-1          XS              ;DEC. THE CHAR COUNT
    037E 0003        1104                 GONC           NXLTX2          ;DONE?
    037F 0003        1105                 GOTO           NXLTX1          ;YES, RESTORE THE C REGISTER
                     1106
                     1107
                     1108
                     1109                 GLB            GCPK04
                     1110                 GLB            GCPK05
                     1111                 GLB            GCPKC
                     1112                 GLB            GCP112
                     1113
                     1114 *  GCPKC - GET/CLEAR/PLACE KEYCODE
                     1115 *- DEPENDING UPON THE INPUT CONDITIONS, THIS SUBROUTINE
                     1116 *- WILL GET, CLEAR OR PLACE A KEYCODE IN THE ASN
                     1117 *- FUNCTION TABLE OR PROGRAM MEMORY, WHICHEVER IS
                     1118 *- APPLICABLE.
                     1119 *-
                     1120 *- GET- IN:  A[1:0]= LOGICAL KEYCODE
                     1121 *-           STATUS BIT 1= 0
                     1122 *-      OUT: CHIP 0 SELECTED
                     1123 *-           C[3:0]= CORRESPONDING FUNCTION CODE IF ROM
                     1124 *-                 = CORRESPONDING LABEL ADDRESS IF RAM
                     1125 *-           S3= 1 IMPLIES C[3:0] IS A RAM LABEL ADDRESS
                     1126 *-           (IF DIGIT 3 = 0 THEN FUNCTION CODE IS 1 BYTE
                     1127 *-            FUNCTION CODE)
                     1128 *-
                     1129 *- CLEAR- IN:  A[1:0]= LOGICAL KEYCODE
                     1130 *-             STATUS BIT 1 = 1
                     1131 *-        OUT: CHIP 0 SELECTED
                     1132 *-
                     1133 *- PLACE- IN:  A[3:2]= LOGICAL KEYCODE
                     1134 *-             A[1:0]= ZERO
                     1135 *              B[3:0] = FUNCTION CODE
                     1136 *-        OUT: S3=1 IMPLIES FUNCTION WAS PLACED
                     1137 *- USES:  A,B,C,M,N,STATUS BIT 3
                     1138 *- USES:  1 SUBROUTINE LEVEL
                     1139
                     1140
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LOCATION OBJECT CODE LINE     SOURCE LINE

                     1141
    0380 0004        1142 GCPKC          ST=0          3          ;-
    0381 0378        1143                C=REGN        13         ;M_CHAINHEAD
    0382 001C        1144                PT=           3
    0383 0110        1145                LC            4          ;C[3:0]=FINAL END ADDR
    0384 0158        1146                M=C                      ;SAVE FINAL ENS ADDR IN M
    0385 001C        1147                PT=           3
    0386 00FC        1148                RCR           10
    0387 00CA        1149                C=B           WPT
    0388 00EE        1150                BCEX          W          ;SAVE .END. ADDR IN B[4:7] TOO
                     1151 *
                     1152                GLB           GCPKC0     ;SEARCH ALBLS FROM ANY LINK
    0389 0130        1153 GCPKC0         LDI                      ;C[2:0] _ 1ST REG
    038A 00BF        1154                CON           191        ;-
    038B 0226        1155 GCPK10         C=C+1         X          ;-
    038C 00AE        1156                ACEX          W          ;CHAINHEAD=REG?
    038D 01D8        1157                MCEX                     ;-
    038E 0366        1158                A#C?          X          ;-
    038F 0003        1159                GONC          GCPK04     ;YES, SEARCH ALBLS
    0390 01D8        1160                MCEX                     ;RESTORE REGS
    0391 00AE        1161                ACEX          W          ;-
    0392 0270        1162                DADD=C                   ;C_REG
    0393 0070        1163                N=C                      ;-
    0394 0038        1164                C=DATA                   ;-
    0395 023E        1165                C=C+1         S          ;END ASNS?
    0396 0003        1166                GONC          GCPK05     ;YES
    0397 027E        1167                C=C-1         S          ;-
    0398 011E        1168                A=C           S          ;-
    0399 031C        1169 GCPK70         PT=           1          ;INITIALIZE
    039A 036A        1170                A#C?          WPT        ;1ST KEYCODE?
    039B 0003        1171                GONC          GCPK80     ;YES
    039C 017C        1172                RCR           6          ;2ND KEYCODE?
    039D 036A        1173                A#C?          WPT        ;-
    039E 0007        1174                GOC           GCPK20     ;NOPE
    039F 034A        1175 GCPK80         A#0?          WPT        ;PLACE?
    03A0 0007        1176                GOC           GCP100     ;NOPE
    03A1 001C        1177                PT=           3          ;-
    03A2 038A        1178                ASR           WPT        ;C[1:0]_K.C.
    03A3 038A        1179                ASR           WPT        ;-
    03A4 00A6        1180                ACEX          X          ;-
    03A5 00B6        1181                ACEX          XS         ;-
    03A6 023C        1182                RCR           2          ;PLACE THE FUNCTION CODE
    03A7 00CA        1183                C=B           WPT        ;-
    03A8 0008        1184                ST=1          3          ;FUNCTION PLACED
    03A9 017C        1185 GCPK90         RCR           6          ;RESTORE REGISTER
    03AA 037E        1186                A#C?          S          ;-
    03AB 0003        1187                GONC          $+2        ;-
    03AC 017C        1188                RCR           6          ;-
    03AD 02F0        1189                DATA=C                   ;RESTORE REGISTER
    03AE 0003        1190                GOTO          GCP112     ;-
    03AF 030C        1191 GCP100         ST=1?         1          ;CLEAR?
    03B0 0003        1192                GONC          GCP110     ;NOPE
    03B1 004A        1193                C=0           WPT        ;ZERO OUT KEYCODE
    03B2 023C        1194                RCR           2          ;RESTORE REGISTER
    03B3 0003        1195                GOTO          GCPK90     ;-
    03B4 023C        1196 GCP110         RCR           2          ;C[3:0]_FUNCTION CODE
    03B5 01D8        1197 GCP112         MCEX                     ;SELECT CHIP 0
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LOCATION OBJECT CODE LINE     SOURCE LINE

    03B6 0046        1198                 C=0            X              ;-
    03B7 0270        1199                 DADD=C                        ;-
    03B8 01D8        1200                 MCEX                          ;-
    03B9 03E0        1201                 RTN                           ;RETURN
                     1202
    03BA 00B0        1203 GCPK20          C=N                           ;INCREMENT TO NXT REG
    03BB 0003        1204                 GOTO           GCPK10
                     1205
    03BC 01D8        1206 GCPK04          MCEX                          ;RESTORE REGISTERS
    03BD 0003        1207                 GOTO           GCPK06
    03BE 00AE        1208 GCPK05          ACEX           W              ;B[5:4]_K.C.
    03BF 00FC        1209 GCPK06          RCR            10             ;-
    03C0 00EE        1210                 BCEX           W              ;-
    03C1 0070        1211                 N=C                           ;SAVE F.C. IN N
    03C2 007C        1212                 RCR            4              ;C[3:0]_CHAINHEAD
    03C3 001C        1213                 PT=            3
    03C4 010A        1214                 A=C            WPT
    03C5 00001000    1215                 GOSUB          =GTLINK
    03C7 02E6        1216 GCPK15          C#0?           X              ;END OF CHAIN?
    03C8 0003        1217                 GONC           GCPK55         ;YES, NOT FOUND
    03C9 00001000    1218                 GOSUB          =UPLINK        ;GET NEXT LINK
    03CB 023E        1219                 C=C+1          S              ;ALBL?
    03CC 0003        1220                 GONC           GCPK15         ;NOPE
    03CD 00FC        1221                 RCR            10             ;SAVE LINK & ADDR IN M
    03CE 00AA        1222                 ACEX           WPT            ;-
    03CF 010E        1223                 A=C            W              ;-
    03D0 0158        1224                 M=C                           ;-
    03D1 00001000    1225                 GOSUB          INCAD2         ;GET KEYCODE BYTE
    03D3 00001000    1226                 GOSUB          NXBYTA         ;-
    03D5 008A        1227                 B=A            WPT            ;-
    03D6 031C        1228                 PT=            1              ;CORRECT K.C.?
    03D7 00DA        1229                 C=B            M              ;-
    03D8 007C        1230                 RCR            4              ;-
    03D9 010A        1231                 A=C            WPT            ;-
    03DA 00FC        1232                 RCR            10             ;-
    03DB 036A        1233                 A#C?           WPT            ;-
    03DC 0007        1234                 GOC            GCPK45         ;NOPE
    03DD 034A        1235 GCPK25          A#0?           WPT            ;PLACE?
    03DE 0007        1236                 GOC            GCPK28         ;NO
    03DF 0046        1237                 C=0            X              ;-
    03E0 001C        1238                 PT=            3              ;-
    03E1 00DA        1239 GCPK55          C=B            M              ;A[1:0]_K.C.
    03E2 0270        1240                 DADD=C                        ;-
    03E3 007C        1241                 RCR            4              ;-
    03E4 010E        1242                 A=C            W              ;-
    03E5 00B0        1243                 C=N                           ;RESTORE F.C.
    03E6 00EE        1244                 BCEX           W              ;-
    03E7 0003        1245                 GOTO           GCP112         ;-
    03E8 030C        1246 GCPK28          ST=1?          1              ;GET?
    03E9 0003        1247                 GONC           GCPK35         ;YES
    03EA 0046        1248                 C=0            X              ;CLEAR K.C.
    03EB 006E        1249                 ABEX           W              ;-
    03EC 00001000    1250                 GOSUB          =PTBYTA        ;-
    03EE 0003        1251                 GOTO           GCP112         ;-
    03EF 0198        1252 GCPK35          C=M                           ;C[3:0]_LBL ADDR
    03F0 0008        1253                 ST=1           3              ;RAM ADDR
    03F1 0003        1254                 GOTO           GCP112         ;-
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

                     1255
    03F2 001C        1256 GCPK45          PT=              3                ;PREPARE TO GET NXT LINK
    03F3 0198        1257                 C=M                               ;-
    03F4 010A        1258                 A=C              WPT              ;-
    03F5 007C        1259                 RCR              4                ;-
    03F6 0003        1260                 GOTO             GCPK15           ;-
                     1261 *
                     1262                 GLB              LEFTJ
                     1263 *
                     1264 * LEFT JUSTIFY LCD
                     1265 *
    03F7 0130        1266 LEFTJ           LDI
    03F8 0020        1267                 CON              32               ;BLANK
    03F9 0106        1268                 A=C              X
    03FA 031C        1269                 PT=              1
    03FB 03F8        1270 LEFTJ1          RABCL
    03FC 036A        1271                 A#C?             WPT
    03FD 0003        1272                 GONC             LEFTJ1
    03FE 03B8        1273                 RABCR
    03FF 03E0        1274                 RTN
                     1275                 FILLTO           1777Q
                     1276                 END

Errors=    0
```

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LINE#	SYMBOL	TYPE	REFERENCES
263	AVAIL	P	4,182,499
277	AVAIL1	P	272
266	AVAILA	P	5
341	BKROM	P	308
343	BKROM1	P	346
840	BKROM2	P	8,349
315	BST1	P	312
316	BST2	P	314
339	BSTE	P	9,350
929	BSTE2	P	7,339
300	BSTEP	P	6
292	BSTEP2	P	302,304
306	BSTEP3	P	293
310	BSTEPA	P	10
322	BSTML	P	331,335,337
338	BSTML1	P	333
327	BSTML2	P	320
576	CALDSP	P	575
	CPGMHD	E	1071
593	DECAD	P	11,783
596	DECADA	P	12,242,315,1044,1066,1067
617	DECADB	P	595
107	ERRDE	P	106
	ERROR	E	107
359	FIXEND	P	13,187,740
392	FLINK	P	14,309
396	FLINK1	P	425
397	FLINK2	P	395
406	FLINK3	P	399,403
424	FLINK5	P	412
391	FLINKA	P	23,733
393	FLINKM	P	24,186
390	FLINKP	P	25,294,848
	FSTIN	E	313,483,862
1191	GCP100	P	1176
1196	GCP110	P	1192
1197	GCP112	P	1112,1190,1245,1251,1254
1206	GCPK04	P	1109,1159
1208	GCPK05	P	1110,1166
1209	GCPK06	P	1207
1155	GCPK10	P	1204
1216	GCPK15	P	1220,1260
1203	GCPK20	P	1174
1235	GCPK25	P	
1246	GCPK28	P	1236
1252	GCPK35	P	1247
1256	GCPK45	P	1234
1239	GCPK55	P	1217
1169	GCPK70	P	
1175	GCPK80	P	1171
1185	GCPK90	P	1195
1142	GCPKC	P	1111
1153	GCPKCO	P	1152
	GENLNK	E	734,736
	GETLIN	E	921
439	GETPC	P	15,306,390,731,901
441	GETPCA	P	28

LINE#	SYMBOL	TYPE	REFERENCES
544	GTBYT	P	26
566	GTBYTA	P	29,316,363,545
546	GTBYTO	P	27
	GTFEND	E	393
	GTLINK	E	480,1070,1215
	GTLNKA	E	189
455	GTONN	P	30
469	GTONN2	P	463
499	GTO_1	P	487
489	GTO_2	P	484,494
495	GTO_2A	P	492
526	GTO_3	P	497
485	GTO_4	P	482
529	GTO_5	P	31
475	GTO__	P	461
696	IN2B	P	687
748	IN2BA	P	699
711	IN2BB	P	702
756	IN2R9	P	750
765	IN2STO	P	758
773	IN3B	P	32,697
172	INB0	P	129
101	INB1	P	131
168	INB2	P	133
164	INB3	P	135
160	INB4	P	137
156	INB5	P	139
140	INB6	P	
173	INBEX	P	144,159,163,167,171
144	INBEXA	P	104
651	INBYT	P	33,684
632	INBYTO	P	36,718,729,773
654	INBYT1	P	37,238
633	INBYTC	P	34,693,723,728,796
634	INBYTP	P	35,753
614	INC1	P	609
615	INC2	P	579
612	INC21	P	606
601	INCAD	P	16
605	INCAD2	P	38,362,488,563,742,1225
608	INCADA	P	17,564,604,732,864
619	INCADB	P	602
603	INCADP	P	39,651
747	INEX	P	40,710,738,754
710	INEXA	P	690,695
203	INL1	P	199
200	INL2	P	204
210	INL3	P	222
182	INLIN	P	41,174
679	INLIN2	P	43
725	INLNK1	P	722
731	INLNK2	P	724
751	INN2B	P	707,712,761,766,769,776,781
763	INRCLS	P	771
764	INSHR2	P	784
709	INSHRT	P	708,764
678	INSLIN	P	42

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LINE#	SYMBOL	TYPE	REFERENCES
	INSSUB	E	678
793	INSTR	P	44,694,730
794	INSTR1	P	801
808	INTXC	P	45,692,725
814	INTXC1	P	818
817	INTXC2	P	813
1266	LEFTJ	P	1262
1270	LEFTJ1	P	1272
919	LINEND	P	893
875	LINML	P	885,889,891
878	LINML1	P	
892	LINML2	P	883,887
842	LINN1A	P	19,473
839	LINNM1	P	18,299,836
858	LINNM2	P	856
857	LINNM3	P	861
864	LINNM4	P	859
862	LINNM5	P	855
867	LINNM6	P	863
834	LINNUM	P	20,300
908	LINRM2	P	916
917	LINRM3	P	910,914
911	LINRM4	P	907
895	LINROM	P	847
	MSGDE	E	108
	NFRC	E	474,747
	NFRPU	E	531
239	NOROOM	P	184
183	NROOM	P	
242	NROOM1	P	248
247	NROOM2	P	241
252	NROOM3	P	46
563	NXBYT3	P	48
564	NXBYTA	P	47,489,865,979,1226
1019	NXL1B	P	49
1087	NXL2B1	P	1077
1076	NXL3B2	P	50,1031,1052,1054,1056,1059,1060,1075,1101
1057	NXLCHN	P	51
1029	NXLDE	P	1023,1025,1039,1041,1043
1044	NXLDE2	P	1034,1037,1069
979	NXLDEL	P	21
1004	NXLIN	P	52,326,878,1027,1096
1014	NXLIN1	P	1005
1049	NXLIN2	P	1018
1073	NXLIN3	P	54,1050
1091	NXLIN4	P	1074
1015	NXLINA	P	53,980
1094	NXLRO	P	
977	NXLSS1	P	974
973	NXLSST	P	22
1098	NXLTX	P	55,1062,1092
1046	NXLTX1	P	1105
1100	NXLTX2	P	1104
	PACKE	E	252,501
	PACKN	E	529
	PATCH1	E	600
97	PBAO	P	61,114

LINE#	SYMBOL	TYPE	REFERENCES
93	PBA1	P	63,116
89	PBA2	P	65,118
85	PBA3	P	67,120
81	PBA4	P	69,122
77	PBA5	P	71,124
72	PBA6	P	125
125	PBA6A	P	155
98	PBAEND	P	76,80,84,88,92,96
	PTBYTA	E	366,709,1250
366	PTBYTM	P	56,244
145	PTLO	P	112
	PTLINK	E	194
	PUTPC	E	743,930
	PUTPCD	E	298,528
930	PUTPCL	P	57
	ROMH35	E	996
	ROMHED	E	895,999
	RTN30	E	458,530
	SKPDEL	E	1058
975	SKPLIN	P	58,908
984	SKPR10	P	987
988	SKPR20	P	991
992	SKPR30	P	1002
982	SKPROM	P	978
128	TBLINB	P	
60	TBLPBA	P	
111	TBLPTL	P	
	UPLINK	E	396,485,857,1218
	XROW1	E	468

```
LOCATION OBJECT CODE LINE     SOURCE LINE

                      1 "COCONUT"
                      2 * HP41C MAINFRAME MICROCODE ADDRESSES @26000-27777
                      3 * CONTENTS:
                      4 *
                      5                GLB             TXTLBL
                      6                GLB             TXTLB1
                      7                GLB             AOUT15
                      8                GLB             APHST
                      9                GLB             APNDNQ
                     10                GLB             APPEND
                     11                GLB             ARGOUT
                     12                GLB             ASCLCD
                     13                GLB             CLLCDE
                     14                GLB             CLRLCD
                     15                GLB             DAT106
                     16                GLB             DAT231
                     17                GLB             DAT260
                     18                GLB             DAT280
                     19                GLB             DAT300
                     20                GLB             DAT320
                     21                GLB             DAT400
                     22                GLB             DAT500
                     23                GLB             DATENT
                     24                GLB             DECMPL
                     25                GLB             INBCHS
                     26                GLB             INBYTJ
                     27                GLB             MASK
                     28                GLB             NXBYTO
                     29                GLB             NXTBYT
                     30                GLB             OPROMT
                     31                GLB             OUTLCD
                     32                GLB             ROLBAK
                     33                GLB             SCROLO
                     34                GLB             SCROLL
                     35                GLB             STBT10
                     36                GLB             STOLCC
                     37                GLB             TEXT
                     38                GLB             XROMNF
                     39                GLB             XECROM
                     40 *
                     41 * SPECIAL CHAR TABLE
                     42 *
0000 007F            43 ASCTBL         CON             177Q            ;LAZY T
0001 0061            44                CON             141Q            ;SMALL A
0002 0062            45                CON             142Q            ;SMALL B
0003 0063            46                CON             143Q            ;SMALL C
0004 0064            47                CON             144Q            ;SMALL D
0005 0065            48                CON             145Q            ;SMALL E
                     49 * LCD 106 OVERBAR ... HELIOS 0 SMALL DIAMOND
0006 0000            50                CON             0Q              ;LCD 106
0007 0060            51                CON             96              ;SUPERSCRIPT T
                     52 * LCD 108 ONE-LEGGED HANGMAN ... HELIOS 6 UPPER CASE GAMMA
0008 0006            53                CON             6Q              ;LCD 108
                     54 * LCD 109 TWO-LEGGED HANGMAN ... HELIOS 4 ALPHA
0009 0004            55                CON             4               ;LCD 109
                     56 * LCD 10A TWO-LEGGED ONE-ARMED HANGMAN ... HELIOS 5 BETA
000A 0005            57                CON             5               ;LCD 10A
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LOCATION OBJECT CODE LINE     SOURCE LINE

                      58 * LCD 10B COMPLETE HANGMAN ... HELIOS 1 LITTLE X
000B 0001             59                  CON             1                   ;LCD 10B
000C 000C             60                  CON             014Q                ;MU
000D 001D             61                  CON             29                  ;NOT EQUAL SIGN
000E 007E             62                  CON             176Q                ;SIGMA SIGN
000F 000D             63                  CON             13                  ;ANGLE SIGN
                      64 *
                      65 *
                      66 * ARGOUT - OUTPUT ALPHA REGISTER TO DISPLAY
                      67 * CALLING SEQUENCE:
                      68 * IF S8=1, NO SCROLL, PROMPT
                      69 * IF S8=0, SCROLL, NO PROMPT
                      70 * IF S8=0, THEN S9 INDICATES WHETHER THE KEYBOARD HAS BEEN RESET
                      71 *          S9=1 : KEYBOARD ALREADY BEEN RESET
                      72 *          S9=0 : KEYBOARD NOT BEEN RESET
                      73 * BY SET/RESET S8,S9 THE KEYBOARD WILL REMAIN ALIVE DURING SCRLLING.
                      74 *        GOSUB  ARGOUT
                      75 * ASSUME NOTHING, RETURN WITH CHIP 0 ENABLE
                      76 * USED A,B,C. CALLED NXBYTA, ASCLCD. 2 SUB LEVELS.
                      77 *
0010 004E             78 ARGOUT           C=0             W
0011 03F0             79                  PFAD=C
0012 005C             80                  PT=             4                   ; LOAD FIRST CHAR ADDR
0013 0190             81                  LC              6                   ;  = 6008 (BYTE 3, REG.8)
0014 0130             82                  LDI
0015 008C             83                  CON             8*16+12
0016 033C             84                  RCR             1
0017 010E             85                  A=C             W
0018 00001000         86 AOUT05           GOSUB           =NXBYTA
001A 031C             87                  PT=             1
001B 02EA             88                  C#0?            WPT                 ;IS A LEADING NULL ?
001C 0007             89                  GOC             AOUT10              ;NO
001D 0130             90                  LDI
001E 0005             91                  CON             0*16+5              ;CHECK END OF AREG.
001F 001C             92                  PT=             3
0020 0042             93                  C=0             PT
0021 036A             94                  A#C?            WPT                 ;LAST CHAR IN AREG. ?
0022 0007             95                  GOC             AOUT05              ;NO
0023 00001000         96                  GOSUB           CLLCDE              ;CLEAR LCD
0025 0003             97                  GOTO            AOUTR0
0026 023C             98 AOUT10           RCR             2
0027 00001000         99                  GOSUB           CLLCDE
0029 02E0            100                  DISOFF
002A 0003            101                  GOTO            AOUT20
002B 006E            102 AOUT15           ABEX            W
002C 0130            103                  LDI
002D 0005            104                  CON             0*16+5
002E 001C            105                  PT=             3
002F 0042            106                  C=0             PT
0030 036A            107                  A#C?            WPT                 ;END OF ALPHA REG. ?
0031 0007            108                  GOC             AOUT18              ;NOT YET
0032 009E            109 AOUTR0           B=A             S                   ;B(13) _ LCD COUNTER
0033 0130            110                  LDI
0034 001F            111                  CON             37Q
0035 010C            112                  ST=1?           8                   ;PROMPT ?
0036 0003            113                  GONC            AOUT16              ;NO
0037 03E8            114                  SLSABC
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LOCATION OBJECT CODE LINE     SOURCE LINE

    0038 01BE          115                    A=A-1          S              ;LCD FULL ?
    0039 0007          116                    GOC            AOUTRT         ;YES
    003A 0226          117 AOUT16             C=C+1          X              ;@37+1 = @40
    003B 01BE          118 AOUT17             A=A-1          S              ;DO WE HAVE TO LEFT JUSTIFY ?
    003C 0007          119                    GOC            AOUTRT         ;NO
    003D 03E8          120                    SLSABC
    003E 0003          121                    GOTO           AOUT17
    003F 02E0          122 AOUTRT             DISOFF
    0040 0320          123                    DISTOG                        ;TURN DISPLAY ON AGAIN
    0041 00DE          124                    C=B            S
    0042 00001002      125                    GOLONG         STOLCC         ;SAVE THE LCD COUNTER
    0044 035E          126 AOUT18             A#0?           S              ;LCD FULL ?
    0045 0007          127                    GOC            AOUT19         ;NO
    0046 010C          128                    ST=1?          8              ;SCROLL NEEDED ?
    0047 00001000      129                    GSUBNC         SCROLL         ;YES
    0049 00001000      130 AOUT19             GOSUB          =ENCP00
    004B 001C          131                    PT=            3
    004C 00001000      132                    GOSUB          =NXBYTA        ;GET NEXT CHAR
    004E 023C          133                    RCR            2
    004F 008E          134 AOUT20             B=A            W
    0050 00001000      135                    GOSUB          =ENLCD         ;ENABLE LCD
    0052 037C          136                    RCR            12             ;C(1:0)  _ CHAR
    0053 0056          137                    C=0            XS             ;C(2)   0
    0054 00001000      138                    GOSUB          ASCLCD         ;SEND IT TO LCD
    0056 0003          139                    GOTO           AOUT15
                       140 *
                       141 * ASCLCD - SEND A ASCII CHAR TO LCD
                       142 * CALLED WITH ASCII IN C(1:0)
                       143 * ASSUME LCD ENABLE, RETURN WITH LCD ENABLE.
                       144 * USED A.X, B.S, C. 1 SUB LEVEL.
                       145 *      GOSUB  ASCLCD
                       146 *
                       147                    GLB            ASCLCA
    0057 0130          148 COLON              LDI
    0058 0080          149                    CON            8*16+0
    0059 0003          150                    GOTO           PUNC
    005A 0130          151 COMMA              LDI
    005B 00C0          152                    CON            12*16+0
    005C 0003          153                    GOTO           PUNC
    005D 0106          154 ASCLCD             A=C            X
    005E 0016          155 ASCLCA             A=0            XS
    005F 0130          156                    LDI
    0060 003A          157                    CON            3*16+10
    0061 0366          158                    A#C?           X              ;IS THIS A COLON ?
    0062 0003          159                    GONC           COLON          ;YES
    0063 0130          160                    LDI
    0064 002C          161                    CON            2*16+12
    0065 0366          162                    A#C?           X              ;IS THIS A COMMA ?
    0066 0003          163                    GONC           COMMA          ;YES
    0067 0130          164                    LDI
    0068 002E          165                    CON            2*16+14
    0069 0366          166                    A#C?           X              ;IS THIS A PERIOD ?
    006A 0007          167                    GOC            MASK           ;NO
    006B 0130          168 PERIOD             LDI
    006C 0040          169                    CON            4*16+0
    006D 0106          170 PUNC               A=C            X
    006E 03B8          171                    FRSABC                        ;LOOK AT PREVIOUS CHAR
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LOCATION OBJECT CODE LINE     SOURCE LINE

    006F 03D8          172                 CSTEX
    0070 014C          173                 ST=1?          6              ;IS THERE A PUNC. WITH IT ?
    0071 0007          174                 GOC            PUNC10         ;YES
    0072 028C          175                 ST=1?          7              ;IS THERE A PUNC. WITH IT?
    0073 0007          176                 GOC            PUNC10         ;YES
    0074 03D8          177                 CSTEX
    0075 02DC          178                 PT=            13
    0076 0310          179                 LC             12
    0077 011E          180                 A=C            S
    0078 00DE          181                 C=B            S
    0079 037E          182                 A#C?           S              ;IS THIS THE FIRST CHAR ?
    007A 0003          183                 GONC           OUTLCD         ;YES
    007B 0003          184                 GOTO           PUNC20
    007C 03D8          185 PUNC10          CSTEX
    007D 03E8          186                 SLSABC                        ;PUT THE PREVIOUS BACK
    007E 0130          187                 LDI
    007F 0020          188                 CON            40Q            ;LOAD A BLANK
    0080 02DE          189 OUTLCD          B#0?           S
    0081 0003          190                 GONC           PUNC20
    0082 007E          191                 ABEX           S
    0083 01BE          192                 A=A-1          S
    0084 007E          193                 ABEX           S
    0085 0370          194 PUNC20          C=C!A
    0086 03E8          195                 SLSABC
    0087 03E0          196                 RTN
                       197 *
                       198 * MASK - CONVERT A ASCII TO LCD CHAR FORM(NOT INCLUDING COMMA,
                       199 *        PERIOD AND COLON)
                       200 * CALLED WITH ASCII IN A[2:0].
                       201 * TWO CALLING SEQUENCE:
                       202 * 1.     GOSUB MASK
                       203 *        NOP
                       204 *        CALLED MASK FOLLOWED BY A NOP, THE LCD CHAR WILL RETURN
                       205 *        IN C[2:0]. CHIP ENABLE UNCHANGED.
                       206 *        USED A.X, C. ASSUME NOTHING. 1 SUB LEVEL.
                       207 * 2.     GOSUB MASK
                       208 *        <ANYTHING BUT NOP>
                       209 *        NOT FOLLOWED A NOP WILL CAUSE THE CHAR BEEN SEND TO DISPLAY,
                       210 *        RETURN WITH CHIP 0 ENABLE. USED A.X, B.S, C. 1 SUB LEVEL.
                       211 *        ASSUME LCD ENABLE.
                       212 *
    0088 0016          213 MASK            A=0            XS
    0089 0130          214                 LDI
    008A 0020          215                 CON            40Q
    008B 0306          216                 A<C?           X              ;ASCII < @40 ?
    008C 0007          217                 GOC            MASK10         ;YES, SPECIAL CHAR
    008D 0130          218                 LDI
    008E 0060          219                 CON            140Q
    008F 0306          220                 A<C?           X              ;ASCII > @137 ?
    0090 0003          221                 GONC           MASK10         ;YES, SPECIAL CHAR
    0091 00A6          222                 ACEX           X
    0092 03D8          223                 CSTEX
    0093 0144          224                 ST=0           6              ;MASK 6 BITS ONLY
    0094 03D8          225                 CSTEX
    0095 0106          226 MASKRT          A=C            X
    0096 01B0          227                 C=STK
    0097 0330          228                 CXISA
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LOCATION OBJECT CODE LINE     SOURCE LINE

    0098 0170          229                 STK=C
    0099 00A6          230                 ACEX          X
    009A 0346          231                 A#0?          X
    009B 03A0          232                 RTNNC
    009C 0006          233                 A=0           X
    009D 0003          234                 GOTO          OUTLCD
    009E 004E          235 MASK10          C=0           W             ;CHECK SPECIAL CHAR TABLE
    009F 015C          236                 PT=           6
    00A0 0090          237                 LC            2             ;TABLE ENTRY AT 0000 OF QUAR 11
    00A1 0310          238                 LC            12
    00A2 001C          239                 PT=           3
    00A3 0330          240 MASK20          CXISA                       ;LOAD 1 CHAR FROM TABLE
    00A4 0366          241                 A#C?          X             ;MATCH A SPECIAL CHAR ?
    00A5 0003          242                 GONC          MASK30        ;YES
    00A6 0222          243                 C=C+1         PT            ;POINT TO NEXT WORD
    00A7 0003          244                 GONC          MASK20        ;GO ON !
    00A8 0130          245                 LDI
    00A9 003A          246                 CON           72Q           ;ALL SEGMENT IF NOT FOUND
    00AA 0003          247                 GOTO          MASKRT
    00AB 003C          248 MASK30          RCR           3
    00AC 0056          249                 C=0           XS
    00AD 0236          250                 C=C+1         XS            ;C[2:0] HAS THE SPECIAL CHAR
                       251                 LEGAL
    00AE 0003          252                 GOTO          MASKRT        ;REPLACE IT
                       253 *
                       254 *
                       255 * TEXT FUNCTION - EXECUTION OF TEXT FC IN RUN TIME
                       256 * ASSUME PGM COUNTER POINTING THE 1ST BYTE OF THE TEXT FUNCTION
                       257 * THIS ROUTINE WILL PICK UP THE CHAR FROM MEM AND STICK IT TO
                       258 * ALPHA REG. IF THE 1ST CHAR IS A LAZY T, THE STRING WILL BE
                       259 * APPENDING TO ALPHA REG. OTHERWISE, THE ALPHA REG WILL BE CLEARED
                       260 * BEFORE THE STRING GOES IN.
                       261 * CALLED APPEND. RETURN TO NFRPU. PC WILL POINT TO LAST BYTE OF TEXT
                       262 * FC ON EXIT.
                       263 *
    00AF 000E          264 TEXT            A=0           W
    00B0 00001000      265                 GOSUB         =GETPC        ;GET PRM COUNTER
    00B2 00001000      266                 GOSUB         =GTBYT
    00B4 031C          267                 PT=           1
    00B5 0042          268                 C=0           PT            ;C(1:0) _ STRING COUNTER
    00B6 026A          269                 C=C-1         WPT
    00B7 0360          270                 RTNC                        ;RTN IF "F0" F.C.
    00B8 00FC          271                 RCR           10            ;C(4)     STRING COUNTER
    00B9 005C          272                 PT=           4             ;MOVE COUNTER TO A(4)
    00BA 0102          273                 A=C           PT
    00BB 00001000      274                 GOSUB         NXTBYT        ;GET FIRST CHAR
    00BD 008E          275                 B=A           W             ;SAVE THE COUNTER IN B
    00BE 039C          276                 PT=           0
    00BF 0058          277                 G=C
    00C0 0106          278                 A=C           X
    00C1 0016          279                 A=0           XS
    00C2 0046          280                 C=0           X
    00C3 0270          281                 DADD=C
    00C4 0130          282                 LDI
    00C5 007F          283                 CON           127           ;TEST FIRST CHAR
    00C6 0366          284                 A#C?          X             ;IS IT A LAZY "T"
    00C7 00001001      285                 GSUBC         =INTARG       ;NO, INITIALIZE ALPHA REG
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    00C9 00CE          286 TEXT30          C=B             W
    00CA 010E          287                 A=C             W
    00CB 001C          288                 PT=             3
    00CC 007C          289                 RCR             4               ;C.X   STRING COUNTER
    00CD 0266          290                 C=C-1           X               ;ALL DONE ?
    00CE 00001003      291                 GOLC            =PUTPC
    00D0 00FC          292 TEXT40          RCR             10
    00D1 010E          293                 A=C             W
    00D2 00001000      294                 GOSUB           NXTBYT          ;POINT TO NEXT CHAR
    00D4 008E          295                 B=A             W               ;SAVE COUNTER IN B
    00D5 039C          296                 PT=             0
    00D6 0058          297                 G=C
    00D7 0046          298                 C=0             X
    00D8 0270          299                 DADD=C                          ;ENABLE CHIP 0
    00D9 00001000      300                 GOSUB           APNDNW          ;STORE CHAR TO AREG.
    00DB 0003          301                 GOTO            TEXT30
                       302 *
                       303 * SCROLL - TURN ON THE DISPLAY AND DECIDE WHETHER TO HAVE A DELAY
                       304 *           AFTER PUSHING A CHAR OFF LEFT END.
                       305 * S8=1 MEANS SCROLL IS NOT REQUIRED, NO DELAY
                       306 * S9=1 MEANS KEYBOARD ALREADY BEEN RESET.
                       307 *       IF ANY KEY HIT WHEN S9=1, NO DELAY ANY MORE. THIS WAY THE
                       308 *       KEYBOARD WILL STAY ALIVE DURING SCROLLING.
                       309 * DESTROYS C.X  MAY SET S9
                       310 * MAY USE A SUBROUTINE LEVEL TO CALL RST05
                       311 *
    00DC 02E0          312 SCROLL          DISOFF
    00DD 0320          313                 DISTOG
    00DE 010C          314 SCROL0          ST=1?           8               ;SCROLL REQUIRED ?
    00DF 0360          315                 RTNC                            ;NO
    00E0 024C          316                 ST=1?           9               ;HAS KEY BOARD BEEN RESET?
    00E1 0007          317                 GOC             SCROL2          ;YES ,
    00E2 03C8          318                 RSTKB
    00E3 03CC          319                 CHKKB
    00E4 0007          320                 GOC             SCROL5          ;OLD KEY STILL DOWN
    00E5 0248          321                 ST=1            9               ;REMEMBER OLD KEY IS UP
    00E6 00001000      322                 GOSUB           =RST05          ;DELAY FOR DEBOUNCE
    00E8 03CC          323 SCROL2          CHKKB                           ;IS A NEW KEY DOWN ?
    00E9 0360          324                 RTNC                            ;YES, NO SCROLL
    00EA 0130          325 SCROL5          LDI
    00EB 0380          326                 CON             1600Q
    00EC 01E6          327                 C=C+C           X               ;*** @1600 FOR FINAL PRODUCT *****
                       328                                                 ;  **********************
    00ED 0266          329 SROL10          C=C-1           X
    00EE 0003          330                 GONC            $-1
    00EF 03E0          331                 RTN
                       332 *
                       333 * CLEAR LCD
                       334 * CLRLCD - ASSUME LCD ENABLE
                       335 * CLLCDE - ENABLE LCD & CLEAR IT
                       336 *
    00F0 0130          337 CLLCDE          LDI
    00F1 0010          338                 CON             1*16+0
    00F2 0270          339                 DADD=C                          ;DISABLE SLEEPER CHIP
    00F3 0130          340                 LDI
    00F4 00FD          341                 CON             15*16+13
    00F5 03F0          342                 PFAD=C                          ;ENABLE LCD CHIP
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LOCATION OBJECT CODE LINE     SOURCE LINE

    00F6 019C          343 CLRLCD          PT=             11
    00F7 004A          344                 C=0             WPT
    00F8 00DC          345                 PT=             10
    00F9 0090          346                 LC              2
    00FA 029C          347                 PT=             7
    00FB 0090          348                 LC              2
    00FC 005C          349                 PT=             4
    00FD 0090          350                 LC              2
    00FE 031C          351                 PT=             1
    00FF 0090          352                 LC              2
    0100 0128          353                 SRLABC
    0101 0128          354                 SRLABC
    0102 0128          355                 SRLABC
    0103 03E0          356                 RTN
                       357 *
                       358 * NXTBYT - GET NEXT BYTE IN RAM OR ROM
                       359 *
                       360                 GLB             NBYTA0
    0104 00001000      361 NBYTA0          GOSUB           =ENCP00
                       362                 GLB             NBYTAB
    0106 006E          363 NBYTAB          ABEX            W
    0107 001C          364 NXTBYT          PT=             3
    0108 00CC          365                 ST=1?           10              ;ROM MEMORY ?
    0109 00001002      366                 GOLNC           =NXBYTA         ;NO
    010B 016E          367 NXBYTO          A=A+1           W
                       368                 LEGAL
    010C 00001002      369                 GOLONG          =GTBYTO
                       370 *
                       371 * APPEND - APPEND A CHAR TO ALPHA REG
                       372 * CHAR IN G
                       373 * ASSUMED CHIP 0 ENABLE. USED A,C. 1 SUB LEVEL
                       374 * TWO ENTRIES :
                       375 * 1. APPEND : WILL GIVE A WARNING IF AREG FULL AND AUDIO ENABLE
                       376 * 2. APNDNW : NO WARNING EVEN IF AREG FULL
                       377 *
    010E 0238          378 APPEND          C=REGN          8               ;CHECK IF AREG. ALMOST FULL?
    010F 031C          379                 PT=             1
    0110 023C          380                 RCR             2               ;CHECK SECOND LAST CHAR
    0111 02EA          381                 C#0?            WPT             ;STILL EMPTY
    0112 00001001      382                 GSUBC           =TONE7X         ;NO, GIVE A WARNING
    0114 031C          383 APNDNW          PT=             1
    0115 0238          384                 C=REGN          8
    0116 037C          385                 RCR             12
    0117 010E          386                 A=C             W
    0118 01F8          387                 C=REGN          7
    0119 037C          388                 RCR             12
    011A 010A          389                 A=C             WPT
    011B 00AE          390                 ACEX            W
    011C 0228          391                 REGN=C          8
    011D 01B8          392                 C=REGN          6
    011E 037C          393                 RCR             12
    011F 010A          394                 A=C             WPT
    0120 00AE          395                 ACEX            W
    0121 01E8          396                 REGN=C          7
    0122 0178          397                 C=REGN          5
    0123 037C          398                 RCR             12
    0124 010A          399                 A=C             WPT
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LOCATION OBJECT CODE LINE     SOURCE LINE

    0125 00AE        400                 ACEX        W
    0126 01A8        401                 REGN=C      6
    0127 00AE        402                 ACEX        W
    0128 039C        403                 PT=         0
    0129 0098        404                 C=G
    012A 0168        405                 REGN=C      5
    012B 03E0        406                 RTN
                     407 *
                     408 * DATA ENTRY - WHEN PARSE DETECTS A DATAENTRY FC, IT PUTS THE FC
                     409 *               IN C[1:0] AND BRANCH TO HERE.
                     410 *
    012C 00E6        411 DATENT          BCEX        X
    012D 00001000    412                 GOSUB       =OFSHFT     ;RESET SHIFT
    012F 00E6        413                 BCEX        X
    0130 0056        414                 C=0         XS
    0131 0106        415                 A=C         X           ;COPY FC TO A.X
    0132 039C        416                 PT=         0
    0133 0058        417                 G=C                     ;COPY FC TO REG.G TOO
    0134 03B8        418                 C=REGN      14
    0135 017C        419                 RCR         6
    0136 03D8        420                 CSTEX
    0137 0304        421                 ST=0        1           ;RESET CATLOG FLAG
    0138 03D8        422                 CSTEX
    0139 013C        423                 RCR         8
    013A 03A8        424                 REGN=C      14
    013B 01F6        425                 C=C+C       XS
    013C 01F6        426                 C=C+C       XS          ;ALREADY IN DATAENTRY ?
    013D 0007        427                 GOC         DAT200      ;YES
    013E 0346        428                 A#0?        X           ;BACK ARROW ?
    013F 0007        429                 GOC         DAT110      ;NO
    0140 008C        430                 ST=1?       5           ;MSGFLAG SET ?
    0141 0007        431                 GOC         DAT140      ;YES
    0142 000C        432 DAT102          ST=1?       3           ;PROGRAM MODE ?
    0143 0003        433                 GONC        DAT105      ;NO
    0144 0130        434                 LDI
    0145 000B        435                 CON         013Q        ;DELETE
    0146 03E0        436                 RTN                     ;RETURN TO PARSE
    0147 028C        437 DAT105          ST=1?       7           ;ALPHA MODE ?
    0148 0007        438                 GOC         DAT106      ;YES
    0149 0130        439                 LDI
    014A 0077        440                 CON         7*16+7      ;CLX
    014B 03E0        441                 RTN                     ;RETURN TO PARSE
    014C 0130        442 DAT106          LDI
    014D 0087        443                 CON         8*16+7      ;CLA
    014E 03E0        444                 RTN
    014F 0130        445 DAT110          LDI
    0150 001C        446                 CON         1*16+12     ;LOAD CHS
    0151 0366        447                 A#C?        X           ;IS IT A CHS ?
    0152 0007        448                 GOC         DAT120      ;NO
    0153 0130        449                 LDI
    0154 0054        450                 CON         5*16+4      ;CHS FC
    0155 03E0        451                 RTN                     ;RETURN TO PARSE
    0156 00001000    452 DAT120          GOSUB       =STFLGS     ;SET MSGFLG & DATAENTRY FLAG
                     453                                         ;STFLGS LEAVES SS ONE-HALF UP
    0158 000C        454                 ST=1?       3           ;ALPHA MODE ?
    0159 00001002    455                 GOLNC       =DIGST_     ;INITIALIZE DIGIT ENTRY
    015B 00001002    456                 GOLONG      APHST_      ;INITIALIZE ALPHA ENTRY
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LOCATION OBJECT CODE LINE     SOURCE LINE

    015D 0084          457 DAT140          ST=0          5          ;CLEAR MSGFLAG
    015E 03B8          458                 C=REGN        14
    015F 0398          459                 C=ST
    0160 03A8          460                 REGN=C        14
    0161 0003          461                 GOTO          DAT220
    0162 0088          462 DAT200          ST=1          5          ;SET MSGFLAG
    0163 03B8          463                 C=REGN        14
    0164 0398          464                 C=ST
    0165 03A8          465                 REGN=C        14
    0166 000C          466                 ST=1?         3          ;PROGMODE ?
    0167 0007          467                 GOC           DAT300     ;YES
    0168 028C          468                 ST=1?         7          ;ALPHA MODE ?
    0169 0003          469                 GONC          DAT235     ;NO
    016A 0130          470 DAT230          LDI
    016B 007F          471                 CON           127
    016C 0106          472                 A=C           X
    016D 039C          473                 PT=           0
    016E 0098          474                 C=G                      ;LOAD THE FC
    016F 02E6          475                 C#0?          X          ;IS THIS A BACK ARROW ?
    0170 00001002      476                 GOLNC         =BAKAPH    ;YES
    0172 0366          477                 A#C?          X          ;IS THIS A LAZY "T"
    0173 0007          478                 GOC           DAT240     ;NO
    0174 00001000      479                 GOSUB         =BLINK     ;BLINK AND IGNORE IT
    0176 0003          480                 GOTO          DAT220
    0177 03B8          481 DAT231          C=REGN        14         ;SET NUMERIC DATA ENTRY FLAG
    0178 013C          482                 RCR           6          ; (FLAG 22)
    0179 03D8          483                 CSTEX
    017A 0308          484                 ST=1          1          ;SET FLAG 22
    017B 03D8          485                 CSTEX
    017C 017C          486                 RCR           6
    017D 03A8          487                 REGN=C        14
    017E 00001000      488 DAT235          GOSUB         =DGENS8    ;TELL DIGENT NO CHS WHEN X=0
    0180 00001000      489                 GOSUB         =NOREG9
    0182 00001000      490                 GOSUB         =RG9LCD
    0184 00001000      491                 GOSUB         =RFDS55
    0186 00001002      492 DAT220          GOLONG        =NERKB
    0188 00001000      493 DAT240          GOSUB         =APPEND    ;APPEND TO ALPHA REG.
    018A 0278          494                 C=REGN        9
    018B 02FE          495                 C#0?          S          ;LCD FULL ?
    018C 0007          496                 GOC           DAT245     ;NOT YET
    018D 00FE          497                 BCEX          S
    018E 00001000      498                 GOSUB         =ENLCD
    0190 03B8          499                 FRSABC
    0191 0003          500                 GOTO          DAT260
    0192 00001000      501 DAT245          GOSUB         ROLBAK
    0194 0046          502 DAT260          C=0           X
    0195 0098          503                 C=G
    0196 00001000      504                 GOSUB         ASCLCD     ;SEND IT TO LCD
    0198 00001000      505 DAT280          GOSUB         OPROMT     ;OUT PUT THE PROMPT
    019A 0003          506                 GOTO          DAT220
    019B 028C          507 DAT300          ST=1?         7          ;ALPHA MODE ?
    019C 00001003      508                 GOLC          DAT500     ;YES
                       509 *
                       510 * DIGIT ENTRY IN PRM MODE
                       511 *
    019E 00001000      512                 GOSUB         =GETPC
    01A0 00001000      513                 GOSUB         =DELLIN
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LOCATION OBJECT CODE LINE     SOURCE LINE

    01A2 004E          514 DAT320          C=0             W
    01A3 0270          515                 DADD=C                          ;ENABLE CHIP 0
    01A4 00001000      516                 GOSUB           =DGENS8         ;TELL DIGENT NO CHS WHEN X=0
    01A6 00001000      517                 GOSUB           =GETPC
    01A8 001E          518                 A=0             S               ;INITIALIZE CT
    01A9 008E          519                 B=A             W
    01AA 00001000      520                 GOSUB           =NXBYTA
    01AC 031C          521                 PT=             1
    01AD 02EA          522                 C#0?            WPT             ;IS FIRST BYTE A NULL ?
    01AE 0003          523                 GONC            DAT322          ;YES
    01AF 006E          524                 ABEX            W               ;OTHERWISE INSERT A NULL FIRST
    01B0 00001000      525                 GOSUB           =INBYTO
    01B2 001E          526                 A=0             S
    01B3 0046          527 DAT322          C=0             X
    01B4 0270          528                 DADD=C                          ;ENABLE CHIP 0
    01B5 020C          529                 ST=1?           2               ;MANTISSA NEGAIVE ?
    01B6 0003          530                 GONC            DAT325          ;NO
    01B7 00001000      531                 GOSUB           INBCHS          ;INSERT A CHS FIRST
    01B9 00E0          532 DAT325          SELQ
    01BA 035C          533                 PT=             12
    01BB 00A0          534                 SELP
    01BC 0278          535                 C=REGN          9               ;LOAD D.P. POS COUNTER IN REG.9(13)
    01BD 02A0          536                 SETDEC
    01BE 02FE          537                 C#0?            S
    01BF 0003          538                 GONC            DAT333
    01C0 029E          539                 C=-C            S               ;TENTH COMPLEMENT
    01C1 0260          540                 SETHEX
    01C2 00FE          541                 CBEX            S               ;SAVE THE D.P. POS IN REG.B
    01C3 00DE          542 DAT330          C=B             S               ;C.S   D.P. POSITION
    01C4 027E          543                 C=C-1           S               ;OUTPUT D.P. NOW ?
    01C5 0003          544                 GONC            DAT335          ;NOT YET
    01C6 038C          545                 ST=1?           0               ;D.P. HIT ?
    01C7 0003          546                 GONC            DAT335          ;NO
    01C8 00FE          547                 CBEX            S
    01C9 0130          548                 LDI
    01CA 001A          549                 CON             1*16+10
    01CB 00001000      550                 GOSUB           INBYTJ          ;INSERT A D.P. TO MEM
    01CD 0003          551                 GOTO            DAT330
    01CE 027E          552 DAT333          C=C-1           S
    01CF 0260          553                 SETHEX
    01D0 00FE          554 DAT335          BCEX            S
    01D1 00E0          555                 SELQ
    01D2 02D4          556                 PT=?            13              ;JUST FINISHED DIGIT 0 ?
    01D3 0007          557                 GOC             DAT380          ;YES, ALL DONE
    01D4 0278          558                 C=REGN          9
    01D5 0222          559                 C=C+1           PT              ;LAST DIGIT IN MANTISSA ?
    01D6 0007          560                 GOC             DAT350          ;YES
    01D7 0214          561                 PT=?            2               ;END OF MANTISSA ?
    01D8 0007          562                 GOC             DAT345          ;YES
    01D9 0262          563                 C=C-1           PT              ;RESTORE THE DIGIT
    01DA 03DC          564                 INCPT                           ;MOVE THE DIGIT TO G
    01DB 0050          565                 LC              1
    01DC 0058          566                 G=C
    01DD 03D4          567                 DECPT                           ;POINT TO NEXT DIGIT
    01DE 00A0          568                 SELP
    01DF 00001000      569                 GOSUB           =INBYT          ;INSET THE DIGIT
    01E1 0003          570                 GOTO            DAT330
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LOCATION OBJECT CODE LINE     SOURCE LINE

    01E2 030C          571 DAT345          ST=1?          1              ;EEX HIT ?
    01E3 0007          572                 GOC            DAT370         ;YES
    01E4 038C          573                 ST=1?          0              ;D.P. HIT ?
    01E5 0003          574                 GONC           DAT380         ;NO, NO PROMPT
    01E6 027E          575                 C=C-1          S              ;D.P. AT DIGIT 3 ?
    01E7 0007          576                 GOC            DAT380         ;YES, NO PROMPT
    01E8 027E          577                 C=C-1          S              ;D.P. AY DIGIT 4 ?
    01E9 0007          578                 GOC            DAT380         ;YES
    01EA 0003          579                 GOTO           DAT390         ;PROMPT
    01EB 0314          580 DAT350          PT=?           1              ;END OF EXP ?
    01EC 0007          581                 GOC            DAT390         ;YES
    01ED 0394          582                 PT=?           0              ;END OF EXP ?
    01EE 0007          583                 GOC            DAT390         ;YES
    01EF 030C          584 DAT360          ST=1?          1              ;EEX HIT ?
    01F0 0003          585                 GONC           DAT390         ;NO, WE ARE DONE
    01F1 031C          586 DAT370          PT=            1
    01F2 00A0          587                 SELP
    01F3 0130          588                 LDI
    01F4 001B          589                 CON            1*16+11
    01F5 00001000      590                 GOSUB          INBYTJ         ;INSERT A EEX
    01F7 0278          591                 C=REGN         9
    01F8 02F6          592                 C#0?           XS             ;EXP NEGATIVE ?
    01F9 0003          593                 GONC           DAT330         ;NO
    01FA 00001000      594                 GOSUB          INBCHS         ;INSERT A CHS
    01FC 0003          595                 GOTO           DAT330
    01FD 00A0          596 DAT380          SELP
    01FE 00001000      597                 GOSUB          =INBYTO
    0200 0104          598 DAT385          ST=0           8              ;NO PROMPT
    0201 0003          599                 GOTO           DAT410
    0202 00A0          600 DAT390          SELP
    0203 00001000      601                 GOSUB          =INBYTO        ;INSERT A NULL AT TAIL
    0205 0108          602 DAT400          ST=1           8              ;SAY PROMPT
    0206 00001000      603 DAT410          GOSUB          =DFILLF
    0208 00001002      604 DAT415          GOLONG         =NFRKB
    020A 0130          605 INBCHS          LDI
    020B 001C          606                 CON            1*16+12        ;LOAD A CHS
    020C 039C          607 INBYTJ          PT=            0
    020D 0058          608                 G=C
    020E 00001002      609                 GOLONG         =INBYT
                       610 *
                       611 * ALPHA ENTRY IN PGM MODE
                       612 *
    0210 0130          613 DAT500          LDI
    0211 007F          614                 CON            127
    0212 0366          615                 A#C?           X              ;IS IT A LAZY T ?
    0213 0003          616                 GONC           DAT400         ;YES, IGNORE IT
    0214 0278          617                 C=REGN         9
    0215 0346          618                 A#0?           X              ;IS IT A BACK ARROW ?
    0216 0007          619                 GOC            DAT510         ;NO
    0217 027E          620                 C=C-1          S              ;STRING LENGTH -1
    0218 02FE          621                 C#0?           S              ;ZERO LENGTH NOW ?
    0219 0007          622                 GOC            DAT505         ;NO
    021A 00001000      623                 GOSUB          =DATOFF        ;RESET DATAENTRY FLAG
    021C 00001002      624                 GOLONG         =XDELET
    021E 00AE          625 DAT505          ACEX           W
    021F 00001000      626                 GOSUB          =PTBYTA        ;ZERO LAST CHAR
    0221 00001000      627                 GOSUB          =DECADA        ;POINT BACK ONE CHAR
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LOCATION OBJECT CODE LINE     SOURCE LINE

    0223 0046          628 DAT507          C=0             X
    0224 0270          629                 DADD=C                          ;ENABLE CHIP 0
    0225 00AE          630                 ACEX            W
    0226 0268          631                 REGN=C          9
    0227 0003          632                 GOTO            DAT520
    0228 023E          633 DAT510          C=C+1           S               ;STRING LENGTH + 1
    0229 0003          634                 GONC            DAT515          ;STRING LENGTH <= 15
    022A 00001000      635                 GOSUB           =BLINK          ;STRING LENGTH > 15
    022C 0003          636                 GOTO            DAT415          ;IGNORE THIS CHAR
    022D 00AE          637 DAT515          ACEX            W
    022E 00001000      638                 GOSUB           =INBYT          ;INSERT THIS CHAR
    0230 01BE          639                 A=A-1           S
    0231 0000          640                 NOP
    0232 0003          641                 GOTO            DAT507
    0233 011E          642 DAT520          A=C             S               ;A.S _ STRING LENGTH
    0234 00001000      643                 GOSUB           =GETPC
    0236 00001000      644                 GOSUB           =INCADA         ;POINT TO 1ST BYTE OF TEXT
    0238 008E          645                 ACEX            S               ;C.S = STRING LENGTH
    0239 011E          646                 A=C             S               ;SAVE THE LENGTH IN A.S
    023A 02FC          647                 RCR             13
    023B 031C          648                 PT=             1
    023C 03D0          649                 LC              15              ;C(0:1)   FX
    023D 00001000      650                 GOSUB           =PTBYTA         ;UPDATE STRING LENGTH
    023F 017E          651                 A=A+1           S               ;LENGTH = 15 ?
    0240 0007          652                 GOC             DAT385          ;YES, NO PROMPT
    0241 0003          653                 GOTO            DAT400
    0242 0278          654 ROLBAK          C=REGN          9               ;LOAD LCD COUNTER
    0243 011E          655                 A=C             S               ;A(13) _ LCD COUNTER
    0244 009E          656                 B=A             S
    0245 00001000      657                 GOSUB           =ENLCD          ;ENABLE LCD CHIP
    0247 035E          658 ROBK10          A#0?            S
    0248 03A0          659                 RTNNC
    0249 01BE          660                 A=A-1           S
    024A 03B8          661                 FRSABC
    024B 0003          662                 GOTO            ROBK10
                       663 *
                       664 * OPROMT - OUTPUT A PROMPT CHAR AND LEFT JUSTIFY DISPLAY AND
                       665 *          AND UPDATE LCD COUNTER.
                       666 * THE LCD COUNTER IS IN B[13] WHEN COME IN, IT WILL BE UPDATED
                       667 * AND STORED TO REG.9[13] ON RETURN.
                       668 * THE COUNTER IS SET TO 12, EVERY TIME A CHAR SHIFT FROM RIGHT
                       669 * END TO DISPLAY THE COUNTER DECREMENT BY ONE.
                       670 * ASSUME LCD ENABLE. RETURN WITH CHIP 0 ENABLE.
                       671 * USED A[13],B[13], C[13], C[2:0],N. 1 SUB LEVEL.
                       672 *
    024C 0130          673 OPROMT          LDI
    024D 001F          674                 CON             37Q
    024E 03E8          675                 SLSABC
    024F 0130          676                 LDI
    0250 0020          677                 CON             40Q
    0251 00DE          678                 C=B             S
    0252 027E          679                 C=C-1           S               ;LCD FULL ?
    0253 0007          680                 GOC             OPMT20          ;YES
    0254 011E          681                 A=C             S
    0255 023E          682                 C=C+1           S               ;RESTORE LCD COUNTER
    0256 035E          683 OPMT10          A#0?            S               ;STRING AT LEFT END ?
    0257 0003          684                 GONC            STOLCC          ;YES
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LOCATION OBJECT CODE LINE     SOURCE LINE

    0258 03E8         685                 SLSABC
    0259 01BE         686                 A=A-1          S
    025A 0003         687                 GONC           OPMT10
    025B 0046         688 STOLCC          C=0            X
    025C 03F0         689                 PFAD=C                        ;DISABLE LCD CHIP
    025D 0270         690                 DADD=C                        ;ENABLE SLEEPER CHIP
    025E 0268         691                 REGN=C         9
    025F 03E0         692                 RTN
    0260 005E         693 OPMT20          C=0            S
    0261 0003         694                 GOTO           STOLCC
                      695 *
                      696 * APHST_ - INITIALIZE ALPHA ENTRY
                      697 * G HAS THE CHAR.
                      698 * CALLED BY DATAENTRY AND RETURN TO DATAENTRY
                      699 *
    0262 0388         700 APHST_          C=REGN         14
    0263 0358         701                 ST=C                          ;LOAD SET #
    0264 000C         702                 ST=1?          3              ;PROGRAM MODE ?
    0265 0007         703                 GOC            APHST4         ;YES
    0266 013C         704                 RCR            8
    0267 03D8         705                 CSTEX
    0268 0388         706                 ST=1           0              ;SET FLAG 23
    0269 03D8         707                 CSTEX
    026A 017C         708                 RCR            6
    026B 03A8         709                 REGN=C         14
    026C 0046         710                 C=0            X
    026D 039C         711                 PT=            0
    026E 0098         712                 C=G                           ;LOAD THE CHAR
    026F 0106         713                 A=C            X
    0270 0130         714                 LDI
    0271 007F         715                 CON            127
    0272 0366         716                 A#C?           X              ;IS THIS A LAZY "T" ?
    0273 0007         717                 GOC            APHST3         ;NO, CLEAR ALPHA REG.
    0274 0178         718                 C=REGN         5
    0275 031C         719                 PT=            1
    0276 02EA         720                 C#0?           WPT            ;ALPHA REG. EMPTY ?
    0277 0007         721                 GOC            APHST1         ;NO
    0278 02DC         722                 PT=            13
    0279 0310         723                 LC             12             ;SET LCD COUNTER
    027A 00FE         724                 BCEX           S
    027B 00001000     725                 GOSUB          =ENLCD
    027D 0003         726                 GOTO           APHST2
    027E 00001000     727 APHST1          GOSUB          ROLBAK
    0280 00001002     728 APHST2          GOLONG         =DAT280
    0282 00001000     729 APHST3          GOSUB          =INTARG
    0284 02DC         730                 PT=            13
    0285 0310         731                 LC             12
    0286 00FE         732                 BCEX           S
    0287 00001000     733                 GOSUB          CLLCDE
    0289 00001002     734                 GOLONG         =DAT260
    028B 00001000     735 APHST4          GOSUB          =INSSUB        ;INCREMENT LINE #
    028D 039C         736                 PT=            0
    028E 0098         737                 C=G
    028F 0070         738                 N=C                           ;SAVE THE CHAR IN N TEMP.
    0290 00001000     739                 GOSUB          =GETPC         ;LOAD THE PGM COUNPER
    0292 001E         740                 A=0            S
    0293 0130         741                 LDI
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LOCATION OBJECT CODE LINE     SOURCE LINE

    0294 00F1          742                CON             15*16+1         ;F1 - ONE CHAR TEXT STRING
    0295 039C          743                PT=             0
    0296 0058          744                G=C
    0297 00001000      745                GOSUB           =INBYT
    0299 00B0          746                C=N                             ;LOAD THE CHAR
    029A 039C          747                PT=             0
    029B 0058          748                G=C
    029C 00001000      749                GOSUB           =INBYT
    029E 00AE          750                ACEX            W
    029F 027E          751                C=C-1           S
    02A0 0268          752                REGN=C          9               ;SAVE WORKING PTR IN REG.9
    02A1 00001002      753                GOLONG          =DAT400         ;EXIT FROM ALPHA ENTRY
                       754 *
                       755 * STBT10 - MOVE SOME STATUS BITS TO SCRATCH AREA (REG.8)
                       756 *     DIGIT(0) - 0 : D.P.HIT
                       757 *                1 : EEX HIT
                       758 *                2 : CHS HIT
                       759 *                3 : MANTISSA NONZERO FLAG
                       760 *     DIGIT(1) - 4 : DIGIT GROUPING FLAG
                       761 *                5 : DECIMAL POINT FLAG
                       762 *                6 : ENG
                       763 *                7 : FIX
                       764 *     DIGIT(2) - # OF DIGITS
                       765 *
    02A3 004E          766 STBT10         C=0             W
    02A4 0270          767                DADD=C
    02A5 015C          768                PT=             6
    02A6 0310          769                LC              12
    02A7 005C          770                PT=             4
    02A8 03D0          771                LC              15
    02A9 0310          772                LC              12
    02AA 010E          773                A=C             W               ;A _ 0000000C0FC000
    02AB 03B8          774                C=REGN          14
    02AC 03B0          775                C=C&A
    02AD 023C          776                RCR             2
    02AE 0106          777                A=C             X
    02AF 01FA          778                C=C+C           M               ;MOVE NO SEPERATOR & COMMA
    02B0 01FA          779                C=C+C           M               ; TO LOWER TOW BITS IN A DIGIT
    02B1 007C          780                RCR             4
    02B2 0146          781                A=A+C           X
    02B3 0238          782                C=REGN          8
    02B4 01BC          783                RCR             11
    02B5 00A60106      784                C=A             X
    02B7 0358          785                ST=C
    02B8 003C          786                RCR             3
    02B9 0228          787                REGN=C          8
    02BA 03E0          788                RTN
                       789 *
                       790 * DECMPL - DECOMPILE
                       791 *
                       792 * CALLING SEQUENCE :
                       793 *          GOSUB  DECMPL
                       794 * ASSUME NOTHING. USED A,B,C,N, ST 0-9. 3 SUB LEVELS
                       795 * RETURN WITH CHIP 0 ENABLE AND LOAD STATUS SET 0
                       796 *     AND R14 IN C (PACH12 IN CN0 DEPENDS ON R14 IN C ON RTN)
                       797 *
                       798 * PACK AND DECOMPILE SHARE COMMON TERMINATION LOGIC
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LOCATION OBJECT CODE LINE     SOURCE LINE

                     799 * PACK TERMINATES BY GOING EITHER TO DCPL00 OR TO DCPLRT.
                     800 * SINCE PACK CAN EITHER RETURN TO THE CALLING PROGRAM OR EXIT
                     801 * VIA ERROR, STATUS BIT S9 IS USED TO CONTROL WHAT TYPE OF
                     802 * TERMINATION IS DONE.  S9 IS CLEARED AT THE DECMPL ENTRY
                     803 * POINT, SO DECOMPILE ALWAYS RETURNS.  PACK SETS OR RESETS
                     804 * S9 AS NECESSARY BEFORE IT COMES TO THE DCPL00 OR DCPLRT ENTRIES.
                     805 *
                     806 * S8 AND S3 ARE USED INSIDE DECOMPILE.  S8 IS USED TO REMEMBER
                     807 * THE STATE OF THE DECOMPILE BIT IN ONE END WHILE TRAVELING UP
                     808 * THE LABEL CHAIN TO FIND THE NEXT PREVIOUS END.  S3 IS USED TO
                     809 * REMEMBER WHETHER ANY PROGRAM HAS BEEN DECOMPILED.  IF NO
                     810 * PROGRAM HAS BEEN DECOMPILED, THEN DECOMPILE SKIPS AROUND
                     811 * THE LOGIC TO ZERO OUT THE SUBROUTINE STACK.
                     812 *
02BB 02E6            813 DCPL17          C#0?            X               ;IS THIS AN CHAIN END ?
02BC 0007            814                 GOC             DCPL15          ;NO
02BD 004E            815 DCPL20          C=0             W               ;REMEMBER WE ARE AT 1ST PGM
02BE 0070            816                 N=C
02BF 00001000        817                 GOSUB           =FSTIN          ;GET REG0
02C1 0003            818                 GOTO            DCPL24
                     819 *
02C2 0244            820 DECMPL          ST=0            9
                     821                 GLB             DCPL00
02C3 00001000        822 DCPL00          GOSUB           =GTFEND         ;LOAD CHAIN HEAD
02C5 00AA            823                 ACEX            WPT
02C6 0070            824                 N=C                             ;SAVE .END. ADDR IN N
02C7 0004            825                 ST=0            3               ;REM NO PGM BEEN DECMPL YET
02C8                 826 DCPL05                                          ;NEXT.END.ADDR IN C[3:0] HERE
02C8 010A            827                 A=C             WPT             ;LOAD END ADDR FROM C
02C9 00001000        828                 GOSUB           =INCAD2         ;POINT TO 3RD BYTE OF END
02CB 00001000        829                 GOSUB           =GTBYTA         ;GET 3RD BYTE OF END
02CD 03D8            830                 CSTEX                           ;CHECK IF DECMPL BIT SET
02CE 030C            831                 ST=1?           1               ;DECMPL BIT SET ?
02CF 0007            832                 GOC             DCPL07          ;YES
02D0 0104            833                 ST=0            8               ;REMEMBER NO DECMPL THIS PGM
02D1 03D8            834                 CSTEX
02D2 0003            835                 GOTO            DCPL11
02D3 0108            836 DCPL07          ST=1            8               ;SET S8 REMEMBER IT
02D4 0304            837                 ST=0            1               ;CLEAR DECMPL BIT
02D5 03D8            838                 CSTEX
02D6 00001000        839                 GOSUB           =PTBYTA         ;PUT THE BYTE BACK
02D8 00B0            840 DCPL11          C=N
02D9 010E            841                 A=C             W
02DA 00001000        842                 GOSUB           =GTLINK
02DC 02E6            843                 C#0?            X               ;CHAIN END ?
02DD 0003            844                 GONC            DCPL20          ;YES
                     845 * MOVES UP SEARCHING FOR END OR FIRST ALBL IN MEM
02DE 00001000        846 DCPL15          GOSUB           =UPLINK         ;MOVES UP ONE LINK
02E0 023E            847                 C=C+1           S               ;IS THIS BYTE AN END ?
02E1 0007            848                 GOC             DCPL17          ;NO, IS AN ALBL
02E2 00AA010A        849                 C=A             WPT
02E4 0070            850                 N=C                             ;SAVE END ADDR IN N
02E5 00001000        851                 GOSUB           =INCAD2         ;POINT TO 3RD BYTE OF END
02E7 010C            852 DCPL24          ST=1?           8               ;NEED DECMPL THIS PGM ?
02E8 0003            853                 GONC            DCPL70          ;NO
02E9 0008            854                 ST=1            3               ;REM AT LEAST DECMPL 1 PGM
02EA 00001000        855                 GOSUB           =GTBYTA
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LOCATION OBJECT CODE LINE     SOURCE LINE

   02EC 037C          856                    RCR             12
   02ED 01A2          857 DCPL25             A=A-1           PT              ;NEXT BYTE ON SAME REG.?
   02EE 0003          858                    GONC            DCPL30          ;YES
   02EF 00AA          859                    ACEX            WPT             ;NEXT BYTE IN NEXT REG.
   02F0 0262          860                    C=C-1           PT
   02F1 0262          861                    C=C-1           PT
   02F2 0266          862                    C=C-1           X               ;POINT TO NEXT REG.
   02F3 0270          863                    DADD=C
   02F4 010A          864                    A=C             WPT
   02F5 0038          865                    C=DATA                          ;LOAD NEXT REG.
   02F6 037C          866                    RCR             12
   02F7 01A2          867 DCPL30             A=A-1           PT              ;POINT TO NEXT BYTE
   02F8 037C          868                    RCR             12              ;C(3:2)   NEXT BYTE
   02F9 0282          869                    C=-C            PT              ;16 COMPLEMENT
   02FA 01E2          870                    C=C+C           PT              ;ONE BYTE ?
   02FB 0007          871                    GOC             DCPL25          ;YES, GO ON TO NEXT LINE
   02FC 01E2          872                    C=C+C           PT              ;THREE BYTE LINE ?
   02FD 0007          873                    GOC             DCPL40          ;NO, ITS TWO BYTES
   02FE 01E2          874                    C=C+C           PT              ;ROW 15 ?
   02FF 0007          875                    GOC             DCPL45          ;NO, ITS ROW 13 OR 14
   0300 01E2          876                    C=C+C           PT              ;TEST ROW 0 OR ROW 15
   0301 0003          877                    GONC            DCPL25          ;ROW 0 IF NO CARRY
                      878 * TEXT ROW, LET THE "NXLIN" ROUTINE HANDLE IT
   0302 00001000      879 DCPL35             GOSUB           =NXLTX
   0304 0003          880                    GOTO            DCPL25          ;GO ON TO NEXT LINE
                      881 *
   0305 00B0          882 DCPL70             C=N                             ;GET STARTING ADDR
   0306 02E6          883                    C#0?            X               ;JUST FINISHING 1ST PGM ?
   0307 0007          884                    GOC             DCPL05          ;NO,KEEP GOING
   0308 0270          885                    DADD=C
   0309 000C          886                    ST=1?           3               ;HAS ANY PGM BEEN DECNPL ?
   030A 0003          887                    GONC            DCPL60          ;NO, DON'T CLEAR SUB STACK
                      888                    GLB             DCPLRT
   030B 00001000      889 DCPLRT             GOSUB           =GETPC          ;CLEAR THE SUBROUTINE STACK
                      890                    GLB             DCRT10
   030D 004E          891 DCRT10             C=0             W
   030E 0270          892                    DADD=C
   030F 02E8          893                    REGN=C          11
   0310 0328          894                    REGN=C          12
   0311 00001000      895                    GOSUB           =PUTPC
   0313 03B8          896 DCPL60             C=REGN          14              ;PUT UP SSO
   0314 0358          897                    ST=C
   0315 024C          898                    ST=1?           9
   0316 03A0          899                    RTNNC
                      900                    GLB             ERRTA
   0317 00001000      901 ERRTA              GOSUB           =ERROR
   0319 0000          902                    CON             =MSGTA
                      903 *
                      904 * TWO BYTES ROW
   031A 01E2          905 DCPL40             C=C+C           PT              ;ROW 9 OR 10 ?
   031B 0007          906                    GOC             DCPL50          ;YES, SIMPLY SKIP 1 BYTE
   031C 02E2          907                    C#0?            PT              ;ROW 12 ?
   031D 0007          908                    GOC             DCPL55          ;NO, ITS ROW 11
   031E 0236          909                    C=C+1           XS              ;IS A LBL.NN ?
   031F 0007          910                    GOC             DCPL50          ;YES, SKIP 1 BYTE
   0320 0236          911                    C=C+1           XS              ;IS A X<>.NN ?
   0321 0007          912                    GOC             DCPL50          ;YES
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LOCATION OBJECT CODE LINE     SOURCE LINE

                     913 * ALBL OR END HERE
0322 00001000        914 DCPL42          GOSUB          =INCADR        ;SKIP OVER THE LINK
0324 00001000        915                 GOSUB          =NXBYTA        ;LOAD THE THIRD BYTE
0326 037C            916                 RCR            12             ;MOVE IT TO C(3:2)
0327 0222            917                 C=C+1          PT             ;IS IT AN ALBL ?
0328 0007            918                 GOC            DCPL35         ;YES, TEXT STRING FOLLOWS
                     919 *
0329 0003            920                 GOTO           DCPL70         ;GOTO TAKE CARE OF END
032A 00001000        921 DCPL50          GOSUB          =NXL3B2
032C 0003            922 DCPL51          GOTO           DCPL25
                     923 * GTO.NN & XEQ.NN HERE (CLEAR 3 DIGITS LINK)
032D 00001000        924 DCPL45          GOSUB          =GTBYTA        ;GET THE FIRST BYTE AGAIN
032F 037C            925                 RCR            12             ;MOVE IT TO C(3:2)
0330 0056            926                 C=0            XS             ;ZERO FIRST DIGIT OF LINK
0331 023C            927                 RCR            2
0332 00001000        928                 GOSUB          =PTBYTA        ;PUT IT BACK TO MEM
0334 00001000        929                 GOSUB          =NXBYTA        ;GET NEXT BYTE
0336 031C            930                 PT=            1
0337 004A            931                 C=0            WPT            ;ZERO LAST TWO DIGITS OF LINK
0338 00EE            932                 BCEX           W              ;SAVE THE REG. IN B
0339 00CE            933                 C=B            W
033A 00001000        934                 GOSUB          =PTBYTA        ;PUT BYTE
033C 00CE            935                 C=B            W
033D 037C            936                 RCR            12
033E 0003            937                 GOTO           DCPL50         ;INCREMENT 1 BYTE
                     938 * GTO.0-14 HERE ( 1 BYTE LINK)
033F 00001000        939 DCPL55          GOSUB          =NXBYTA        ;GET  THE LINK BYTE
0341 031C            940                 PT=            1
0342 004A            941                 C=0            WPT
0343 00EE            942                 BCEX           W              ;SAVE THE REG. IN B
0344 00CE            943                 C=B            W
0345 00001000        944                 GOSUB          =PTBYTA
0347 00CE            945                 C=B            W
0348 037C            946                 RCR            12
0349 0003            947                 GOTO           DCPL51
                     948 *
                     949 * XECROM - DISPLAY ROM FUNCTION
                     950 * CALLED FROM DFILLF WHEN IT HAS A EXCROM FUNCTION.
                     951 * CALLED WITH A.X HAS THE 1ST BYTE OF THE 2 BYTE'S FC, PT=1.
                     952 *
034A 00A6            953 XECROM          ACEX           X
034B 02FC            954                 RCR            13
034C 0058            955                 G=C                           ;SAVE 1ST BYTE IN G
034D 006E            956                 ABEX           W
034E 00001000        957                 GOSUB          NXTBYT         ; GET THE SECOND BYTE
0350 021C            958                 PT=            2
0351 0098            959                 C=G                           ;PUT 2 BYTES TOGETHER IN C[3:0]
0352 00001000        960                 GOSUB          =GTRMAD        ;FIND IT IN THE ROM
0354 0003            961                 GOTO           XROMNF         ;ROM NOT PLUGED IN
0355 00AE            962                 ACEX           W
0356 01BC            963                 RCR            11             ;C.M _ XADR
0357 00001000        964                 GOSUB          =ENLCD
0359 000C            965                 ST=1?          3              ;XTYPE=0 ?
035A 0003            966                 GONC           XROM10         ;YES, MICRO CODE FUNCTION
035B 023A            967                 C=C+1          M
035C 023A            968                 C=C+1          M              ;POINT TO THIRD BYTE OF ALBL
035D 0330            969                 CXISA                         ;GET 1ST BYTE OF TEXT STRING
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    035E 0106          970                 A=C             X
    035F 01A6          971                 A=A-1           X
    0360 003C          972                 RCR             3               ;C(3:0) _ 1ST BYTE ADDR
    0361 022E          973                 C=C+1           W
    0362 00EE          974                 BCEX            W               ;SAVE 1ST BYTE ADDR IN B
    0363 00001000      975                 GOSUB           OUTROM          ;SEND "XROM" TO LCD
    0365 0104          976                 ST=0            8               ;CLEAR S8 FOR TXRW10
    0366 00001002      977                 GOLONG          =TXTROM         ;DISPLAY TEXT STRING FROM ROM
    0368               978 XROM10
    0368 00001000      979                 GOSUB           =PROMF2
    036A 00001002      980 XROMRT          GOLONG          =DF150          ;@2202
                       981 *
                       982 * XROMNF
                       983 *     ROM NOT PLUGGED IN, DISPLAY ROM ID & FC #
                       984 *
                       985 * IN: B(5:3)= BINARY ROM ID
                       986 *     B.X=    BINARY FUNCTION NUMBER
                       987 *     S1=   0 (1) -- DO (NOT) LEFT JUSTIFY
                       988 * ASSUMES: HEXMODE
                       989 * OUT:  CHIP 0 ENABLED, STATUS SET 0 UP, C= REG 14
                       990 * USES: A, B.S, B.X, C,  ACTIVE PT, S0-S7, +2 SUB LEVELS, DADD, PFAD
                       991 *
    036C 00001000      992 XROMNF          GOSUB           =ENLCD
    036E 00001000      993                 GOSUB           OUTROM          ;SEND "XROM" TO LCD   [CN11, @1756]
    0370 00CE          994                 C=B             W               ;GET ROM ID
    0371 003C          995                 RCR             3
    0372 0106          996                 A=C             X
    0373 001E          997                 A=0             S
    0374 00001000      998                 GOSUB           =GENNUM
    0376 03B8          999                 FRSABC
    0377 031C         1000                 PT=             1
    0378 03D0         1001                 LC              15
    0379 03E8         1002                 SLSABC
    037A 0066         1003                 ABEX            X               ;GET FUNCTION #
    037B 001E         1004                 A=0             S
    037C 00001000     1005                 GOSUB           =GENNUM
    037E 0003         1006                 GOTO            XROMRT
                      1007
                      1008
                      1009
                      1010                 GLB             SRBMAP
                      1011                 GLB             TBITMP
                      1012                 GLB             TBITMA
                      1013                 GLB             XROM.
                      1014
                      1015
                      1016
                      1017
                      1018 *  TBITMP - TEST BIT MAP
                      1019 *- TEST THE CORRECT BIT MAP (SHIFTED/UNSHIFTED) TO
                      1020 *- DETERMINE WHETHER A PARTICULAR KEY HAS BEEN
                      1021 *- ASSIGNED OR NOT
                      1022 *
                      1023 *- IN:  A[2:1]= COLUMN:ROW= LOGICAL KEYCODE (0:79 FORM)
                      1024 *               COLUMNS= 0-4,   ROWS=  0-7   UNSHIFTED
                      1025 *                                     8-15  SHIFTED
                      1026 *  ASSUME: HEXMODE, CHIP 0 ENABLED, PERIPHERALS DISABLED
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LOCATION OBJECT CODE LINE     SOURCE LINE

                     1027 *- OUT: C=0 -- BIT NOT SET
                     1028 *-      C#0 -- THE BIT IS SET  (AND IT IS THE ONLY BIT SET IN C)
                     1029 *-      M= BIT MAP
                     1030 *       SO=  1  (0) -- IT IS (NOT) A SHIFTED KEY
                     1031 *-      THE APPROPRIATE BIT MAP REGISTER IN CHIP 0 IS ENABLED
                     1032 *- USES: A,C,M,  ACTIVE PT, SO
                     1033 *            (+0 SUB LEVELS)
                     1034 *
                     1035 * TBITMA ENTRY - SAME AS TBITMP EXCEPT KC IS IN A[1:0] AND IS
                     1036 * IN 1-80 FORM ON ENTRY
                     1037
                     1038
                     1039
   037F 01A6         1040 TBITMA          A=A-1          X          ;DECREMENT K.C.
   0380 03EE         1041                 ASL            W          ;A[2]_COL
   0381 021C         1042 TBITMP          PT=            2          ;C[2]_4
   0382 0110         1043                 LC             4          ;-
   0383 0384         1044                 ST=0           0          ;SO_SHIFTSET
   0384 0210         1045                 LC             8          ;-
   0385 031C         1046                 PT=            1          ;-
   0386 0242         1047                 C=A-C          PT         ;SUBTRACT 8 FROM ROW TO TEST SHIFT
   0387 0007         1048                 GOC            $+3        ;NOT SHIFTED
   0388 0102         1049                 A=C            PT         ;WAS SHIFTED
   0389 0388         1050                 ST=1           0          ;REMEMBER SHIFT SET
   038A 009C         1051                 PT=            5          ;POSITION PTR AT COLUMN
   038B 0003         1052                 GOTO           $+3        ;-
   038C 03DC         1053                 INCPT                     ;-
   038D 03DC         1054                 INCPT                     ;-
   038E 01B6         1055                 A=A-1          XS         ;A.XS= COLUMN
   038F 0003         1056                 GONC           $-3        ;-
   0390 03E6         1057                 ASL            X          ;A[2]=ROW
   0391 0316         1058                 A<C?           XS         ;ROW<4?
   0392 0007         1059                 GOC            $+3        ;YES
   0393 03DC         1060                 INCPT                     ;SET PTR
   0394 01D6         1061                 A=A-C          XS         ;-
   0395 004E         1062                 C=0            W          ;POSITON ROW,COL BIT
   0396 0394         1063                 PT=?           0          ;-  (TOP ROW KEYS?)
   0397 0360         1064                 RTNC                      ;-  (YES)
   0398 0222         1065                 C=C+1          PT         ;-
                     1066                 LEGAL
   0399 0003         1067                 GOTO           $+2        ;-   (YES)
   039A 01E2         1068                 C=C+C          PT         ;-
   039B 01B6         1069                 A=A-1          XS         ;-
   039C 0003         1070                 GONC           $-2        ;-
   039D 010E         1071                 A=C            W          ;A_MASK
   039E 03F8         1072                 C=REGN         15         ;-
   039F 038C         1073                 ST=1?          0          ;SHIFTSET?
   03A0 0007         1074                 GOC            $+2        ;YES
   03A1 02B8         1075                 C=REGN         10         ;-
   03A2 0158         1076                 M=C                       ;M= C= BIT MAP
   03A3 03B0         1077                 C=C&A                     ;ROW,COL BIT SET?
   03A4 03E0         1078                 RTN                       ;-
                     1079
                     1080
                     1081
                     1082
                     1083 *  SRBMAP - SET/RESET BIT MAP
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

                     1084 *- TOGGLE THE BIT DESIGNATED BY THE MASK FOUND IN
                     1085 *- REGISTER C.
                     1086 *
                     1087 *- IN:  A= C=    BIT MAP MASK (RESULT OF TBITMP)
                     1088 *-      M[13:0]= BIT MAP
                     1089 *-      THE APPROPRIATE REGISTER MUST BE SELECTED
                     1090 *- OUT: CHIP 0 SELECTED
                     1091 *- USES: C[13:0], M[13:0], A[13:0]
                     1092
                     1093
                     1094
  03A5 02EE          1095 SRBMAP          C#0?            W               ;SET?
  03A6 0007          1096                 GOC             SRBM10          ;YES,RESET
  03A7 0198          1097                 C=M                             ;-
  03A8 0202          1098                 C=A+C           PT              ;SET IT
                     1099                 LEGAL
  03A9 0003          1100                 GOTO            $+4             ;-
  03AA 0198          1101 SRBM10          C=M                             ;-
  03AB 00AE          1102                 ACEX            W               ;-
  03AC 024E          1103                 C=A-C           W               ;-
  03AD 02F0          1104                 DATA=C                          ;RESTORE BIT MAP
  03AE 03E0          1105                 RTN                             ;RETURN
```

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```
LOCATION OBJECT CODE LINE     SOURCE LINE

                     1107 * XROM - EXECUTE ROM FUNCTION
                     1108 *- LOCATES ROM FUNCTION AND PREPARES IT FOR EXECUTION.
                     1109 *- IF THE FUNCTION IS A USER LANGUAGE PROGRAM, A TRANSFER
                     1110 *- IS MADE TO THE XEQC PROGRAM SEGMENT.  IF THE FUNCTION
                     1111 *- IS MICRO CODED, A JUMP IS MADE DIRECTLY TO THE FUNCTION'S
                     1112 *- EXECUTION POINT.
                     1113 *  IN:  FIRST BYTE OF FC IS IN G
                     1114 *       SECOND BYTE OF FC IS IN ST AND IN C[1:0]
                     1115 *       PT=2
                     1116 *       NUMERIC ARGUMENT, IF ANY, IS IN B.X
                     1117 *       ALPHA ARGUMENT, IF ANY, IS IN REG 9
                     1118 *- OUT: FOR MICROCODE FCNS, SS0 UP, NUMERIC ARG IN A.X, ALPHA ARG IN
                     1119 *             REG 9, NFRPU ON THE STACK
                     1120 *       FOR USER LANGUAGE FCNS, CURRENT ADDR SAVED IN R10[3:0],
                     1121 *             NEW ADDR IN C[3:0], EXITS TO XGI57
                     1122 *- USES: 1 SUBROUTINE LEVEL
                     1123
03AF 00CE            1124 XROM          C=B          W            ;SAVE NUMERIC ARGUMENT
03B0 0070            1125               N=C                       ; IN N
03B1 0098            1126               C=G                       ;RESTORE FC TO
03B2 0398            1127               C=ST                      ; C[3:0]
03B3 00001000        1128               GOSUB        =GTRMAD
03B5 0003            1129               GOTO         XRM20        ;COULDN'T FIND IT
                     1130 * GTRMAD RETURNS TO P+2 WITH FOUND ADDRESS IN A[3:0]
03B6 000C            1131               ST=1?        3            ;USER LANGUAGE?
03B7 0007            1132               GOC          XRM10        ;YES
                     1133                                         ;MICROCODE FCN
03B8 03B8            1134               C=REGN       14           ;PUT UP SS0
03B9 0358            1135               ST=C
03BA 00B0            1136               C=N                       ;RETRIEVE NUMERIC ARG TO A.X
03BB 00AE            1137               ACEX         W
03BC 01BC            1138               RCR          11
03BD 01E0            1139               GOTOC
                     1140
03BE                 1141 XRM10                                   ;USER LANGUAGE FCN
03BE 006E            1142               ABEX         W            ;SAVE NEW ADDR IN B
03BF 00001000        1143               GOSUB        =SAVRTN      ;SAVE OLD ADDR IN R10
03C1 00CE            1144               C=B          W            ;PUT NEW ADDR IN C[3:0]
03C2 00001002        1145               GOLONG       =XGI57
                     1146
03C4 00001002        1147 XRM20         GOLONG       =ERRNE       ;REPORT ERROR
                     1148
                     1149
                     1150
                     1151
                     1152
                     1153
                     1154
                     1155
                     1156
                     1157
                     1158
                     1159 ***********************************************
                     1160 *TXTLBL-TEXT OF LABEL STRING
                     1161 *THIS IS THE FRONT END FOR TEXT LBL
                     1162 *GIVEN A PC IN A(0,3) POINTING AT THE FIRST BYTE
                     1163 *OF AN ALPHA LBL THIS ROUTINE DISPLAYS THE ALPAH TEXT
```

```
LOCATION OBJECT CODE LINE     SOURCE LINE

                     1164 *STRING.
                     1165 *FOR ROM S2=1. FOR RAM S2=0.
                     1166 *SETS STATUS FOR NO PROMT AND LCD NOT FULL.
                     1167 *
                     1168 * TXTLB1 - SAME AS TXTLBL EXCEPT CLEARS S4 ON ENTRY.
                     1169 *      S4 IS USED TO DECIDE WHETHER TO CLEAR THE DISPLAY
                     1170 *      BEFORE PUTTING UP THE TEXTSTRING.  S4=0 IMPLIES
                     1171 *      CLEAR THE DISPLAY, S4=1 IMPLIES DON'T CLEAR FIRST.
                     1172 ***********************************************************
03C6 0044            1173 TXTLB1          ST=0            4                ;REMEMBER TO CLEAR DISPLAY
03C7 0104            1174 TXTLBL          ST=0            8                ;NO PROMPT
03C8 0304            1175                 ST=0            1                ;LCD NOT FULL
03C9 020C            1176                 ST=1?           2                ;ROM OR RAM?
03CA 0007            1177                 GOC             ROMSTG           ;ROM
03CB 00001000        1178                 GOSUB           =INCADP          ;SET PT=3 INC ADR
03CD 00001000        1179                 GOSUB           =NXBYTA          ;GET # CHR
03CF 00001000        1180                 GOSUB           =INCADA          ;SKIP ASSIGN BIT
03D1 0003            1181                 GOTO            CLRL
03D2 016E            1182 ROMSTG          A=A+1           W                ;INC ADR
                     1183                 LEGAL
03D3 00001000        1184                 GOSUB           =NXBYTO          ;GET # CHRT
03D5 016E            1185                 A=A+1           W
03D6 0266            1186 CLRL            C=C-1           X
03D7 00E6            1187                 BCEX            X
03D8 006E            1188                 ABEX            W                ;COUNT IN A,ADR IN B
03D9 00001000        1189                 GOSUB           =ENLCD
                     1190 *!!! TXTSTR ENABLES THE LCD SO THIS "GOSUB ENLCD" COULD PROBABLY BE DELETED
                     1191 *!!! AND THE FOLLOWING "GSUBNC CLRLCD" CHANGED TO "GSUBNC CLLCDE"
03DB 004C            1192                 ST=1?           4                ;SKIP CLEARING THE DISPLAY?
03DC 00001000        1193                 GSUBNC          =CLRLCD          ;NO. CLEAR THE DISPLAY
03DE 00001002        1194                 GOLONG          =TXTSTR
                     1195
                     1196                 GLB             STBT30
                     1197                 GLB             STBT31
03E0 010C            1198 STBT30          ST=1?           8                ;LAST PGM NEEDS PACK ?
03E1 0003            1199                 GONC            STBT31           ;NO
03E2 00EE            1200                 BCEX            W
03E3 0158            1201                 M=C
03E4 00EE            1202                 BCEX            W
03E5 0104            1203 STBT31          ST=0            8
03E6 03D8            1204                 CSTEX
03E7 020C            1205                 ST=1?           2
03E8 0003            1206                 GONC            STBT32
03E9 0108            1207                 ST=1            8
03EA 0204            1208                 ST=0            2
03EB 0308            1209                 ST=1            1
03EC 03D8            1210 STBT32          CSTEX
03ED 03E0            1211                 RTN
                     1212 *
                     1213 * OUTROM - SHIFT "XROM " INTO THE LCD FROM THE RIGHT END
                     1214 *
                     1215 * IN & ASSUME: DISPLAY ENABLED, RAM DISABLED, HEXMODE
                     1216 * USES: C[6:0], +1 SUB LEVEL
                     1217 *        (NO PT, NO ST)
                     1218 *
                     1219                 GLB             OUTROM
03EE 00001000        1220 OUTROM          GOSUB           =MESSL
```

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LOCATION OBJECT CODE LINE     SOURCE LINE

    03F0 0018        1221                 CON             24              ;X
    03F1 0012        1222                 CON             18              ;R
    03F2 000F        1223                 CON             15              ;O
    03F3 000D        1224                 CON             13              ;M
    03F4 0220        1225                 CON             1040Q           ;BLANK
    03F5 03E0        1226                 RTN
                     1227 * RESERVE 2 WORDS AT THE END OF CN11 FOR THE CHIP 2 CHECKSUM AND
                     1228 * TRAILER.
    03F6 00000000    1229                 FILLTO          1775Q
    03FE 0006        1230 REVLV2          CON             6               ;REV LEVEL= F
    03FF             1231 CKSUM2          BSS             1
                     1232                 END

Errors=    0
```

LINE#	SYMBOL	TYPE	REFERENCES
86	AOUT05	P	95
98	AOUT10	P	89
102	AOUT15	P	7,139
117	AOUT16	P	113
118	AOUT17	P	121
126	AOUT18	P	108
130	AOUT19	P	127
134	AOUT20	P	101
109	AOUTRO	P	97
122	AOUTRT	P	116,119
727	APHST1	P	721
728	APHST2	P	726
729	APHST3	P	717
735	APHST4	P	703
700	APHST	P	8,456
383	APNDNW	P	9,300
378	APPEND	P	10,493
78	ARGOUT	P	11
155	ASCLCA	P	147
154	ASCLCD	P	12,138,504
43	ASCTBL	P	
	BAKAPH	E	476
	BLINK	E	479,635
1231	CKSUM2	P	
337	CLLCDE	P	13,96,99,733
1186	CLRL	P	1181
343	CLRLCD	P	14,1193
148	COLON	P	159
151	COMMA	P	163
432	DAT102	P	
437	DAT105	P	433
442	DAT106	P	15,438
445	DAT110	P	429
452	DAT120	P	448
457	DAT140	P	431
462	DAT200	P	427
492	DAT220	P	461,480,506
470	DAT230	P	
481	DAT231	P	16
488	DAT235	P	469
493	DAT240	P	478
501	DAT245	P	496
502	DAT260	P	17,500,734
505	DAT280	P	18,728
507	DAT300	P	19,467
514	DAT320	P	20
527	DAT322	P	523
532	DAT325	P	530
542	DAT330	P	551,570,593,595
552	DAT333	P	538
554	DAT335	P	544,546
571	DAT345	P	562
580	DAT350	P	560
584	DAT360	P	
586	DAT370	P	572
596	DAT380	P	557,574,576,578
598	DAT385	P	652

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LINE#	SYMBOL	TYPE	REFERENCES
600	DAT390	P	579,581,583,585
602	DAT400	P	21,616,653,753
603	DAT410	P	599
604	DAT415	P	636
613	DAT500	P	22,508
625	DAT505	P	622
628	DAT507	P	641
633	DAT510	P	619
637	DAT515	P	634
642	DAT520	P	632
411	DATENT	P	23
	DATOFF	E	623
822	DCPL00	P	821
826	DCPL05	P	884
836	DCPL07	P	832
840	DCPL11	P	835
846	DCPL15	P	814
813	DCPL17	P	848
815	DCPL20	P	844
852	DCPL24	P	818
857	DCPL25	P	871,877,880,922
867	DCPL30	P	858
879	DCPL35	P	918
905	DCPL40	P	873
914	DCPL42	P	
924	DCPL45	P	875
921	DCPL50	P	906,910,912,937
922	DCPL51	P	947
939	DCPL55	P	908
896	DCPL60	P	887
882	DCPL70	P	853,920
889	DCPLRT	P	888
891	DCRT10	P	890
	DECADA	E	627
820	DECMPL	P	24
	DELLIN	E	513
	DF150	E	980
	DFILLF	E	603
	DGENS8	E	488,516
	DIGST_	E	455
	ENCP00	E	130,361
	ENLCD	E	135,498,657,725,964,992,1189
	ERRNE	E	1147
	ERROR	E	901
901	ERRTA	P	900
	FSTIN	E	817
	GENNUM	E	998,1005
	GETPC	E	265,512,517,643,739,889
	GTBYT	E	266
	GTBYTA	E	829,855,924
	GTBYTO	E	369
	GTFEND	E	822
	GTLINK	E	842
	GTRMAD	E	960,1128
605	INBCHS	P	25,531,594
	INBYT	E	569,609,638,745,749
	INBYTO	E	525,597,601

LINE#	SYMBOL	TYPE	REFERENCES
607	INBYTJ	P	26,550,590
	INCAD2	E	828,851
	INCADA	E	644,914,1180
	INCADP	E	1178
	INSSUB	E	735
	INTARG	E	285,729
213	MASK	P	27,167
235	MASK10	P	217,221
240	MASK20	P	244
248	MASK30	P	242
226	MASKRT	P	247,252
	MESSL	E	1220
	MSGTA	E	902
361	NBYTA0	P	360
363	NBYTAB	P	362
	NFRKB	E	492,604
	NOREG9	E	489
	NXBYTA	E	86,132,366,520,915,929,939,1179
367	NXBYTO	P	28,1184
	NXL3B2	E	921
	NXLTX	E	879
364	NXTBYT	P	29,274,294,957
	OFSHFT	E	412
683	OPMT10	P	687
693	OPMT20	P	680
673	OPROMT	P	30,505
189	OUTLCD	P	31,183,234
1220	OUTROM	P	975,993,1219
168	PERIOD	P	
	PROMF2	E	979
	PTBYTA	E	626,650,839,928,934,944
170	PUNC	P	150,153
185	PUNC10	P	174,176
194	PUNC20	P	184,190
	PUTPC	E	291,895
1230	REVLV2	P	
	RFDS55	E	491
	RG9LCD	E	490
658	ROBK10	P	662
654	ROLBAK	P	32,501,727
1182	ROMSTG	P	1177
	RSTO5	E	322
	SAVRTN	E	1143
314	SCROL0	P	33
323	SCROL2	P	317
325	SCROL5	P	320
312	SCROLL	P	34,129
1101	SRBM10	P	1096
1095	SRBMAP	P	1010
329	SROL10	P	
766	STBT10	P	35
1198	STBT30	P	1196
1203	STBT31	P	1197,1199
1210	STBT32	P	1206
	STFLGS	E	452
688	STOLCC	P	36,125,684,694
1040	TBITMA	P	1012

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LINE#	SYMBOL	TYPE	REFERENCES
1042	TBITMP	P	1011
264	TEXT	P	37
286	TEXT30	P	301
292	TEXT40	P	
	TONE7X	E	382
1173	TXTLB1	P	6
1174	TXTLBL	P	5
	TXTROM	E	977
	TXTSTR	E	1194
	UPLINK	E	846
	XDELET	E	624
953	XECROM	P	39
	XGI57	E	1145
1141	XRM10	P	1132
1147	XRM20	P	1129
1124	XROM	P	1013
978	XROM10	P	966
992	XROMNF	P	38,961
980	XROMRT	P	1006

FILE/PROG NAME	PROGRAM	DATA	COMMON	ABSOLUTE	DATE	TIME	COMMENTS
QUAD0:COCONU	0000				Fri, 8 Mar 1985,	9:25	
QUAD1:COCONU	0400				Fri, 8 Mar 1985,	9:26	
QUAD2:COCONU	0800				Fri, 8 Mar 1985,	9:27	
QUAD3:COCONU	0C00				Fri, 8 Mar 1985,	9:28	
next address	1000						
QUAD4:COCONU	1000				Fri, 8 Mar 1985,	9:29	
QUAD5:COCONU	1400				Fri, 8 Mar 1985,	9:30	
QUAD6:COCONU	1800				Fri, 8 Mar 1985,	9:31	
QUAD7:COCONU	1C00				Fri, 8 Mar 1985,	9:32	
next address	2000						
QUAD8:COCONU	2000				Fri, 8 Mar 1985,	9:33	
QUAD9:COCONU	2400				Fri, 8 Mar 1985,	9:34	
QUAD10:COCONU	2800				Fri, 8 Mar 1985,	9:35	
QUAD11:COCONU	2C00				Fri, 8 Mar 1985,	9:36	
next address	3000						

XFER address= 0000 Defined by DEFAULT
absolute & link_com file name=COCONUT:COCONU
Total# of words loaded= 3000

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SYMBOL	R	VALUE	DEF BY	REFERENCES				
ABS	P	1076	QUAD4:COCONU	QUAD5:COCONU				
ABTS10	P	0D16	QUAD3:COCONU					
ABTSEQ	P	0D12	QUAD3:COCONU					
ACOS	P	107D	QUAD4:COCONU	QUAD5:COCONU				
AD1_10	P	1809	QUAD6:COCONU	QUAD7:COCONU				
AD2_10	P	1807	QUAD6:COCONU	QUAD7:COCONU	QUAD5:COCONU	QUAD4:COCONU		
AD2_13	P	180C	QUAD6:COCONU	QUAD7:COCONU				
ADD1	P	1CE0	QUAD7:COCONU					
ADD2	P	1CE3	QUAD7:COCONU					
ADDONE	P	1800	QUAD6:COCONU	QUAD7:COCONU				
ADRFCH	P	0004	QUAD0:COCONU	QUAD9:COCONU				
ADVNCE	P	114D	QUAD4:COCONU	QUAD5:COCONU				
AFORMT	P	0628	QUAD1:COCONU	QUAD5:COCONU				
AGTO	P	1085	QUAD4:COCONU	QUAD5:COCONU				
AJ2	P	0DD4	QUAD3:COCONU					
AJ3	P	0DD0	QUAD3:COCONU					
ALCL00	P	06C9	QUAD1:COCONU	QUAD3:COCONU				
ALLOK	P	02CD	QUAD0:COCONU					
ALPDEF	P	03AE	QUAD0:COCONU	QUAD4:COCONU				
ANNOUT	P	075C	QUAD1:COCONU	QUAD8:COCONU	QUAD5:COCONU	QUAD4:COCONU	QUAD3:COCONU	QUAD0:COCONU
ANN_14	P	075B	QUAD1:COCONU	QUAD5:COCONU	QUAD3:COCONU			
AOFF	P	1345	QUAD4:COCONU	QUAD5:COCONU				
AON	P	133C	QUAD4:COCONU	QUAD5:COCONU				
AOUT15	P	2C2B	QUAD11:COCONU					
APHST	P	2E62	QUAD11:COCONU					
APND10	P	1FF5	QUAD7:COCONU	QUAD1:COCONU				
APNDDG	P	1FFA	QUAD7:COCONU	QUAD1:COCONU				
APNDNW	P	2D14	QUAD11:COCONU	QUAD7:COCONU	QUAD5:COCONU			
APND	P	1FF3	QUAD7:COCONU	QUAD1:COCONU				
APPEND	P	2D0E	QUAD11:COCONU					
ARCL	P	108C	QUAD4:COCONU	QUAD5:COCONU				
ARGOUT	P	2C10	QUAD11:COCONU	QUAD5:COCONU	QUAD2:COCONU	QUAD0:COCONU		
ASCLCA	P	2C5E	QUAD11:COCONU					
ASCLCD	P	2C5D	QUAD11:COCONU	QUAD2:COCONU	QUAD1:COCONU			
ASHF	P	1092	QUAD4:COCONU	QUAD5:COCONU				
ASIN	P	1098	QUAD4:COCONU	QUAD5:COCONU				
ASN	P	109E	QUAD4:COCONU	QUAD5:COCONU				
ASN15	P	27C2	QUAD9:COCONU					
ASN20	P	27CC	QUAD9:COCONU					
ASRCH	P	26C5	QUAD9:COCONU	QUAD8:COCONU	QUAD3:COCONU			
ASTO	P	10A4	QUAD4:COCONU	QUAD5:COCONU				
ATAN	P	10AA	QUAD4:COCONU	QUAD5:COCONU				
AVAIL	P	28C4	QUAD10:COCONU					
AVAILA	P	28C7	QUAD10:COCONU	QUAD9:COCONU				
AVIEW	P	10B2	QUAD4:COCONU	QUAD5:COCONU				
AXEQ	P	10B5	QUAD4:COCONU	QUAD5:COCONU				
BAKAPH	P	09E3	QUAD2:COCONU	QUAD11:COCONU				
BAKDE	P	09A5	QUAD2:COCONU					
BCDBIN	P	02E3	QUAD0:COCONU	QUAD9:COCONU				
BEEP	P	10BB	QUAD4:COCONU	QUAD5:COCONU				
BIGBRC	P	004F	QUAD0:COCONU					
BKROM2	P	2A91	QUAD10:COCONU					
BLANK	P	05B7	QUAD1:COCONU					
BLINK	P	0899	QUAD2:COCONU	QUAD11:COCONU	QUAD3:COCONU	QUAD1:COCONU	QUAD0:COCONU	
BLINK1	P	0899	QUAD2:COCONU					

BRT100	P 1D80	QUAD7:COCONU	QUAD4:COCONU				
BRT140	P 1DEC	QUAD7:COCONU					
BRT160	P 1DA8	QUAD7:COCONU					
BRT200	P 1E0F	QUAD7:COCONU					
BRT290	P 1DAC	QUAD7:COCONU					
BRTS10	P 1D6B	QUAD7:COCONU					
BST	P 10C2	QUAD4:COCONU	QUAD5:COCONU				
BSTCAT	P 0BBA	QUAD2:COCONU	QUAD8:COCONU				
BSTE	P 290B	QUAD10:COCONU					
BSTE2	P 2AF2	QUAD10:COCONU					
BSTEP	P 28DE	QUAD10:COCONU	QUAD8:COCONU				
BSTEPA	P 28EB	QUAD10:COCONU	QUAD8:COCONU				
CALDSP	P 29C3	QUAD10:COCONU	QUAD9:COCONU				
CAT	P 10C8	QUAD4:COCONU	QUAD5:COCONU				
CAT1	P 0BC3	QUAD2:COCONU					
CAT2	P 0B53	QUAD2:COCONU					
CAT3	P 1383	QUAD4:COCONU	QUAD2:COCONU				
CF	P 10CC	QUAD4:COCONU	QUAD5:COCONU				
CHKAD4	P 1686	QUAD5:COCONU					
CHKADR	P 166E	QUAD5:COCONU	QUAD0:COCONU				
CHKFUL	P 05BA	QUAD1:COCONU					
CHKRPC	P 0222	QUAD0:COCONU	QUAD9:COCONU				
CHK_NO_S	P 14D8	QUAD5:COCONU	QUAD7:COCONU	QUAD6:COCONU	QUAD0:COCONU		
CHK_NO_S1	P 14D4	QUAD5:COCONU					
CHK_NO_S2	P 14D9	QUAD5:COCONU	QUAD0:COCONU				
CHRLCD	P 05B9	QUAD1:COCONU					
CHS	P 123A	QUAD4:COCONU	QUAD5:COCONU				
CHSA	P 1CDA	QUAD7:COCONU					
CHSA1	P 1CDC	QUAD7:COCONU					
CLA	P 10D1	QUAD4:COCONU	QUAD5:COCONU				
CLCTMG	P 03C9	QUAD0:COCONU	QUAD2:COCONU				
CLDSP	P 10E0	QUAD4:COCONU	QUAD5:COCONU				
CLLCDE	P 2CF0	QUAD11:COCONU	QUAD7:COCONU	QUAD3:COCONU	QUAD2:COCONU	QUAD1:COCONU	QUAD0:COCONU
CLP	P 10E7	QUAD4:COCONU	QUAD5:COCONU				
CLR	P 1733	QUAD5:COCONU	QUAD4:COCONU				
CLREG	P 10ED	QUAD4:COCONU	QUAD5:COCONU				
CLRLCD	P 2CF6	QUAD11:COCONU					
CLRPGM	P 228C	QUAD8:COCONU	QUAD4:COCONU				
CLRREG	P 2155	QUAD8:COCONU					
CLRSB2	P 0C00	QUAD3:COCONU	QUAD9:COCONU	QUAD2:COCONU			
CLRSB3	P 0C02	QUAD3:COCONU	QUAD9:COCONU				
CLSIG	P 10F3	QUAD4:COCONU	QUAD5:COCONU				
CLST	P 10F9	QUAD4:COCONU	QUAD5:COCONU				
CLX	P 1101	QUAD4:COCONU	QUAD5:COCONU				
CNTLOP	P 0B9D	QUAD2:COCONU	QUAD0:COCONU				
COLDST	P 0232	QUAD0:COCONU	QUAD5:COCONU				
COPY	P 1109	QUAD4:COCONU	QUAD5:COCONU				
COS	P 127C	QUAD4:COCONU	QUAD5:COCONU				
CPGM10	P 067F	QUAD1:COCONU					
CPGMHD	P 067B	QUAD1:COCONU	QUAD10:COCONU	QUAD9:COCONU	QUAD8:COCONU		
DAT106	P 2D4C	QUAD11:COCONU	QUAD2:COCONU				
DAT231	P 2D77	QUAD11:COCONU	QUAD2:COCONU				
DAT260	P 2D94	QUAD11:COCONU					
DAT280	P 2D98	QUAD11:COCONU					
DAT300	P 2D9B	QUAD11:COCONU					
DAT320	P 2DA2	QUAD11:COCONU	QUAD2:COCONU				
DAT400	P 2E05	QUAD11:COCONU					

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DAT500	P 2E10	QUAD11:COCONU					
DATENT	P 2D2C	QUAD11:COCONU	QUAD3:COCONU				
DATOFF	P 0390	QUAD0:COCONU	QUAD11:COCONU	QUAD4:COCONU	QUAD2:COCONU		
DCPL00	P 2EC3	QUAD11:COCONU	QUAD8:COCONU				
DCPLRT	P 2F0B	QUAD11:COCONU	QUAD8:COCONU				
DCRT10	P 2F0D	QUAD11:COCONU	QUAD9:COCONU	QUAD5:COCONU			
DEC	P 132B	QUAD4:COCONU	QUAD5:COCONU				
DECAD	P 29C7	QUAD10:COCONU	QUAD9:COCONU	QUAD8:COCONU	QUAD2:COCONU		
DECADA	P 29CA	QUAD10:COCONU	QUAD11:COCONU	QUAD9:COCONU	QUAD8:COCONU		
DECMPL	P 2EC2	QUAD11:COCONU	QUAD8:COCONU	QUAD4:COCONU	QUAD0:COCONU		
DEEXP	P 088C	QUAD2:COCONU					
DEG	P 1114	QUAD4:COCONU	QUAD5:COCONU				
DEG00	P 172A	QUAD5:COCONU					
DEL	P 1124	QUAD4:COCONU	QUAD5:COCONU				
DELETE	P 1127	QUAD4:COCONU	QUAD5:COCONU				
DELLIN	P 2306	QUAD8:COCONU	QUAD11:COCONU				
DELNNN	P 22A8	QUAD8:COCONU	QUAD4:COCONU				
DEROVF	P 08EB	QUAD2:COCONU					
DEROW	P 04AD	QUAD1:COCONU					
DERUN	P 08AD	QUAD2:COCONU	QUAD0:COCONU				
DERW00	P 04B2	QUAD1:COCONU					
DF060	P 0587	QUAD1:COCONU	QUAD2:COCONU				
DF150	P 0482	QUAD1:COCONU	QUAD11:COCONU				
DF160	P 0485	QUAD1:COCONU					
DF200	P 04E7	QUAD1:COCONU					
DFILLF	P 0563	QUAD1:COCONU	QUAD11:COCONU				
DFKBCK	P 0559	QUAD1:COCONU	QUAD8:COCONU				
DFRST8	P 0562	QUAD1:COCONU	QUAD0:COCONU				
DFRST9	P 0561	QUAD1:COCONU	QUAD8:COCONU				
DGENS8	P 0836	QUAD2:COCONU	QUAD11:COCONU				
DIGENT	P 0837	QUAD2:COCONU					
DIGST_	P 08B2	QUAD2:COCONU	QUAD11:COCONU				
DIV110	P 18A5	QUAD6:COCONU					
DIV120	P 18AF	QUAD6:COCONU	QUAD7:COCONU				
DIV15	P 18A9	QUAD6:COCONU	QUAD7:COCONU				
DIVIDE	P 106F	QUAD4:COCONU	QUAD5:COCONU				
DOSKP	P 1631	QUAD5:COCONU					
DOSRC1	P 24E3	QUAD9:COCONU					
DOSRCH	P 24E4	QUAD9:COCONU					
DROPST	P 00E4	QUAD0:COCONU					
DROWSY	P 0160	QUAD0:COCONU					
DRSY05	P 0161	QUAD0:COCONU	QUAD4:COCONU				
DRSY25	P 0173	QUAD0:COCONU	QUAD8:COCONU				
DRSY50	P 0190	QUAD0:COCONU	QUAD4:COCONU				
DRSY51	P 0194	QUAD0:COCONU	QUAD4:COCONU				
DSE	P 112D	QUAD4:COCONU	QUAD5:COCONU				
DSPCA	P 0B35	QUAD2:COCONU					
DSPCRG	P 0B26	QUAD2:COCONU	QUAD0:COCONU				
DSPLN_	P 0FC7	QUAD3:COCONU					
DSWKUP	P 01AD	QUAD0:COCONU					
DTOR	P 1981	QUAD6:COCONU	QUAD4:COCONU				
DV1_10	P 189A	QUAD6:COCONU	QUAD7:COCONU	QUAD4:COCONU			
DV2_10	P 1898	QUAD6:COCONU	QUAD7:COCONU	QUAD4:COCONU			
DV2_13	P 189D	QUAD6:COCONU	QUAD7:COCONU				
D_R	P 110E	QUAD4:COCONU	QUAD5:COCONU				
ENCP00	P 0952	QUAD2:COCONU	QUAD11:COCONU	QUAD9:COCONU	QUAD7:COCONU	QUAD3:COCONU	QUAD1:COCONU
			QUAD0:COCONU				

END	P 1132	QUAD4:COCONU	QUAD5:COCONU
END2	P 03B6	QUAD0:COCONU	QUAD2:COCONU
END3	P 03BE	QUAD0:COCONU	QUAD2:COCONU
ENG	P 1135	QUAD4:COCONU	QUAD5:COCONU
ENLCD	P 07F6	QUAD1:COCONU	QUAD11:COCONU QUAD9:COCONU QUAD3:COCONU QUAD2:COCONU QUAD0:COCONU
ENTER	P 113E	QUAD4:COCONU	QUAD5:COCONU
ERR0	P 18C3	QUAD6:COCONU	QUAD7:COCONU
ERR110	P 22FB	QUAD8:COCONU	
ERR120	P 22FF	QUAD8:COCONU	QUAD2:COCONU
ERRRD	P 14E2	QUAD5:COCONU	QUAD0:COCONU
ERRDE	P 282D	QUAD10:COCONU	QUAD6:COCONU QUAD0:COCONU
ERRIGN	P 00BB	QUAD0:COCONU	QUAD2:COCONU
ERRNE	P 02E0	QUAD0:COCONU	QUAD11:COCONU QUAD9:COCONU QUAD8:COCONU QUAD7:COCONU QUAD5:COCONU QUAD3:COCONU
ERROF	P 00A2	QUAD0:COCONU	QUAD7:COCONU
ERROR	P 22F5	QUAD8:COCONU	QUAD11:COCONU QUAD10:COCONU QUAD5:COCONU QUAD0:COCONU
ERRPR	P 2184	QUAD8:COCONU	
ERRRAM	P 2172	QUAD8:COCONU	
ERRSUB	P 22E8	QUAD8:COCONU	
ERRTA	P 2F17	QUAD11:COCONU	
EXP10	P 1A0A	QUAD6:COCONU	QUAD4:COCONU
EXP13	P 1A0D	QUAD6:COCONU	
EXP400	P 1A21	QUAD6:COCONU	
EXP500	P 1A61	QUAD6:COCONU	
EXP710	P 1A4C	QUAD6:COCONU	
EXP720	P 1A50	QUAD6:COCONU	
EXSCR	P 192A	QUAD6:COCONU	QUAD7:COCONU
E_TO_X	P 1147	QUAD4:COCONU	QUAD5:COCONU
E_TO_X_MINUS_1	P 1163	QUAD4:COCONU	QUAD5:COCONU
FACT	P 1154	QUAD4:COCONU	QUAD5:COCONU
FC	P 115A	QUAD4:COCONU	QUAD5:COCONU
FCNTBL	P 1400	QUAD5:COCONU	
FC_C	P 116B	QUAD4:COCONU	QUAD5:COCONU
FDIG20	P 0E3D	QUAD3:COCONU	
FDIGIT	P 0E2F	QUAD3:COCONU	
FILLXL	P 00EA	QUAD0:COCONU	
FIND_NO_1	P 1775	QUAD5:COCONU	
FIX	P 1171	QUAD4:COCONU	QUAD5:COCONU
FIX57	P 0AC3	QUAD2:COCONU	
FIXEND	P 2918	QUAD10:COCONU	QUAD8:COCONU
FLGANN	P 1651	QUAD5:COCONU	
FLINK	P 2928	QUAD10:COCONU	QUAD8:COCONU
FLINKA	P 2927	QUAD10:COCONU	QUAD8:COCONU QUAD2:COCONU
FLINKM	P 2929	QUAD10:COCONU	
FLINKP	P 2925	QUAD10:COCONU	QUAD9:COCONU QUAD8:COCONU
FNDEND	P 1730	QUAD5:COCONU	
FORMAT	P 0A7B	QUAD2:COCONU	QUAD1:COCONU
FRAC	P 117C	QUAD4:COCONU	QUAD5:COCONU
FS	P 1182	QUAD4:COCONU	QUAD5:COCONU
FSTIN	P 14C2	QUAD5:COCONU	QUAD11:COCONU QUAD10:COCONU QUAD8:COCONU QUAD2:COCONU QUAD1:COCONU
FS_C	P 1188	QUAD4:COCONU	QUAD5:COCONU
GCP112	P 2BB5	QUAD10:COCONU	
GCPK04	P 2BBC	QUAD10:COCONU	
GCPK05	P 2BBE	QUAD10:COCONU	
GCPKC	P 2B80	QUAD10:COCONU	QUAD9:COCONU QUAD1:COCONU
GCPKCO	P 2B89	QUAD10:COCONU	
GENLNK	P 239A	QUAD8:COCONU	QUAD10:COCONU

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GENNUM	P 05E8	QUAD1:COCONU	QUAD11:COCONU	QUAD3:COCONU			
GETLIN	P 1419	QUAD5:COCONU	QUAD10:COCONU	QUAD8:COCONU			
GETN	P 1CEA	QUAD7:COCONU					
GETPC	P 2950	QUAD10:COCONU	QUAD11:COCONU	QUAD9:COCONU	QUAD8:COCONU	QUAD5:COCONU	QUAD3:COCONU
			QUAD2:COCONU	QUAD1:COCONU			
GETPCA	P 2952	QUAD10:COCONU	QUAD9:COCONU	QUAD0:COCONU			
GETX	P 1CEF	QUAD7:COCONU					
GETXSQ	P 1CEE	QUAD7:COCONU					
GETXY	P 1CEB	QUAD7:COCONU					
GETY	P 1CED	QUAD7:COCONU					
GETYSQ	P 1CEC	QUAD7:COCONU					
GOL0	P 23D0	QUAD8:COCONU					
GOL1	P 23D9	QUAD8:COCONU					
GOL2	P 23E2	QUAD8:COCONU					
GOL3	P 23EB	QUAD8:COCONU					
GOLNGH	P 0FD9	QUAD3:COCONU					
GOLONG	P 0FDA	QUAD3:COCONU					
GOSUB	P 0FDE	QUAD3:COCONU					
GOSUB0	P 23D2	QUAD8:COCONU					
GOSUB1	P 23DB	QUAD8:COCONU					
GOSUB2	P 23E4	QUAD8:COCONU					
GOSUB3	P 23ED	QUAD8:COCONU					
GOSUBH	P 0FDD	QUAD3:COCONU					
GOTINT	P 02F8	QUAD0:COCONU					
GRAD	P 111A	QUAD4:COCONU	QUAD5:COCONU				
GSB000	P 23FA	QUAD8:COCONU					
GSB256	P 23FA	QUAD8:COCONU					
GSB512	P 23FA	QUAD8:COCONU					
GSB768	P 23FA	QUAD8:COCONU					
GSUBS1	P 23C9	QUAD8:COCONU					
GT3DBT	P 0FEB	QUAD3:COCONU	QUAD9:COCONU				
GTACOD	P 1FDB	QUAD7:COCONU	QUAD3:COCONU				
GTAI40	P 0341	QUAD0:COCONU					
GTAINC	P 0304	QUAD0:COCONU	QUAD9:COCONU				
GTBYT	P 29B0	QUAD10:COCONU	QUAD11:COCONU	QUAD9:COCONU			
GTBYTA	P 29BB	QUAD10:COCONU	QUAD11:COCONU	QUAD9:COCONU	QUAD3:COCONU		
GTBYTO	P 29B2	QUAD10:COCONU	QUAD11:COCONU				
GTCNTR	P 0B8D	QUAD2:COCONU					
GTFEN1	P 20EB	QUAD8:COCONU					
GTFEN0	P 20E8	QUAD8:COCONU	QUAD11:COCONU	QUAD10:COCONU			
GTLINK	P 224E	QUAD8:COCONU	QUAD11:COCONU	QUAD10:COCONU	QUAD9:COCONU	QUAD1:COCONU	
GTLNKA	P 2247	QUAD8:COCONU	QUAD10:COCONU	QUAD1:COCONU			
GTO	P 1191	QUAD4:COCONU	QUAD5:COCONU				
GTOL	P 118C	QUAD4:COCONU	QUAD5:COCONU				
GTONN	P 2959	QUAD10:COCONU	QUAD4:COCONU				
GTO_5	P 29AA	QUAD10:COCONU	QUAD8:COCONU				
GTRMAD	P 0800	QUAD2:COCONU	QUAD11:COCONU	QUAD1:COCONU			
GTSRCH	P 24DF	QUAD9:COCONU					
HMSDV	P 19E5	QUAD6:COCONU					
HMSMP	P 19E7	QUAD6:COCONU					
HMS_H	P 1193	QUAD4:COCONU	QUAD5:COCONU				
HMS_MINUS	P 1045	QUAD4:COCONU	QUAD5:COCONU				
HMS_PLUS	P 1032	QUAD4:COCONU	QUAD5:COCONU				
H_HMS	P 1199	QUAD4:COCONU	QUAD5:COCONU				
IN3B	P 2A65	QUAD10:COCONU					
INBCHS	P 2E0A	QUAD11:COCONU					
INBYT	P 29E6	QUAD10:COCONU	QUAD11:COCONU				

INBYTO	P 29E3	QUAD10:COCONU	QUAD11:COCONU					
INBYT1	P 29EA	QUAD10:COCONU						
INBYTC	P 29E4	QUAD10:COCONU						
INBYTJ	P 2E0C	QUAD11:COCONU						
INBYTP	P 29E5	QUAD10:COCONU						
INCAD	P 29CF	QUAD10:COCONU	QUAD9:COCONU	QUAD2:COCONU	QUAD1:COCONU			
INCAD2	P 29D3	QUAD10:COCONU	QUAD11:COCONU	QUAD9:COCONU	QUAD8:COCONU	QUAD3:COCONU	QUAD2:COCONU	QUAD1:COCONU
INCADA	P 29D6	QUAD10:COCONU	QUAD11:COCONU	QUAD9:COCONU	QUAD8:COCONU	QUAD0:COCONU		
INCADP	P 29D1	QUAD10:COCONU	QUAD11:COCONU					
INCGT2	P 0286	QUAD0:COCONU	QUAD9:COCONU					
IND	P 0DB2	QUAD3:COCONU						
IND21	P 0DC4	QUAD3:COCONU						
INEX	P 2A4A	QUAD10:COCONU						
INLIN	P 2876	QUAD10:COCONU						
INLIN2	P 29F6	QUAD10:COCONU						
INPIDG	P 08A0	QUAD2:COCONU						
INSHRT	P 2A17	QUAD10:COCONU						
INSLIN	P 29F4	QUAD10:COCONU	QUAD3:COCONU					
INSSUB	P 23B2	QUAD8:COCONU	QUAD11:COCONU	QUAD10:COCONU	QUAD2:COCONU			
INSTR	P 2A73	QUAD10:COCONU						
INT	P 1177	QUAD4:COCONU	QUAD5:COCONU					
INTARG	P 07E1	QUAD1:COCONU	QUAD11:COCONU					
INTFRC	P 193B	QUAD6:COCONU	QUAD7:COCONU	QUAD4:COCONU				
INTINT	P 02FB	QUAD0:COCONU						
INTXC	P 2A7D	QUAD10:COCONU						
IORUN	P 27E4	QUAD9:COCONU	QUAD0:COCONU					
ISG	P 119E	QUAD4:COCONU	QUAD5:COCONU					
KEYOP	P 068A	QUAD1:COCONU	QUAD3:COCONU					
KYOPCK	P 0693	QUAD1:COCONU						
LASTX	P 1228	QUAD4:COCONU	QUAD5:COCONU					
LBL	P 11A4	QUAD4:COCONU	QUAD5:COCONU					
LD90	P 1995	QUAD6:COCONU						
LDDP10	P 0B1E	QUAD2:COCONU						
LDD_P	P 0B1D	QUAD2:COCONU						
LDSSTO	P 0797	QUAD1:COCONU	QUAD3:COCONU	QUAD2:COCONU				
LEFTJ	P 2BF7	QUAD10:COCONU	QUAD3:COCONU	QUAD1:COCONU	QUAD0:COCONU			
LINN1A	P 2A93	QUAD10:COCONU						
LINNM1	P 2A90	QUAD10:COCONU						
LINNUM	P 2A8B	QUAD10:COCONU	QUAD8:COCONU	QUAD1:COCONU	QUAD0:COCONU			
LN	P 11A6	QUAD4:COCONU	QUAD5:COCONU					
LN10	P 1B45	QUAD6:COCONU	QUAD4:COCONU					
LN1_PLUS_X	P 1220	QUAD4:COCONU	QUAD5:COCONU					
LNS80	P 1BD3	QUAD6:COCONU						
LNAP	P 1A8A	QUAD6:COCONU						
LNC10	P 1AAE	QUAD6:COCONU						
LNC10_	P 1AAD	QUAD6:COCONU						
LNC20	P 1ABD	QUAD6:COCONU						
LNSUB	P 19F9	QUAD6:COCONU						
LNSUB_MINUS	P 19F8	QUAD6:COCONU						
LOAD3	P 14FA	QUAD5:COCONU	QUAD2:COCONU					
LOG	P 11AC	QUAD4:COCONU	QUAD5:COCONU					
LSWKUP	P 0180	QUAD0:COCONU						
MASK	P 2C88	QUAD11:COCONU	QUAD9:COCONU	QUAD3:COCONU				
MEAN	P 11B9	QUAD4:COCONU	QUAD5:COCONU					
MEMCHK	P 0205	QUAD0:COCONU	QUAD4:COCONU					
MEMLFT	P 05A1	QUAD1:COCONU	QUAD8:COCONU	QUAD5:COCONU				

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MESSL	P 07EF	QUAD1:COCONU	QUAD11:COCONU	QUAD3:COCONU			
MIDDIG	P 0DE0	QUAD3:COCONU					
MINUS	P 1054	QUAD4:COCONU	QUAD5:COCONU				
MOD	P 104F	QUAD4:COCONU	QUAD5:COCONU				
MOD10	P 195C	QUAD6:COCONU	QUAD4:COCONU				
MODE	P 134D	QUAD4:COCONU	QUAD5:COCONU				
MODE1	P 134F	QUAD4:COCONU					
MOVREG	P 215C	QUAD8:COCONU					
MP1_10	P 184F	QUAD6:COCONU	QUAD7:COCONU				
MP2_10	P 184D	QUAD6:COCONU	QUAD7:COCONU	QUAD4:COCONU			
MP2_13	P 1852	QUAD6:COCONU	QUAD7:COCONU				
MPYI50	P 1865	QUAD6:COCONU					
MSG	P 1C6B	QUAD7:COCONU	QUAD8:COCONU	QUAD5:COCONU	QUAD1:COCONU		
MSG105	P 1C80	QUAD7:COCONU					
MSG110	P 1C86	QUAD7:COCONU					
MSGA	P 1C6C	QUAD7:COCONU	QUAD3:COCONU	QUAD1:COCONU	QUAD0:COCONU		
MSGAD	P 1C18	QUAD7:COCONU	QUAD5:COCONU				
MSGDE	P 1C22	QUAD7:COCONU	QUAD10:COCONU				
MSGDLY	P 037C	QUAD0:COCONU	QUAD7:COCONU				
MSGE	P 1C71	QUAD7:COCONU	QUAD8:COCONU				
MSGML	P 1C2D	QUAD7:COCONU	QUAD0:COCONU				
MSGNE	P 1C38	QUAD7:COCONU	QUAD0:COCONU				
MSGNL	P 1C3C	QUAD7:COCONU	QUAD3:COCONU				
MSGNO	P 1C64	QUAD7:COCONU	QUAD5:COCONU				
MSGOF	P 1C4F	QUAD7:COCONU	QUAD0:COCONU				
MSGPR	P 1C43	QUAD7:COCONU	QUAD8:COCONU	QUAD1:COCONU			
MSGRAM	P 1C67	QUAD7:COCONU	QUAD8:COCONU				
MSGROM	P 1C6A	QUAD7:COCONU	QUAD8:COCONU				
MSGTA	P 1C5F	QUAD7:COCONU	QUAD11:COCONU				
MSGWR	P 1C56	QUAD7:COCONU	QUAD8:COCONU				
MSGX	P 1C75	QUAD7:COCONU					
MSGYES	P 1C62	QUAD7:COCONU	QUAD5:COCONU				
MULTIPLY	P 105C	QUAD4:COCONU	QUAD5:COCONU				
NAM40	P 0F34	QUAD3:COCONU					
NAM44	P 0F7D	QUAD3:COCONU	QUAD1:COCONU				
NAME20	P 0EE6	QUAD3:COCONU					
NAME21	P 0EE9	QUAD3:COCONU					
NAME33	P 0EEF	QUAD3:COCONU					
NAME37	P 0F09	QUAD3:COCONU					
NAME4A	P 0FA4	QUAD3:COCONU	QUAD1:COCONU				
NAME4D	P 0FAC	QUAD3:COCONU	QUAD1:COCONU				
NAMEA	P 0ED9	QUAD3:COCONU					
NBYTA0	P 2D04	QUAD11:COCONU	QUAD1:COCONU				
NBYTAB	P 2D06	QUAD11:COCONU	QUAD2:COCONU	QUAD1:COCONU			
NEXT	P 0E50	QUAD3:COCONU					
NEXT1	P 0E45	QUAD3:COCONU	QUAD1:COCONU				
NEXT2	P 0E48	QUAD3:COCONU					
NEXT3	P 0E4B	QUAD3:COCONU					
NFRC	P 00F1	QUAD0:COCONU	QUAD10:COCONU				
NFRENT	P 00C4	QUAD0:COCONU	QUAD4:COCONU				
NFRFST	P 00F7	QUAD0:COCONU					
NFRKB	P 00C7	QUAD0:COCONU	QUAD11:COCONU	QUAD8:COCONU	QUAD3:COCONU	QUAD2:COCONU	
NFRKB1	P 00C6	QUAD0:COCONU	QUAD8:COCONU	QUAD2:COCONU			
NFRNC	P 00A5	QUAD0:COCONU	QUAD4:COCONU				
NFRNI0	P 0106	QUAD0:COCONU					
NFRPR	P 00EE	QUAD0:COCONU	QUAD5:COCONU	QUAD4:COCONU			
NFRPU	P 00F0	QUAD0:COCONU	QUAD10:COCONU	QUAD9:COCONU	QUAD5:COCONU	QUAD2:COCONU	QUAD1:COCONU

NFRSIG	P 00C2	QUAD0:COCONU	QUAD4:COCONU				
NFRST_PLUS	P 0BEE	QUAD2:COCONU	QUAD4:COCONU				
NFRX	P 00CC	QUAD0:COCONU	QUAD4:COCONU	QUAD3:COCONU			
NFRXY	P 00DA	QUAD0:COCONU	QUAD4:COCONU				
NLT000	P 0E91	QUAD3:COCONU					
NLT020	P 0EA0	QUAD3:COCONU	QUAD1:COCONU				
NLT040	P 0EAA	QUAD3:COCONU					
NM44_5	P 0F7E	QUAD3:COCONU	QUAD1:COCONU				
NOPRT	P 015B	QUAD0:COCONU					
NOREG9	P 095E	QUAD2:COCONU	QUAD11:COCONU				
NOSKP	P 1619	QUAD5:COCONU					
NOTFIX	P 0ADD	QUAD2:COCONU					
NRM10	P 1870	QUAD6:COCONU					
NRM11	P 1871	QUAD6:COCONU					
NRM12	P 1872	QUAD6:COCONU					
NRM13	P 1884	QUAD6:COCONU					
NROOM3	P 28C2	QUAD10:COCONU					
NULTST	P 0EC6	QUAD3:COCONU	QUAD8:COCONU	QUAD1:COCONU			
NULT_	P 0E65	QUAD3:COCONU					
NULT_3	P 0E7C	QUAD3:COCONU	QUAD1:COCONU				
NULT_5	P 0E8F	QUAD3:COCONU					
NWGOOS	P 07D4	QUAD1:COCONU	QUAD4:COCONU				
NXBYT3	P 29B7	QUAD10:COCONU	QUAD1:COCONU				
NXBYTA	P 29B9	QUAD10:COCONU	QUAD11:COCONU	QUAD9:COCONU	QUAD8:COCONU	QUAD1:COCONU	QUAD0:COCONU
NXBYTO	P 2D0B	QUAD11:COCONU	QUAD1:COCONU				
NXL1B	P 2B23	QUAD10:COCONU					
NXL3B2	P 2B63	QUAD10:COCONU	QUAD11:COCONU				
NXLCHN	P 2B49	QUAD10:COCONU					
NXLDEL	P 2AFD	QUAD10:COCONU	QUAD8:COCONU				
NXLIN	P 2B14	QUAD10:COCONU					
NXLIN3	P 2B5F	QUAD10:COCONU					
NXLINA	P 2B1F	QUAD10:COCONU					
NXLSST	P 2AF7	QUAD10:COCONU	QUAD8:COCONU				
NXLTX	P 2B77	QUAD10:COCONU	QUAD11:COCONU	QUAD9:COCONU	QUAD8:COCONU		
NXTBYT	P 2D07	QUAD11:COCONU	QUAD9:COCONU	QUAD1:COCONU			
OCT	P 1330	QUAD4:COCONU	QUAD5:COCONU				
OFF	P 11C8	QUAD4:COCONU	QUAD5:COCONU	QUAD2:COCONU	QUAD0:COCONU		
OFFSHF	P 0750	QUAD1:COCONU					
OFSHFT	P 0749	QUAD1:COCONU	QUAD11:COCONU	QUAD3:COCONU			
ONE_BY_X	P 11D6	QUAD4:COCONU	QUAD5:COCONU				
ONE_BY_X10	P 188B	QUAD6:COCONU	QUAD4:COCONU				
ONE_BY_X13	P 188E	QUAD6:COCONU	QUAD7:COCONU				
OPROMT	P 2E4C	QUAD11:COCONU	QUAD2:COCONU				
OUTLCD	P 2C80	QUAD11:COCONU					
OUTROM	P 2FEE	QUAD11:COCONU					
OVFL10	P 1429	QUAD5:COCONU	QUAD7:COCONU	QUAD2:COCONU	QUAD0:COCONU		
P10RTN	P 02AC	QUAD0:COCONU					
P6RTN	P 1670	QUAD5:COCONU	QUAD7:COCONU				
PACH10	P 03EC	QUAD0:COCONU					
PACH11	P 03F5	QUAD0:COCONU					
PACH12	P 03FC	QUAD0:COCONU					
PACH4	P 03E2	QUAD0:COCONU	QUAD1:COCONU				
PACK	P 11E7	QUAD4:COCONU	QUAD5:COCONU				
PACKE	P 2002	QUAD8:COCONU	QUAD10:COCONU	QUAD9:COCONU	QUAD5:COCONU		
PACKN	P 2000	QUAD8:COCONU	QUAD10:COCONU				
PAK200	P 2055	QUAD8:COCONU					
PAKEND	P 20AC	QUAD8:COCONU					

PAKSPC	P 20F2	QUAD8:COCONU						
PAR111	P 0CED	QUAD3:COCONU						
PAR112	P 0CF5	QUAD3:COCONU						
PARA06	P 0D22	QUAD3:COCONU						
PARA60	P 0D35	QUAD3:COCONU						
PARA61	P 0D37	QUAD3:COCONU						
PARA75	P 0D49	QUAD3:COCONU						
PARB40	P 0D99	QUAD3:COCONU						
PARS05	P 0C34	QUAD3:COCONU						
PARS56	P 0C93	QUAD3:COCONU	QUAD1:COCONU					
PARS75	P 0CCD	QUAD3:COCONU						
PARSDE	P 0C90	QUAD3:COCONU						
PARSE	P 0C05	QUAD3:COCONU	QUAD0:COCONU					
PARSEB	P 0D6D	QUAD3:COCONU						
PATCH1	P 21DC	QUAD8:COCONU	QUAD10:COCONU					
PATCH2	P 21E1	QUAD8:COCONU						
PATCH3	P 21EE	QUAD8:COCONU						
PATCH5	P 21F3	QUAD8:COCONU						
PATCH6	P 1C06	QUAD7:COCONU	QUAD5:COCONU					
PATCH9	P 1C03	QUAD7:COCONU						
PCKDUR	P 16FC	QUAD5:COCONU						
PCT	P 1061	QUAD4:COCONU	QUAD5:COCONU					
PCTCH	P 11EC	QUAD4:COCONU	QUAD5:COCONU					
PGMAON	P 0956	QUAD2:COCONU	QUAD1:COCONU	QUAD0:COCONU				
PI	P 1242	QUAD4:COCONU	QUAD5:COCONU					
PI_BY_2	P 199A	QUAD6:COCONU	QUAD7:COCONU	QUAD4:COCONU				
PKIOAS	P 2114	QUAD8:COCONU	QUAD0:COCONU					
PLUS	P 104A	QUAD4:COCONU	QUAD5:COCONU					
PMUL	P 1BE9	QUAD6:COCONU						
POWER_OF_TEN	P 12CA	QUAD4:COCONU	QUAD5:COCONU					
PR10RT	P 0372	QUAD0:COCONU						
PR14RT	P 1365	QUAD4:COCONU						
PR15RT	P 22DF	QUAD8:COCONU						
PR3RT	P 0EDD	QUAD3:COCONU						
PROMF1	P 05CB	QUAD1:COCONU	QUAD3:COCONU					
PROMF2	P 05D3	QUAD1:COCONU	QUAD11:COCONU	QUAD3:COCONU	QUAD0:COCONU			
PROMFC	P 05C7	QUAD1:COCONU						
PROMPT	P 1209	QUAD4:COCONU	QUAD5:COCONU					
PSE	P 11FC	QUAD4:COCONU	QUAD5:COCONU					
PSESTP	P 03AC	QUAD0:COCONU	QUAD4:COCONU					
PTBYTA	P 2323	QUAD8:COCONU	QUAD11:COCONU	QUAD10:COCONU	QUAD9:COCONU			
PTBYTM	P 2921	QUAD10:COCONU	QUAD8:COCONU					
PTBYTP	P 2328	QUAD8:COCONU						
PTLINK	P 231A	QUAD8:COCONU	QUAD10:COCONU					
PTLNKA	P 231B	QUAD8:COCONU						
PTLNKB	P 2321	QUAD8:COCONU						
PUTPC	P 2337	QUAD8:COCONU	QUAD11:COCONU	QUAD10:COCONU	QUAD9:COCONU	QUAD2:COCONU	QUAD0:COCONU	
PUTPCA	P 2339	QUAD8:COCONU						
PUTPCD	P 232C	QUAD8:COCONU	QUAD10:COCONU	QUAD2:COCONU				
PUTPCF	P 2331	QUAD8:COCONU						
PUTPCL	P 2AF3	QUAD10:COCONU	QUAD8:COCONU					
PUTPCX	P 232F	QUAD8:COCONU	QUAD9:COCONU	QUAD5:COCONU	QUAD3:COCONU	QUAD0:COCONU		
PUTREG	P 215E	QUAD8:COCONU						
P_R	P 11DC	QUAD4:COCONU	QUAD5:COCONU					
QUTCAT	P 03D5	QUAD0:COCONU	QUAD2:COCONU					
RAD	P 111F	QUAD4:COCONU	QUAD5:COCONU					
RAK06	P 0C7F	QUAD3:COCONU						

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RAK60	P 06FA	QUAD1:COCONU	QUAD3:COCONU		
RAK70	P 070A	QUAD1:COCONU			
RCL	P 122E	QUAD4:COCONU	QUAD5:COCONU		
RCSCR	P 1934	QUAD6:COCONU	QUAD7:COCONU		
RCSCR_	P 1932	QUAD6:COCONU	QUAD7:COCONU		
RDN	P 1252	QUAD4:COCONU	QUAD5:COCONU		
RDNSUB	P 14E9	QUAD5:COCONU			
REGLFT	P 059A	QUAD1:COCONU			
RFDS55	P 0949	QUAD2:COCONU	QUAD11:COCONU		
RG9LCD	P 08EF	QUAD2:COCONU	QUAD11:COCONU		
RMCK05	P 27EC	QUAD9:COCONU	QUAD0:COCONU		
RMCK10	P 27F3	QUAD9:COCONU			
RMCK15	P 27F4	QUAD9:COCONU			
RND	P 1257	QUAD4:COCONU	QUAD5:COCONU		
ROLBAK	P 2E42	QUAD11:COCONU	QUAD2:COCONU		
ROLLUP	P 1260	QUAD4:COCONU	QUAD5:COCONU		
ROMCHK	P 27E6	QUAD9:COCONU	QUAD4:COCONU	QUAD0:COCONU	
ROMH05	P 066C	QUAD1:COCONU	QUAD8:COCONU		
ROMH35	P 0678	QUAD1:COCONU	QUAD10:COCONU		
ROMHED	P 066A	QUAD1:COCONU	QUAD10:COCONU	QUAD9:COCONU	QUAD8:COCONU
ROUND	P 0A35	QUAD2:COCONU			
ROW0	P 2766	QUAD9:COCONU	QUAD0:COCONU		
ROW10	P 02A6	QUAD0:COCONU			
ROW11	P 25AD	QUAD9:COCONU	QUAD0:COCONU		
ROW12	P 2743	QUAD9:COCONU	QUAD0:COCONU		
ROW120	P 0519	QUAD1:COCONU			
ROW933	P 0467	QUAD1:COCONU			
ROW940	P 0487	QUAD1:COCONU	QUAD3:COCONU		
RST05	P 009B	QUAD0:COCONU	QUAD11:COCONU	QUAD3:COCONU	
RSTANN	P 0759	QUAD1:COCONU	QUAD0:COCONU		
RSTKB	P 0098	QUAD0:COCONU	QUAD4:COCONU	QUAD3:COCONU	QUAD2:COCONU
RSTMS0	P 038E	QUAD0:COCONU	QUAD8:COCONU		
RSTMS1	P 0390	QUAD0:COCONU	QUAD4:COCONU	QUAD1:COCONU	
RSTMSC	P 0392	QUAD0:COCONU			
RSTSEQ	P 0384	QUAD0:COCONU	QUAD8:COCONU	QUAD3:COCONU	
RSTSQ	P 0385	QUAD0:COCONU			
RSTST	P 08A7	QUAD2:COCONU			
RTJLBL	P 14C9	QUAD5:COCONU	QUAD3:COCONU	QUAD1:COCONU	QUAD0:COCONU
RTN	P 125C	QUAD4:COCONU	QUAD5:COCONU		
RTN30	P 272F	QUAD9:COCONU	QUAD10:COCONU		
RTOD	P 198C	QUAD6:COCONU	QUAD4:COCONU		
RUN	P 07C2	QUAD1:COCONU	QUAD9:COCONU	QUAD0:COCONU	
RUNING	P 0108	QUAD0:COCONU	QUAD9:COCONU		
RUNNK	P 011D	QUAD0:COCONU	QUAD8:COCONU		
RUN_STOP	P 1218	QUAD4:COCONU	QUAD5:COCONU		
RWOI10	P 04E9	QUAD1:COCONU			
RWO141	P 04F1	QUAD1:COCONU			
R_D	P 120E	QUAD4:COCONU	QUAD5:COCONU		
R_P	P 11C0	QUAD4:COCONU	QUAD5:COCONU		
R_SCAT	P 0BB7	QUAD2:COCONU	QUAD1:COCONU		
R_SUB	P 14ED	QUAD5:COCONU	QUAD4:COCONU	QUAD2:COCONU	
SAR021	P 2640	QUAD9:COCONU			
SAR022	P 2641	QUAD9:COCONU			
SAROM	P 260D	QUAD9:COCONU			
SAVR10	P 27D5	QUAD9:COCONU			
SAVRC	P 27DF	QUAD9:COCONU			
SAVRTN	P 27D3	QUAD9:COCONU	QUAD11:COCONU		

SCI	P 1265	QUAD4:COCONU	QUAD5:COCONU		
SCROLO	P 2CDE	QUAD11:COCONU	QUAD1:COCONU		
SCROLL	P 2CDC	QUAD11:COCONU			
SD	P 1D10	QUAD7:COCONU	QUAD4:COCONU		
SEARC1	P 2434	QUAD9:COCONU			
SEARCH	P 2433	QUAD9:COCONU	QUAD3:COCONU		
SEPXY	P 14D2	QUAD5:COCONU	QUAD4:COCONU		
SERR	P 24E8	QUAD9:COCONU			
SETQ_P	P 0B15	QUAD2:COCONU			
SETSST	P 17F9	QUAD5:COCONU	QUAD8:COCONU	QUAD2:COCONU	
SF	P 1269	QUAD4:COCONU	QUAD5:COCONU		
SGT019	P 25C9	QUAD9:COCONU			
SHF10	P 186D	QUAD6:COCONU	QUAD7:COCONU		
SHF40	P 186C	QUAD6:COCONU	QUAD5:COCONU		
SHIFT	P 1348	QUAD4:COCONU	QUAD5:COCONU		
SIGMA	P 1C88	QUAD7:COCONU	QUAD4:COCONU		
SIGMA_MINUS	P 1271	QUAD4:COCONU	QUAD5:COCONU		
SIGMA_PLUS	P 126D	QUAD4:COCONU	QUAD5:COCONU		
SIGN	P 1337	QUAD4:COCONU	QUAD5:COCONU		
SIGREG	P 1277	QUAD4:COCONU	QUAD5:COCONU		
SIN	P 1288	QUAD4:COCONU	QUAD5:COCONU		
SINFR	P 1947	QUAD6:COCONU	QUAD5:COCONU		
SINFRA	P 194A	QUAD6:COCONU			
SIZE	P 1292	QUAD4:COCONU	QUAD5:COCONU		
SIZSUB	P 1797	QUAD5:COCONU			
SKP	P 162E	QUAD5:COCONU			
SKPDEL	P 2349	QUAD8:COCONU	QUAD10:COCONU		
SKPLIN	P 2AF9	QUAD10:COCONU	QUAD8:COCONU	QUAD5:COCONU	
SNR10	P 243F	QUAD9:COCONU			
SNR12	P 2441	QUAD9:COCONU			
SNROM	P 2400	QUAD9:COCONU			
SQR10	P 18BE	QUAD6:COCONU	QUAD4:COCONU		
SQR13	P 18C1	QUAD6:COCONU	QUAD7:COCONU		
SQRT	P 1298	QUAD4:COCONU	QUAD5:COCONU		
SRBMAP	P 2FA5	QUAD11:COCONU	QUAD9:COCONU	QUAD8:COCONU	QUAD5:COCONU
SST	P 129E	QUAD4:COCONU	QUAD5:COCONU		
SSTBST	P 22DD	QUAD8:COCONU			
SSTCAT	P 0BB4	QUAD2:COCONU	QUAD8:COCONU		
STATCK	P 1CC8	QUAD7:COCONU			
STAYON	P 12A3	QUAD4:COCONU	QUAD5:COCONU		
STBT10	P 2EA3	QUAD11:COCONU	QUAD2:COCONU		
STBT30	P 2FE0	QUAD11:COCONU	QUAD8:COCONU		
STBT31	P 2FE5	QUAD11:COCONU	QUAD8:COCONU		
STDEV	P 11B2	QUAD4:COCONU	QUAD5:COCONU		
STFLGS	P 16A7	QUAD5:COCONU	QUAD11:COCONU		
STK	P 0DF3	QUAD3:COCONU			
STK00	P 0DFA	QUAD3:COCONU			
STK04	P 0E00	QUAD3:COCONU			
STMSGF	P 037E	QUAD0:COCONU			
STO	P 10DA	QUAD4:COCONU	QUAD5:COCONU		
STOLCC	P 2E5B	QUAD11:COCONU	QUAD2:COCONU		
STOP	P 1215	QUAD4:COCONU	QUAD5:COCONU		
STOPS	P 03A7	QUAD0:COCONU	QUAD8:COCONU		
STOPSB	P 03A9	QUAD0:COCONU	QUAD4:COCONU		
STORFC	P 07E8	QUAD1:COCONU	QUAD3:COCONU		
STOSTO	P 013B	QUAD0:COCONU	QUAD4:COCONU		
STO_DIVIDE	P 12C1	QUAD4:COCONU	QUAD5:COCONU		

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STO_MINUS	P 12B9	QUAD4:COCONU	QUAD5:COCONU		
STO_MULTIPLY	P 12A8	QUAD4:COCONU	QUAD5:COCONU		
STO_PLUS	P 12B0	QUAD4:COCONU	QUAD5:COCONU		
STSCR	P 1922	QUAD6:COCONU	QUAD7:COCONU		
STSCR_	P 1920	QUAD6:COCONU	QUAD7:COCONU		
SUBONE	P 1802	QUAD6:COCONU	QUAD7:COCONU		
SUMCHK	P 1667	QUAD5:COCONU	QUAD7:COCONU		
SUMCK2	P 1669	QUAD5:COCONU			
TAN	P 1282	QUAD4:COCONU	QUAD5:COCONU		
TBITMA	P 2F7F	QUAD11:COCONU	QUAD9:COCONU	QUAD5:COCONU	
TBITMP	P 2F81	QUAD11:COCONU	QUAD8:COCONU	QUAD3:COCONU	
TEN_TO_X	P 1BF8	QUAD6:COCONU	QUAD4:COCONU		
TEXT	P 2CAF	QUAD11:COCONU	QUAD0:COCONU		
TGSHF1	P 1FE7	QUAD7:COCONU	QUAD4:COCONU		
TODEC	P 1FB3	QUAD7:COCONU			
TOGSHF	P 1FE5	QUAD7:COCONU	QUAD3:COCONU	QUAD1:COCONU	
TONE	P 12D0	QUAD4:COCONU	QUAD5:COCONU		
TONE7	P 1716	QUAD5:COCONU			
TONE7X	P 16DB	QUAD5:COCONU	QUAD11:COCONU	QUAD0:COCONU	
TONEB	P 16DD	QUAD5:COCONU			
TONSTF	P 0054	QUAD0:COCONU	QUAD2:COCONU		
TOOCT	P 1F79	QUAD7:COCONU	QUAD4:COCONU		
TOPOL	P 1D49	QUAD7:COCONU	QUAD4:COCONU		
TOREC	P 1E75	QUAD7:COCONU	QUAD4:COCONU		
TRC10	P 19A1	QUAD6:COCONU	QUAD7:COCONU		
TRC30	P 1E38	QUAD7:COCONU			
TRCS10	P 1E57	QUAD7:COCONU			
TRG100	P 1E78	QUAD7:COCONU	QUAD4:COCONU		
TRG240	P 1ED1	QUAD7:COCONU			
TRG430	P 1F5B	QUAD7:COCONU			
TRGSET	P 21D4	QUAD8:COCONU	QUAD4:COCONU		
TSTMAP	P 14A1	QUAD5:COCONU	QUAD9:COCONU		
TXRW10	P 04F6	QUAD1:COCONU			
TXTLB1	P 2FC6	QUAD11:COCONU	QUAD2:COCONU		
TXTLBL	P 2FC7	QUAD11:COCONU	QUAD3:COCONU		
TXTROM	P 04F5	QUAD1:COCONU	QUAD11:COCONU		
TXTROW	P 04F2	QUAD1:COCONU			
TXTSTR	P 04F6	QUAD1:COCONU	QUAD11:COCONU		
UPLINK	P 2235	QUAD8:COCONU	QUAD11:COCONU	QUAD10:COCONU	QUAD9:COCONU	QUAD1:COCONU
VIEW	P 12D6	QUAD4:COCONU	QUAD5:COCONU		
WKUP10	P 0184	QUAD0:COCONU	QUAD3:COCONU		
WKUP21	P 01A7	QUAD0:COCONU			
WKUP25	P 01BA	QUAD0:COCONU			
WKUP70	P 01F5	QUAD0:COCONU			
WKUP80	P 01FF	QUAD0:COCONU			
XARCL	P 1696	QUAD5:COCONU	QUAD4:COCONU		
XASHF	P 1748	QUAD5:COCONU	QUAD4:COCONU		
XASN	P 276A	QUAD9:COCONU	QUAD4:COCONU		
XASTO	P 175C	QUAD5:COCONU	QUAD4:COCONU		
XAVIEW	P 0364	QUAD0:COCONU	QUAD4:COCONU		
XBAR	P 1CFE	QUAD7:COCONU	QUAD4:COCONU		
XBAR_	P 1D07	QUAD7:COCONU			
XBEEP	P 16D1	QUAD5:COCONU	QUAD4:COCONU		
XBST	P 2250	QUAD8:COCONU	QUAD4:COCONU		
XCAT	P 0B80	QUAD2:COCONU	QUAD4:COCONU		
XCF	P 164D	QUAD5:COCONU	QUAD4:COCONU		
XCLSIG	P 14B0	QUAD5:COCONU	QUAD4:COCONU		

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XCLX1	P 1102	QUAD4:COCONU	QUAD7:COCONU	
XCOPY	P 2165	QUAD8:COCONU	QUAD4:COCONU	
XCUTB1	P 0091	QUAD0:COCONU	QUAD3:COCONU	
XCUTE	P 015B	QUAD0:COCONU	QUAD3:COCONU	
XCUTEB	P 0090	QUAD0:COCONU		
XDEG	P 171C	QUAD5:COCONU	QUAD4:COCONU	
XDELET	P 22AF	QUAD8:COCONU	QUAD11:COCONU	QUAD4:COCONU
XDSE	P 159F	QUAD5:COCONU	QUAD4:COCONU	
XECROM	P 2F4A	QUAD11:COCONU	QUAD1:COCONU	
XEND	P 2728	QUAD9:COCONU		
XEQ	P 1328	QUAD4:COCONU	QUAD5:COCONU	
XEQC01	P 24EA	QUAD9:COCONU		
XFS	P 1645	QUAD5:COCONU	QUAD4:COCONU	
XFT100	P 18EC	QUAD6:COCONU	QUAD4:COCONU	
XGA00	P 248D	QUAD9:COCONU	QUAD4:COCONU	
XGI	P 24C7	QUAD9:COCONU	QUAD4:COCONU	
XGI07	P 24DA	QUAD9:COCONU		
XGI57	P 24C1	QUAD9:COCONU	QUAD11:COCONU	
XGNN10	P 2512	QUAD9:COCONU		
XGNN12	P 2514	QUAD9:COCONU		
XGNN40	P 255D	QUAD9:COCONU		
XGOIND	P 1323	QUAD4:COCONU	QUAD5:COCONU	
XGRAD	P 1726	QUAD5:COCONU	QUAD4:COCONU	
XGTO	P 2505	QUAD9:COCONU	QUAD0:COCONU	
XISG	P 15A0	QUAD5:COCONU	QUAD4:COCONU	
XLN1_PLUS_X	P 1B73	QUAD6:COCONU	QUAD4:COCONU	
XMSGPR	P 056D	QUAD1:COCONU		
XNNROW	P 0026	QUAD0:COCONU	QUAD9:COCONU	
XPACK	P 2000	QUAD8:COCONU	QUAD4:COCONU	
XPRMPT	P 03A0	QUAD0:COCONU	QUAD4:COCONU	
XRAD	P 1722	QUAD5:COCONU	QUAD4:COCONU	
XRDN	P 14BD	QUAD5:COCONU	QUAD4:COCONU	
XRND	P 0A2F	QUAD2:COCONU	QUAD4:COCONU	
XROLLUP	P 14E5	QUAD5:COCONU	QUAD4:COCONU	
XROM	P 2FAF	QUAD11:COCONU	QUAD0:COCONU	
XROMNF	P 2F6C	QUAD11:COCONU	QUAD1:COCONU	
XROW1	P 0074	QUAD0:COCONU	QUAD10:COCONU	
XRS45	P 07BE	QUAD1:COCONU	QUAD0:COCONU	
XRTN	P 2703	QUAD9:COCONU	QUAD4:COCONU	
XR_S	P 079D	QUAD1:COCONU	QUAD4:COCONU	
XSCI	P 16C0	QUAD5:COCONU	QUAD4:COCONU	
XSF	P 164A	QUAD5:COCONU	QUAD4:COCONU	
XSGREG	P 1659	QUAD5:COCONU	QUAD4:COCONU	
XSIGN	P 0FF4	QUAD3:COCONU	QUAD4:COCONU	
XSIZE	P 1795	QUAD5:COCONU	QUAD4:COCONU	
XSST	P 2260	QUAD8:COCONU	QUAD4:COCONU	
XSTYON	P 1411	QUAD5:COCONU	QUAD4:COCONU	
XTOHRS	P 19B2	QUAD6:COCONU	QUAD4:COCONU	
XTONE	P 16DE	QUAD5:COCONU	QUAD4:COCONU	
XVIEW	P 036F	QUAD0:COCONU	QUAD4:COCONU	
XXEQ	P 252F	QUAD9:COCONU	QUAD0:COCONU	
XX_EQ_0	P 1606	QUAD5:COCONU	QUAD4:COCONU	
XX_EQ_Y	P 1614	QUAD5:COCONU	QUAD4:COCONU	
XX_GT_0	P 15F1	QUAD5:COCONU	QUAD4:COCONU	
XX_GT_Y	P 15F8	QUAD5:COCONU	QUAD4:COCONU	
XX_LE_0	P 160D	QUAD5:COCONU		
XX_LE_0A	P 1609	QUAD5:COCONU	QUAD4:COCONU	

XX_LE_Y	P 1601	QUAD5:COCONU	QUAD4:COCONU
XX_LT_0	P 15FA	QUAD5:COCONU	QUAD4:COCONU
XX_LT_Y	P 15EF	QUAD5:COCONU	QUAD4:COCONU
XX_NE_0	P 1611	QUAD5:COCONU	QUAD4:COCONU
XX_NE_Y	P 1629	QUAD5:COCONU	QUAD4:COCONU
XY_TO_X	P 1B11	QUAD6:COCONU	QUAD4:COCONU
X_BY_Y13	P 1893	QUAD6:COCONU	QUAD7:COCONU
X_EQ_0	P 130E	QUAD4:COCONU	QUAD5:COCONU
X_EQ_Y	P 1314	QUAD4:COCONU	QUAD5:COCONU
X_GT_0	P 131A	QUAD4:COCONU	QUAD5:COCONU
X_GT_Y	P 1320	QUAD4:COCONU	QUAD5:COCONU
X_LE_0	P 12EF	QUAD4:COCONU	QUAD5:COCONU
X_LE_Y	P 12F6	QUAD4:COCONU	QUAD5:COCONU
X_LT_0	P 12E8	QUAD4:COCONU	QUAD5:COCONU
X_LT_Y	P 1308	QUAD4:COCONU	QUAD5:COCONU
X_NE_0	P 12DC	QUAD4:COCONU	QUAD5:COCONU
X_NE_Y	P 12E2	QUAD4:COCONU	QUAD5:COCONU
X_TO_2	P 106B	QUAD4:COCONU	QUAD5:COCONU
X_XCHNG	P 124C	QUAD4:COCONU	QUAD5:COCONU
X_XCHNG_Y	P 12FC	QUAD4:COCONU	QUAD5:COCONU
Y_MINUS_X	P 1421	QUAD5:COCONU	
Y_TO_X	P 102A	QUAD4:COCONU	QUAD5:COCONU

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recipient agrees NOT to contact manufacturer